GF Piping Systems

+GF+

Vinyl Piping Systems
Technical Manual 2024



Schedule 80 PVC

Schedule 40 and 80 ChlorFIT® CPVC

Schedule 40 PVC

Schedule 40 and 80 Clear PVC

Harvel Speciality Pipe

Extruded Shapes

Metric PVC

Valves

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+ Fittings
+ Valves
+ Instrumentation

Metric-To-Inch Conversion Chart

16 mm = ⅜"	50 mm = 1½"	160 mm = 6"	400 mm = 16"
20 mm = ½"	63 mm = 2"	225 mm = 8"	450 mm = 18"
25 mm = ¾"	75 mm = 2½"	280 mm = 10"	500 mm = 20"
32 mm = 1"	90 mm = 3"	315 mm = 12"	600 mm = 24"
40 mm = 1¼"	110 mm = 4"	355 mm = 14"	

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PVC and CPVC Piping

Overview Vinyl Piping Systems

Product Summary

PVC

Polyvinyl Chloride (PVC) is an amorphous thermoplastic material that can be formulated, or compounded, to target a specific application. Minor ingredients must be blended with PVC resin to create a PVC compound that is processable into a finished product. The physical properties of PVC can be altered considerably to provide desirable properties by compounding techniques. Additives such as impact modifiers, stabilizers, lubricants, processing aids, pigments, and other ingredients can be modified to obtain desirable properties. As such, PVC is available in a wide range of compounds formulated specifically for the productions of different PVC product lines. This ensures tight control over consistency and quality in the end product, which has been optimized for chemical resistance and pressure bearing capability. GF Piping Systems PVC materials are compliant with NSF/ANSI Standard 61 Drinking Water System Components – Health Effects and NSF/ANSI Standard 14 Plastics Piping System Components and Related Materials as being safe for use in potable water applications.

CPVC

Chlorinated polyvinyl chloride (CPVC) is created by subjecting PVC resin to a post chlorination reaction that results in additional chlorine atoms on the base molecule. This results in an amorphous thermoplastic material similar to PVC with added advantages: a higher heat distortion temperature and improved fire performance properties at relatively low cost compared to alternate materials. As with PVC, the physical properties of CPVC can be altered considerably to provide desirable properties by compounding techniques. Due to its higher heat distortion temperature, GF Piping Systems CPVC can be used in piping applications up to 60°F (33°C) higher than PVC piping. GF Piping Systems CPVC provides an economic solution for piping utilized in process piping, hot water, and similar service applications where operating conditions exceed the recommended temperature limits of PVC. This greatly expands the application range for thermoplastic pipe, providing an economical solution for piping used in elevated temperature service. GF Piping Systems CPVC materials are compliant with NSF/ANSI Standard 61 Drinking Water System Components – Health Effects and NSF/ANSI Standard 14 Plastics Piping System Components and Related Materials as being safe for use in potable water applications.

Cell Classification

ASTM Standard D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds calls out minimum physical property requirements of compounds that are used in the production of PVC and CPVC pipe and fittings. This standard classifies the physical properties through a Cell Classification system that calls out base resin, minimum impact strength, tensile strength, modulus of elasticity, heat deflection temperature under load, and flammability when tested per applicable ASTM standards.

Refer to Material Data: Physical Properties, Chemical Compatibility Awareness, and Industry Standards and Test Methods sections for additional information.

PVC

Unplasticized, or rigid, PVC compounds used for the manufacture of pipe and fittings has a Cell Classification of 12454 per ASTM D1784 and is also known as Type I Grade I PVC or PVC 1120.

CPVC

Unplasticized, or rigid, CPVC compounds used for the manufacture of pipe and fittings has a Cell Classification of 23447 per ASTM D1784 and is also known as Type IV Grade I CPVC or CPVC 4120.

NOTE: Although PVC and CPVC are similar in nature, they are not the same. Care should be used when investigating chemical resistance, joining/fabrication techniques, and service applications. GF Piping Systems utilizes several different PVC and CPVC compounds to produce different product lines. Different compounds may exhibit slight variations in actual physical properties and resultant cell classifications as compared to those stated. Contact GF Piping Systems Technical Services for additional information if necessary.

Temperature Effects

Thermoplastics tend to be more sensitive to temperature than metallic piping. The below sections describe properties that must be taken into account when designing with thermoplastics.

Ductility

Ductility is the ability of a solid material to deform under tensile stress. Thermoplastics have a relatively high ductility with respect to other materials at room temperature. When the temperature drops, ductility decreases; conversely, when temperature rises, ductility increases. The Charpy Impact Test is an inexpensive test to determine relative ductility. A material with low ductility is also considered to be brittle. A brittle material is more likely to fracture under stress. See the Material Data: Physical Properties section for additional ductility information.

Expansion and Contraction

Thermoplastics expand and contract significantly more than metals when temperature rises and drops, respectively. The thermal expansion and contraction must be considered when the system is designed. Large thermal contractions can cause large stresses in the system that must be compensated for through expansion joints, expansion loops, and/or changes in direction. A combination of the contraction of the piping and expansion of the transported fluid can cause devastating effects. See Thermal Expansion & Contraction Section for more information on designing for temperature changes.

Cold Temperatures

Expansion and contraction affect both the transported fluid and the piping material. Water is one of the only substances that expands when frozen. When temperatures drop, pure water becomes its most dense at 39°F (4°C). As the temperature drops from 39°F (4°C) to 32°F (0°C) water expands. In a completely filled pipe, this expansion can cause the pipe to burst. Care must be taken to ensure water systems do not freeze during operation or during down-time.

Though there are potential problems associated with below freezing temperatures, given proper design thermoplastics can be used in these temperatures. Due to the loss of ductility, special care must be taken during installation to prevent significant bending in the piping. Care is also to be taken during installation and operation to prevent any impacts. Bending and impacts that would normally not cause damage can cause fractures in low temperatures. It is recommended that protection to the piping system be added to prevent accidental impacts after installation.

Benefits with Respect to Metallic Piping

There are many benefits to using thermoplastics over traditional metal piping in non-essential systems including corrosion resistance, reduced cost, and reduced weight. The following sections highlight some of the major benefits.

Corrosion

Metallic piping systems are subject to the following types of damage:

1. Rusting – The formation of iron oxide on iron or steel by oxidation, especially in the presence of moisture.
2. Scaling – A coating of oxide formed on heated metal.
3. Pitting – Localized corrosion confined to a point or small area that takes the form of cavities.
4. Corrosion – Deterioration due to oxides that flake away from the base metal.
5. Electrolysis – The process in which a metallic surface is continuously corroded by another metal it is in contact with.

Thermoplastics will not rust, scale, pit, or corrode, nor are they subject to electrolysis. Metallic piping will quickly corrode in many applications. You are assured many years of leak-free, maintenance-free service with GF Piping Systems thermoplastics. Because of the corrosion protection offered by thermoplastics, painting is not required for indoor, non-exposed installations.

Installation Costs

Generally speaking, PVC and CPVC installation costs are substantially lower than metallic systems, and material costs are competitive. Solvent cemented connections contribute to this lower installed cost while the much lighter weight speeds and simplifies handling during installation Installation times are reduced by half, or more, when solvent welded systems are used.

Heat Loss

Thermoplastics are less thermally conductive than their metal counterparts, which leads to less heat loss during service. This benefits you in both hot and cold service as less energy is consumed initially as the fluid retains its temperature for a longer period in thermoplastic piping.

Metal piping can also be required to have protection from condensation due to the surrounding environment. Condensation can cause metal piping to corrode and can cause damage to electrical equipment around the piping system. Special care is to be taken when metal piping is used in cold fluid service as this is when condensation is most likely to form. Thermoplastics do not require protection from condensation which reduces both installation time and costs.

Weight

PVC and CPVC are light weight and easily transported during installation. Table 1-2 shows the density comparison between PVC, CPVC, and commonly used metal pipes. Weight is a design factor in some designs, and the weight savings in doing an entire system in thermoplastics is significant.

Table 1-2: Densities of various materials

Material	Density (lb/ft3)
Industrial PVC	87
Industrial CPVC	95
Copper	556
Steel	503
Stainless Steel	491

GF Piping Systems Quality Control

GF Piping Systems has always been known for providing the highest quality products, and that is no different when it comes to the manufacturing of our vinyl products, PVC and CPVC. While other manufacturers may consider these materials commodities, we consider them highly engineered fluid delivery systems that must satisfy demanding applications and are no different from the many other thermoplastic piping systems we manufacture. The same rigorous attention to detail, material qualification, raw material testing, and in-process quality assurance are essential steps that we apply to maintain these same consistently high standards of quality you've come to expect from GF Piping Systems.

It starts with the right choice of raw materials, choosing the best suppliers, and verifying that each and every shipment received meets our high standards. We insist on strict quality control throughout the entire manufacturing process to make sure our products not only meet or exceed our stringent specifications but also look good, provide trouble-free installation, and provide years of service. Finally, we take extra care in packaging and protecting the products before they leave our plant. You can expect the product to arrive at the job site in the same excellent condition as when it left our plant.

In-Process Manufacturing Steps

A coordinate measurement machine (CMM) is an extremely precise measuring device that is used to qualify dimensional tolerances on finished products. In many cases, the GF Piping Systems specifications are tighter than ASTM specifications. When making solvent cemented joints, a proper fit-up between pipe and fitting is important to ensure leak-proof connections. Too big of a gap can result in weak joints and possible premature failure.

Fittings are routinely pressure tested to failure. This process helps understand safety factors and ensures the fitting meets or exceeds ASTM standards.

In addition to pressure tests, fittings are also crushed under extreme pressures. ASTM requires a 25% compression in order to pass. A GF Piping Systems fitting will usually meet a 75% or better compression without fracture. Fittings that pass this test are considered ductile and will not fail catastrophically.

All manufacturing processes are constantly monitored, recorded, and analyzed to make sure products are produced to the most exacting specifications. In most cases, the GF Piping Systems internal tolerance and safety factor requirement specifications are tighter than industry standards and ASTM tolerances.

Packaging and Handling

All of these efforts to produce the highest quality part would be lost unless we ensure they are delivered to our customers in the same high quality condition they were produced. Unlike other manufacturers, GF Piping Systems wraps every lift of PVC and CPVC pipe in UV resistant plastic and encloses pipe ends so it arrives clean and free of scratches.

Applications

GF Piping Systems PVC and CPVC piping products can be found in applications in the following industries where water, chemical and corrosive fluid production, transfer, and mixing are utilized:

Chemical Process Industries
Chemical Processing - Industrial Waste - Laboratory Semiconductor - Pulp and Paper - Electroplating - Electronics Metal Treating - Chlor-Alkali - Fertilizer - Color Industries - Textile - Mining - Air Pollution Control - Photo Finishing - Printing

Industrial Processing
Plant Water Distribution - Cooling Water - Waste-Water - Process Water - Reclaim - Waste Treatment - HVAC Pollution Control - Brine Production and Disposal

Power Generation
Boiler Feed Water - Atomic Energy - Fly Ash Slurries - Coal Mining - Gas Industry - Oil Refining Cooling Water - Water and Waste Water Treatment

Food and Beverage
Potable Water - Bottled Water - Ultra-Pure Water - Food Processing - Meat Packing - Poultry Farming and Processing Distilled Water - Ice Production and Equipment

High Purity Applications
Semiconductor - Pharmaceutical Biotechnology - Chemical Manufacturing - Health Care - Universities - Clean Room Applications - Wet Bench Construction - Ultra-Pure Water

Water and Waste Water
Water Treatment - Waste Water Treatment - Reclaim Aeration - Desalination - Detention and Collection - Water Resource Conservation - Ground Remediation - Well Casing and Well Monitoring

Aquaculture
Life Support Systems - Public Aquariums - Fish Hatcheries - Lobster Ponds - Fish Ladders - Fish Farming

Recreational
Water Parks - Theme Parks - Fountains - Water Features - Swimming Pools

Agricultural/Irrigation
Commercial Irrigation - Golf Courses - Farming - Genetic Engineering - Greenhouses

General Services

Hot and Cold Water Plumbing - Municipal Water - Process Water - Commercial Roof Drain - Bridge Drain - Industrial Parks - Shopping Centers - Surface Drainage - Landfill - Marine Applications - Drain, Waste, and Vent (DWV)

Specialty Applications

Visual Leak Detection - Dual Containment - Decorative Applications - Civil Defense - Naval Military Applications - Fire Resistive Construction Overview Vinyl Piping Systems

Material Data: Physical Properties

Table 2-1: Typical physical properties for PVC and CPVC thermoplastic materials in Imperial units

Mechanical

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Density	lb/in3	0.0506 ± 0.0007	0.0549 ± 0.0007	D-792
Tensile Strength @ 73°F (23°C)	psi	7,200	7,750	D-638
Modulus of Elasticity (E) @ 73°F (23°C)	psi	430,000	360,000	D-638
Compressive Strength (ó) @ 73°F (23°C)	psi	9,500	10,000	D-695
Flexural Strength @ 73°F (23°C)	psi	13,000	13,000	D-790
Flexural Modulus @ 73°F (23°C)	psi	360,000	360,000	D-790
Izod Impact @ 73°F (23°C)	Ft-Lbs/In of Notch	0.75	2.0	D-256
Relative Hardness @ 73°F (23°C)	Rockwell "R"	110-120	117	D-785

Thermodynamics

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Coefficient of Thermal Linear Expansion (α)	in/in/°F	2.8 × 10-5	3.7 × 10-5	D-696
Thermal Conductivity	BTU-in/hr-ft2-°F	1.30	0.95	C-177
Maximum Operating Temperature	°F	140	200	200
Heat Deflection Temperature @ 264 psi (18 bar)	°F	158	226	D-648

Other

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Average Time of Burning	sec.	< 5	< 5	D-635
Average Extent of Burning	in.	< 0.4	< 0.4	D-635
Flame Spread		Not tested	< 25	E-84
Flash Ignition	°F	730	900	
Smoke Generation		Not tested	< 50	
Flammability (0.062 in, 1.57 mm)		V-0	V-0, 5VB, 5VA	UL-94
Softening Starts, approx.	°F	250	295	
Material Becomes Viscous	°F	350	395	
Material Carbonizes	°F	425	450	
Limiting Oxygen Index (LOI)	% Vol.	43	60	D-2863

Other

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Water Absorption	%	+0.05 @ 77°F	+0.03 @ 77°F	D-570
Poisson's Ratio @ 73°F (23°C)		0.380	0.386	
ASTM Cell Classification		12454	23447	D-1784
Color		White, Dark Gray	Medium Gray	
NSF Potable Water Approved		Yes	Yes	

Note: This data is based on information compiled from multiple sources.

Table 2-2: Typical physical properties of PVC and CPVC thermoplastic materials in Metric units

Mechanical

Properties	Unit	PVC (Metric)	CPVC (Metric)	ASTM Test
Density	g/cm^3	1.40 ± 0.02	1.52 ± 0.02	D-792
Tensile Strength @ 73°F (23°C)	MPa	50	53	D-638
Modulus of Elasticity (E) @ 73°F (23°C)	MPa	2970	2480	D-638
Compressive Strength (ó) @ 73°F (23°C)	MPa	65.5	69	D-695
Flexural Strength @ 73°F (23°C)	MPa	90	90	D-790
Flexural Modulus @ 73°F (23°C)	MPa	2500	2500	D-790
Izod Impact @ 73°F (23°C)	m-g/cm of Notch	38	109	D-256
Relative Hardness @ 73°F (23°C)	Rockwell "R"	110-120	117	D-785

Thermodynamics

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Coefficient of Thermal Linear Expansion (α)	mm/mm/°C	5.1 × 10-5	6.7 × 10-5	D-696
Thermal Conductivity	KCal/m-hr-°C	0.161	0.118	C-177
Maximum Operating Temperature	°C	60	93	200
Heat Deflection Temperature @ 264 psi (18 bar)	°C	70	108	D-648

Other

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Average Time of Burning	sec.	< 5	< 5	D-635
Average Extent of Burning	mm	< 10	< 10	D-635
Flame Spread		Not tested	< 25	E-84
Flash Ignition	°C	390	482	
Smoke Generation		Not tested	< 50	
Flammability (0.062 in, 1.57 mm)		V-0	V-0, 5VB, 5VA	UL-94
Softening Starts, approx.	°C	121	146	
Material Becomes Viscous	°C	177	202	
Material Carbonizes	°C	218	232	
Limiting Oxygen Index (LOI)	% Vol.	43	60	D-2863

Other

Properties	Unit	PVC (Imperial)	CPVC (Imperial)	ASTM Test
Water Absorption	%	+0.05 @ 25°C	+0.03 @ 25°C	D-570
Poisson's Ratio @ 73°F (23°C)		0.380	0.386	
ASTM Cell Classification		12454	23447	D-1784
Color		White, Dark Gray	Medium Gray	
NSF Potable Water Approved		Yes	Yes	

Note: This data is based on information compiled from multiple sources.

Engineering Design

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

Note: The equations in this section give a general idea as to the design of a piping system but do not substitute for the judgement of a licensed engineer.

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

The following sections detail the basic theory and equations associated with each of these factors. Note that unless otherwise specified, all calculations assume an infinitely long pipe, and if a short pipe is being used the calculations may be significantly different. A short pipe varies in definition, but a good rule of thumb is L/D should be greater than 10-50 where L is the length of pipe and D is the outer diameter.

PVC and CPVC Schedule Dimension Pipe - Imperial

Schedule 40

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
⅛	0.405	0.249	0.068	0.051
¼	0.540	0.344	0.088	0.086
⅜	0.675	0.473	0.091	0.115
½	0.840	0.602	0.109	0.170
¾	1.050	0.804	0.113	0.226
1	1.315	1.029	0.133	0.333
1¼	1.660	1.360	0.140	0.450
1½	1.900	1.590	0.145	0.537
2	2.375	2.047	0.154	0.720
2½	2.875	2.445	0.203	1.136
3	3.500	3.042	0.216	1.488
3½	4.000	3.521	0.226	1.789
4	4.500	3.998	0.237	2.118
5	5.563	5.016	0.258	2.874
6	6.625	6.031	0.280	3.733
8	8.625	7.942	0.322	5.619
10	10.750	9.976	0.365	7.966
12	12.750	11.889	0.406	10.534
14	14.000	13.073	0.437	12.462
16	16.000	14.940	0.500	16.286
18	18.000	16.809	0.562	20.587
20	20.000	18.743	0.593	24.183
24	24.000	22.544	0.687	33.652

Schedule 80

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
⅛	0.405	0.195	0.095	0.063
¼	0.540	0.282	0.119	0.105
⅜	0.675	0.403	0.126	0.146
½	0.840	0.526	0.147	0.213
¾	1.050	0.722	0.154	0.289
1	1.315	0.936	0.179	0.424
1¼	1.660	1.255	0.191	0.586
1½	1.900	1.476	0.200	0.711
2	2.375	1.913	0.218	0.984
2½	2.875	2.290	0.276	1.500
3	3.500	2.864	0.300	2.010
3½	4.000	3.326	0.318	2.452
4	4.500	3.786	0.337	2.938
5	5.563	4.768	0.375	4.078
6	6.625	5.709	0.432	5.610
8	8.625	7.565	0.500	8.522
10	10.750	9.493	0.593	12.635
12	12.750	11.294	0.687	17.384
14	14.000	12.410	0.750	20.852
16	16.000	14.213	0.843	26.810
18	18.000	16.014	0.937	33.544
20	20.000	17.814	1.031	41.047
24	24.000	21.418	1.218	58.233

Schedule 120

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
½	0.840	0.480	0.170	0.236
¾	1.050	0.690	0.170	0.311
1	1.315	0.891	0.200	0.464
1¼	1.660	1.204	0.215	0.649
1½	1.900	1.423	0.225	0.787
2	2.375	1.845	0.250	1.111
2½	2.875	2.239	0.300	1.615
3	3.500	2.758	0.350	2.306
4	4.500	3.574	0.437	3.713
6	6.625	5.434	0.562	7.132
8	8.625	7.189	0.718	11.27

PVC Standard Dimension Ratio Pipe

SDR 13.5

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
½	0.840	0.696	0.062	0.110

SDR 21

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
¾	1.050	0.910	0.060	0.136
1	1.315	1.169	0.063	0.180
1¼	1.660	1.482	0.079	0.278
1½	1.900	1.700	0.090	0.358
2	2.375	2.129	0.113	0.550
2½	2.875	2.581	0.137	0.797
3	3.500	3.146	0.167	1.168
3½	4.000	3.597	0.190	1.520
4	4.500	4.046	0.214	1.927
5	5.563	5.001	0.265	2.948
6	6.625	5.955	0.316	4.185
8	8.625	7.756	0.410	7.069

SDR 26

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
1	1.315	1.175	0.060	0.173
1¼	1.660	1.512	0.064	0.233
1½	1.900	1.734	0.073	0.300
2	2.375	2.173	0.091	0.456
2½	2.875	2.635	0.110	0.657
3	3.500	3.210	0.135	0.966
3½	4.000	3.672	0.154	1.250
4	4.500	4.134	0.173	1.569
5	5.563	5.108	0.214	2.411
6	6.625	6.084	0.255	3.414
8	8.625	7.921	0.332	5.784
10	10.750	9.874	0.413	8.971
12	12.750	11.711	0.490	12.620
14	14.000	12.860	0.538	15.205
16	16.000	14.696	0.615	19.877
18	18.000	16.533	0.692	25.156
20	20.000	18.370	0.769	31.057
24	24.000	22.043	0.923	44.744

SDR 41

Nominal Size (inch)	Outside Diameter	Average Inside Diameter	Minimum Wall	Nominal Weight per Foot
18	18.000	17.070	0.439	15.370
20	20.000	18.970	0.489	18.920
24	24.000	22.748	0.585	27.320

Pressure Rating

Determining Pressure-Stress Pipe Relationships

The pressure rating of a pipe is determined by the circumferential stress resulting from internal pressure. The pressure rating of a pipe represents the maximum allowable operating pressure within a piping system for water at 73°F (23°C). The hydrostatic design basis (HDB) is an estimated long-term strength in the circumferential (hoop) direction; for both PVC and CPVC the HDB for long-term calculations is 4000 psi (28 MPa) and the equivalent short-term value is 6400 psi (44 MPa). ASTM requires a safety factor (SF) of 2 for long-term pressures and 3.2 for short-term pressures. The pressure ratings for both PVC and CPVC are listed below. The relationship between maximum allowable internal pressure, circumferential stress, wall thickness, and diameter is governed by the following equations:

Equation (3-1) - Imperial

$$P = \frac{1}{SF} \times \frac{2 \times St}{D_o - t}$$

Equation (3-2) - Metric

$$P = \frac{1}{SF} \times \frac{20 \times St}{D_o - t}$$

Where:
P = Internal Pressure, psi (bar)
S = Circumferential Stress, psi (MPa)
t = Wall Thickness, in. (mm)
D_o = Outside Pipe Diameter, in. (mm.)
SF = Safety Factor

Equation (3-1) - Imperial Example

What is the long-term pressure rating of 1" Schedule 80 Industrial PVC Pipe?

Equation (3-1) - Schedule Long-Term Pressure Rating

S = 4000 psi D_o = 1.315 in
t = 0.179 in SF = 2.0

$$P = \frac{1}{2.0} \times \frac{2\,(4000psi)(0.179in)}{1.315in - 0.179in}$$

$$P = 630psi$$

Equation (3-1) - Schedule Short-Term Pressure Rating

S = 6400 psi D_o = 1.315 in
t = 0.179 in SF = 3.2

$$P = \frac{1}{3.2} \times \frac{2\,(6400psi)(0.179in)}{1.315in - 0.179in}$$

$$P = 630psi$$

Equation (3-2) - Metric Example

What is the short-term burst pressure rating of 1" Schedule 80 Industrial CPVC Pipe?

Equation (3-2) - Metric Long-Term Pressure Rating

S = 27.6 bar D_o = 33.40 mm
t = 4.55 mm SF = 2.0

$$P = \frac{1}{2.0} \times \frac{20\,(27.6\text{MPa})(4.55\text{mm})}{33.40\text{mm} - 4.55\text{mm}}$$

P = 43.4 bar

Equation (3-2) - Metric Short-Term Pressure Rating

S = 44.0 bar D_o = 33.40 mm
t = 4.55 mm SF = 3.2

$$P = \frac{1}{3.2} \times \frac{20\,(44.0\text{MPa})(4.55\text{mm})}{33.40\text{mm} - 4.55\text{mm}}$$

P = 43.4 bar

The table below shows the maximum pressure rating results of Equation (3-1) and Equation (3-2) for the PVC and CPVC pipe sizes and schedules available from GF Piping Systems.

Table 3-2: Maximum pressure rating for all PVC and CPVC pipe at 73°F (23°C) for available sizes and Schedules

Nominal Size (inch)	Schedule 40		Schedule 80		Schedule 120	
	P (psi)	P (bar)	P (psi)	P (bar)	P (psi)	P (bar)
⅛	810	55.8	1230	84.8	—	—
¼	780	53.8	1130	77.9	—	—
⅜	620	42.7	920	63.4	—	—
½	600	41.4	850	58.6	1010	69.6
¾	480	33.1	690	47.6	770	53.1
1	450	31.0	630	43.4	720	49.6
1¼	370	25.5	520	35.9	600	41.4
1½	330	22.8	470	32.4	540	37.2
2	280	19.3	400	27.6	470	32.4
2½	300	20.7	420	29.0	470	32.4
3	260	17.9	370	25.5	440	30.3
3½	240	16.5	350	24.1	—	—
4	220	15.2	320	22.1	430	29.6
5	190	13.1	290	20.0	—	—
6	180	12.4	280	19.3	370	25.5
8	160	11.0	250	17.2	380	26.2
10	140	9.7	230	15.9	—	—
12	130	9.0	230	15.9	—	—
14	130	9.1	220	15.4	—	—
16	130	9.1	220	15.4	—	—
18	130	9.1	220	15.4	—	—
20	120	8.4	220	15.4	—	—
24	120	8.4	210	14.7	—	—

Negative Pressures

Critical collapse pressure is the maximum allowable pressure that can be applied externally to a pipe and is directly related to the wall thickness and diameter of the pipe selected. Examples of when external pressure conditions can occur are as follows:

1. When buried pipe is subjected to soil loads
2. Underwater applications
3. Vacuum service
4. Pipe installed on pump suction lines

The actual external load being applied to the pipe is the difference between the external pressure and the internal pressure which counteract each other. Thus, a pressurized pipe can withstand a greater external load than an empty pipe. As implied by the collapse rating, thermoplastic pipe is suitable for vacuum pressure conditions as well. The process for determining maximum vacuum pressures are the same as for external pressures as negative pressure inside the pipe is equivalent to positive pressure outside the pipe.

Note: Collapse pressure calculations are for static external pressures only. Dynamic factors are not taken in to account and may cause additional stresses.

Equation (3-3) and Equation (3-4) below are the basic formulas for calculating critical collapse pressure applied uniformly to a long pipe.

Equation (3-3) - Imperial

$$P_c = \frac{1}{SF} \times \frac{2 \times E}{(1 - \nu^2)(D_{ave} / t_{min})^3}$$

Equation (3-4) - Metric

$$P_c = \frac{1}{SF} \times \frac{20 \times E}{(1 - \nu^2)(D_{ave} / t_{min})^3}$$

Where:
P_c = Critical Collapse Pressure, psi (bar)
E = Modulus of Elasticity, psi (MPa)
ν = Poisson's Ratio
D_{ave} = Average Pipe Diameter, in. (mm)
t_{min} = Minimum wall thickness, in. (mm)
SF = Safety factor

Equation (3-3) - Imperial Examples

What is the critical collapse pressure for 1" Schedule 80 Industrial PVC Pipe?

Equation (3-3) - Schedule with no Safety Factor

E = 420,000psi D_{ave} = 1.136in t_{min} = 0.179
ν = 0.41 SF = 1.0

D_{ave} = 1.315in - 0.179in = 1.136in

$$P_c = \frac{1}{1.0} \times \frac{2 \times 420{,}000\text{psi}}{(1 - 0.41^2)(1.136\text{in} / 0.179\text{in})^3}$$

P_c = 3950psi

Equation (3-3) - Schedule with Safety Factor = 3.0

E = 420,000psi D_{ave} = 1.136in t_{min} = 0.179
ν = 0.41 SF = 3.0

D_{ave} = 1.315in - 0.179in = 1.136in

$$P_c = \frac{1}{3.0} \times \frac{2 \times 420{,}000\text{psi}}{(1 - 0.41^2)(1.136\text{in} / 0.179\text{in})^3}$$

P_c = 1316psi

Equation (3-4) - Metric Examples

What is the short-term burst pressure rating of 1" Schedule 80 Industrial CPVC Pipe?

Equation (3-4) - Metric with no Safety Factor

$E = 2500MPa$ $D_{ave} = 28.85mm$ $t_{min} = 4.55mm$

$\nu = 0.386$ $SF = 1.0$

$D_{ave} = 33.40mm - 4.55mm = 28.85mm$

$$P_c = \frac{1}{1.0} \times \frac{20 \times 2500MPa}{(1 - 0.386^2)(28.85mm / 4.55mm)^3}$$

$P_c = 230bar$

Equation (3-4) - Metric with Safety Factor = 3.0

$E = 2500MPa$ $D_{ave} = 28.85mm$ $t_{min} = 4.55mm$

$\nu = 0.386$ $SF = 3.0$

$D_{ave} = 1.315in - 0.179in = 1.136in$

$$P_c = \frac{1}{3.0} \times \frac{20 \times 2500MPa}{(1 - 0.386^2)(28.85mm / 4.55mm)^3}$$

$P_c = 77bar$

GF Piping Systems recommends the use of solvent-cemented connections when using PVC and CPVC piping in vacuum service applications. Threaded connections are not recommended due to the greater potential for leakage when used in negative pressure applications.

The following Table 3-3, Table 3-4 and Table 3-5 give the calculated critical collapse pressure with no safety factor. For long term collapse pressures, values should be divided by a safety factor of 2 or 3.

Also, note that external pressures are also subject to temperature derating factors.

Table 3-3: Short term collapse pressure for available sizes of PVC Schedule 120 pipe at 73°F (23°C)

Nominal Size (inch)	Industrial PVC	
	P (psi)	P (bar)
½	16494	1137.2
¾	7280	501.9
1	5827	401.8
1¼	3326	229.3
1½	2447	168.7
2	1644	113.4
2½	1597	110.1
3	1385	95.5
4	1256	86.6
6	804	55.4
8	756	52.1

Table 3-4: Short term collapse pressure for available sizes of PVC and CPVC Schedule 40 pipe at 73°F (23°C)

Nominal Size (inch)	Industrial PVC		Industrial CPVC	
	P (psi)	P (bar)	P (psi)	P (bar)
⅛	8258	569.4	-	-
¼	7418	511.4	6244	430.5
⅜	3803	262.2	3201	220.7
½	3332	229.8	2805	193.4
¾	1763	121.6	1484	102.3
1	1432	98.7	1205	83.1
1¼	785	54.2	661	45.6
1½	567	39.1	477	32.9
2	335	23.1	282	19.4
2½	441	30.4	371	25.6
3	286	19.7	241	16.6
3½	216	14.9	182	12.5
4	173	11.9	145	10.0
5	116	8.0	97	6.7
6	86	6.0	73	5.0
8	59	4.0	49	3.4
10	44	3.0	37	2.5
12	36	2.5	30	2.1
14	34	2.3	28	2.0
16	34	2.3	28	2.0
18	34	2.3	28	2.0
20	29	2.0	24	1.7
24	26	1.8	22	1.5

Table 3-5: Short term collapse pressure for available sizes of PVC and CPVC Schedule 80 pipe at 73°F (23°C)

Nominal Size (inch)	Industrial PVC		Industrial CPVC	
	P (psi)	P (bar)	P (psi)	P (bar)
⅛	29060	2003.6	-	-
¼	22804	1572.3	19107	1317.4
⅜	12207	841.6	10228	705.2
½	9637	664.5	8075	556.8
¾	5127	353.5	4296	296.2
1	3950	272.4	3310	228.2
1¼	2219	153.0	1860	128.2
1½	1644	113.4	1378	95.0
2	1042	71.9	873	60.2
2½	1209	83.4	1013	69.9
3	832	57.4	697	48.1
3½	650	44.8	545	37.6
4	536	36.9	449	30.9
5	381	26.3	320	22.0
6	343	23.6	287	19.8
8	235	16.2	197	13.6
10	201	13.9	168	11.6
12	187	12.9	156	10.8
14	183	12.6	153	10.6
16	174	12.0	146	10.0
18	167	11.5	140	9.7
20	162	11.2	136	9.4
24	154	10.6	129	8.9

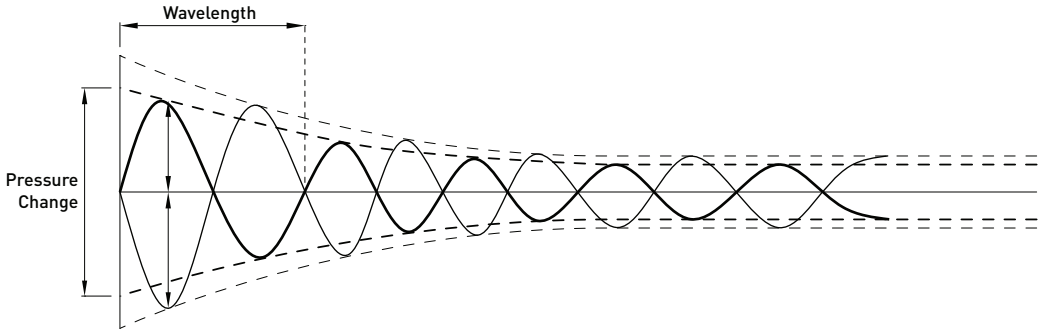
Surge Pressure (Water Hammer)

Surge pressure, or water hammer, is a term used to describe dynamic surges caused by pressure changes in a piping system. They occur whenever there is a deviation from the steady state, i.e.; when the velocity of the fluid is increased or decreased, and may be transient or oscillating. Waves of positive or negative pressure may be generated by any of the following:

- Opening or closing of a valve
- Pump startup or shutdown
- Change in pump or turbine speed
- Wave action in a feed tank
- Entrapped air

The pressure waves travel along at speeds limited by the speed of sound in the medium, causing the pipe to expand and contract. The energy carried by the wave is dissipated and the waves are progressively damped (see figure below).

The pressure excess to water hammer must be considered in addition to the hydrostatic load, and this total pressure must be sustainable by the piping system. In the case of oscillatory surge pressures, extreme caution is needed as surging at the harmonic frequency of the system could lead to catastrophic damage.



The maximum positive or negative addition of pressure due to surging is a function of fluid velocity, fluid density, bulk fluid density and pipe dimensions of the piping system. It can be calculated using the following steps.

Step 1

Determine the velocity of the pressure wave in pipes.

v_w = velocity of pressure wave (ft/s)
K = bulk modulus of elasticity of fluid (psi)
ρ = fluid density (slugs/ft^3)
n_i = conversion factor 1/144 (ft^2/in^2)
E = modulus of elasticity of pipe wall (psi)
d_i = pipe inner diameter (inch)
e = pipe wall thickness (inch)

$$v_w = \sqrt{\frac{K}{\rho \times n_i \left(1+\frac{K \times d_i}{e \times E}\right)}}$$

Step 2

Critical time for valve closure.

t_c = Time for Valve Closure (sec)
V_w = Velocity of Pressure Wave (ft/sec)
L = Upstream Pipe Length (ft)

$$t_c = \frac{2L}{V_w}$$

Step 3

Maximum pressure increase; assume valve closure time is less than the critical closure time and fluid velocity goes to 0.

P_i = Maximum Total Pressure (lb/in^2)
δ = Fluid Density (slugs/ft^3)
V = Fluid Velocity (ft/sec)
V_w = Velocity of Pressure Wave
n_i = Conversion Factor 1/144 (ft^2/in^2)

$$P_i = \delta \cdot V \cdot V_w n_i$$

Special Consideration

Calculate the Maximum Instantaneous System Pressure.

P_{max} = Maximum System Operating Pressure (lb/in^2)
P_i = Maximum Pressure Increase (lb/in^2)
P_s = Standard System Operating Pressure (lb/in^2)

$$P_{max} = P_i + P_s$$

Cautionary Note

Caution is recommended if P_{max} is greater than the maximum system design pressure multiplied by a safety factor of 2×.
e.g., Pipe is rated at 150 psi. If P_{max} exceeds 300 psi (150 psi × 2 safety factor), then precaution must be implemented in case of maximum pressure wave (i.e. water hammer) to prevent possible pipe failure.

Step 4

Determine the Maximum System Pressure Increase with Gradual Valve Closure

$$P_g = \frac{2 \cdot \delta \cdot L \cdot V \cdot n_i}{t_v}$$

P_g = Gradual Pressure Increase with Valve Closure (lb/in²)
L = Upstream Pipe Length (ft.)
V = Fluid Velocity (ft./sec)
n_i = Conversion Factor 1/144 (ft²/in²)
t_v = Time of Valve Closure (sec)

Thrust Blocking

It is recommended to limit velocities to 5 ft/s (1.5 m/s), especially with larger diameters (6 in and above), and consideration should be given to stresses induced with intermittent pump operation, quick opening stresses induced with intermittent pump operation, quick opening valves, and back flow in elevated discharge lines. Use of bypass piping with electrically actuated time cycle valves or variable speed pumps and check valves on the discharge side are suggested with higher flow rates.

Thrust blocking should be considered for directional changes and pump operations in buried lines 10 in and above, particularly where fabricated fittings are utilized. Above grade installations 10 in and above should have equivalent bracing to simulate thrust blocking at directional changes and for intermittent pump operations. Thrust blocking of directional changes and time cycle valves are also recommended for large diameter drain lines in installations such as large swimming pools and tanks. Use of appropriate pump vibration dampers are also recommended.

The calculation for thrusts due to static internal pressure is below followed by a table of values for the available sizes.

Equation (3-5) - Imperial

$$F_T = \frac{D_i^2 \times \pi}{4} \times P_W C_T$$

Equation (3-6) - Metric

$$F_T = \frac{D_i^2 \times \pi}{40} \times P_W C_T$$

Where:
F_T = Thrust Force, lb (N)
D_i = Inner Diameter, in (mm)
P_W = Working Pressure, psi (bar)
C_T = Thrust Constant

Equation (3-5) - Imperial Example

What is the thrust from static internal pressure of a 1" Schedule 80 Industrial Plus PVC pipe at full working pressure at a 90° ell fitting?

P_W = 630psi C_T = 1.414

D_i = 1.315in - 2(0.179in) = 0.957in

$$F_T = \frac{(0.957in)^2 \times \pi}{4} \times (630psi)(1.414)$$

F_T = 641lb

Equation (3-6) - Metric Example

What is the thrust from static internal pressure of a 1" Schedule 80 Industrial CPVC pipe at full working pressure at a 45° ell fitting?

P_W = 43.4bar C_T = 0.764

D_i = 33.4mm - 2(4.55mm) = 24.3mm

$$F_T = \frac{(24.3mm)^2 \times \pi}{40} \times (43.4bar)(0.764)$$

F_T = 1540N

Equation (3-7) - Imperial/Metric

$F_R = D_O \times \pi \times L_S \times T_C$ (Imperial/Metric Example)

Where:
F_R = Joint Resistance to Thrust, lb (N)
D_O = Outside Diameter of Pipe, in (mm)
L_S = Length of Socket, in (mm)
T_C = Shear Strength of Cement Bond psi (MPa)*
*Usually at least 300psi (2.1MPa) in a good bond

Equation (3-7) - Imperial Example

What is the joint resistance to thrust for a 1" Schedule 80 PVC Industrial Plus pipe at a 90° ell fitting?

D_O = 1.315in L_S = 1.125in T_C = 300psi

F_R = (1.315in) × π × (1.125in) × (300psi)

F_R = 1395lbs

Equation (3-7) - Metric Example

What is the joint resistance to thrust for a 1" Schedule 80 Industrial CPVC pipe at a 45° ell fitting?

D_O = 33.4mm L_S = 28.6mm T_C = 2.1MPa

F_R = (33.4mm) × π × (28.6mm) × (2.1MPa)

F_R = 6302N

Equation (3-9) - Imperial Example

What is the joint resistance to thrust for a 1" Schedule 80 PVC Industrial Plus pipe at a 90° ell fitting?

D_O = 1.315in L_S = 1.125in T_C = 300psi

F_R = (1.315in) × π × (1.125in) × (300psi)

F_R = 1395lbs

Equation (3-9) - Metric Example

What is the joint resistance to thrust for a 1" Schedule 80 Industrial CPVC pipe at a 45° ell fitting?

D_O = 33.4mm L_S = 28.6mm T_C = 2.1MPa

F_R = (33.4mm) × π × (28.6mm) × (2.1MPa)

F_R = 6302N

Table 3-6: Thrust constant for various fittings

Fitting	C_T
Tee	1.000
22.5° Ell	0.390
45° Ell	0.764
60° Ell	1.000
90° Ell	1.414
Plugs and Caps	1.000

Table 3-7: Thrust in pounds from static internal pressure

THRUST IN POUNDS FROM STATIC INTERNAL PRESSURE							
Size in.	**Socket Depth in.**	**For Plug, 60° Ell Cap Tee**	**For 22.5° Ell**	**For 45° Ell**	**For 90° Ell**	**Joint Resistant To Thrust**	**90° Ell Safety Factor**
6	6	7,170	2,800	16	16	16	16
8	6	11,240	4,380	16	16	16	16
10	8	16,280	6,350	16	16	16	16
12	8	23,040	8,990	16	16	16	16
14	9	26,610	10,380	16	16	16	16
16	10	34,910	13,620	16	16	16	16
18	12	44,290	17,270	16	16	16	16
20	12	43,410	16,450	16	16	16	16
24	14	61,040	23,810	16	16	16	16

Table 3-8: Thrust and joint resistance to thrust for PVC and CPVC Schedule 80

Imperial Units

Thrust (lbs) Size (inch)	Joint Resistant to Thrust (ft/s)	For Tee, Plug, Cap, 60°Ell	For 22.5°Ell	For 45°Ell	For 90°Ell
¼	318	81	32	62	114
⅜	477	129	50	99	183
½	693	199	78	152	281
¾	990	298	116	228	422
1	1,394	453	177	346	641
1¼	1,956	667	260	510	943
1½	2,462	831	324	635	1,174
2	3,358	1,181	461	902	1,670
2½	4,742	1,780	694	1,360	2,517
3	6,185	2,444	953	1,867	3,456
3½	8,011	3,111	1,213	2,377	4,399
4	9,543	3,679	1,435	2,811	5,202
5	13,763	5,276	2,058	4,031	7,461
6	18,732	7,299	2,846	5,576	10,320
8	32,515	11,416	4,452	8,722	16,142
10	50,658	16,523	6,444	12,624	23,364
12	72,100	23,377	9,117	17,860	33,056

Metric Units

Thrust (lbs) Size (inch)	Joint Resistant to Thrust (m/s)	For Tee, Plug, Cap, 60°Ell	For 22.5°Ell	For 45°Ell	For 90°Ell
¼	1,415	360	140	275	43,083
⅜	2,123	575	224	440	814
½	3,083	886	345	677	1,252
¾	4,404	1,328	518	1,014	1,877
1	6,205	2,017	786	1,541	2,851
1¼	8,703	2,968	1,158	2,268	4,197
1½	10,957	3,696	1,441	2,824	5,226
2	14,941	5,256	2,050	4,016	7,432
2½	21,101	7,921	3,089	6,052	11,201
3	27,523	10,875	4,241	8,309	15,378
3½	35,649	13,843	5,399	10,576	19,574
4	42,465	16,372	6,385	12,508	23,149
5	61,245	23,479	9,157	17,938	33,199
6	83,356	32,479	12,667	24,814	45,925
8	144,694	50,801	19,812	38,812	71,832
10	225,429	73,529	28,676	56,176	103,970
12	320,843	104,030	40,572	79,479	147,098

Velocity

Thermoplastic piping has been successfully installed in systems with a water velocity in excess of 10 ft/s (3 m/s). Thermoplastic pipe is not subject to erosion caused by high velocities and turbulent flow and is superior to metal piping systems in this regard, particularly where corrosive or chemically aggressive fluids are involved. The accepted industry position is that while the maximum safe water velocity in a thermoplastic piping system depends on the specific details of the system and operating conditions, 5 ft/s (1.5 m/s) is considered safe. Higher velocities may be used in systems where the operating characteristics of the valves and pumps are known and sudden changes in flow velocity can be controlled. It is important that the total pressure in the system at any time (operating plus surge or water hammer) not exceed 150% of the pressure rating for the system.

Entrapped Air

Entrapped air presents both an important and not well understood factor in piping systems. Systems can develop entrapped air where the fluid enters the system, during the initial filling of the system, through mechanical air releases when the system pressure drops below atmospheric pressure, or from dissolved air in water during large temperature or pressure changes within the system. The entrapped air accumulates at the local high points in the system; this causes a restriction in flow area, causing a larger liquid velocity. The liquid velocity then moves the air packets along the system to an outlet. When the air pocket reaches the outlet, the increased air pressure forces the air out at a high velocity and is then followed by a surge of the transported medium. This causes the equivalent of water hammer and can cause the system to fail.

Entrapped air is not well understood, but the effects can be reduced by filling the system slowly with a fluid velocity of less than 1 ft/s (0.3 m/s) and venting air from high points.

Cyclic Fatigue

When discussing water hammer or pressure surge in a piping system, one should also be aware of a failure mode termed cyclic fatigue. Fatigue is caused when a system is exposed to intermittent stresses and can cause failure even when the stresses do not exceed the maximum allowable stress of the system. A piping system that has frequent and significant changes in flow conditions or pressure, creating a fluctuating surge, can effect the structural integrity of a thermoplastic fitting. This condition has been observed in golf course irrigation systems that experience tens of thousands of water pressure surges over the course of a year. The resultant failure from cyclic fatigue is very similar in appearance to long-term static failure, and it may be very difficult to ascertain the exact cause of such failures.

The design engineer should consider the phenomenon when designing a thermoplastic piping system with frequent pressure changes, particularly if the surge pressure exceeds 50% of the system's working pressure. Based on some testing by Keller-Bliesener Engineering, the engineer may want to consider devaluing the fitting by 40% from the published pipe burst pressure. Keeping the flow velocity to 5 ft/s (1.5 m/s) or less will also reduce pressure surges. Other considerations would be to use actuated valves that can be set to provide a slow opening or to install soft-start pumps as both will limit the water hammer and the resultant pressure surges.

Temperature Effects

Temperature De-rating

The pressure ratings given are for water, non-shock, @ 73°F. The following temperature de-rating factors are to be applied to the working pressure ratings (W.P.) listed when operating at elevated temperatures.

Multiply the working pressure rating of the selected pipe at 73°F, by the appropriate de-rating factor to determine the maximum working pressure rating of the pipe at the elevated temperature chosen.

Solvent-cemented joints should be utilized when working at or near maximum temperatures of the material selected. GF does not recommend the use of standard threaded connections at temperatures above 110°F for PVC or at temperatures above 150°F for CPVC; use flanged joints or unions where disassembly is necessary at elevated temperatures.

Threading of Schedule 40 pipe (PVC or CPVC) is not a recommended practice due to insufficient wall thickness. Thread only Schedule 80 or heavier walls. Threading requires a 50% reduction in pressure rating stated for plain end pipe @73°F.

Chemical resistance data should be referenced for proper material selection and possible pressure de-rating when working with fluids other than water. Refer to GF Harvel's chemical resistance guide for additional information.

PVC Pipe		CPVC Pipe	
Operating temp (°F)	**De-rating factor**	**Operating temp (°F)**	**De-rating factor**
73	1.00	73-80	1.00
80	0.88	90	0.91
90	0.75	100	0.82
100	0.62	110	0.72
110	0.51	120	0.65
120	0.40	130	0.57
130	0.31	140	0.50
140	0.22	150	0.42
Ex: 10" PVC sch 80 @ 120°F 230 psi × 0.40 = 92 psi max. @ 120°F		160	0.40
		180	0.25
		200	0.20
		Ex: 10" CPVC sch 80 @ 120°F 230 psi × 0.65 = 149.5 psi max. @ 120°F	

Equation (3-8)

$P_{OT} = P_{73°F} f$

Where:

P_{OT} = Pressure at the operating temperature, psi (bar)

$P_{73°F}$ = Pressure at room temperature, psi (bar)

f = Derating factor

The tables show the derated pressures in Imperial and Metric units for the full range of PVC and CPVC piping sizes available from GF Piping Systems.

Table 3-9: Derated pressures for available sizes of Industrial Plus PVC Schedule 40

Nominal Size (inch)	Imperial Units								Metric Units							
Temp. f = s(psi/bar)=	32-73°F 1.00 2000	80°F 0.88 1760	90°F 0.75 1500	100°F 0.62 1240	110°F 0.51 1020	120°F 0.40 800	130°F 0.31 800	140°F 0.22 440	0-23°C 1.00 138	27°C 0.88 121	32°C 0.75 103	38°C 0.62 86	43°C 0.51 70	49°C 0.40 55	54°C 0.31 55	60°C 0.22 30
⅛	810	713	608	502	413	324	251	178	55.8	49.1	41.9	34.6	28.5	22.3	17.3	12.3
¼	780	686	585	484	398	312	242	172	53.8	47.3	40.4	33.4	27.4	21.5	16.7	11.8
⅜	620	546	465	384	316	248	192	136	42.7	37.6	32.0	26.5	21.8	17.1	13.2	9.4
½	600	528	450	372	306	240	186	132	41.4	36.4	31.1	25.7	21.1	16.6	12.8	9.1
¾	480	422	360	298	245	192	149	106	33.1	29.1	24.8	20.5	16.9	13.2	10.3	7.3
1	450	396	338	279	230	180	140	99	31.0	27.3	23.3	19.2	15.8	12.4	9.6	6.8
1¼	370	326	278	229	189	148	115	81	25.5	22.4	19.1	15.8	13.0	10.2	7.9	5.6
1½	330	290	248	205	168	132	102	73	22.8	20.1	17.1	14.1	11.6	9.1	7.1	5.0
2	280	246	210	174	143	112	87	62	19.3	17.0	14.5	12.0	9.8	7.7	6.0	4.2
2½	300	264	225	186	153	120	93	66	20.7	18.2	15.5	12.8	10.6	8.3	6.4	4.6
3	260	229	195	161	133	104	81	57	17.9	15.8	13.4	11.1	9.1	7.2	5.5	3.9
3½	240	211	180	149	122	96	74	53	16.5	14.5	12.4	10.2	8.4	6.6	5.1	3.6
4	220	194	165	136	112	88	68	48	15.2	13.4	11.4	9.4	7.8	6.1	4.7	3.3
5	190	167	143	118	97	76	59	42	13.1	11.5	9.8	8.1	6.7	5.2	4.1	2.9
6	180	158	135	112	92	72	56	40	12.4	10.9	9.3	7.7	6.3	5.0	3.8	2.7
8	160	141	120	99	82	64	50	35	11.0	9.7	8.3	6.8	5.6	4.4	3.4	2.4
10	140	123	105	87	71	56	43	31	9.7	8.5	7.3	6.0	4.9	3.9	3.0	2.1
12	130	114	98	81	66	52	40	29	9.0	7.9	6.8	5.6	4.6	3.6	2.8	2.0
14	130	114	98	81	66	52	40	29	9.1	8.0	6.8	5.6	4.6	3.6	2.8	2.0
16	130	114	98	81	66	52	40	29	9.1	8.0	6.8	5.6	4.6	3.6	2.8	2.0
18	130	114	98	81	66	52	40	29	9.1	8.0	6.8	5.6	4.6	3.6	2.8	2.0
20	120	106	90	74	61	48	37	26	8.4	7.4	6.3	5.2	4.3	3.4	2.6	1.8
24	120	106	90	74	61	48	37	26	8.4	7.4	6.3	5.2	4.3	3.4	2.6	1.8

Table 3-10: Derated pressures for available sizes of CPVC Schedule 40

Nominal Size (inch)	Imperial Units										
Temp. f = s(psi/bar)=	32-73°F 1.00 2000	90°F 0.91 1760	100°F 0.82 1500	110°F 0.72 1240	120°F 0.65 1020	130°F 0.57 800	140°F 0.50 800	150°F 0.42 440	160°F 0.40 1020	180°F 0.25 800	200°F 0.20 800
¼	780	710	640	562	507	445	390	328	312	195	156
⅜	620	564	508	446	403	353	310	260	248	155	124
½	600	546	492	432	390	342	300	252	240	150	120
¾	480	437	394	346	312	274	240	202	192	120	96
1	450	410	369	324	293	257	225	189	180	113	90
1¼	370	337	303	266	241	211	185	155	148	93	74
1½	330	300	271	238	215	188	165	139	132	83	66
2	280	255	230	202	182	160	140	118	112	70	56
2½	300	273	246	216	195	171	150	126	120	75	60
3	260	237	213	187	169	148	130	109	104	65	52
3½	240	218	197	173	156	137	120	101	96	60	48
4	220	200	180	158	143	125	110	92	88	55	44
5	190	173	156	137	124	108	95	80	76	48	38
6	180	164	148	130	117	103	90	76	72	45	36
8	160	146	131	115	104	91	80	67	64	40	32
10	140	127	115	101	91	80	70	59	56	35	28
12	130	118	107	94	85	74	65	55	52	33	26
14	130	118	107	94	85	74	65	55	52	33	26
16	130	118	107	94	85	74	65	55	52	33	26
18	130	118	107	94	85	74	65	55	52	33	26
20	120	109	98	86	78	68	60	50	48	30	24
24	120	109	98	86	78	68	60	50	48	30	24

Table 3-11: Derated pressures for available sizes of CPVC Schedule 40 - Metric

Nominal Size (inch)	Metric Units										
Temp. f = s(psi/bar)=	**0-23°C 1.00 13.8**	**32°C 0.91 12.1**	**38°C 0.82 10.4**	**43°C 0.72 8.6**	**49°C 0.65 7.0**	**54°C 0.57 5.5**	**60°C 0.50 4.3**	**66°C 0.42 3.0**	**71°C 0.40 7.0**	**82°C 0.25 5.5**	**93°C 0.20 4.3**
¼	53.8	49.0	44.1	38.7	35.0	30.7	26.9	22.6	21.5	13.5	10.8
⅜	42.7	38.9	35.0	30.7	27.8	24.3	21.4	17.9	17.1	10.7	8.5
½	41.4	37.7	33.9	29.8	26.9	23.6	20.7	17.4	16.6	10.4	8.3
¾	33.1	30.1	27.1	23.8	21.5	18.9	16.6	13.9	13.2	8.3	6.6
1	31.0	28.2	25.4	22.3	20.2	17.7	15.5	13.0	12.4	7.8	6.2
1¼	25.5	23.2	20.9	18.4	16.6	14.5	12.8	10.7	10.2	6.4	5.1
1½	22.8	20.7	18.7	16.4	14.8	13.0	11.4	9.6	9.1	5.7	4.6
2	19.3	17.6	15.8	13.9	12.5	11.0	9.7	8.1	7.7	4.8	3.9
2½	20.7	18.8	17.0	14.9	13.5	11.8	10.4	8.7	8.3	5.2	4.1
3	17.9	16.3	14.7	12.9	11.6	10.2	9.0	7.5	7.2	4.5	3.6
3½	16.5	15.0	13.5	11.9	10.7	9.4	8.3	6.9	6.6	4.1	3.3
4	15.2	13.8	12.5	10.9	9.9	8.7	7.6	6.4	6.1	3.8	3.0
5	13.1	11.9	10.7	9.4	8.5	7.5	6.6	5.5	5.2	3.3	2.6
6	12.4	11.3	10.2	8.9	8.1	7.1	6.2	5.2	5.0	3.1	2.5
8	11.0	10.0	9.0	7.9	7.2	6.3	5.5	4.6	4.4	2.8	2.2
10	9.7	8.8	8.0	7.0	6.3	5.5	4.9	4.1	3.9	2.4	1.9
12	9.0	8.2	7.4	6.5	5.9	5.1	4.5	3.8	3.6	2.3	1.8
14	9.1	8.3	7.5	6.6	5.9	5.2	4.6	3.8	3.6	2.3	1.8
16	9.1	8.3	7.5	6.6	5.9	5.2	4.6	3.8	3.6	2.3	1.8
18	9.1	8.3	7.5	6.6	5.9	5.2	4.6	3.8	3.6	2.3	1.8
20	8.4	7.6	6.9	6.0	5.5	4.8	4.2	3.5	3.4	2.1	1.7
24	8.4	7.6	6.9	6.0	5.5	4.8	4.2	3.5	3.4	2.1	1.7

Table 3-12: Derated pressures for available sizes of Industrial Plus PVC Schedule 80

Nominal Size (inch)	Imperial Units								Metric Units							
Temp. f = s(psi/bar)=	**32-73°F 1.00 2000**	**80°F 0.88 1760**	**90°F 0.75 1500**	**100°F 0.62 1240**	**110°F 0.51 1020**	**120°F 0.40 800**	**130°F 0.31 800**	**140°F 0.22 440**	**0-23°C 1.00 13.8**	**27°C 0.88 12.1**	**32°C 0.75 10.4**	**38°C 0.62 8.6**	**43°C 0.51 7.0**	**49°C 0.40 5.5**	**54°C 0.31 4.3**	**60°C 0.22 3.0**
⅛	1230	1082	923	763	627	492	381	271	84.8	74.6	63.6	52.6	43.2	33.9	26.3	18.7
¼	1130	994	848	701	576	452	350	249	77.9	68.6	58.4	48.3	39.7	31.2	24.1	17.1
⅜	920	810	690	570	469	368	285	202	63.4	55.8	47.6	39.3	32.3	25.4	19.7	13.9
½	850	748	638	527	434	340	264	187	58.6	51.6	44.0	36.3	29.9	23.4	18.2	12.9
¾	690	607	518	428	352	276	214	152	47.6	41.9	35.7	29.5	24.3	19.0	14.8	10.5
1	630	554	473	391	321	252	195	139	43.4	38.2	32.6	26.9	22.1	17.4	13.5	9.5
1¼	520	458	390	322	265	208	161	114	35.9	31.6	26.9	22.3	18.3	14.4	11.1	7.9
1½	470	414	353	291	240	188	146	103	32.4	28.5	24.3	20.1	16.5	13.0	10.0	7.1
2	400	352	300	248	204	160	124	88	27.6	24.3	20.7	17.1	14.1	11.0	8.6	6.1
2½	420	370	315	260	214	168	130	92	29.0	25.5	21.8	18.0	14.8	11.6	9.0	6.4
3	370	326	278	229	189	148	115	81	25.5	22.4	19.1	15.8	13.0	10.2	7.9	5.6
3½	350	308	263	217	179	140	109	77	24.1	21.2	18.1	14.9	12.3	9.6	7.5	5.3
4	320	282	240	198	163	128	99	70	22.1	19.4	16.6	13.7	11.3	8.8	6.9	4.9
5	290	255	218	180	148	116	90	64	20.0	17.6	15.0	12.4	10.2	8.0	6.2	4.4
6	280	246	210	174	143	112	87	62	19.3	17.0	14.5	12.0	9.8	7.7	6.0	4.2
8	250	220	188	155	128	100	78	55	17.2	15.1	12.9	10.7	8.8	6.9	5.3	3.8
10	230	202	173	143	117	92	71	51	15.9	14.0	11.9	9.9	8.1	6.4	4.9	3.5
12	230	202	173	143	117	92	71	51	15.9	14.0	11.9	9.9	8.1	6.4	4.9	3.5
14	220	194	165	136	112	88	68	48	15.4	13.6	11.6	9.5	7.9	6.2	4.8	3.4
16	220	194	165	136	112	88	68	48	15.4	13.6	11.6	9.5	7.9	6.2	4.8	3.4
18	220	194	165	136	112	88	68	48	15.4	13.6	11.6	9.5	7.9	6.2	4.8	3.4
20	220	194	165	136	112	88	68	48	15.4	13.6	11.6	9.5	7.9	6.2	4.8	3.4
24	210	185	158	130	107	84	65	46	14.7	12.9	11.0	9.1	7.5	5.9	4.6	3.2

Table 3-13: Derated pressures for available sizes of CPVC Schedule 80

Nominal Size (inch)	Imperial Units										
Temp. f = s(psi/bar)=	32-73°F 1.00 2000	90°F 0.91 1760	100°F 0.82 1500	110°F 0.72 1240	120°F 0.65 1020	130°F 0.57 800	140°F 0.50 800	150°F 0.42 440	160°F 0.40 1020	180°F 0.25 800	200°F 0.20 800
¼	1130	1028	927	814	735	644	565	475	452	283	226
⅜	920	837	754	662	598	524	460	386	368	230	184
½	850	774	697	612	553	485	425	357	340	213	170
¾	690	628	566	497	449	393	345	290	276	173	138
1	630	573	517	454	410	359	315	265	252	158	126
1¼	520	473	426	374	338	296	260	218	208	130	104
1½	470	428	385	338	306	268	235	197	188	118	94
2	400	364	328	288	260	228	200	168	160	100	80
2½	420	382	344	302	273	239	210	176	168	105	84
3	370	337	303	266	241	211	185	155	148	93	74
3½	350	319	287	252	228	200	175	147	140	88	70
4	320	291	262	230	208	182	160	134	128	80	64
5	290	264	238	209	189	165	145	122	116	73	58
6	280	255	230	202	182	160	140	118	112	70	56
8	250	228	205	180	163	143	125	105	100	63	50
10	230	209	189	166	150	131	115	97	92	58	46
12	230	209	189	166	150	131	115	97	92	58	46
14	220	200	180	158	143	125	110	92	88	55	44
16	220	200	180	158	143	125	110	92	88	55	44
18	220	200	180	158	143	125	110	92	88	55	44
20	220	200	180	158	143	125	110	92	88	55	44
24	210	191	172	151	137	120	105	88	84	53	42

Table 3-14: Derated pressures for available sizes of CPVC Schedule 80 - Metric

Nominal Size (inch)	Metric Units										
Temp. f = s(psi/bar)=	0-23°C 1.00 13.8	32°C 0.91 12.1	38°C 0.82 10.4	43°C 0.72 8.6	49°C 0.65 7.0	54°C 0.57 5.5	60°C 0.50 4.3	66°C 0.42 3.0	71°C 0.40 7.0	82°C 0.25 5.5	93°C 0.20 4.3
¼	77.9	70.9	63.9	56.1	50.6	44.4	39.0	32.7	31.2	19.5	15.6
⅜	63.4	57.7	52.0	45.6	41.2	36.1	31.7	26.6	25.4	15.9	12.7
½	58.6	53.3	48.1	42.2	38.1	33.4	29.3	24.6	23.4	14.7	11.7
¾	47.6	43.3	39.0	34.3	30.9	27.1	23.8	20.0	19.0	11.9	9.5
1	43.4	39.5	35.6	31.2	28.2	24.7	21.7	18.2	17.4	10.9	8.7
1¼	35.9	32.7	29.4	25.8	23.3	20.5	18.0	15.1	14.4	9.0	7.2
1½	32.4	29.5	26.6	23.3	21.1	18.5	16.2	13.6	13.0	8.1	6.5
2	27.6	25.1	22.6	19.9	17.9	15.7	13.8	11.6	11.0	6.9	5.5
2½	29.0	26.4	23.8	20.9	18.9	16.5	14.5	12.2	11.6	7.3	5.8
3	25.5	23.2	20.9	18.4	16.6	14.5	12.8	10.7	10.2	6.4	5.1
3½	24.1	21.9	19.8	17.4	15.7	13.7	12.1	10.1	9.6	6.0	4.8
4	22.1	20.1	18.1	15.9	14.4	12.6	11.1	9.3	8.8	5.5	4.4
5	20.0	18.2	16.4	14.4	13.0	11.4	10.0	8.4	8.0	5.0	4.0
6	19.3	17.6	15.8	13.9	12.5	11.0	9.7	8.1	7.7	4.8	3.9
8	17.2	15.7	14.1	12.4	11.2	9.8	8.6	7.2	6.9	4.3	3.4
10	15.9	14.5	13.0	11.4	10.3	9.1	8.0	6.7	6.4	4.0	3.2
12	15.9	14.5	13.0	11.4	10.3	9.1	8.0	6.7	6.4	4.0	3.2
14	15.4	14.0	12.6	11.1	10.0	8.8	7.7	6.5	6.2	3.9	3.1
16	15.4	14.0	12.6	11.1	10.0	8.8	7.7	6.5	6.2	3.9	3.1
18	15.4	14.0	12.6	11.1	10.0	8.8	7.7	6.5	6.2	3.9	3.1
20	15.4	14.0	12.6	11.1	10.0	8.8	7.7	6.5	6.2	3.9	3.1
24	14.7	13.4	12.1	10.6	9.6	8.4	7.4	6.2	5.9	3.7	2.9

Table 3-15: Derated pressures for available sizes of Industrial Plus PVC Schedule 120

Nominal Size (inch)	Imperial Units								Metric Units							
Temp. f = s(psi/bar)=	32-73°F 1.00 2000	80°F 0.88 1760	90°F 0.75 1500	100°F 0.62 1240	110°F 0.51 1020	120°F 0.40 800	130°F 0.31 800	140°F 0.22 440	0-23°C 1.00 13.8	27°C 0.88 12.1	32°C 0.75 10.4	38°C 0.62 8.6	43°C 0.51 7.0	49°C 0.40 5.5	54°C 0.31 4.3	60°C 0.22 3.0
½	1010	889	758	626	515	404	313	222	69.6	61.2	52.2	43.2	35.5	27.8	21.6	15.3
¾	770	678	578	477	393	308	239	169	53.1	46.7	39.8	32.9	27.1	21.2	16.5	11.7
1	720	634	540	446	367	288	223	158	49.6	43.6	37.2	30.8	25.3	19.8	15.4	10.9
1¼	600	528	450	372	306	240	186	132	41.4	36.4	31.1	25.7	21.1	16.6	12.8	9.1
1½	540	475	405	335	275	216	167	119	37.2	32.7	27.9	23.1	19.0	14.9	11.5	8.2
2	470	414	353	291	240	188	146	103	32.4	28.5	24.3	20.1	16.5	13.0	10.0	7.1
2½	470	414	353	291	240	188	146	103	32.4	28.5	24.3	20.1	16.5	13.0	10.0	7.1
3	440	387	330	273	224	176	136	97	30.3	26.7	22.7	18.8	15.5	12.1	9.4	6.7
4	430	378	323	267	219	172	133	95	29.6	26.0	22.2	18.4	15.1	11.8	9.2	6.5
6	370	326	278	229	189	148	115	81	25.5	22.4	19.1	15.8	13.0	10.2	7.9	5.6
8	380	334	285	236	194	152	118	84	26.2	23.1	19.7	16.2	13.4	10.5	8.1	5.8

Solvent-cemented joints should be utilized when working at or near maximum temperatures of the material selected. GF Piping Systems does not recommend the use of standard threaded connections at temperatures above 110°F (43°C) for PVC or at temperatures above 150°F (66°C) for CPVC; use specialty reinforced adapters, flanged joints, unions or roll grooved couplings where disassembly is necessary at elevated temperatures.

Threaded Schedule 40 pipe (PVC and CPVC) is not a recommended practice due to insufficient wall thickness. Thread only Schedule 80 or heavier walls. Threading requires a 50% reduction in pressure rating stated for plain end pipe at 73°F (23°C).

Chemical resistance data should be referenced for proper material selection and possible pressure derating when working with fluids other than water. Refer to GF's online chemical resistance guide for additional information.

Thermal Expansion and Contraction

All piping systems expand and contract with changes in temperature. Thermoplastics exhibit a relatively high coefficient of thermal expansion that can be as much as ten times that of steel. The issue must be addressed with appropriate system design to prevent damage to the piping system. The degree of movement (change in length) generated as the result of temperature changes must be calculated based on the type of piping material and the anticipated temperature changes of the system. The rate of expansion does not vary with pipe size. In many cases this movement must then be compensated for by the construction of appropriate sized expansion loops, offsets, or bends or the installation of expansion joints.

If designed improperly, expansion and contraction can cause unnecessary bending stresses in the piping system. The above described configurations will absorb the stresses generated from the movement, thereby minimizing damage to the piping. The effects of thermal expansion and contraction must be considered during the design phase, particularly for systems involving long runs, hot water lines, hot drain lines, and piping systems exposed to environmental temperature extremes (i.e. summer to winter).

Thermal expansion can be evaluated using Equation (3-9) and values are illustrated in Table 3-17 and Table 3-18t.

Calculating Linear Movement Caused by Thermal Expansion

The rate of movement (change in length) caused by thermal expansion or contraction can be calculated as follows:

Equation (3-9)

$\Delta L = 12 y l (\Delta T)$

Where:

ΔL = expansion or contraction in inches

y = Coefficient of linear expansion of piping material selected

l = length of piping run in feet

$\Delta T = (T1 - T2)$ temperature change °F

Where:

T1= maximum service temperature of system and

T2 = temperature at time of installation (or difference between lowest system temperature and maximum system temperature – whichever is greatest)

Equation (3-9) - Imperial Example

Example 1: Calculate the change in length for a 100 foot straight run of 2" Schedule 80 PVC pipe operating at a temperature of 73°F; installed at 32°F.

$\Delta L = 12 y l (\Delta T)$

Where:

ΔL = linear expansion or contraction in inches

$y = 2.9 \times 10\text{-}5$ in/in/°F

l = 100ft

ΔT = 41°F (73°F – 32°F)

ΔL = 12 in/ft x 0.000029 in/in/ft × 100ft × 41°F

ΔL = 1.43"

In this example the piping would expand approximately 1½" in length over a 100 ft straight run once the operating temperature of 73°F was obtained.

Table 3-16: Coefficient of Linear Expansion

Coefficient of Linear Expansion (y) of Various GF Harvel Piping Products (in/in/°F) per ASTM D696	
Pipe Material	**y**
GF Harvel PVC Pressure Pipe (all schedules & SDR's) and PVC Duct	2.9×10^{-5}
GF Harvel CPVC Schedule 40 & Schedule 80 Pressure Pipe	3.7×10^{-5}
GF Harvel CPVC Duct	3.9×10^{-5}
GF Harvel Clear PVC Schedule 40 & Schedule 80 Pipe	4.1×10^{-5}

Note: Refer to appropriate physical Properties Tables for additional detailed information

Table 3-17: Thermal expansion of Industrial Plus PVC, all schedules

Imperial Units (inch)

	Length of Pipe (Ft)																	
Change in Temperature (°F)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**125**	**150**	**175**	**200**	**250**	**300**	**350**	**400**
10	0.03	0.07	0.10	0.13	0.17	0.20	0.24	0.27	0.30	0.34	0.42	0.50	0.59	0.67	0.84	1.01	1.18	1.34
20	0.07	0.13	0.20	0.27	0.34	0.40	0.47	0.54	0.60	0.67	0.84	1.01	1.18	1.34	1.68	2.02	2.35	2.69
30	0.10	0.20	0.30	0.40	0.50	0.60	0.71	0.81	0.91	1.01	1.26	1.51	1.76	2.02	2.52	3.02	3.53	4.03
40	0.13	0.27	0.40	0.54	0.67	0.81	0.94	1.08	1.21	1.34	1.68	2.02	2.35	2.69	3.36	4.03	4.70	5.38
50	0.17	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.10	2.52	2.94	3.36	4.20	5.04	5.88	6.72
60	0.20	0.40	0.60	0.81	1.01	1.21	1.41	1.61	1.81	2.02	2.52	3.02	3.53	4.03	5.04	6.05	7.06	8.06
70	0.24	0.47	0.71	0.94	1.18	1.41	1.65	1.88	2.12	2.35	2.94	3.53	4.12	4.70	5.88	7.06	8.23	9.41
80	0.27	0.54	0.81	1.08	1.34	1.61	1.88	2.15	2.42	2.69	3.36	4.03	4.70	5.38	6.72	8.06	9.41	10.75
90	0.30	0.60	0.91	1.21	1.51	1.81	2.12	2.42	2.72	3.02	3.78	4.54	5.29	6.05	7.56	9.07	10.58	12.10
100	0.34	0.67	1.01	1.34	1.68	2.02	2.35	2.69	3.02	3.36	4.20	5.04	5.88	6.72	8.40	10.08	11.76	13.44

Metric Units (mm)

	Length of Pipe (m)																	
Change in Temperature (°C)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**
5	1	3	4	5	6	8	9	10	11	13	15	18	20	23	26	28	31	33
10	3	5	8	10	13	15	18	20	23	26	31	36	41	46	51	56	61	66
15	4	8	11	15	19	23	27	31	34	38	46	54	61	69	77	84	92	99
20	5	10	15	20	26	31	36	41	46	51	61	71	82	92	102	112	122	133
25	6	13	19	26	32	38	45	51	57	64	77	89	102	115	128	140	153	166
30	8	15	23	31	38	46	54	61	69	77	92	107	122	138	153	168	184	199
35	9	18	27	36	45	54	62	71	80	89	107	125	143	161	179	196	214	232
40	10	20	31	41	51	61	71	82	92	102	122	143	163	184	204	224	245	265
45	11	23	34	46	57	69	80	92	103	115	138	161	184	207	230	252	275	298
50	13	26	38	51	64	77	89	102	115	128	153	179	204	230	255	281	306	332

Table 3-18: Thermal expansion of CPVC, all schedules

Imperial Units (inch)

	Length of Pipe (Ft)																	
Change in Temperature (°F)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**125**	**150**	**175**	**200**	**250**	**300**	**350**	**400**
10	0.04	0.09	0.13	0.18	0.22	0.27	0.31	0.36	0.40	0.44	0.56	0.67	0.78	0.89	1.11	1.33	1.55	1.78
20	0.09	0.18	0.27	0.36	0.44	0.53	0.62	0.71	0.80	0.89	1.11	1.33	1.55	1.78	2.22	2.66	3.11	3.55
30	0.13	0.27	0.40	0.53	0.67	0.80	0.93	1.07	1.20	1.33	1.67	2.00	2.33	2.66	3.33	4.00	4.66	5.33
40	0.18	0.36	0.53	0.71	0.89	1.07	1.24	1.42	1.60	1.78	2.22	2.66	3.11	3.55	4.44	5.33	6.22	7.10
50	0.22	0.44	0.67	0.89	1.11	1.33	1.55	1.78	2.00	2.22	2.78	3.33	3.89	4.44	5.55	6.66	7.77	8.88
60	0.27	0.53	0.80	1.07	1.33	1.60	1.86	2.13	2.40	2.66	3.33	4.00	4.66	5.33	6.66	7.99	9.32	10.66
70	0.31	0.62	0.93	1.24	1.55	1.86	2.18	2.49	2.80	3.11	3.89	4.66	5.44	6.22	7.77	9.32	10.88	12.43
80	0.36	0.71	1.07	1.42	1.78	2.13	2.49	2.84	3.20	3.55	4.44	5.33	6.22	7.10	8.88	10.66	12.43	14.21
90	0.40	0.80	1.20	1.60	2.00	2.40	2.80	3.20	3.60	4.00	5.00	5.99	6.99	7.99	9.99	11.99	13.99	15.98
100	0.44	0.89	1.33	1.78	2.22	2.66	3.11	3.55	4.00	4.44	5.55	6.66	7.77	8.88	11.10	13.32	15.54	17.76

Metric Units (mm)

	Length of Pipe (m)																	
Change in Temperature (°C)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**
5	2	3	5	7	8	10	12	13	15	17	20	23	27	30	34	37	40	44
10	3	7	10	13	17	20	23	27	30	34	40	47	54	60	67	74	80	87
15	5	10	15	20	25	30	35	40	45	50	60	70	80	90	101	111	121	131
20	7	13	20	27	34	40	47	54	60	67	80	94	107	121	134	147	161	174
25	8	17	25	34	42	50	59	67	75	84	101	117	134	151	168	184	201	218
30	10	20	30	40	50	60	70	80	90	101	121	141	161	181	201	221	241	261
35	12	23	35	47	59	70	82	94	106	117	141	164	188	211	235	258	281	305
40	13	27	40	54	67	80	94	107	121	134	161	188	214	241	268	295	322	348
45	15	30	45	60	75	90	106	121	136	151	181	211	241	271	302	332	362	392
50	17	34	50	67	84	101	117	134	151	168	201	235	268	302	335	369	402	436

Expansion Control

In most piping applications, the effects of thermal expansion/ contraction are usually absorbed by the system in changes of direction in the piping. However, long, straight runs of piping are more susceptible to experiencing measurable movement with changes in temperature.

Thermal Stress

Compressive stress is generated in piping that is restrained from expanding in cases where the effects of thermal expansion are not addressed. This induced stress can damage the piping system leading to premature failure and in some cases also cause damage to hangers, supports, or other structural members.

The amount of compressive stress generated is dependent on the pipe material, coefficient of thermal expansion, and tensile modulus and can be determined by the following equation:

Equation (3-10)

$S = E\alpha\Delta T$ (Imperial and Metric)
Where:
S = Thermal stress introduced in the pipe, psi (MPa)
E = Modulus of Elasticity
ΔT = Maximum change in temperature between installation and operation, °F (°C)
α = Coefficient of thermal expansion, in/in-°F (mm/mm-°C)

Equation (3-10) - Imperial Example

What is the thermal stress of a 1" Schedule 80 PVC pipe installed at 80°F and operating at 180°F?

E = 420,00 psi
ΔT = 180 °F - 80 °F = 100 °F
$\alpha = 2.9 \times 10^{-5}$ in/in-°F
S = (420,000 psi)$(2.9 \times 10^{-5}$ in/in-°F) × (100 °F)
S =1220 psi

Equation (3-10) - Metric Example

What is the thermal stress of a 1" Schedule 80 PVC pipe installed at 23°C and operating at 50°C?

L = 2480 MPa
ΔT = 50°C - 23°C = 27 °C
$\alpha = 6.7 \times 10^{-5}$ in/in-°C
S = (2480 MPa) × $(6.7 \times 10^{-5}$ in/in-°C) × (27 °C)
S =4.5 MPa

The stress induced in the pipe as a result of thermal influences must not exceed the maximum allowable working stress of the pipe material. The maximum allowable working stress (fiber stress) is dependent on the temperature the pipe is exposed to. Increases in temperature will reduce the allowable stress as shown in Table 3-19 and Table 3-20.

Table 3-19: Maximum allowable working (fiber) stress and tensile modulus at various temperatures for Industrial Plus PVC

Temperature (°F)	Temperature (°C)	Maximum Allowable Working (Fiber) Stress (psi)	Maximum Allowable Working (Fiber) Stress (MPa)	Tensile Modulus of Elasticity (psi)	Tensile Modulus of Elasticity (Mpa)
73	23	2,000	13.79	420,000	2,896
80	27	1,760	12.14	369,600	2,548
90	32	1,500	10.34	315,000	2,172
100	38	1,240	8.55	260,400	1,796
110	43	1,020	7.03	214,200	1,477
120	49	800	5.52	168,000	1,158
130	54	620	4.27	130,200	898
140	60	440	3.03	92,400	637

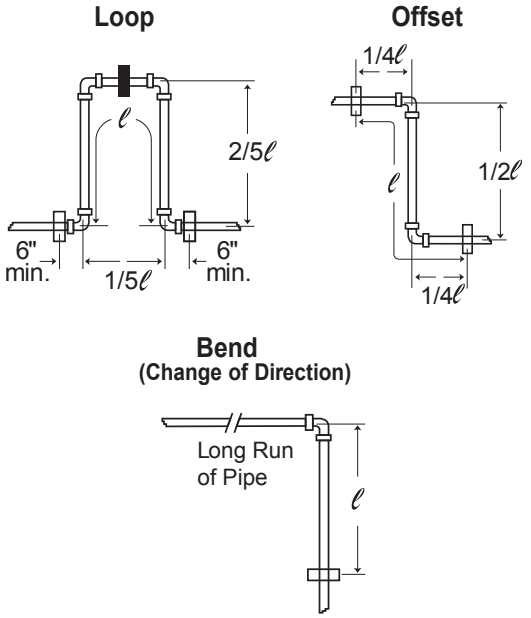
Table 3-20: Maximum allowable working (fiber) stress and tensile modulus at various temperatures for CPVC

Temperature (°F)	Temperature (°C)	Maximum Allowable Working (Fiber) Stress (psi)	Maximum Allowable Working (Fiber) Stress (MPa)	Tensile Modulus of Elasticity (psi)	Tensile Modulus of Elasticity (Mpa)
73	23	2,000	13.79	360,000	2,482
90	32	1,820	12.55	327,600	2,259
100	38	1,640	11.31	295,200	2,035
110	43	1,440	9.93	259,200	1,787
120	49	1,300	9.0	234,000	1,613
130	54	1,140	7.9	205,200	1,415
140	60	1,000	6.9	180,000	1,241
150	66	840	5.8	151,200	1,042
160	71	800	5.5	144,000	993
180	82	500	3.5	90,000	621
200	93	400	2.8	72,000	496

Compensating for Movement Caused by Thermal Expansion and Contraction

As with other piping materials, the installation of expansion joints, expansion loops or offsets is required on long, straight runs. This will allow the piping system to absorb the forces generated by expansion and contraction without damage. Examples are shown in Figure 3-1.

Figure 3-1: Expansion loop, offset, and change in direction.



Once the change in length (ΔL) has been determined, the length of an offset, expansion loop, or bend required to compensate for this change can be calculated as follows:

Equation (3-11) - Imperial/Metric

$$\ell = \sqrt{\frac{3ED_{ave}\Delta L}{2S}} \qquad (10)$$

Where:

ℓ	= Compensated expansion length, in. (mm)
E	= Modulus of elasticity, psi (MPa)
Dave	= Average outside diameter of pipe, in. (mm)
ΔL	= Change in length of pipe due to temperature change, in. (mm)
S	= Thermal stress at maximum temperature, psi (MPa)

Equation (3-11) - Imperial Example

What is the minimum sizing of an expansion loop for 1" Schedule 80 CPVC pipe installed at 80°F and operating at 180°F, and with a ΔL of 4"?

E = 360,000 psi
D_{ave} = 1.136 in.
ΔL = 4"
S = 500 psi

$$\ell = \sqrt{\frac{3(360{,}000\ \text{psi})(1.136\ \text{in})(4\ \text{in})}{2(500\ \text{psi})}}$$

ℓ = 70 in ⅖ℓ = 28 in ⅕ℓ = 14 in

Equation (3-11) - Metric Example

What is the minimum sizing of a bend for 1" Schedule 80 CPVC pipe installed at 23°C and operating at 43°C, and with a ΔL of 100 mm?

E = 2500 MPa
D_{ave} = 28.85 mm
ΔL = 100 mm
S = 10.3 MPa

$$\ell = \sqrt{\frac{3(2500\ \text{MPa})(28.85\ \text{mm})(100\ \text{mm})}{2(10.3\ \text{MPa})}}$$

ℓ = 1025 mm = 1.03 m

Hangers or guides should only be placed in the loop, offset, or change of direction as indicated above, and they must not compress or restrict the pipe from axial movement. Piping supports should restrict lateral movement and should direct axial movement into the expansion loop configuration. Do not restrain change in direction configurations by butting up against joists, studs, walls, or other structures. Use only solvent-cemented connections on straight pipe lengths, in combination with 90° elbows, to construct the expansion loop, offset, or bend. The use of threaded components to construct the loop configuration is not recommended.

Expansion loops, offsets, and bends should be installed as nearly as possible to the midpoint between anchors. Concentrated loads, such as valves, should not be installed in the developed length. Calculated support guide spacing distances for offsets and bends must not exceed recommended hanger support spacing for the maximum anticipated temperature. If this occurs, the distance between anchors must be reduced until the support guide spacing distance is less than or equal to the maximum recommended support spacing distance for the appropriate pipe size at the temperature used. All valve support should not restrict movement.

Expansion Joints

Expansion joints are necessary when standard expansion loops are not practical or not desired. Expansion joints allow for rigid mounting between two fixed points with the inner tube expanding and contracting, like a piston, against the anchored outer tube. Expansion joints are an effective means of designing for expansion or contraction and should be the preferred consideration when

1. The system has critical dimensions with no room for movement (i.e. manifold systems),
2. The system has significant space constraints (i.e. containment piping systems),
3. The system will experience frequent thermal cycling,
4. The system will be exposed to a temperature change beyond 30°F (17°C), or
5. Physical appearance is critical.

Normally expansion joints are not necessary indoors unless the temperature of the air and/or liquid is going to vary. Outdoor installations need to consider expansion and contraction. The amount of expansion is based on the temperature differential between the minimum and maximum of the air and/or liquid.

GF expansion joints are available in 6 in and 12 in piston lengths. Table 3-17 and Table 3-18 give the pressure ratings of the expansion joints depending on pipe diameter and temperature. Equation (3-12) will assist in the determination of piston position during installation.

Note that the thermal expansion equation in Section 3.2.2 is used to determine the minimum piston length.

Caution: Do not test with air or air over water.

Figure 3-2: Piston position for expansion joint

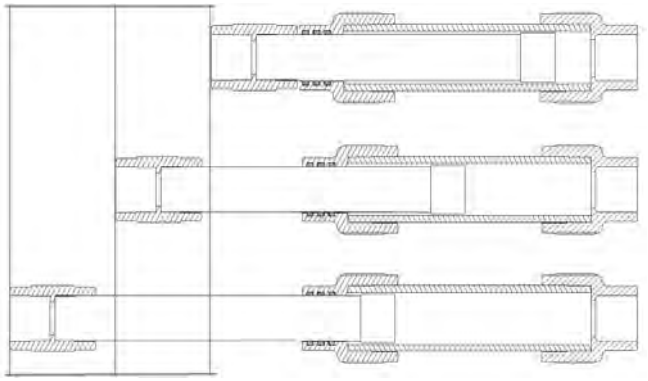


Table 3-21: Expansion joint pressure ratings for Industrial Plus PVC

Max. Pressure	73°F	100°F	120°F	140°F	23°C	38°C	49°C	60°C
½"	340	260	170	95	23.4	17.9	11.7	6.6
¾"	340	210	140	75	23.4	14.5	9.7	5.2
1"	320	200	130	70	22.1	13.8	9.0	4.8
1¼"	260	165	105	60	17.9	11.4	7.2	4.1
1½"	240	150	100	55	16.5	10.3	6.9	3.8
2"	200	125	80	45	13.8	8.6	5.5	3.1
3"	190	120	75	42	13.1	8.3	5.2	2.9
4"	160	100	65	40	11.0	6.9	4.5	2.8
6"	130	100	55	30	9.0	6.9	3.8	2.1
8"	130	100	55	30	9.0	6.9	3.8	2.1
10"	130	100	55	30	9.0	6.9	3.8	2.1

Table 3-22: Expansion joint pressure ratings for CPVC

Max. Pressure	73°F	120°F	140°F	160°F	180°F	23°C	49°C	60°C	71°C	82°C
½"	340	275	215	170	110	23.4	19.0	14.8	11.7	7.6
¾"	340	225	170	135	85	23.4	15.5	11.7	9.3	5.9
1"	320	205	160	125	80	22.1	14.1	11.0	8.6	5.5
1¼"	260	170	130	105	65	17.9	11.7	9.0	7.2	4.5
1½"	240	150	120	95	60	16.5	10.3	8.3	6.6	4.1
2"	200	130	100	80	50	13.8	9.0	6.9	5.5	3.4
3"	190	125	95	75	50	13.1	8.6	6.6	5.2	3.4
4"	160	105	80	65	40	11.0	7.2	5.5	4.5	2.8
6"	130	90	70	50	36	9.0	6.2	4.8	3.4	2.5
8"	130	90	70	50	36	9.0	6.2	4.8	3.4	2.5
10"	130	90	70	50	36	9.0	6.2	4.8	3.4	2.5

Equation (3-12) - Imperial/Metric

$$P_x = \frac{T_{max} - T_{amb}}{T_{max} - T_{min}} \Delta x$$

Where:
P_x = Piston position at time of installation, in (mm)
T_{max} = Temperature maximum, °F (°C)
T_{amb} = Temperature ambient, °F (°C)
T_{min} = Temperature minimum, °F (°C)
Δx = Piston Length, in (mm)

Equation (3-12) - Imperial Example

What is the required piston length and installation position of a 1" Schedule 80 CPVC expansion joint when the ambient temperature is 60°F, maximum temperature is 90°F, and the minimum temperature is 50°F? The pipe run is 300 feet long.

T_{tmin} = 50°F T_{max} = 90°F T_{amb} = 60°F L = 300ft × 12in/ft = 3600in

α = 3.7×10^{-5}in/in-°F

ΔT = 90°F - 50°F = 40°F

ΔL = (3.7 × 10-5in/in-°F)(3600in)(40°F)

ΔL = 5.3in → Δx = 6in

$$P_x = \frac{90°F - 60°F}{90°F - 50°F} \times 6in$$

P_x = 4.5in

Equation (3-12) - Metric Example

What is the required piston length and installation position of a 1" Schedule 80 CPVC expansion joint when the ambient temperature is 23°C, maximum temperature is 32°C, and the minimum temperature is 15°C? The pipe run is 150 m long.

T_{min} = 15°C T_{max} = 32°C T_{amb} = 23°C

L = 150m × 1000mm/m = 150,000mm

α = 6.7×10^{-5}mm/mm-°C

ΔT = 32°C - 15°C = 17°C

ΔL = $(6.7 \times 10^{-5}$mm/mm-°C)(150,000mm)(17°C)

ΔL = 170.9mm → Δx = 304.8mm

$$P_X = \frac{32°C - 23°C}{32°C - 15°C} \times 304.8mm$$

P_X = 161.4mm

Thermal Conductivity

One of the benefits to using thermoplastic piping is its ability to act as a thermal insulator. The heat transfer coefficient, a constant describing the ability of a material to transfer heat, is significantly lower than that of metal piping. This reduces the condensation production on the outside of the piping; condensation can cause issues with electrical equipment, cause corrosion, and present a safety hazard. A lower heat transfer coefficient also allows the transported fluid to retain heat, or lack thereof, leading to smaller temperature changes throughout the system. Equation (3-13) demonstrates the calculations for heat flux.

Equation (3-13) - Imperial/Metric

$$q = \frac{2\pi KL\Delta T}{\ell n(D_o/D_i)}$$

Where:

q = Heat gain (negative values = heat loss, BTU/hr (W)

K = Thermal conductivity of pipe, BTU/hr°F ft (W/°C m)

L = Length of pipe, ft (m)

D_o = Outside diameter, in (mm)

D_i = Inside diameter, in (mm)

T_{amb} = Temperature ambient, °F (°C)

T_i = Temperature fluid, °F (°C)

ΔT = T_{amb} - T_i, °F (°C)

ℓn(x) = Natural Log of x

Equation (3-13) - Imperial Example

What is the heat gain (loss) of a 1" Schedule 80 CPVC pipe, 100ft long, where the fluid temperature is 180°F and the ambient temperature is 75°F?.

L = 100ft

D_o = 1.315in

D_i = 0.957in

T_{amb} = 75°F

T_i = 180°F

ΔT = 75°F - 180°F = -105°F

K = 0.079 BTU/hr°F ft

$$q = \frac{2\pi(0.079\ BTU/hr°F\ ft)(100ft)(-105°F)}{\ell n(1.315in/0.957in)}$$

P_X = -16400 BTU/hr (heat loss)

Equation (3-13) - Metric Example

What is the heat gain (loss) of a 1" Schedule 80 SeaCor pipe, 100m long, where the fluid temperature is 10°C and the ambient temperature is 25°C?

L = 100m

D_o = 33.4mm

D_i = 24.3mm

T_{amb} = 25°C

T_i = 10°C

ΔT = 25°C - 10°C = 15°C

K = 0.138 W/°C m

$$q = \frac{2\pi(0.138\ W/°C\ m)(100m)(15°C)}{\ell n(33.4mm/24.3mm)}$$

P_X = 4088 W (heat gain)

Thermal conductivity coefficients are listed Table 3-19. Equation (3-13) is to be used as a general estimate of heat flux. More complicated systems will also need to evaluate heat flux based on:

1. A more accurate heat transfer coefficient
2. Fluid conductivity
3. Fluid heat capacity
4. Viscosity
5. Air temperature
6. Air velocity

Table 3-23: Coefficients of thermal conductivity for various materials

Material	K (BTU/hr°F ft)	K (W/°C m)
PVC	0.108	0.187
CPVC	0.079	0.137
Carbon Steel	21-31	36-54
Cast Iron	32	55
Copper	222	385
Stainless Steel	9.4-14	16.3-24
FRP	0.13-0.61	0.23-1.06
Polyethylene	0.24-0.29	0.42-0.51

Friction Loss

A major advantage of thermoplastic pipe is its exceptionally smooth inside surface, which reduces friction loss compared to other materials. Friction loss in thermoplastic pipe remains constant over extended periods of time in contrast to many traditional materials where the value of the Hazen and Williams C factor (constant for inside roughness) decreases with time.

C Factors

The relationship between a material's C factor and inside roughness is such that the higher the C factor, the smoother the surface. Tests made both with new pipe and pipe that had been in service revealed C factor values for thermoplastic pipe between 160 and 165; thus, the factor of 150 recommended for water 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. A benefit with thermoplastic piping systems is that it is often possible to achieve the desired flow rate using a smaller diameter pipe, resulting in less initial cost for pipe, valves, fittings, and pumps and still maintaining the same, or even lower, friction losses. A long-term benefit would be the resultant savings in energy required to operate the system.

Hazen and Williams Formula

The head losses resulting from various water flow rates in thermoplastic piping may be calculated by means of the Hazen and Williams equation below, assuming a value of 150 for C:

Equation (3-14) - Imperial

$$f = 0.0983 \frac{Q^{1.852}}{D_i^{4.8655}}$$

Equation (3-15) - Metric

$$f = 56962 \frac{Q^{1.852}}{D_i^{4.8655}}$$

Where:

- f = Friction head in ft. (m) of water per 100 ft. (100m) of pipe
- D_i = Inside pipe diameter, in. (mm)
- Q = Flow rate, gal/min (L/min)

Equation (3-14) - Imperial Example

What is the head loss for 50 ft of 1" Schedule 80 CPVC at a flow rate of 5 gal/minute?

Q = 5 gal/min

D_i = 1.315in -2(0.179) = 0.957in

$$f = 0.0983 \frac{(5 \text{ gal/min})^{1.852}}{(0.957\text{in})^{4.8655}}$$

f = 2.40 (ft/100ft)

f = 1.20 (ft/50ft)

Equation (3-15) - Metric Example

What is the head loss for 200 m of 1" Schedule 80 CPVC at a flow rate of 10 l/minute?

Q = 10 l/min

D_i = 33.40mm -2(4.55mm) = 24.3mm

$$f = 56962 \frac{(10 \text{ l/min})^{1.852}}{(24.3\text{mm})^{4.8655}}$$

f = 0.734 (m/100m)

f = 1.468 (m/200m)

Pressure losses are generally described in psi (bar) for calculations. Equation (3-18) and Equation (3-19) give the conversions from head loss to pressure loss for water.

Equation (3-16) - Imperial

P = 0.4335f

Equation (3-17) - Metric

P = 0.980f

Where:

P = Pressure loss per 100ft (100m) of pipe, psi (bar)

Equation (3-16) - Imperial Example

What is the pressure loss per 100 ft of pipe if the head loss is 2ft/100ft of pipe?

f = 2ft/100ft of pipe

P = 0.4335 (2ft/100ft)

P = 0.867 psi/100ft

Equation (3-17) - Metric Example

What is the pressure loss per 100 m of pipe if the head loss is 0.1m/100m of pipe?

f = 0.1m/100m of pipe

P = 0.980 (0.1m/100m)

P = 0.0196 bar/100m

Friction Loss

Carrying capacity, friction loss, and flow data for the various schedules of thermoplastic pipe are presented in tabular form in the following tables. These tables are applicable to pipe made of either PVC or CPVC as they have equally smooth interior surfaces.

Table 3-24: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Imperial units (⅛ in - 1¼ in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	⅛ in			¼ in			⅜ in			½ in			¾ in			1 in			1¼ in		
	ID = 0.269in			ID = 0.364in			ID = 0.493in			ID = 0.622in			ID = 0.824in			ID = 1.049in			ID = 1.380in		
0.25	1.39	4.49	1.95	0.76	1.03	0.45	0.41	0.24	0.10	0.26	0.08	0.03	0.15	0.02	0.01	0.09	0.01	0.00			
0.5	2.79	16.20	7.02	1.52	3.72	1.61	0.83	0.85	0.37	0.52	0.27	0.12	0.30	0.07	0.03	0.18	0.02	0.01	0.11	0.01	0.00
0.75	4.18	34.33	14.88	2.28	7.88	3.42	1.24	1.80	0.78	0.78	0.58	0.25	0.45	0.15	0.06	0.27	0.05	0.02	0.16	0.01	0.01
1	5.57	58.49	25.36	3.04	13.43	5.82	1.66	3.07	1.33	1.04	0.99	0.43	0.59	0.25	0.11	0.37	0.08	0.03	0.21	0.02	0.01
1.5	8.36	123.94	53.73	4.57	28.45	12.33	2.49	6.50	2.82	1.56	2.10	0.91	0.89	0.55	0.23	0.55	0.17	0.07	0.32	0.04	0.02
2	11.5	211.15	91.54	6.09	48.48	21.01	3.32	11.08	4.80	2.09	3.58	1.55	1.19	0.91	0.39	0.73	0.28	0.12	0.42	0.07	0.03
3.5				10.66	136.66	59.24	5.81	31.23	13.54	3.65	10.08	4.37	2.08	2.57	1.11	1.28	0.79	0.34	0.74	0.21	0.09
5							8.30	60.46	26.21	5.21	19.51	8.46	2.97	4.97	2.15	1.83	1.53	0.67	1.06	0.40	0.18
6							9.96	84.75	36.74	6.26	27.35	11.86	3.56	6.96	3.02	2.20	2.15	0.93	1.27	0.57	0.25
7							11.62	112.75	48.88	7.30	36.39	15.78	4.16	9.26	4.02	2.57	2.86	1.24	1.48	0.75	0.33
10										10.43	70.45	30.54	5.94	17.93	7.77	3.67	5.54	2.40	2.12	1.46	0.63
15													8.91	38.00	16.47	5.50	11.74	5.09	3.18	3.09	1.34
20													11.88	64.73	28.06	7.33	20.00	8.67	4.24	5.27	2.28
25																9.16	30.23	13.11	5.30	7.96	3.45
30																11.00	42.37	18.37	6.35	11.16	4.84
35																			7.41	14.85	6.44
40																			8.47	19.01	8.24
50																			10.59	28.74	12.46

Table 3-24: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Imperial units (1½ in - 6in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	1½ in			2 in			2½ in			3 in			3½ in			4 in			5 in			6 in		
	ID = 1.61in			ID = 2.067in			ID = 2.469in			ID = 3.068in			ID = 3.548in			ID = 4.026in			ID = 5.047in			ID = 6.065in		
1	0.16	0.01	0.00																					
2	0.31	0.03	0.02	0.19	0.01	0.00	0.13	0.00	0.00															
5	0.78	0.19	0.08	0.47	0.06	0.02	0.33	0.02	0.01	0.21	0.01	0.00												
7	1.09	0.36	0.15	0.66	0.11	0.05	0.46	0.04	0.02	0.30	0.02	0.01	0.22	0.01	0.00									
10	1.56	0.69	0.30	0.94	0.20	0.09	0.66	0.09	0.04	0.43	0.03	0.01	0.32	0.01	0.01	0.25	0.01	0.00						
15	2.33	1.46	0.63	1.42	0.43	0.19	0.99	0.18	0.08	0.64	0.06	0.03	0.48	0.03	0.01	0.37	0.02	0.01	0.24	0.01	0.00			
20	3.11	2.49	1.08	1.89	0.74	0.32	1.32	0.31	0.13	0.86	0.11	0.05	0.64	0.05	0.02	0.50	0.03	0.01	0.32	0.01	0.00			
25	3.89	3.76	1.63	2.36	1.11	0.48	1.65	0.47	0.20	1.07	0.16	0.07	0.80	0.08	0.03	0.62	0.04	0.02	0.40	0.01	0.01	0.27	0.01	0.00
30	4.67	5.27	2.28	2.83	1.56	0.68	1.99	0.66	0.29	1.29	0.23	0.10	0.96	0.11	0.05	0.75	0.06	0.03	0.48	0.02	0.01	0.33	0.01	0.00
35	5.45	7.01	3.04	3.30	2.08	0.90	2.32	0.88	0.38	1.50	0.30	0.13	1.12	0.15	0.07	0.87	0.08	0.04	0.55	0.03	0.01	0.38	0.01	0.00
40	6.22	8.98	3.89	3.78	2.66	1.15	2.65	1.12	0.49	1.71	0.39	0.17	1.28	0.19	0.08	1.00	0.10	0.05	0.63	0.03	0.01	0.44	0.01	0.01
45	7.00	11.17	4.84	4.25	3.31	1.44	2.98	1.39	0.60	1.93	0.48	0.21	1.44	0.24	0.10	1.12	0.13	0.06	0.71	0.04	0.02	0.49	0.02	0.01
50	7.78	13.57	5.88	4.72	4.02	1.74	3.31	1.70	0.73	2.14	0.59	0.26	1.60	0.29	0.13	1.24	0.16	0.07	0.79	0.05	0.02	0.55	0.02	0.01
55	8.56	16.20	7.02	5.19	4.80	2.08	3.64	2.02	0.88	2.36	0.70	0.30	1.76	0.35	0.15	1.37	0.19	0.08	0.87	0.06	0.03	0.60	0.03	0.01
60	9.34	19.03	8.25	5.66	5.64	2.45	3.97	2.38	1.03	2.57	0.83	0.36	1.92	0.41	0.18	1.49	0.22	0.10	0.95	0.07	0.03	0.66	0.03	0.01
65	10.11	22.07	9.57	6.14	6.54	2.84	4.30	2.76	1.19	2.79	0.96	0.42	2.08	0.47	0.20	1.62	0.26	0.11	1.03	0.09	0.04	0.71	0.03	0.02
70	10.89	25.31	10.97	6.61	7.51	3.25	4.63	3.16	1.37	3.00	1.10	0.48	2.24	0.54	0.23	1.74	0.29	0.13	1.11	0.10	0.04	0.77	0.04	0.02
75				7.08	8.53	3.70	4.96	3.59	1.56	3.21	1.25	0.54	2.40	0.62	0.27	1.87	0.33	0.14	1.19	0.11	0.05	0.82	0.05	0.02
80				7.55	9.61	4.17	5.29	4.05	1.75	3.43	1.41	0.61	2.56	0.69	0.30	1.99	0.38	0.16	1.27	0.12	0.05	0.88	0.05	0.02
90				8.50	11.95	5.18	5.96	5.03	2.18	3.86	1.75	0.76	2.88	0.86	0.37	2.24	0.47	0.20	1.43	0.16	0.07	0.99	0.06	0.03
100				9.44	14.53	6.30	6.62	6.12	2.65	4.29	2.13	0.92	3.20	1.05	0.45	2.49	0.57	0.25	1.58	0.19	0.08	1.10	0.08	0.03
125				11.80	21.97	9.52	8.27	9.25	4.01	5.36	3.22	1.39	4.01	1.59	0.69	3.11	0.86	0.37	1.98	0.29	0.12	1.37	0.12	0.05
150							9.93	12.97	5.62	6.43	4.51	1.95	4.81	2.22	0.96	3.73	1.20	0.52	2.38	0.40	0.17	1.64	0.16	0.07
175							11.58	17.25	7.48	7.50	6.00	2.60	5.61	2.96	1.28	4.35	1.60	0.69	2.77	0.53	0.23	1.92	0.22	0.09
200										8.57	7.68	3.33	6.41	3.79	1.64	4.98	2.05	0.89	3.17	0.68	0.30	2.19	0.28	0.12
250										10.71	11.61	5.03	8.01	5.72	2.48	6.22	3.09	1.34	3.96	1.03	0.45	2.74	0.42	0.18
300													9.61	8.02	3.48	7.47	4.34	1.88	4.75	1.44	0.63	3.29	0.59	0.26
350										vvv			11.21	10.67	4.63	8.71	5.77	2.50	5.54	1.92	0.83	3.84	0.79	0.34
400																9.95	7.39	3.20	6.33	2.46	1.07	4.39	1.01	0.44
450																11.20	9.19	3.98	7.13	3.06	1.33	4.93	1.25	0.54
500																			7.92	3.72	1.61	5.48	1.52	0.66
750																			11.88	7.88	3.42	8.22	3.22	1.40
800																						8.77	3.63	1.57
1000																						10.97	5.49	2.38

Table 3-24: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Imperial units (8in -24in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	8 in			10 in			12 in			14 in			16 in			18 in			20 in			24 in		
	7.981			10.02			11.938			13.126			15.000			16.876			18.814			22.626		
75	0.47	0.01	0.01																					
80	0.51	0.01	0.01	0.32	0.00	0.00	0.23	0.00	0.00															
90	0.57	0.02	0.01	0.36	0.01	0.00	0.25	0.00	0.00	0.21	0.00	0.00												
100	0.63	0.02	0.01	0.40	0.01	0.00	0.28	0.00	0.00	0.23	0.00	0.00												
125	0.79	0.03	0.01	0.50	0.01	0.00	0.35	0.00	0.00	0.29	0.00	0.00	0.22	0.00	0.00									
150	0.95	0.04	0.02	0.60	0.01	0.01	0.42	0.01	0.00	0.35	0.00	0.00	0.27	0.00	0.00	0.21	0.00	0.00						
175	1.11	0.06	0.02	0.70	0.02	0.01	0.50	0.01	0.00	0.41	0.01	0.00	0.31	0.00	0.00	0.25	0.00	0.00	0.20	0.00	0.00			
200	1.27	0.07	0.03	0.80	0.02	0.01	0.57	0.01	0.00	0.47	0.01	0.00	0.36	0.00	0.00	0.28	0.00	0.00	0.23	0.00	0.00			
250	1.58	0.11	0.05	1.00	0.04	0.02	0.71	0.02	0.01	0.59	0.01	0.00	0.45	0.01	0.00	0.35	0.00	0.00	0.28	0.00	0.00	0.20	0.00	0.00
300	1.90	0.16	0.07	1.21	0.05	0.02	0.85	0.02	0.01	0.70	0.01	0.01	0.54	0.01	0.00	0.42	0.00	0.00	0.34	0.00	0.00	0.24	0.00	0.00
350	2.22	0.21	0.09	1.41	0.07	0.03	0.99	0.03	0.01	0.82	0.02	0.01	0.63	0.01	0.00	0.50	0.01	0.00	0.40	0.00	0.00	0.28	0.00	0.00
400	2.53	0.26	0.11	1.61	0.09	0.04	1.13	0.04	0.02	0.94	0.02	0.01	0.72	0.01	0.01	0.57	0.01	0.00	0.46	0.00	0.00	0.32	0.00	0.00
450	2.85	0.33	0.14	1.81	0.11	0.05	1.27	0.05	0.02	1.05	0.03	0.01	0.81	0.02	0.01	0.64	0.01	0.00	0.51	0.01	0.00	0.35	0.00	0.00
500	3.17	0.40	0.17	2.01	0.13	0.06	1.42	0.06	0.02	1.17	0.04	0.02	0.90	0.02	0.01	0.71	0.01	0.00	0.57	0.01	0.00	0.39	0.00	0.00
750	4.75	0.85	0.37	3.01	0.28	0.12	2.12	0.12	0.05	1.76	0.08	0.03	1.34	0.04	0.02	1.06	0.02	0.01	0.85	0.01	0.01	0.59	0.01	0.00
1000	6.33	1.44	0.63	4.02	0.48	0.21	2.83	0.20	0.09	2.34	0.13	0.06	1.79	0.07	0.03	1.42	0.04	0.02	1.14	0.02	0.01	0.79	0.01	0.00
1250	7.92	2.18	0.95	5.02	0.72	0.31	3.54	0.31	0.13	2.93	0.19	0.08	2.24	0.10	0.04	1.77	0.06	0.02	1.42	0.03	0.01	0.98	0.01	0.01
1500	9.50	3.06	1.33	6.03	1.01	0.44	4.25	0.43	0.19	3.51	0.27	0.12	2.69	0.14	0.06	2.12	0.08	0.03	1.71	0.05	0.02	1.18	0.02	0.01
1750	11.08	4.07	1.76	7.03	1.35	0.58	4.95	0.57	0.25	4.10	0.36	0.16	3.14	0.19	0.08	2.48	0.11	0.05	1.99	0.06	0.03	1.38	0.03	0.01
2000				8.04	1.72	0.75	5.66	0.73	0.32	4.68	0.46	0.20	3.59	0.24	0.10	2.83	0.14	0.06	2.28	0.08	0.03	1.58	0.03	0.01
2500				10.04	2.61	1.13	7.08	1.11	0.48	5.85	0.70	0.30	4.48	0.37	0.16	3.54	0.21	0.09	2.85	0.12	0.05	1.97	0.05	0.02
3000							8.49	1.56	0.68	7.02	0.98	0.43	5.38	0.51	0.22	4.25	0.29	0.13	3.42	0.17	0.07	2.36	0.07	0.03
3500							9.91	2.07	0.90	8.19	1.31	0.57	6.27	0.68	0.30	4.96	0.38	0.17	3.99	0.23	0.10	2.76	0.09	0.04
4000							11.32	2.65	1.15	9.36	1.67	0.72	7.17	0.87	0.38	5.67	0.49	0.21	4.56	0.29	0.13	3.15	0.12	0.05
4500										10.54	2.08	0.90	8.07	1.09	0.47	6.37	0.61	0.27	5.13	0.36	0.16	3.55	0.15	0.06
5000													8.96	1.32	0.57	7.08	0.74	0.32	5.70	0.44	0.19	3.94	0.18	0.08
5500													9.86	1.58	0.68	7.79	0.89	0.38	6.27	0.52	0.23	4.33	0.21	0.09
6000													10.76	1.85	0.80	8.50	1.04	0.45	6.84	0.61	0.27	4.73	0.25	0.11
6500																9.21	1.21	0.52	7.41	0.71	0.31	5.12	0.29	0.13
7000																9.91	1.39	0.60	7.98	0.82	0.35	5.52	0.33	0.14
7500																10.62	1.58	0.68	8.55	0.93	0.40	5.91	0.38	0.16
8000																			9.12	1.05	0.45	6.30	0.43	0.19
9000																			10.26	1.30	0.56	7.09	0.53	0.23
10000																						7.88	0.65	0.28
12000																						9.45	0.90	0.39
14000																						11.03	1.20	0.52

Table 3-25: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Metric units (⅛ in - 1¼ in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	⅛ in			¼ in			⅜ in			½ in			¾ in			1 in			1¼ in		
	6.8			9.2			12.5			15.8			20.9			26.6			35.1		
1	11.4	5.0	4.9	6.2	1.1	1.1	3.4	0.3	0.3	2.1	0.1	0.1	1.2	0.0	0.0	0.7	0.0	0.0			
5	56.8	97.6	95.6	31.0	22.4	22.0	16.9	5.1	5.0	10.6	1.7	1.6	6.1	0.4	0.4	3.7	0.1	0.1	2.2	0.0	0.0
10	113.6	352.3	345.2	62.1	80.9	79.3	33.8	18.5	18.1	21.3	6.0	5.8	12.1	1.5	1.5	7.5	0.5	0.5	4.3	0.1	0.1
15	170.5	746.5	731.6	93.1	171.4	167.9	50.8	39.2	38.4	31.9	12.6	12.4	18.2	3.2	3.2	11.2	1.0	1.0	6.5	0.3	0.3
30	340.9	2694.9	2641.0	186.2	618.7	606.3	101.5	141.4	138.6	63.8	45.6	44.7	36.3	11.6	11.4	22.4	3.6	3.5	13.0	0.9	0.9
50				310.3	1593.4	1561.5	169.2	364.2	356.9	106.3	117.5	115.2	60.6	29.9	29.3	37.4	9.2	9.1	21.6	2.4	2.4
75							253.8	771.7	756.2	159.4	249.1	244.1	90.8	63.4	62.1	56.0	19.6	19.2	32.4	5.2	5.1
100							338.3	1314.7	1288.4	212.5	424.3	415.8	121.1	108.0	105.8	74.7	33.4	32.7	43.2	8.8	8.6
125										265.7	641.4	628.6	151.4	163.3	160.0	93.4	50.4	49.4	54.0	13.3	13.0
150										318.8	899.1	881.1	181.7	228.8	224.3	112.1	70.7	69.3	64.8	18.6	18.2
175													211.9	304.5	298.4	130.8	94.1	92.2	75.6	24.8	24.3
200													242.2	389.9	382.1	149.5	120.4	118.0	86.4	31.7	31.1
225													272.5	484.9	475.2	168.1	149.8	146.8	97.2	39.4	38.7
250													302.8	589.4	577.6	186.8	182.1	178.4	107.9	47.9	47.0
275													333.1	703.2	689.1	205.5	217.2	212.9	118.7	57.2	56.1
300																224.2	255.2	250.1	129.5	67.2	65.9
325																242.9	296.0	290.1	140.3	77.9	76.4
350																261.6	339.5	332.8	151.1	89.4	87.6
400																298.9	434.8	426.1	172.7	114.5	112.2
450																336.3	540.8	530.0	194.3	142.4	139.6
500																			215.9	173.1	169.6
600																			259.1	242.6	237.8
700																			302.3	322.8	316.3
800																			345.4	413.3	405.1

Table 3-25: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Metric units (1½ in - 6 in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	1½ in			2 in			2 ½ in			3 in			3 ½ in			4 in			5 in			6 in		
	40.9			52.5			62.7			77.9			90.1			102.3			128.2			154.1		
10	3.2	0.1	0.1																					
15	4.8	0.1	0.1	2.9	0.0	0.0																		
30	9.5	0.4	0.4	5.8	0.1	0.1	4.0	0.1	0.1	2.6	0.0	0.0												
50	15.9	1.1	1.1	9.6	0.3	0.3	6.7	0.1	0.1	4.4	0.0	0.0	3.3	0.0	0.0									
75	23.8	2.4	2.4	14.4	0.7	0.7	10.1	0.3	0.3	6.6	0.1	0.1	4.9	0.1	0.1	3.8	0.0	0.0						
100	31.7	4.1	4.1	19.2	1.2	1.2	13.5	0.5	0.5	8.7	0.2	0.2	6.5	0.1	0.1	5.1	0.0	0.0	3.2	0.0	0.0			
125	39.6	6.3	6.1	24.1	1.9	1.8	16.9	0.8	0.8	10.9	0.3	0.3	8.2	0.1	0.1	6.3	0.1	0.1	4.0	0.0	0.0	2.8	0.0	0.0
150	47.6	8.8	8.6	28.9	2.6	2.6	20.2	1.1	1.1	13.1	0.4	0.4	9.8	0.2	0.2	7.6	0.1	0.1	4.8	0.0	0.0	3.4	0.0	0.0
175	55.5	11.7	11.5	33.7	3.5	3.4	23.6	1.5	1.4	15.3	0.5	0.5	11.4	0.3	0.2	8.9	0.1	0.1	5.6	0.0	0.0	3.9	0.0	0.0
200	63.4	15.0	14.7	38.5	4.4	4.4	27.0	1.9	1.8	17.5	0.7	0.6	13.1	0.3	0.3	10.1	0.2	0.2	6.5	0.1	0.1	4.5	0.0	0.0
225	71.4	18.6	18.2	43.3	5.5	5.4	30.4	2.3	2.3	19.7	0.8	0.8	14.7	0.4	0.4	11.4	0.2	0.2	7.3	0.1	0.1	5.0	0.0	0.0
250	79.3	22.6	22.2	48.1	6.7	6.6	33.7	2.8	2.8	21.9	1.0	1.0	16.3	0.5	0.5	12.7	0.3	0.3	8.1	0.1	0.1	5.6	0.0	0.0
275	87.2	27.0	26.5	52.9	8.0	7.9	37.1	3.4	3.3	24.0	1.2	1.2	18.0	0.6	0.6	13.9	0.3	0.3	8.9	0.1	0.1	6.1	0.0	0.0
300	95.1	31.7	31.1	57.7	9.4	9.2	40.5	4.0	3.9	26.2	1.4	1.4	19.6	0.7	0.7	15.2	0.4	0.4	9.7	0.1	0.1	6.7	0.0	0.0
325	103.1	36.8	36.1	62.6	10.9	10.7	43.9	4.6	4.5	28.4	1.6	1.6	21.2	0.8	0.8	16.5	0.4	0.4	10.5	0.1	0.1	7.3	0.1	0.1
350	111.0	42.2	41.4	67.4	12.5	12.3	47.2	5.3	5.2	30.6	1.8	1.8	22.9	0.9	0.9	17.7	0.5	0.5	11.3	0.2	0.2	7.8	0.1	0.1
400	126.9	54.0	53.0	77.0	16.0	15.7	54.0	6.8	6.6	35.0	2.4	2.3	26.1	1.2	1.1	20.3	0.6	0.6	12.9	0.2	0.2	8.9	0.1	0.1
450	142.7	67.2	65.9	86.6	19.9	19.5	60.7	8.4	8.2	39.3	2.9	2.9	29.4	1.4	1.4	22.8	0.8	0.8	14.5	0.3	0.3	10.1	0.1	0.1
500	158.6	81.7	80.1	96.2	24.2	23.8	67.5	10.2	10.0	43.7	3.6	3.5	32.7	1.8	1.7	25.3	0.9	0.9	16.1	0.3	0.3	11.2	0.1	0.1
550	174.4	97.5	95.5	105.9	28.9	28.3	74.2	12.2	11.9	48.1	4.2	4.2	35.9	2.1	2.0	27.9	1.1	1.1	17.8	0.4	0.4	12.3	0.2	0.2
600	190.3	114.5	112.2	115.5	34.0	33.3	81.0	14.3	14.0	52.5	5.0	4.9	39.2	2.5	2.4	30.4	1.3	1.3	19.4	0.4	0.4	13.4	0.2	0.2
750	237.9	173.1	169.7	144.4	51.4	50.3	101.2	21.7	21.2	65.6	7.5	7.4	49.0	3.7	3.6	38.0	2.0	2.0	24.2	0.7	0.7	16.8	0.3	0.3
1000	317.1	294.9	289.0	192.5	87.5	85.8	134.9	36.9	36.2	87.4	12.8	12.6	65.4	6.3	6.2	50.7	3.4	3.3	32.3	1.1	1.1	22.3	0.5	0.5
1250				240.6	132.3	129.7	168.7	55.8	54.7	109.3	19.4	19.0	81.7	9.6	9.4	63.4	5.2	5.0	40.3	1.7	1.7	27.9	0.7	0.7
1500				288.7	185.5	181.8	202.4	78.2	76.6	131.1	27.2	26.6	98.0	13.4	13.1	76.0	7.2	7.1	48.4	2.4	2.4	33.5	1.0	1.0
1750				336.8	246.7	241.8	236.2	104.0	101.9	153.0	36.2	35.5	114.4	17.8	17.5	88.7	9.6	9.4	56.5	3.2	3.1	39.1	1.3	1.3
2000							269.9	133.2	130.5	174.8	46.3	45.4	130.7	22.8	22.4	101.4	12.3	12.1	64.6	4.1	4.0	44.7	1.7	1.6
3000							404.8	282.2	276.6	262.3	98.2	96.2	196.1	48.4	47.4	152.1	26.1	25.5	96.8	8.7	8.5	67.0	3.6	3.5
4000										349.7	167.2	163.9	261.4	82.4	80.7	202.8	44.4	43.5	129.1	14.8	14.5	89.4	6.1	5.9
5000													326.8	124.6	122.1	253.5	67.1	65.8	161.4	22.4	21.9	111.7	9.1	9.0
6000																304.2	94.1	92.2	193.7	31.4	30.8	134.0	12.8	12.6
7000																			226.0	41.8	40.9	156.4	17.1	16.7
8000																			258.2	53.5	52.4	178.7	21.8	21.4
9000																			290.5	66.5	65.2	201.1	27.2	26.6
10000																			322.8	80.8	79.2	223.4	33.0	32.4
12000																						268.1	46.3	45.4
14000																						312.8	61.6	60.4

Table 3-25: Friction loss for Industrial Plus PVC, and CPVC Schedule 40 in Metric units (8 in - 24 in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	8 in			10 in			12 in			14 in			16 in			18 in			20 in			24 in		
	202.7			254.5			303.2			333.4			381.0			428.7			477.9			574.7		
500	6.5	0.0	0.0	4.1	0.0	0.0	2.9	0.0	0.0															
550	7.1	0.0	0.0	4.5	0.0	0.0	3.2	0.0	0.0															
600	7.7	0.0	0.0	4.9	0.0	0.0	3.5	0.0	0.0	2.9	0.0	0.0												
750	9.7	0.1	0.1	6.1	0.0	0.0	4.3	0.0	0.0	3.6	0.0	0.0	2.7	0.0	0.0									
1000	12.9	0.1	0.1	8.2	0.0	0.0	5.8	0.0	0.0	4.8	0.0	0.0	3.7	0.0	0.0	2.9	0.0	0.0						
1250	16.1	0.2	0.2	10.2	0.1	0.1	7.2	0.0	0.0	6.0	0.0	0.0	4.6	0.0	0.0	3.6	0.0	0.0	2.9	0.0	0.0			
1500	19.4	0.3	0.3	12.3	0.1	0.1	8.7	0.0	0.0	7.2	0.0	0.0	5.5	0.0	0.0	4.3	0.0	0.0	3.5	0.0	0.0			
1750	22.6	0.3	0.3	14.3	0.1	0.1	10.1	0.0	0.0	8.4	0.0	0.0	6.4	0.0	0.0	5.1	0.0	0.0	4.1	0.0	0.0	2.8	0.0	0.0
2000	25.8	0.4	0.4	16.4	0.1	0.1	11.5	0.1	0.1	9.5	0.0	0.0	7.3	0.0	0.0	5.8	0.0	0.0	4.6	0.0	0.0	3.2	0.0	0.0
3000	38.7	0.9	0.9	24.6	0.3	0.3	17.3	0.1	0.1	14.3	0.1	0.1	11.0	0.0	0.0	8.7	0.0	0.0	7.0	0.0	0.0	4.8	0.0	0.0
4000	51.6	1.6	1.6	32.8	0.5	0.5	23.1	0.2	0.2	19.1	0.1	0.1	14.6	0.1	0.1	11.5	0.0	0.0	9.3	0.0	0.0	6.4	0.0	0.0
5000	64.5	2.4	2.4	41.0	0.8	0.8	28.9	0.3	0.3	23.9	0.2	0.2	18.3	0.1	0.1	14.4	0.1	0.1	11.6	0.0	0.0	8.0	0.0	0.0
6000	77.5	3.4	3.3	49.1	1.1	1.1	34.6	0.5	0.5	28.6	0.3	0.3	21.9	0.2	0.2	17.3	0.1	0.1	13.9	0.1	0.1	9.6	0.0	0.0
7000	90.4	4.5	4.4	57.3	1.5	1.5	40.4	0.6	0.6	33.4	0.4	0.4	25.6	0.2	0.2	20.2	0.1	0.1	16.3	0.1	0.1	11.2	0.0	0.0
8000	103.3	5.8	5.6	65.5	1.9	1.9	46.2	0.8	0.8	38.2	0.5	0.5	29.2	0.3	0.3	23.1	0.2	0.1	18.6	0.1	0.1	12.9	0.0	0.0
9000	116.2	7.2	7.0	73.7	2.4	2.3	51.9	1.0	1.0	43.0	0.6	0.6	32.9	0.3	0.3	26.0	0.2	0.2	20.9	0.1	0.1	14.5	0.0	0.0
10000	129.1	8.7	8.5	81.9	2.9	2.8	57.7	1.2	1.2	47.7	0.8	0.8	36.5	0.4	0.4	28.9	0.2	0.2	23.2	0.1	0.1	16.1	0.1	0.1
12500	161.4	13.1	12.9	102.4	4.3	4.3	72.1	1.9	1.8	59.7	1.2	1.1	45.7	0.6	0.6	36.1	0.3	0.3	29.0	0.2	0.2	20.1	0.1	0.1
15000	193.6	18.4	18.1	122.9	6.1	6.0	86.6	2.6	2.5	71.6	1.6	1.6	54.8	0.9	0.8	43.3	0.5	0.5	34.8	0.3	0.3	24.1	0.1	0.1
17500	225.9	24.5	24.0	143.3	8.1	7.9	101.0	3.5	3.4	83.5	2.2	2.1	64.0	1.1	1.1	50.5	0.6	0.6	40.7	0.4	0.4	28.1	0.2	0.2
20000	258.2	31.4	30.8	163.8	10.4	10.2	115.4	4.4	4.3	95.5	2.8	2.7	73.1	1.5	1.4	57.7	0.8	0.8	46.5	0.5	0.5	32.1	0.2	0.2
22500	290.5	39.1	38.3	184.3	12.9	12.7	129.8	5.5	5.4	107.4	3.5	3.4	82.2	1.8	1.8	65.0	1.0	1.0	52.3	0.6	0.6	36.1	0.2	0.2
25000	322.7	47.5	46.5	204.8	15.7	15.4	144.3	6.7	6.6	119.3	4.2	4.1	91.4	2.2	2.2	72.2	1.2	1.2	58.1	0.7	0.7	40.2	0.3	0.3
27500				225.2	18.7	18.3	158.7	8.0	7.8	131.3	5.0	4.9	100.5	2.6	2.6	79.4	1.5	1.5	63.9	0.9	0.9	44.2	0.4	0.3
30000				245.7	22.0	21.6	173.1	9.4	9.2	143.2	5.9	5.8	109.6	3.1	3.0	86.6	1.7	1.7	69.7	1.0	1.0	48.2	0.4	0.4
35000				286.7	29.3	28.7	202.0	12.5	12.2	167.0	7.9	7.7	127.9	4.1	4.0	101.1	2.3	2.3	81.3	1.4	1.3	56.2	0.6	0.5
40000				327.6	37.5	36.7	230.8	16.0	15.7	190.9	10.1	9.9	146.2	5.3	5.2	115.5	3.0	2.9	92.9	1.7	1.7	64.3	0.7	0.7
45000							259.7	19.9	19.5	214.8	12.5	12.3	164.5	6.5	6.4	129.9	3.7	3.6	104.5	2.2	2.1	72.3	0.9	0.9
50000							288.5	24.2	23.7	238.6	15.2	14.9	182.7	8.0	7.8	144.4	4.5	4.4	116.2	2.6	2.6	80.3	1.1	1.1
60000							346.2	33.9	33.2	286.4	21.3	20.9	219.3	11.1	10.9	173.2	6.3	6.2	139.4	3.7	3.6	96.4	1.5	1.5
70000										334.1	28.4	27.8	255.8	14.8	14.5	202.1	8.4	8.2	162.6	4.9	4.8	112.4	2.0	2.0
80000													292.4	19.0	18.6	231.0	10.7	10.5	185.9	6.3	6.2	128.5	2.6	2.5
90000													328.9	23.6	23.2	259.9	13.3	13.0	209.1	7.8	7.7	144.6	3.2	3.1
100000																288.7	16.2	15.9	232.3	9.5	9.3	160.6	3.9	3.8
120000																346.5	22.7	22.2	278.8	13.4	13.1	192.8	5.4	5.3
140000																			325.2	17.8	17.4	224.9	7.2	7.1
160000																						257.0	9.3	9.1
200000																						321.3	14.0	13.7

Table 3-26: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Imperial units (⅛ in - 1¼ in)

per minute Gallons	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	⅛ in			¼ in			⅜ in			½ in			¾ in			1 in			1¼ in		
	0.215			0.302			0.423			0.546			0.742			0.957			1.278		
0.25	2.18	13.35	5.79	1.11	2.56	1.11	0.56	0.50	0.22	0.34	0.14	0.06	0.18	0.03	0.01	0.11	0.01	0.00	0.06	0.00	0.00
0.5	4.36	48.20	20.90	2.21	9.23	4.00	1.13	1.79	0.78	0.68	0.52	0.22	0.37	0.12	0.05	0.22	0.03	0.01	0.12	0.01	0.00
0.75	6.54	102.14	44.28	3.32	19.55	8.48	1.69	3.79	1.65	1.01	1.10	0.48	0.55	0.25	0.11	0.33	0.07	0.03	0.19	0.02	0.01
1	8.73	174.01	75.43	4.42	33.31	14.44	2.25	6.47	2.80	1.35	1.87	0.81	0.73	0.42	0.18	0.44	0.12	0.05	0.25	0.03	0.01
1.25	10.91	263.06	114.04	5.53	50.36	21.83	2.82	9.77	4.24	1.69	2.82	1.22	0.92	0.63	0.28	0.55	0.18	0.08	0.31	0.05	0.02
1.5				6.63	70.58	30.60	3.38	13.70	5.94	2.03	3.96	1.72	1.10	0.89	0.39	0.66	0.26	0.11	0.37	0.06	0.03
2				8.85	120.25	52.13	4.51	23.34	10.12	2.71	6.74	2.92	1.47	1.52	0.66	0.88	0.44	0.19	0.49	0.11	0.05
2.5				11.06	181.79	78.80	5.64	35.28	15.30	3.38	10.19	4.42	1.83	2.29	0.99	1.10	0.66	0.29	0.62	0.16	0.07
3							6.76	49.46	21.44	4.06	14.28	6.19	2.20	3.21	1.39	1.32	0.93	0.40	0.74	0.23	0.10
3.5							7.89	65.80	28.52	4.74	19.00	8.24	2.56	4.27	1.85	1.54	1.24	0.54	0.86	0.30	0.13
4							9.02	84.26	36.53	5.41	24.34	10.55	2.93	5.47	2.37	1.76	1.59	0.69	0.99	0.39	0.17
4.5							10.14	104.80	45.43	6.09	30.27	13.12	3.30	6.81	2.95	1.98	1.97	0.86	1.11	0.48	0.21
5										6.77	36.79	15.95	3.66	8.27	3.59	2.20	2.40	1.04	1.23	0.59	0.25
7.5										10.15	77.96	33.79	5.49	17.53	7.60	3.30	5.08	2.20	1.85	1.24	0.54
10													7.33	29.86	12.94	4.40	8.66	3.75	2.47	2.12	0.92
12.5													9.16	45.14	19.57	5.51	13.09	5.67	3.09	3.20	1.39
15													10.99	63.27	27.43	6.61	18.35	7.95	3.70	4.49	1.95
17.5																7.71	24.41	10.58	4.32	5.97	2.59
20																8.81	31.26	13.55	4.94	7.65	3.32
25																11.01	47.25	20.48	6.17	11.57	5.01
30																			7.41	16.21	7.03
35																			8.64	21.57	9.35
40																			9.88	27.62	11.97
45																			11.11	34.35	14.89

Table 3-26: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Imperial units (1½ in - 6 in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	1½ in			2 in			2½ in			3 in			3½ in			4 in			5 in			6 in		
	1.500			1.939			2.323			2.900			3.364			3.826			4.813			5.761		
2	0.36	0.05	0.02	0.21	0.01	0.01																		
5	0.90	0.27	0.12	0.54	0.08	0.03	0.37	0.03	0.01	0.24	0.01	0.00												
7	1.25	0.50	0.22	0.75	0.14	0.06	0.52	0.06	0.03	0.34	0.02	0.01	0.25	0.01	0.00									
10	1.79	0.97	0.42	1.07	0.28	0.12	0.75	0.12	0.05	0.48	0.04	0.02	0.36	0.02	0.01	0.28	0.01	0.00						
15	2.69	2.06	0.89	1.61	0.59	0.26	1.12	0.25	0.11	0.72	0.08	0.04	0.53	0.04	0.02	0.41	0.02	0.01	0.26	0.01	0.00			
20	3.59	3.51	1.52	2.15	1.01	0.44	1.49	0.42	0.18	0.96	0.14	0.06	0.71	0.07	0.03	0.55	0.04	0.02	0.35	0.01	0.01	0.24	0.01	0.00
25	4.48	5.31	2.30	2.68	1.52	0.66	1.87	0.63	0.27	1.20	0.21	0.09	0.89	0.10	0.05	0.69	0.06	0.02	0.44	0.02	0.01	0.30	0.01	0.00
30	5.38	7.44	3.22	3.22	2.13	0.92	2.24	0.89	0.38	1.44	0.30	0.13	1.07	0.15	0.06	0.83	0.08	0.03	0.52	0.03	0.01	0.36	0.01	0.00
35	6.27	9.89	4.29	3.75	2.84	1.23	2.62	1.18	0.51	1.68	0.40	0.17	1.25	0.19	0.08	0.96	0.10	0.05	0.61	0.03	0.01	0.43	0.01	0.01
40	7.17	12.67	5.49	4.29	3.63	1.58	2.99	1.51	0.65	1.92	0.51	0.22	1.43	0.25	0.11	1.10	0.13	0.06	0.70	0.04	0.02	0.49	0.02	0.01
45	8.07	15.76	6.83	4.83	4.52	1.96	3.36	1.88	0.81	2.16	0.64	0.28	1.60	0.31	0.13	1.24	0.17	0.07	0.78	0.05	0.02	0.55	0.02	0.01
50	8.96	19.15	8.30	5.36	5.49	2.38	3.74	2.28	0.99	2.40	0.77	0.34	1.78	0.38	0.16	1.38	0.20	0.09	0.87	0.07	0.03	0.61	0.03	0.01
55	9.86	22.85	9.91	5.90	6.55	2.84	4.11	2.72	1.18	2.64	0.92	0.40	1.96	0.45	0.19	1.52	0.24	0.10	0.96	0.08	0.03	0.67	0.03	0.01
60	10.76	26.85	11.64	6.44	7.70	3.34	4.48	3.20	1.39	2.88	1.09	0.47	2.14	0.53	0.23	1.65	0.28	0.12	1.04	0.09	0.04	0.73	0.04	0.02
65	11.65	31.14	13.50	6.97	8.93	3.87	4.86	3.71	1.61	3.12	1.26	0.55	2.32	0.61	0.27	1.79	0.33	0.14	1.13	0.11	0.05	0.79	0.04	0.02
70				7.51	10.24	4.44	5.23	4.25	1.84	3.36	1.45	0.63	2.50	0.70	0.30	1.93	0.38	0.16	1.22	0.12	0.05	0.85	0.05	0.02
75				8.05	11.64	5.05	5.61	4.83	2.09	3.60	1.64	0.71	2.67	0.80	0.35	2.07	0.43	0.18	1.31	0.14	0.06	0.91	0.06	0.03
80				8.58	13.12	5.69	5.98	5.45	2.36	3.84	1.85	0.80	2.85	0.90	0.39	2.20	0.48	0.21	1.39	0.16	0.07	0.97	0.07	0.03
90				9.66	16.32	7.07	6.73	6.77	2.94	4.32	2.30	1.00	3.21	1.12	0.48	2.48	0.60	0.26	1.57	0.20	0.08	1.09	0.08	0.04
100				10.73	19.83	8.60	7.47	8.23	3.57	4.80	2.80	1.21	3.56	1.36	0.59	2.76	0.73	0.31	1.74	0.24	0.10	1.22	0.10	0.04
125							9.34	12.45	5.40	6.00	4.23	1.83	4.46	2.05	0.89	3.44	1.10	0.48	2.18	0.36	0.16	1.52	0.15	0.06
150							11.21	17.44	7.56	7.19	5.93	2.57	5.35	2.88	1.25	4.13	1.54	0.67	2.61	0.50	0.22	1.82	0.21	0.09
175										8.39	7.89	3.42	6.24	3.83	1.66	4.82	2.05	0.89	3.05	0.67	0.29	2.13	0.28	0.12
200										9.59	10.10	4.38	7.13	4.91	2.13	5.51	2.62	1.14	3.48	0.86	0.37	2.43	0.36	0.16
250										11.99	15.27	6.62	8.91	7.42	3.21	6.89	3.96	1.72	4.35	1.30	0.56	3.04	0.54	0.23
300													10.69	10.39	4.51	8.27	5.56	2.41	5.22	1.82	0.79	3.65	0.76	0.33
350																9.64	7.39	3.20	6.09	2.42	1.05	4.25	1.01	0.44
400																11.02	9.47	4.10	6.97	3.10	1.34	4.86	1.29	0.56
450																			7.84	3.85	1.67	5.47	1.61	0.70
500																			8.71	4.69	2.03	6.08	1.95	0.85
600																			10.45	6.57	2.85	7.29	2.74	1.19
700																						8.51	3.64	1.58
800																						9.72	4.67	2.02
900																						10.94	5.80	2.52

Table 3-26: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Imperial units (8 in - 24 in)

Flow Rate (GPM)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	8 in			10 in			12 in			14 in			16 in			18 in			20 in			24 in		
	7.625			9.564			11.376			12.500			14.314			16.126			17.938			21.564		
75	0.52	0.01	0.01	0.33	0.00	0.00	0.23	0.00	0.00															
80	0.56	0.02	0.01	0.35	0.01	0.00	0.25	0.00	0.00															
90	0.62	0.02	0.01	0.40	0.01	0.00	0.28	0.00	0.00	0.23	0.00	0.00												
100	0.69	0.03	0.01	0.44	0.01	0.00	0.31	0.00	0.00	0.26	0.00	0.00												
125	0.87	0.04	0.02	0.55	0.01	0.01	0.39	0.01	0.00	0.32	0.00	0.00	0.25	0.00	0.00									
150	1.04	0.05	0.02	0.66	0.02	0.01	0.47	0.01	0.00	0.39	0.00	0.00	0.30	0.00	0.00	0.23	0.00	0.00						
175	1.21	0.07	0.03	0.77	0.02	0.01	0.55	0.01	0.00	0.45	0.01	0.00	0.34	0.00	0.00	0.27	0.00	0.00	0.22	0.00	0.00			
200	1.39	0.09	0.04	0.88	0.03	0.01	0.62	0.01	0.01	0.52	0.01	0.00	0.39	0.00	0.00	0.31	0.00	0.00	0.25	0.00	0.00			
250	1.73	0.14	0.06	1.10	0.05	0.02	0.78	0.02	0.01	0.65	0.01	0.01	0.49	0.01	0.00	0.39	0.00	0.00	0.31	0.00	0.00	0.22	0.00	0.00
300	2.08	0.19	0.08	1.32	0.06	0.03	0.94	0.03	0.01	0.77	0.02	0.01	0.59	0.01	0.00	0.47	0.01	0.00	0.38	0.00	0.00	0.26	0.00	0.00
350	2.43	0.26	0.11	1.54	0.09	0.04	1.09	0.04	0.02	0.90	0.02	0.01	0.69	0.01	0.01	0.54	0.01	0.00	0.44	0.00	0.00	0.30	0.00	0.00
400	2.78	0.33	0.14	1.76	0.11	0.05	1.25	0.05	0.02	1.03	0.03	0.01	0.79	0.02	0.01	0.62	0.01	0.00	0.50	0.01	0.00	0.35	0.00	0.00
450	3.12	0.41	0.18	1.98	0.14	0.06	1.40	0.06	0.03	1.16	0.04	0.02	0.89	0.02	0.01	0.70	0.01	0.00	0.56	0.01	0.00	0.39	0.00	0.00
500	3.47	0.50	0.22	2.20	0.17	0.07	1.56	0.07	0.03	1.29	0.05	0.02	0.98	0.02	0.01	0.78	0.01	0.01	0.63	0.01	0.00	0.43	0.00	0.00
750	5.20	1.06	0.46	3.31	0.35	0.15	2.34	0.15	0.07	1.94	0.10	0.04	1.48	0.05	0.02	1.16	0.03	0.01	0.94	0.02	0.01	0.65	0.01	0.00
1000	6.94	1.80	0.78	4.41	0.60	0.26	3.12	0.26	0.11	2.58	0.16	0.07	1.97	0.08	0.04	1.55	0.05	0.02	1.25	0.03	0.01	0.87	0.01	0.00
1250	8.67	2.73	1.18	5.51	0.91	0.39	3.90	0.39	0.17	3.23	0.25	0.11	2.46	0.13	0.06	1.94	0.07	0.03	1.57	0.04	0.02	1.08	0.02	0.01
1500	10.41	3.82	1.66	6.61	1.27	0.55	4.68	0.55	0.24	3.87	0.34	0.15	2.95	0.18	0.08	2.33	0.10	0.04	1.88	0.06	0.03	1.30	0.02	0.01
2000				8.82	2.16	0.94	6.23	0.93	0.40	5.16	0.59	0.25	3.94	0.30	0.13	3.10	0.17	0.07	2.51	0.10	0.04	1.73	0.04	0.02
2500				11.02	3.27	1.42	7.79	1.40	0.61	6.45	0.89	0.39	4.92	0.46	0.20	3.88	0.26	0.11	3.13	0.15	0.07	2.17	0.06	0.03
3000							9.35	1.97	0.85	7.74	1.24	0.54	5.91	0.64	0.28	4.65	0.36	0.16	3.76	0.21	0.09	2.60	0.09	0.04
3500							10.91	2.62	1.14	9.04	1.66	0.72	6.89	0.86	0.37	5.43	0.48	0.21	4.39	0.29	0.12	3.04	0.12	0.05
4000										10.33	2.12	0.92	7.87	1.10	0.48	6.20	0.61	0.27	5.01	0.37	0.16	3.47	0.15	0.06
4500													8.86	1.36	0.59	6.98	0.76	0.33	5.64	0.46	0.20	3.90	0.19	0.08
5000													9.84	1.66	0.72	7.76	0.93	0.40	6.27	0.55	0.24	4.34	0.23	0.10
5500													10.83	1.98	0.86	8.53	1.11	0.48	6.89	0.66	0.29	4.77	0.27	0.12
6000																9.31	1.30	0.56	7.52	0.78	0.34	5.20	0.32	0.14
6500																10.08	1.51	0.65	8.15	0.90	0.39	5.64	0.37	0.16
7000																			8.77	1.03	0.45	6.07	0.42	0.18
7500																			9.40	1.17	0.51	6.51	0.48	0.21
8000																			10.03	1.32	0.57	6.94	0.54	0.23
10000																						8.67	0.82	0.35
11000																						9.54	0.97	0.42
12000																						10.41	1.14	0.50

Table 3-27: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Metric units (⅛ in - 1¼ in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	⅛ in			¼ in			⅜ in			½ in			¾ in			1 in			1¼ in		
	5.5			7.7			10.7			13.9			18.8			24.3			32.5		
1	17.8	14.7	14.4	9.0	2.8	2.8	4.6	0.5	0.5	2.8	0.2	0.2	1.5	0.0	0.0	0.9	0.0	0.0	0.5	0.0	0.0
5	88.9	290.3	284.5	45.1	55.6	54.5	23.0	10.8	10.6	13.8	3.1	3.1	7.5	0.7	0.7	4.5	0.2	0.2	2.5	0.0	0.0
10	177.9	1048.1	1027.1	90.2	200.6	196.6	46.0	38.9	38.2	27.6	11.2	11.0	14.9	2.5	2.5	9.0	0.7	0.7	5.0	0.2	0.2
15	266.8	2220.8	2176.4	135.2	425.1	416.6	68.9	82.5	80.9	41.4	23.8	23.4	22.4	5.4	5.3	13.5	1.6	1.5	7.6	0.4	0.4
20	355.8	3783.5	3707.8	180.3	724.3	709.8	91.9	140.6	137.8	55.2	40.6	39.8	29.9	9.1	8.9	18.0	2.6	2.6	10.1	0.6	0.6
30				270.5	1534.7	1504.0	137.9	297.9	291.9	82.8	86.0	84.3	44.8	19.3	19.0	26.9	5.6	5.5	15.1	1.4	1.3
40				360.7	2614.6	2562.3	183.8	507.5	497.3	110.3	146.6	143.6	59.7	33.0	32.3	35.9	9.6	9.4	20.1	2.3	2.3
50							229.8	767.2	751.8	137.9	221.6	217.2	74.7	49.8	48.8	44.9	14.4	14.2	25.2	3.5	3.5
75										206.9	469.5	460.1	112.0	105.6	103.5	67.3	30.6	30.0	37.8	7.5	7.3
100										275.8	799.9	783.9	149.4	179.9	176.3	89.8	52.1	51.1	50.3	12.8	12.5
125										344.8	1209.3	1185.1	186.7	271.9	266.5	112.2	78.8	77.3	62.9	19.3	18.9
150													224.0	381.1	373.5	134.7	110.5	108.3	75.5	27.0	26.5
175													261.4	507.0	496.9	157.1	147.0	144.1	88.1	36.0	35.3
200													298.7	649.3	636.3	179.6	188.3	184.5	100.7	46.1	45.2
225													336.1	807.5	791.4	202.0	234.1	229.5	113.3	57.3	56.2
250																224.5	284.6	278.9	125.9	69.7	68.3
275																246.9	339.5	332.7	138.5	83.1	81.5
300																269.4	398.9	390.9	151.0	97.6	95.7
325																291.8	462.6	453.4	163.6	113.3	111.0
350																314.3	530.7	520.1	176.2	129.9	127.3
400																			201.4	166.4	163.0
500																			251.7	251.5	246.5
600																			302.1	352.5	345.5

Table 3-27: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Metric units (1½ in - 6 in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	1½ in			2 in			2½ in			3 in			3½ in			4 in			5 in			6 in		
	38.1			49.3			59.0			73.7			85.4			97.2			122.3			146.3		
10	3.7	0.1	0.1																					
15	5.5	0.2	0.2	3.3	0.1	0.0																		
30	11.0	0.6	0.6	6.6	0.2	0.2	4.6	0.1	0.1	2.9	0.0	0.0												
50	18.3	1.6	1.6	10.9	0.5	0.5	7.6	0.2	0.2	4.9	0.1	0.1	3.6	0.0	0.0	2.8	0.0	0.0						
75	27.4	3.4	3.4	16.4	1.0	1.0	11.4	0.4	0.4	7.3	0.1	0.1	5.4	0.1	0.1	4.2	0.0	0.0	2.7	0.0	0.0			
100	36.5	5.9	5.7	21.9	1.7	1.6	15.2	0.7	0.7	9.8	0.2	0.2	7.3	0.1	0.1	5.6	0.1	0.1	3.5	0.0	0.0			
125	45.7	8.9	8.7	27.3	2.5	2.5	19.0	1.1	1.0	12.2	0.4	0.4	9.1	0.2	0.2	7.0	0.1	0.1	4.4	0.0	0.0	3.1	0.0	0.0
150	54.8	12.4	12.2	32.8	3.6	3.5	22.9	1.5	1.4	14.7	0.5	0.5	10.9	0.2	0.2	8.4	0.1	0.1	5.3	0.0	0.0	3.7	0.0	0.0
175	64.0	16.5	16.2	38.3	4.7	4.6	26.7	2.0	1.9	17.1	0.7	0.7	12.7	0.3	0.3	9.8	0.2	0.2	6.2	0.1	0.1	4.3	0.0	0.0
200	73.1	21.1	20.7	43.7	6.1	5.9	30.5	2.5	2.5	19.6	0.9	0.8	14.5	0.4	0.4	11.2	0.2	0.2	7.1	0.1	0.1	5.0	0.0	0.0
225	82.2	26.3	25.8	49.2	7.5	7.4	34.3	3.1	3.1	22.0	1.1	1.0	16.3	0.5	0.5	12.6	0.3	0.3	8.0	0.1	0.1	5.6	0.0	0.0
250	91.4	32.0	31.3	54.7	9.2	9.0	38.1	3.8	3.7	24.4	1.3	1.3	18.2	0.6	0.6	14.0	0.3	0.3	8.9	0.1	0.1	6.2	0.0	0.0
275	100.5	38.1	37.4	60.1	10.9	10.7	41.9	4.5	4.4	26.9	1.5	1.5	20.0	0.7	0.7	15.4	0.4	0.4	9.8	0.1	0.1	6.8	0.1	0.1
300	109.6	44.8	43.9	65.6	12.8	12.6	45.7	5.3	5.2	29.3	1.8	1.8	21.8	0.9	0.9	16.9	0.5	0.5	10.6	0.2	0.2	7.4	0.1	0.1
325	118.8	52.0	50.9	71.1	14.9	14.6	49.5	6.2	6.1	31.8	2.1	2.1	23.6	1.0	1.0	18.3	0.5	0.5	11.5	0.2	0.2	8.1	0.1	0.1
350	127.9	59.6	58.4	76.6	17.1	16.7	53.3	7.1	7.0	34.2	2.4	2.4	25.4	1.2	1.1	19.7	0.6	0.6	12.4	0.2	0.2	8.7	0.1	0.1
400	146.2	76.3	74.8	87.5	21.9	21.4	61.0	9.1	8.9	39.1	3.1	3.0	29.1	1.5	1.5	22.5	0.8	0.8	14.2	0.3	0.3	9.9	0.1	0.1
450	164.5	94.9	93.0	98.4	27.2	26.7	68.6	11.3	11.1	44.0	3.8	3.8	32.7	1.9	1.8	25.3	1.0	1.0	16.0	0.3	0.3	11.1	0.1	0.1
500	182.7	115.4	113.1	109.4	33.1	32.4	76.2	13.7	13.5	48.9	4.7	4.6	36.3	2.3	2.2	28.1	1.2	1.2	17.7	0.4	0.4	12.4	0.2	0.2
550	201.0	137.6	134.9	120.3	39.5	38.7	83.8	16.4	16.1	53.8	5.6	5.5	40.0	2.7	2.7	30.9	1.4	1.4	19.5	0.5	0.5	13.6	0.2	0.2
600	219.3	161.7	158.5	131.2	46.4	45.4	91.4	19.3	18.9	58.7	6.5	6.4	43.6	3.2	3.1	33.7	1.7	1.7	21.3	0.6	0.5	14.9	0.2	0.2
750	274.1	244.5	239.6	164.0	70.1	68.7	114.3	29.1	28.5	73.3	9.9	9.7	54.5	4.8	4.7	42.1	2.6	2.5	26.6	0.8	0.8	18.6	0.4	0.3
1000	365.5	416.5	408.2	218.7	119.4	117.1	152.4	49.6	48.6	97.8	16.8	16.5	72.7	8.2	8.0	56.2	4.4	4.3	35.5	1.4	1.4	24.8	0.6	0.6
1250				273.4	180.6	177.0	190.5	75.0	73.5	122.2	25.5	25.0	90.8	12.4	12.1	70.2	6.6	6.5	44.4	2.2	2.1	31.0	0.9	0.9
1500				328.1	253.1	248.0	228.6	105.1	103.0	146.7	35.7	35.0	109.0	17.3	17.0	84.3	9.3	9.1	53.2	3.0	3.0	37.2	1.3	1.2
1750							266.7	139.8	137.0	171.1	47.5	46.5	127.2	23.1	22.6	98.3	12.3	12.1	62.1	4.0	4.0	43.4	1.7	1.7
2000							304.8	179.0	175.4	195.6	60.8	59.6	145.3	29.5	29.0	112.4	15.8	15.5	71.0	5.2	5.1	49.6	2.2	2.1
3000										293.3	128.9	126.3	218.0	62.6	61.3	168.5	33.5	32.8	106.5	11.0	10.7	74.3	4.6	4.5
4000													290.7	106.7	104.5	224.7	57.0	55.9	142.0	18.7	18.3	99.1	7.8	7.6
5000													363.3	161.2	158.0	280.9	86.2	84.5	177.5	28.2	27.7	123.9	11.8	11.5
6000																337.1	120.8	118.4	213.0	39.6	38.8	148.7	16.5	16.2
7000																			248.5	52.6	51.6	173.4	21.9	21.5
8000																			284.0	67.4	66.0	198.2	28.1	27.5
9000																			319.5	83.8	82.1	223.0	34.9	34.2
10000																						247.8	42.5	41.6
11000																						272.5	50.7	49.7
12000																						297.3	59.5	58.3
13000																						322.1	69.1	67.7

Table 3-27: Friction loss for Industrial Plus PVC, and CPVC Schedule 80 in Metric units (8 in - 24 in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	8 in			10 in			12 in			14 in			16 in			18 in			20 in			24 in		
	193.7			242.9			289.0			317.5			363.6			409.6			455.6			547.7		
350	5.0	0.0	0.0	3.1	0.0	0.0																		
400	5.7	0.0	0.0	3.6	0.0	0.0	2.5	0.0	0.0															
450	6.4	0.0	0.0	4.0	0.0	0.0	2.9	0.0	0.0															
500	7.1	0.0	0.0	4.5	0.0	0.0	3.2	0.0	0.0	2.6	0.0	0.0												
550	7.8	0.1	0.0	4.9	0.0	0.0	3.5	0.0	0.0	2.9	0.0	0.0												
600	8.5	0.1	0.1	5.4	0.0	0.0	3.8	0.0	0.0	3.2	0.0	0.0	2.4	0.0	0.0									
750	10.6	0.1	0.1	6.7	0.0	0.0	4.8	0.0	0.0	3.9	0.0	0.0	3.0	0.0	0.0	2.4	0.0	0.0						
1000	14.1	0.2	0.1	9.0	0.1	0.0	6.4	0.0	0.0	5.3	0.0	0.0	4.0	0.0	0.0	3.2	0.0	0.0	2.6	0.0	0.0			
1250	17.7	0.2	0.2	11.2	0.1	0.1	7.9	0.0	0.0	6.6	0.0	0.0	5.0	0.0	0.0	4.0	0.0	0.0	3.2	0.0	0.0	2.2	0.0	0.0
1500	21.2	0.3	0.3	13.5	0.1	0.1	9.5	0.0	0.0	7.9	0.0	0.0	6.0	0.0	0.0	4.7	0.0	0.0	3.8	0.0	0.0	2.7	0.0	0.0
1750	24.8	0.4	0.4	15.7	0.1	0.1	11.1	0.1	0.1	9.2	0.0	0.0	7.0	0.0	0.0	5.5	0.0	0.0	4.5	0.0	0.0	3.1	0.0	0.0
2000	28.3	0.6	0.5	18.0	0.2	0.2	12.7	0.1	0.1	10.5	0.0	0.0	8.0	0.0	0.0	6.3	0.0	0.0	5.1	0.0	0.0	3.5	0.0	0.0
3000	42.4	1.2	1.1	27.0	0.4	0.4	19.1	0.2	0.2	15.8	0.1	0.1	12.0	0.1	0.1	9.5	0.0	0.0	7.7	0.0	0.0	5.3	0.0	0.0
4000	56.6	2.0	2.0	36.0	0.7	0.6	25.4	0.3	0.3	21.1	0.2	0.2	16.1	0.1	0.1	12.6	0.1	0.1	10.2	0.0	0.0	7.1	0.0	0.0
5000	70.7	3.0	2.9	45.0	1.0	1.0	31.8	0.4	0.4	26.3	0.3	0.3	20.1	0.1	0.1	15.8	0.1	0.1	12.8	0.0	0.0	8.8	0.0	0.0
6000	84.9	4.2	4.1	53.9	1.4	1.4	38.1	0.6	0.6	31.6	0.4	0.4	24.1	0.2	0.2	19.0	0.1	0.1	15.3	0.1	0.1	10.6	0.0	0.0
7000	99.0	5.6	5.5	62.9	1.9	1.8	44.5	0.8	0.8	36.8	0.5	0.5	28.1	0.3	0.3	22.1	0.1	0.1	17.9	0.1	0.1	12.4	0.0	0.0
8000	113.1	7.2	7.0	71.9	2.4	2.3	50.8	1.0	1.0	42.1	0.6	0.6	32.1	0.3	0.3	25.3	0.2	0.2	20.4	0.1	0.1	14.1	0.0	0.0
9000	127.3	8.9	8.8	80.9	3.0	2.9	57.2	1.3	1.3	47.4	0.8	0.8	36.1	0.4	0.4	28.5	0.2	0.2	23.0	0.1	0.1	15.9	0.1	0.1
10000	141.4	10.9	10.6	89.9	3.6	3.5	63.5	1.6	1.5	52.6	1.0	1.0	40.1	0.5	0.5	31.6	0.3	0.3	25.6	0.2	0.2	17.7	0.1	0.1
12500	176.8	16.4	16.1	112.4	5.5	5.3	79.4	2.3	2.3	65.8	1.5	1.5	50.2	0.8	0.8	39.5	0.4	0.4	31.9	0.3	0.3	22.1	0.1	0.1
15000	212.2	23.0	22.6	134.9	7.6	7.5	95.3	3.3	3.2	78.9	2.1	2.0	60.2	1.1	1.1	47.4	0.6	0.6	38.3	0.4	0.4	26.5	0.1	0.1
17500	247.5	30.6	30.0	157.3	10.2	10.0	111.2	4.4	4.3	92.1	2.8	2.7	70.2	1.4	1.4	55.3	0.8	0.8	44.7	0.5	0.5	30.9	0.2	0.2
20000	282.9	39.2	38.4	179.8	13.0	12.8	127.1	5.6	5.5	105.3	3.5	3.5	80.3	1.8	1.8	63.2	1.0	1.0	51.1	0.6	0.6	35.4	0.2	0.2
22500	318.2	48.8	47.8	202.3	16.2	15.9	143.0	7.0	6.8	118.4	4.4	4.3	90.3	2.3	2.2	71.1	1.3	1.2	57.5	0.8	0.7	39.8	0.3	0.3
25000				224.8	19.7	19.3	158.9	8.5	8.3	131.6	5.3	5.2	100.3	2.8	2.7	79.1	1.5	1.5	63.9	0.9	0.9	44.2	0.4	0.4
27500				247.2	23.5	23.0	174.7	10.1	9.9	144.7	6.4	6.3	110.4	3.3	3.2	87.0	1.8	1.8	70.3	1.1	1.1	48.6	0.4	0.4
30000				269.7	27.6	27.0	190.6	11.9	11.6	157.9	7.5	7.3	120.4	3.9	3.8	94.9	2.2	2.1	76.7	1.3	1.3	53.1	0.5	0.5
35000				314.7	36.7	36.0	222.4	15.8	15.5	184.2	10.0	9.8	140.5	5.2	5.1	110.7	2.9	2.8	89.4	1.7	1.7	61.9	0.7	0.7
40000							254.2	20.2	19.8	210.5	12.8	12.5	160.5	6.6	6.5	126.5	3.7	3.6	102.2	2.2	2.2	70.7	0.9	0.9
45000							285.9	25.1	24.6	236.8	15.9	15.6	180.6	8.2	8.1	142.3	4.6	4.5	115.0	2.7	2.7	79.6	1.1	1.1
50000							317.7	30.5	29.9	263.1	19.3	18.9	200.7	10.0	9.8	158.1	5.6	5.5	127.8	3.3	3.3	88.4	1.4	1.3
60000										315.8	27.1	26.5	240.8	14.0	13.7	189.7	7.8	7.7	153.3	4.7	4.6	106.1	1.9	1.9
70000													280.9	18.6	18.3	221.4	10.4	10.2	178.9	6.2	6.1	123.8	2.5	2.5
80000													321.1	23.9	23.4	253.0	13.4	13.1	204.4	8.0	7.8	141.5	3.2	3.2
90000																284.6	16.6	16.3	230.0	9.9	9.7	159.2	4.0	4.0
100000																316.2	20.2	19.8	255.6	12.0	11.8	176.8	4.9	4.8
110000																			281.1	14.3	14.1	194.5	5.9	5.7
125000																			319.4	18.2	17.8	221.1	7.4	7.3
150000																						265.3	10.4	10.2
175000																						309.5	13.8	13.6

Table 3-28: Friction loss for Industrial Plus PVC Schedule 120 in Imperial units (½ in - 2½ in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	½ in			¾in			1 in			1¼ in			1½ in			2 in			2½ in		
	0.500			0.710			0.915			1.230			1.450			1.875			2.275		
0.25	0.40	0.22	0.10	0.20	0.04	0.02	0.12	0.01	0.01	0.07	0.00	0.00	0.05	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.00
0.5	0.81	0.79	0.34	0.40	0.14	0.06	0.24	0.04	0.02	0.13	0.01	0.00	0.10	0.00	0.00	0.06	0.00	0.00	0.04	0.00	0.00
0.75	1.21	1.68	0.73	0.60	0.31	0.13	0.36	0.09	0.04	0.20	0.02	0.01	0.14	0.01	0.00	0.09	0.00	0.00	0.06	0.00	0.00
1	1.61	2.87	1.24	0.80	0.52	0.23	0.48	0.15	0.07	0.27	0.04	0.02	0.19	0.02	0.01	0.11	0.00	0.00	0.08	0.00	0.00
2	3.23	10.34	4.48	1.60	1.88	0.81	0.96	0.55	0.24	0.53	0.13	0.06	0.38	0.06	0.03	0.23	0.02	0.01	0.16	0.01	0.00
5	8.07	56.46	24.47	4.00	10.25	4.44	2.41	2.98	1.29	1.33	0.71	0.31	0.96	0.32	0.14	0.57	0.09	0.04	0.39	0.04	0.02
7	11.29	105.28	45.64	5.60	19.12	8.29	3.37	5.56	2.41	1.87	1.32	0.57	1.34	0.59	0.26	0.80	0.17	0.07	0.55	0.07	0.03
10				8.00	37.00	16.04	4.82	10.77	4.67	2.67	2.55	1.11	1.92	1.15	0.50	1.15	0.33	0.14	0.78	0.13	0.06
15				12.00	78.41	33.99	7.23	22.82	9.89	4.00	5.41	2.35	2.88	2.43	1.05	1.72	0.70	0.30	1.17	0.27	0.12
20							9.64	38.88	16.86	5.33	9.22	4.00	3.84	4.14	1.79	2.29	1.19	0.51	1.56	0.46	0.20
25							12.04	58.78	25.48	6.67	13.93	6.04	4.80	6.26	2.71	2.87	1.79	0.78	1.95	0.70	0.30
30										8.00	19.53	8.47	5.76	8.77	3.80	3.44	2.51	1.09	2.34	0.98	0.42
35										9.33	25.99	11.26	6.71	11.67	5.06	4.02	3.34	1.45	2.73	1.30	0.57
40										10.66	33.28	14.43	7.67	14.94	6.48	4.59	4.28	1.85	3.12	1.67	0.72
45													8.63	18.59	8.06	5.16	5.32	2.31	3.51	2.08	0.90
50													9.59	22.59	9.79	5.74	6.47	2.80	3.90	2.52	1.09
55													10.55	26.95	11.68	6.31	7.72	3.35	4.29	3.01	1.31
60																6.88	9.07	3.93	4.68	3.54	1.53
65																7.46	10.51	4.56	5.07	4.10	1.78
70																8.03	12.06	5.23	5.46	4.71	2.04
75																8.61	13.71	5.94	5.85	5.35	2.32
80																9.18	15.45	6.70	6.23	6.03	2.61
90																10.33	19.21	8.33	7.01	7.50	3.25
100																			7.79	9.11	3.95
110																			8.57	10.87	4.71
120																			9.35	12.77	5.54
130																			10.13	14.81	6.42

Table 3-28: Friction loss for Industrial Plus PVC Schedule 120 in Imperial units (3 in - 8 in)

Gallons per minute	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)	Velocity (ft/s)	Friction Loss (ft/100 ft)	Friction Loss (psi/100 ft)
	3 in			4 in			6 in			8 in		
	2.800			3.626			5.501			7.189		
10	0.51	0.05	0.02	0.31	0.01	0.01	0.13	0.00	0.00	0.08	0.00	0.00
15	0.77	0.10	0.04	0.46	0.03	0.01	0.20	0.00	0.00	0.12	0.00	0.00
20	1.03	0.17	0.07	0.61	0.05	0.02	0.27	0.01	0.00	0.16	0.00	0.00
25	1.29	0.25	0.11	0.77	0.07	0.03	0.33	0.01	0.00	0.20	0.00	0.00
30	1.54	0.36	0.15	0.92	0.10	0.04	0.40	0.01	0.01	0.23	0.00	0.00
35	1.80	0.47	0.21	1.07	0.13	0.06	0.47	0.02	0.01	0.27	0.00	0.00
40	2.06	0.61	0.26	1.23	0.17	0.07	0.53	0.02	0.01	0.31	0.01	0.00
45	2.32	0.76	0.33	1.38	0.21	0.09	0.60	0.03	0.01	0.35	0.01	0.00
50	2.57	0.92	0.40	1.53	0.26	0.11	0.67	0.03	0.01	0.39	0.01	0.00
55	2.83	1.10	0.48	1.69	0.31	0.14	0.73	0.04	0.02	0.43	0.01	0.00
60	3.09	1.29	0.56	1.84	0.37	0.16	0.80	0.05	0.02	0.47	0.01	0.01
65	3.34	1.49	0.65	1.99	0.42	0.18	0.87	0.06	0.02	0.51	0.02	0.01
70	3.60	1.71	0.74	2.15	0.49	0.21	0.93	0.06	0.03	0.55	0.02	0.01
75	3.86	1.95	0.84	2.30	0.55	0.24	1.00	0.07	0.03	0.59	0.02	0.01
80	4.12	2.19	0.95	2.45	0.62	0.27	1.07	0.08	0.04	0.62	0.02	0.01
90	4.63	2.73	1.18	2.76	0.78	0.34	1.20	0.10	0.04	0.70	0.03	0.01
100	5.14	3.32	1.44	3.07	0.94	0.41	1.33	0.12	0.05	0.78	0.03	0.01
125	6.43	5.02	2.17	3.83	1.43	0.62	1.67	0.19	0.08	0.98	0.05	0.02
150	7.72	7.03	3.05	4.60	2.00	0.87	2.00	0.26	0.11	1.17	0.07	0.03
175	9.00	9.35	4.06	5.37	2.66	1.15	2.33	0.35	0.15	1.37	0.10	0.04
200	10.29	11.98	5.19	6.14	3.41	1.48	2.67	0.45	0.19	1.56	0.12	0.05
250				7.67	5.15	2.23	3.33	0.68	0.29	1.95	0.18	0.08
300				9.20	7.22	3.13	4.00	0.95	0.41	2.34	0.26	0.11
350				10.74	9.60	4.16	4.67	1.26	0.55	2.73	0.34	0.15
400							5.33	1.62	0.70	3.12	0.44	0.19
450							6.00	2.01	0.87	3.51	0.55	0.24
500							6.66	2.45	1.06	3.90	0.67	0.29
750							10.00	5.18	2.25	5.85	1.41	0.61
1000										7.80	2.40	1.04
1250										9.76	3.63	1.57
1500										11.71	5.09	2.21

Table 3-29: Friction loss for Industrial Plus Schedule 120 in Metric units (1½ in - 2½ in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	½ in			¾ in			1 in			1¼ in			1½ in			2 in			2½ in		
	12.700			18.034			23.241			31.242			36.830			47.625			57.785		
1	3.3	0.2	0.2	1.6	0.0	0.0															
5	16.4	4.8	4.7	8.2	0.9	0.9	4.9	0.3	0.2	2.7	0.1	0.1									
10	32.9	17.3	16.9	16.3	3.1	3.1	9.8	0.9	0.9	5.4	0.2	0.2	3.9	0.1	0.1						
15	49.3	36.6	35.8	24.5	6.6	6.5	14.7	1.9	1.9	8.2	0.5	0.4	5.9	0.2	0.2	3.5	0.1	0.1	2.4	0.0	0.0
30	98.7	132.0	129.4	48.9	24.0	23.5	29.5	7.0	6.8	16.3	1.7	1.6	11.7	0.7	0.7	7.0	0.2	0.2	4.8	0.1	0.1
50	164.5	340.0	333.2	81.6	61.7	60.5	49.1	18.0	17.6	27.2	4.3	4.2	19.6	1.9	1.9	11.7	0.5	0.5	7.9	0.2	0.2
75	246.7	720.5	706.1	122.3	130.8	128.2	73.7	38.1	37.3	40.8	9.0	8.8	29.3	4.1	4.0	17.5	1.2	1.1	11.9	0.5	0.4
100	328.9	1227.5	1203.0	163.1	222.9	218.4	98.2	64.9	63.6	54.4	15.4	15.1	39.1	6.9	6.8	23.4	2.0	1.9	15.9	0.8	0.8
125				203.9	336.9	330.2	122.8	98.1	96.1	67.9	23.2	22.8	48.9	10.4	10.2	29.2	3.0	2.9	19.9	1.2	1.1
150				244.7	472.3	462.8	147.3	137.5	134.7	81.5	32.6	31.9	58.7	14.6	14.3	35.1	4.2	4.1	23.8	1.6	1.6
175				285.5	628.3	615.7	171.9	182.9	179.2	95.1	43.4	42.5	68.4	19.5	19.1	40.9	5.6	5.5	27.8	2.2	2.1
200				326.3	804.6	788.5	196.4	234.2	229.5	108.7	55.5	54.4	78.2	24.9	24.4	46.8	7.1	7.0	31.8	2.8	2.7
225							221.0	291.3	285.5	122.3	69.1	67.7	88.0	31.0	30.4	52.6	8.9	8.7	35.7	3.5	3.4
250							245.5	354.0	347.0	135.9	83.9	82.3	97.8	37.7	36.9	58.5	10.8	10.6	39.7	4.2	4.1
275							270.1	422.4	413.9	149.5	100.1	98.1	107.6	45.0	44.1	64.3	12.9	12.6	43.7	5.0	4.9
300							294.7	496.3	486.3	163.1	117.6	115.3	117.3	52.8	51.8	70.2	15.1	14.8	47.7	5.9	5.8
325							319.2	575.5	564.0	176.6	136.4	133.7	127.1	61.3	60.0	76.0	17.5	17.2	51.6	6.8	6.7
350										190.2	156.5	153.4	136.9	70.3	68.9	81.9	20.1	19.7	55.6	7.9	7.7
400										217.4	200.4	196.4	156.4	90.0	88.2	93.6	25.8	25.3	63.6	10.1	9.9
450										244.6	249.3	244.3	176.0	111.9	109.7	105.3	32.1	31.4	71.5	12.5	12.3
500										271.8	303.0	296.9	195.6	136.1	133.3	117.0	39.0	38.2	79.4	15.2	14.9
550										298.9	361.5	354.3	215.1	162.3	159.1	128.6	46.5	45.5	87.4	18.1	17.8
600										326.1	424.7	416.2	234.7	190.7	186.9	140.3	54.6	53.5	95.3	21.3	20.9
750													293.3	288.3	282.5	175.4	82.5	80.9	119.2	32.2	31.6
1000													391.1	491.2	481.3	233.9	140.6	137.8	158.9	54.9	53.8
1250																292.4	212.6	208.3	198.6	83.0	81.3
1500																350.9	298.0	292.0	238.3	116.3	114.0
1750																			278.0	154.7	151.6
2000																			317.8	198.1	194.2
1250																			199	83.0	81.3

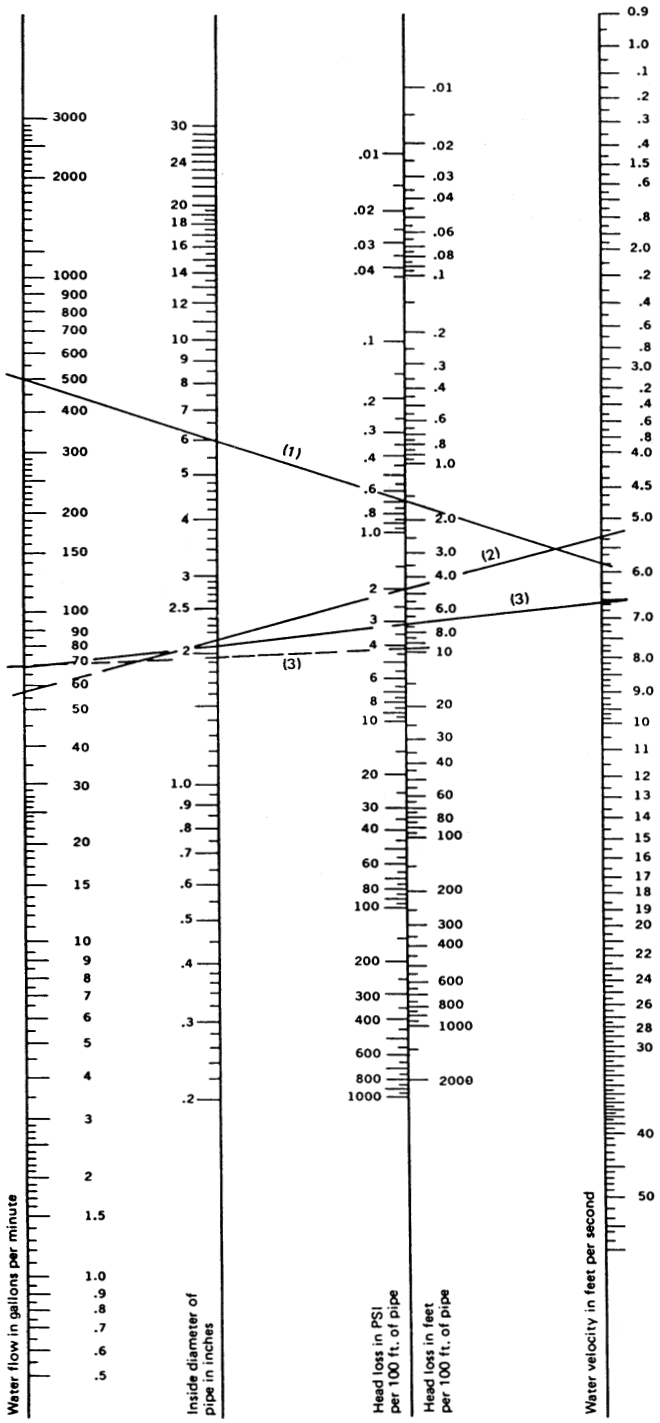
Table 3-29: Friction loss for Industrial Plus Schedule 120 in Metric units (3 in - 8 in)

Flow Rate (L/min)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)	Velocity (cm/s)	Friction Loss (m/100 m)	Friction Loss (bar/100 m)
	3 in			4 in			6 in			8 in		
	71.12			92.1004			139.7254			182.6006		
100	10.5	0.3	0.3	6.3	0.1	0.1						
125	13.1	0.4	0.4	7.8	0.1	0.1						
150	15.7	0.6	0.6	9.4	0.2	0.2	4.1	0.0	0.0			
175	18.4	0.8	0.8	10.9	0.2	0.2	4.8	0.0	0.0			
200	21.0	1.0	1.0	12.5	0.3	0.3	5.4	0.0	0.0			
225	23.6	1.3	1.2	14.1	0.4	0.4	6.1	0.0	0.0	3.6	0.0	0.0
250	26.2	1.5	1.5	15.6	0.4	0.4	6.8	0.1	0.1	4.0	0.0	0.0
275	28.8	1.8	1.8	17.2	0.5	0.5	7.5	0.1	0.1	4.4	0.0	0.0
300	31.5	2.1	2.1	18.8	0.6	0.6	8.2	0.1	0.1	4.8	0.0	0.0
325	34.1	2.5	2.4	20.3	0.7	0.7	8.8	0.1	0.1	5.2	0.0	0.0
350	36.7	2.9	2.8	21.9	0.8	0.8	9.5	0.1	0.1	5.6	0.0	0.0
400	42.0	3.7	3.6	25.0	1.0	1.0	10.9	0.1	0.1	6.4	0.0	0.0
450	47.2	4.6	4.5	28.1	1.3	1.3	12.2	0.2	0.2	7.2	0.0	0.0
500	52.4	5.5	5.4	31.3	1.6	1.5	13.6	0.2	0.2	8.0	0.1	0.1
550	57.7	6.6	6.5	34.4	1.9	1.8	14.9	0.2	0.2	8.8	0.1	0.1
600	62.9	7.8	7.6	37.5	2.2	2.2	16.3	0.3	0.3	9.5	0.1	0.1
750	78.7	11.7	11.5	46.9	3.3	3.3	20.4	0.4	0.4	11.9	0.1	0.1
1000	104.9	20.0	19.6	62.5	5.7	5.6	27.2	0.7	0.7	15.9	0.2	0.2
1250	131.1	30.2	29.6	78.2	8.6	8.4	34.0	1.1	1.1	19.9	0.3	0.3
1500	157.3	42.3	41.5	93.8	12.0	11.8	40.8	1.6	1.6	23.9	0.4	0.4
1750	183.6	56.3	55.2	109.5	16.0	15.7	47.6	2.1	2.1	27.8	0.6	0.6
2000	209.8	72.1	70.7	125.1	20.5	20.1	54.3	2.7	2.6	31.8	0.7	0.7
3000	314.7	152.9	149.8	187.6	43.5	42.6	81.5	5.7	5.6	47.7	1.6	1.5
4000				250.2	74.0	72.6	108.7	9.7	9.5	63.6	2.7	2.6
5000				312.7	111.9	109.7	135.9	14.7	14.4	79.6	4.0	3.9
6000							163.0	20.6	20.2	95.5	5.6	5.5
7000							190.2	27.5	26.9	111.4	7.5	7.3
8000							217.4	35.2	34.5	127.3	9.6	9.4
9000							244.6	43.8	42.9	143.2	11.9	11.7
10000							271.7	53.2	52.1	159.1	14.5	14.2
12500							339.7	80.4	78.8	198.9	21.9	21.4
15000										238.7	30.6	30.0
17500										278.4	40.8	40.0
20000										318.2	52.2	51.2
12500										199	21.9	21.4

The nomograph in Figure 3-3 provides approximate values for a wide range of thermoplastic pipe sizes. 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 gpm may be obtained with a 6 in inside diameter pipe with a pressure loss of about 0.65 psi per 100 feet of pipe at a velocity of 6.0 ft/s. Line (2) indicates that to have a flow of about 60 gpm at with a loss of pressure of 2 psi per 100 feet of pipe, you must have a pipe with an inside diameter of 2.1 in. Line (3) and dotted line (3) show that with a flow of 70 gpm, to reduce the pressure loss from 4 psi to 3 psi per 100 feet of pipe, the pipe size must increase from 2 in to 2.1 in inside diameter. Flow velocities in excess of 5.0 ft/s (1.5 m/s) are not recommended.

Figure 3-3: Head Loss Nomograph

Courtesy of Plastics Pipe Institute, a division of The Society of The Plastics Industry



Pressure Loss of Fittings

Pressure loss due to fittings depends on the type. In general it can be calculated from the following formula:

$$L_e = K_r \times \frac{(V^2)}{2 \times g}$$

where

L_e = Head loss in equivalent feet of pipe
K_r = resistance coefficient (dimensionless, depends on fitting type)
g = Gravitational constant 32 ft/sec^2
V = Flow velocity in ft/sec

K_r

Sweep 90	Sharp 90	45 Elbow	Tee	Reducer	Increaser
0.4	1.2	0.3	1.3	1.0	0.5

The pressure loss due to all fittings in the piping system is the sum of each L_e. For example, the pressure loss due to ten sweep 90 elbows in a system flowing at 5 ft/sec is approximately:

$$L_e = (10 \times 0.4) \times \frac{5^2}{2 \times 32} = 1.6 \text{ ft pipe equivalent}$$

Drainage Design

Drainage systems are to be designed to maintain a minimum velocity of 2 ft/s (0.6 m/s) to prevent build-up of sediment, inhibit bacterial growth, and promote self-cleaning of the system. The velocity of the drainage system can be determined by:

Equation (3-18) - Imperial

$$V = 1.49 n^{-1} R^{2/3} S^{1/2}$$

Equation (3-19) - Metric

$$V = 1.00 n^{-1} R^{2/3} S^{1/2}$$

Where:

V = Cross-sectional mean velocity of fully developed flow, ft/s (m/s)
n = Manning's coefficient, unitless
R = Hydraulic radius = A/P_w ft (m)
S = Slope, ft/ft (m/m)
A = Cross-sectional area of fluid, ft² (m²)
P_w = Wetted perimeter, ft (m)

Conversely Equation (3-21) and Equation (3-22) above can be rearranged to find the required slope of the system via

Equation (3-20) - Imperial

$$S = 0.45 n^2 R^{-4/3} V^2$$

Equation (3-20) - Imperial Example

What is the velocity of water in a half-filled 2" Schedule 80 CPVC pipe with a slope of 0.005?

$S = 0.005$

$r_i = \frac{2.375 \text{ in}}{2} - 0.218 \text{ in} = 0.9695 \text{in}$

$R = \frac{A}{P_w} = \frac{\pi r_i^2}{2} \times \frac{2}{2\pi r_i} = \frac{r_i}{2} = 0.485 \text{ in} = 0.040 \text{ ft}$

$V = 1.49 (0.009)^{-1} (0.040 \text{ ft})^{2/3} (0.005)^{1/2}$

$V = 1.37 \text{ ft/s}$

Equation (3-21) - Metric

$$S = 1.00 n^2 R^{-4/3} V^2$$

Equation (3-21) - Metric

What is the required slope to maintain a velocity of 0.7 m/s in a 2" Schedule 80 CPVC pipe completely filled?

$n = 0.009$

$V = 0.7 \text{ m/s}$

$r_i = \frac{60.33 \text{ mm}}{2} - 5.537 \text{ mm} = 24.6 \text{ mm}$

$R = \frac{A}{P_w} = \frac{\pi r_i^2}{2} \times \frac{2}{2\pi r_i} = \frac{r_i}{2} = 12.3 \text{ mm} = 0.0123 \text{ m}$

$S = 1.00 (0.009)^2 (0.0123 \text{ m})^{-4/3} (0.7 \text{ m/s})^2$

$S = 0.014$

$S =$ drop of 14m for every 1000m

The Manning coefficient used in the above equations are constants, some of which are listed in Table 3-30.

Table 3-30 Manning's coefficient for various materials

Material	n
CPVC	0.009
Copper	0.011
Steel	0.012

Installation Instructions

The following information is considered general in nature and is provided as a reference to assist in ensuring the highest system integrity during installation. Thermoplastic piping systems must be designed, engineered, installed, and operated in accordance with accepted industry standards and practices, as well as any applicable code requirements. Suitability for the intended service must be clearly established prior to use. Proper selection, application, and installation of thermoplastic piping products are the responsibility of the end user.

Storage and Handling

Piping products from GF Piping Systems are inspected, handled, and loaded with great care at the factory using methods that have been developed specifically for thermoplastic piping products to ensure that damage is minimized and overall quality is maintained during shipping. It is the carrier's responsibility to deliver the shipment in good condition. It is the receiver's responsibility to ensure that there has been no loss or damage and that the products are unloaded and stored properly after receipt. Reasonable care and common sense should be used when handling and storing GF Piping Systems thermoplastic piping products.

Thermoplastic pipe and fittings may be stored indoors or outside in yards. If stored outdoors, pipe and fittings should be protected from direct exposure to sunlight, and pipe should be properly supported in storage to prevent sagging or bending. Pipe should be stored in the yard on level ground in the unit packages provided by the factory. Caution must be exercised to avoid compression, damage, or deformation. When unit packages are stacked, care must be used to ensure that the weight of the upper units does not cause deformation to pipe in the lower units. Package units should not be stacked more than 8 ft (2.5 m) high. Care must be used to ensure that the height of the stack does not result in instability which can cause collapse, pipe damage, or personnel injury. Unit packages should be supported by wooden racks or other suitable means and spaced properly to prevent damage.

Thermoplastic pipe and fittings must not be stored in tightly enclosed areas subject to elevated temperatures or close to heat producing sources such as heaters, boilers, steam lines, engine exhaust, etc. Exposure to excessive temperatures will result in distortion and deformation of the product. When stored outdoors, thermoplastic pipe must be covered with non-transparent material. This covering must provide adequate air circulation above and around the pipe as required to prevent excessive heat absorption that can result in discoloration and deformation of the product. PVC and CPVC piping products in storage should not be exposed to temperatures above 140°F (66°C) and 200°F (99°C), respectively.

Although GF Piping Systems products are tough and corrosion resistant, they should not be dropped, have objects dropped on them, nor be subjected to external loads. Thermoplastics can be damaged by abrasion and gouging. Pipe must not be dragged across the ground or over obstacles. Impacts such as dropping and/or rough handling should be avoided particularly in cold weather. The product shall be inspected for any scratches, splits, or gouges that may have occurred from improper handling or storage. If found, damaged sections must be cut out and discarded.

Thermoplastic Piping Tools

The use of tools that have been specifically designed for use with thermoplastic pipe and fittings is strongly recommended to obtain optimum results when installing thermoplastic piping systems. A variety of tools that are designed for cutting, beveling, and assembling plastic pipe and fittings are readily available through local wholesale supply houses dealing in plastic pipe and fittings. Improper use of tools normally used with metal piping systems, i.e. hacksaws, water pump pliers, pipe wrenches, etc., can cause damage to plastic pipe and fittings. Visible and non-visible fractures, scoring or gouging of material and over tightening of plastic threaded connections are some of the major problems associated with the use of incorrect tools and/or procedures.

Pipe Cutters

Plastic pipe must have square-cut ends to allow for the proper interfacing of the pipe end and the fitting socket bottom. A wheel type pipe cutter with special blades for plastic pipe provides easy and clean cutting action. The raised bead left on the outside of the pipe after cutting must then be removed. A miter box saw may also be used to produce square-cut ends.

Pipe Cutters for Large Diameter Pipe

Blade cutters made for use with large diameter plastic pipe are easy to adjust and operate for square, burr-less cuts. Blades with carbide edges will provide longer life. With one style blade cutter, pipe ends may also be beveled for solvent joints while being cut by using an optional bevel tool in place of one cutter blade.

Power Saws

Power saws specifically for use with plastic pipe are available. These are particularly useful in prefabrication operations where a large quantity of pipe is being cut. Blades designed for thermoplastic pipe MUST be used. Follow manufacturer's instructions regarding speed, set, and proper use of the tool.

Power Beveling Tools

Portable and mounted power beveling tools as well as hand beveling tools specifically designed for use with plastic pipe are available. Pipe ends must be beveled (chamfered) to allow easy insertion of the pipe into the fitting and to help prevent

scraping the solvent cement from the inside of the fitting socket. A recommended bevel of 3/32 in (2.5 mm) at a 10° to 15° angle can be quickly achieved using a plastic pipe beveling tool.

Deburring Tools

A smooth, beveled pipe end helps spread the solvent easily as the pipe is joined to the fitting. All burrs must be removed from the inside as well as the outside of the pipe ends. Special plastic pipe deburring tools deburr pipe ends quickly and efficiently.

Strap Wrenches and Chain Vises

Strap wrenches with special woven nylon straps are extra strong and are treated for slip resistance. These strap wrenches, designed for use with plastic pipe, provide gripping power for turning without scratching or deforming the pipe.

Chain vises are made with jaws for holding plastic pipe. The jaws are engineered for use with plastic pipe and provide holding power without damage to the pipe.

Joining Devices

Pipe and fitting pullers are available, designed specifically for joining large diameter PVC and CPVC pipe and fittings 6 in and larger. These tools are designed to allow the pipe to be inserted to the proper insertion depth, maintain proper alignment during assembly, and hold freshly solvent cemented connections to prevent the fitting from backing off until the initial set time is achieved. The use of these types of tools can also reduce assembly time.

Joining Techniques

Solvent Welding

PVC and CPVC piping systems are joined in the field via the proven two-step primer and solvent cement welding process providing a quick, strong, leak-tight seal. GF Piping Systems primer rapidly softens and dissolves the joining surfaces of PVC and CPVC pipe and fittings. The benefit of this priming action is especially noticeable on parts being joined together in cold weather.

GF Piping Systems solvent cement is specially formulated for GF Piping Systems PVC and CPVC piping applications, including applications requiring chemical resistance to caustics such as hypochlorite solutions, mineral acids, aggressive water, and aqueous salt solutions. GF Piping Systems solvent cement is an industrial grade, low VOC emission, heavy-bodied, high-strength solvent cement.

Safety Precautions

Primer and solvent cement products are flammable and contain chemical solvents; therefore, appropriate safety precautions should be taken. Always read the primer and solvent cement can label before use.

Be aware at all times of good safety practices. Primer and solvent cements for pipe and fittings are flammable, so there should be no smoking or other sources of heat or flame in working or storage areas. Be sure to work only in a well ventilated place and avoid unnecessary skin contact with all solvents. More detailed safety information is available from SDS (Safety Data Sheets) provided by the manufacturer upon request.

Virtually all solvent cements and primers for plastic pipe are flammable and should not be used or stored near heat, spark, or open flames. Do not smoke during use. Eliminate all ignition sources. Primer and solvent cement cans should be kept closed and stored in cool areas above 40°F (5°C). If cement is stored at a very cold temperature and gels, it can be reconstituted by bringing it into a warm environment, 60°-90°F (16°-32°C), and allowing it to sit for 24 hours. Do not try to artificially heat it. Before use, vigorously shake the solvent cement.

Avoid breathing vapors. They should be used only with adequate ventilation. Explosion-proof general mechanical ventilation or local exhaust is recommended to maintain vapor concentrations below recommended exposure limits. In confined or partially enclosed areas a ventilating device should be used to remove vapors and minimize their inhalation. A NIOSH-approved organic vapor cartridge respirator with full face piece is recommended. Commercially available respirators specially designed to minimize the inhalation of organic vapors can also be used. Containers should be kept tightly closed when not in use and covered as much as possible when in use.

Avoid frequent contact with skin and eyes. Solvents may be absorbed through the skin; wearing PVA coated protected gloves and an impervious apron are recommended. These chemicals may cause eye injury; avoid any contact with eyes. Splash proof chemical goggles are recommended. In case of contact, flush with plenty of water for 15 minutes. If irritation persists, get medical attention. If swallowed, call a physician immediately and follow precautionary statements found on the label of the primer and solvent cement cans. Keep out of reach of children.

Containers should be kept tightly closed when not in use and covered as much as possible when in use. Use of an applicator can with applicator attached to a lid is especially recommended. The date on the bottom of the primer and solvent cement can is the date of manufacture. The shelf life of the products is per Table 4-1.

Table 4-1: Product shelf life for primer and solvent cement

Product Shelf Life	
Primer	3 Years
Solvent Cement	2 Years

*Refer to solvent cement safety data sheet (SDS) prior to use.

On projects where plastic pipe is being installed or has recently been solvent welded, special caution should be taken when using welding torches or other equipment where sparks may be involved. Flammable vapors from cemented joints sometimes linger within or around a piping system for some time. Special care must be taken when installing in elevator shafts or similar applications where fumes could accumulate or when installing pumps.

In all cases, lines should be purged to remove solvent vapors before welding.

Warning: Use caution with welding torches.

Do not use a dry, granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with solvent cements and primers (including their vapors) may result in violent chemical reactions if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system; this solution will be non-volatile. Furthermore, dry granular calcium hypochlorite should not be stored or used near solvent cements or primers.

Warning: Use caution with calcium hypochlorite.

Solvent Cement and Primer Spills

Work areas should be protected by using drop cloths in case of an accidental spill. Solvent cement and/or primer spills can cause irreparable damage depending on the type of surface affected. Accidental spills should be wiped up immediately before the cement sets. A mild soap and water mixture may aid in removal of a stain; however, the use of solvents or harsh cleansers may do more damage than good. In the event of a spill, consult the manufacturer of the affected surface for possible suggestions. Protecting the work area prior to starting is recommended.

Accidents and injuries have seldom occurred in the use of these products. Help maintain and improve this excellent record by following the above recommendations.

Applicators

A wide variety of daubers and swabs are available. Use the appropriate type and size applicator for the materials being joined. It is important to use a proper size applicator. A dauber or swab approximately one-half the size of the pipe diameter being joined is appropriate. The dauber supplied with the primer and solvent cement quart cans is the proper size for use with 2, 2 ½, and 3 in diameters only. For smaller and larger sizes see Table 4-2.

Table 4-2: Applicator guide

Nominal Size	½"	¾"	1"	1¼"	1½"	2"	2 ½"	3"	4"	6"	8"	10"	12"
⅜" Dauber	•	•											
½" Dauber		•	•										
¾" Dauber				•	•								
1½" Dauber						•	•	•					
4" Swab									•	•	•	•	•

Primers

The use of primer is necessary to penetrate and dissolve the surface of the pipe and fitting prior to the application of solvent cement. Primer must be applied to both pipe and fittings. Apply primer to the fitting socket, then to the outside of the pipe end, then a second coat to the fitting socket; re-dip the applicator as necessary to ensure entire surface is wet.

Solvent Cements

The cement system used for joining PVC and CPVC is a solvent-based type. The solvent dissolves the mating surfaces when properly applied to each surface. The thermoplastic resin filler contained in the cement assists in filling the gaps between pipes and fitting surfaces. An evaporation retardant slows the rate of evaporation of the prime solvent. Joining of the wet mating surfaces in one minute or less after starting to cement is essential to prevent dry spots that will not bond. The bond interface will consist of a mixture of cement resin and dissolved material from the attached pipe and fitting surfaces. As the solvent evaporates, the interface becomes homogeneous with the pipe and fitting surfaces, except for residual solvent, which dissipates over a period of time. The resultant homogeneous bonded area has led to the term “solvent welded” although no heat is applied to melt and fuse the bonded areas as in metal welding.

Note: Solvent cement should be applied immediately after primer while the surfaces are still tacky.

Basic Principles of Solvent Cementing

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. If the basic principles involved are explained, known, and understood, a better understanding is gained as to what techniques are necessary to suit particular applications, temperature conditions, and variations in size and fit of pipe and fittings. Be aware at all times of good safety practices. Solvent cements for pipe and fittings are flammable, so there should be no smoking or other sources of heat or flame in working or storage areas. Be sure to work only in a well-ventilated space and avoid unnecessary skin contact with all solvents. .

To consistently make good joints, the following should be carefully understood:

1. The joining surfaces must be softened and made semi-fluid.
2. Sufficient cement must be applied to fill the gap between pipe and socket 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 of the cement will bond to both surfaces.

Hot Weather

There are many occasions when solvent cementing in 95°F (35°C) temperatures or over cannot be avoided. If a few special precautions are taken, problems can be avoided. Solvent cements contain high-strength solvents which evaporate faster at elevated temperatures. This is especially true when there is a hot wind blowing. If the pipe has been in direct sunlight for any length of time, surface temperatures may be 20°F–30°F (11°C–17°C) above air temperature. Solvents attack these hot surfaces faster and deeper, especially inside a joint. Thus, it is very important to avoid puddling inside sockets and to wipe off excess cement outside. Following are tips to follow when solvent cementing in high temperatures:

1. Store solvent cements in a cool or shaded area prior to use.
2. If possible, store the fittings and pipe, or at least the ends to be solvent welded, in a shady areas before cementing.
3. Cool surfaces to be joined by wiping with a damp rag. Be sure that surfaces are 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 joined are still wet with solvent cement when putting them together.

Cold Weather

Solvent cement products have excellent cold weather stability and are formulated to have well balanced drying characteristics even in subfreezing temperatures. Good solvent cemented joints can be made in very cold conditions provided proper care and a little common sense are used. In cold weather, solvents penetrate and soften surfaces more slowly than in warm weather. The plastic is also more resistant to solvent attack; therefore, it becomes more important to pre-soften surfaces. Because of slower evaporation, a longer cure time is necessary. The following are some tips to follow when solvent cementing in low temperatures:

1. Prefabricate as much of the system as possible in a heated work area.
2. Store solvent cements in a warmer area above 40°F (4°C) when not in use, and make sure they remain fluid.
3. Take special care to remove moisture including ice and snow.
4. Use special care to ensure joining surfaces are adequately softened; more than one application may be necessary.
5. Allow a longer cure period before the system is used.
6. Follow appropriate set and cure times prior to pressure testing.

Getting Started

1. Review safety precautions.
2. Review cement and primer can labels.
3. Review assembly instructions.
4. Condition pipe and fittings being joined to the same temperature conditions prior to use.

Inspection before Use

Pipe and fittings should always be inspected for damage before actual installation. Pipe or pipe fittings with cuts, gouges, scratches, splits, or other signs of damage from improper handling or storage should not be used. Damaged sections on lengths of pipe can easily be cut out using proper techniques for cutting thermoplastic pipe. Always cut at least 6 inches (150 mm) beyond any visible crack.

Check Material

Make sure the fittings, valves, and pipe being joined are PVC or CPVC from GF Piping Systems. The expansion and contraction features, pressures, etc. among plastics are vastly different and use of materials from different manufacturers could cause failure. The solvent cement should meet all the requirements of Specification D2564 for PVC solvent cement of Specification F493 for CPVC solvent cement. Verify that the primer and solvent cement are within their shelf lives.

Handling of Cement

Keep cement containers covered while not in use. If the container of cement with the lid off is subjected to prolonged exposure to air, the cement in the can becomes thick and viscous, or gel-like. Chances are, this condition has been brought about by the evaporation of the solvent. If this occurred, the cement is useless. Do not try to restore the cement by stirring in a thinner. For this reason, it is suggested that smaller containers of cement, rather than the large container, be used especially in warm or hot weather. Prior to using an unopened can of cement, shake it vigorously to ensure proper dispersion of the resin and solvents. Keep in mind that the solvents contained in cements are highly flammable and should not be used near an open flame. The area in which the cement is being used should be well ventilated, and prolonged breathing of the fumes should be avoided as well as contact with the skin or eyes. All cement should be handled in the same manner as a very fast-drying lacquer. Verify that the primer and solvent cement are within their shelf lives.

Estimated Quantities of Solvent Cement

Estimated quantities of cement can vary due to installation conditions, tolerance variations, and socket depths. It is better practice to err on the liberal side than skimp if precautions, as outlined in GF Piping Systems's instructions, are recognized and followed. Field conditions or other factors could occur during installation that have not yet been encountered or addressed in this manual. Consequently, the information contained herein may be considered as a basis for recommendation but not as a guarantee.

Table 4-3 gives an estimate of the quantities of cement required based on pipe diameter. Quantities of primer average half of the cement required quantity.

Table 4-3: Estimated quantities of primer and cement

Nominal Size (inch)	Pint			Quart		
	No. of Joints	No. of Couplings or 90s	No. of Tees	No. of Joints	No. of Couplings or 90s	No. of Tees
½	190.0	95.0	64.0	380.0	190.0	128.0
¾	120.0	60.0	40.0	240.0	120.0	80.0
1	100.0	50.0	33.0	200.0	100.0	66.0
1¼	70.0	35.0	24.0	140.0	70.0	48.0
1½	50.0	25.0	17.0	100.0	50.0	34.0
2	30.0	15.0	10.0	60.0	30.0	20.0
2½	25.0	12.0	8.0	50.0	24.0	16.0
3	20.0	10.0	6.0	40.0	20.0	12.0
4	12.0	6.0	4.0	24.0	12.0	8.0
5	9.0	4.5	3.0	18.0	9.0	6.0
6	5.0	2.5	1.7	10.0	5.0	3.3
8	2.5	1.0	0.8	5.0	2.1	1.6

Caution: Before applying primer and cement, appropriate safety precautions should be taken.

Assembly Instructions

Primer and solvent cement should be stored in the shade between 40°F (5°C) and 110°F (43°C). Eliminate all ignition sources. Avoid breathing vapors. Use only with adequate ventilation; explosion-proof general mechanical ventilation or local exhaust is recommended to maintain vapor concentrations below recommended exposure limits. In confined or partially enclosed areas, a NIOSH-approved organic vapor cartridge respirator with full face piece is recommended. Containers should be kept tightly closed when not in use and covered as much as possible when in use. Avoid frequent contact with the skin; wearing PVA-coated protective gloves and an impervious apron are recommended. Avoid any contact with eyes; splash-proof chemical goggles are recommended. Verify that the primer and solvent cement are within their shelf lives.

Condition the pipe and fittings to the same temperature conditions prior to use. All pipe, fittings, and tools used for joining must be clean and free of dirt, moisture, grease, or other contamination prior to and during the joining process.

Cutting

It is important to cut the pipe square. A square cut provides the surface of the pipe with the maximum bonding area. Pipe can be easily cut with a wheel-type plastic pipe cutter, power saw, chop saw, or fine-toothed saw. Proper PPE must be used. GF Piping Systems does NOT recommend the use of ratchet cutters as they may split the pipe during cutting. Tools used to cut pipe must be designed for use with plastics and must be in good condition in accordance with the tool manufacturer's recommendations. If there is any indication of damage or evidence of cracking on the pipe, cut off at least 6 in (152 mm) beyond any visible crack.

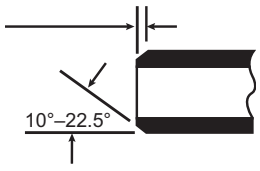


Bevel/Deburr

Burrs and filings can prevent proper contact between pipe and fitting during insertion or assembly and must be removed from the outside and inside of the cut pipe. A chamfering tool or a file is suitable for this purpose. A slight bevel (approximately 10°–15° chamfer) and a minimum width of 3/32 in (2.5 mm) shall be placed at the end of the pipe to ease entry of the pipe into the fitting socket. This will minimize the chance that the edges of the pipe will wipe solvent cement or will scrape softened surface material from the fitting socket during the insertion of the pipe.



5⁄64" (2.0mm) min. for ½"–2" pipe
3⁄32" (2.5mm) min. for 2½"–3" pipe
¼" (6.4mm) min. for 4"–12" pipe
1½" (38mm) min. for 14"– 24"pipe



Joining Preparation

Using a clean, dry rag, wipe any dirt and moisture from the fitting socket and pipe end. Moisture will slow the cure time, and dirt and/or grease will prevent weld adhesion. A cleaner is recommended if the pipe end or fitting socket is excessively dirty or greasy. After cleaning, check pipe and fitting for

possible damage, such as splits or cracks, and replace if necessary.

Prior to cementing, measure the socket depth and mark the pipe. Then mark the pipe again 2 in (50 mm) from the first mark. The first mark may later be removed during the cleaning or cementing process. The purpose of making the second mark on the pipe is to ensure the pipe has been fully inserted during the cementing process. After joining, the distance from the fitting to the second mark should be 2 in (50 mm). Test the dry fit of the joint. For proper interference fit, the fitting should go over the end of the pipe easily but become tight about ⅓ to ⅔ of the socket depth. Do NOT force the pipe to bottom out in the socket.

Primer Application

The purpose of a primer is to penetrate and soften the surfaces so they can fuse, or weld, together. Because joining occurs in a wide variety of conditions, it is important to check for sufficient softening of the pipe. Check the penetration, or softening, on a piece of scrap pipe before you start the installation or if the weather changes during the day. Using a knife or other sharp object, drag the edge over the coated surface. Proper penetration has been made if you can scrape a few thousandths of the primed surface away. Weather conditions can affect priming and cementing action, so be aware of the following:

1. Repeated applications to either or both surfaces may be necessary.
2. In cold weather, more time may be required for proper penetration.
3. In hot weather, penetration time may be shortened due to rapid evaporation.

Using the correct applicator, aggressively work the primer into the fitting socket, keeping the surface and applicator wet until the surface has been softened. More applications may be needed in cold weather conditions. Re-dip the applicator in primer as required. When the surface is primed, drain any puddles of primer from the socket. Next, aggressively work the primer onto the end of the pipe to a point ½ in (13 mm) beyond the mark you made for the depth of the fitting socket. Then, work a second coat of primer into the fitting socket. Immediately, while the surfaces are still wet, move to the next step.





Solvent Cement Application

Using the correct applicator, apply a full, even layer of cement on the pipe end equal to the depth of the fitting socket. Do not brush it out too thin as this will dry within a few seconds. Work a medium layer of cement into the fitting socket; avoid excess cement from puddling or running beyond the socket depth. Apply a second, even layer of cement on the pipe. Immediately, while the surfaces are still wet, move to the next step.

Assembly

If the solvent cement is not completely wet, re-coat parts before assembly. If solvent cement coatings have hardened, cut pipe, dispose of fitting, and start over. Do NOT assemble partially cured surfaces. Immediately, while solvent cement is still wet, assemble the pipe and fittings with one smooth insertion action, not stopping until the pipe is completely bottomed out to the fitting pipe stop. If possible, twist the pipe a ¼ turn as you insert it into the fitting socket.

For ½"–3" joints, hold the pipe and fitting together for a minimum of 30 seconds or 90 seconds minimum for 4" and larger joints to avoid push out and allow the fusion weld to form. Using a rag, remove the excess solvent cement from the pipe and fitting as it will needlessly soften the pipe and fitting, does not add to the joint strength, and will extend the cure time.



Avoid disturbing or moving the joint until the initial set time has been reached. Do not pressure test until the cure time for the test pressure has been reached. See Table 4-4 and Table 4-5 for set and cure times.

Set and Cure Times

The joint should not be disturbed immediately after the cementing procedure until the initial set time has passed. Exact curing time is difficult to predict because it depends on variables such as temperature, humidity, and cement integrity.

Table 4-4 and Table 4-5 show a guideline for initial set and cure times.

Table 4-4: Initial set times

Temperature range (relative humidity 60% or less)		Pipe Sizes				
°F	°C	½" to 1¼"	1½" to 2"	2½" to 8"	10" to 14"	16" to 24"
61°–100°	16°–38°	2 min	5 min	30 min	2 hr	4 hr
41°–60°	5°C–16°	5 min	10 min	2 hr	8 hr	16 hr
0°–40°	-18°–5°	10 min	15 min	12 hr	24 hr	48 hr

Table 4-5: Initial cure times

Relative Humidity > 60%		Pipe Sizes							
Temp. Range		½" to 1¼"		1½" to 2"		2½" to 8"		10" to 14"	16" to 24"
°F	°C	up to 160 psi (11 bar)	161-370 psi (11-26 bar)	up to 160 psi (11 bar)	161-370 psi (11-26 bar)	up to 160 psi (11 bar)	161-370 psi (11-26 bar)	up to 100 psi (7 bar)	up to 100 psi (7 bar)
61°–100°	16°–38°	15 min	6 hrs	30 min	12 hrs	90 min	24 hrs	2 days	3 days
41°–60°	5°C–16°	20 min	12 hrs	45 min	24 hrs	4 hrs	48 hrs	4 days	6 days
0°–40°	-18°–5°	30 min	48 hrs	60 min	96 hrs	72 hrs	8 days	8 days	14 days

Note: The sure schedules are based on laboratory test data obtained on net fit joints. Net fit joints are defined as a joint that, in a dry fit, the pipe bottoms snugly in the fitting socket without meeting interference).

Techniques to Ensure Strong Joints

Installers should verify for themselves that they can make satisfactory joints under varying conditions and should receive training in installation and safety procedures.

Consult GF Piping Systems assembly instructions, Safety Data Sheets, ASTM D2855 Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets, and ASTM F402 Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.

Note: Follow appropriate cure times prior to pressure testing.

Heavy-bodied cements are successfully used in place of the lighter cements. There have been more field problems created using the lighter and quicker drying cements on larger and heavier-walled pipe, than using heavy-bodied cements on lighter-walled and small-diameter pipe. It is extremely difficult to get a satisfactory bond in the first case and quite easy with reasonable care in the second. More care should be used in cementing fitting sockets and avoiding puddling of cement or primer within the components being joined. Puddling causes excess softening of the material and could cause damage to the product, especially in small-diameter pipe. Maximum or somewhere extended cure times should also be followed with the heavy-bodied cements.

The cement should still be wet when the surfaces are mated. In certain cases, difficult areas may extend cement-to-joining times to the upper one-minute limit. A check should be made with the cement supplied to ensure it will provide a still wet surface for at least one full minute with a normal full coat under the actual field conditions. This can be done by preparing a scrap piece of pipe with the primer, applying a full, even coating stroke with the solvent cement applicator, and checking to see if the cement is still wet after one full minute.

Joint Evaluation

Good PVC and CPVC solvent joints exhibit a complete dull surface on both surfaces when cut in half and pried apart. Leaky joints will show a continuous or an almost continuous series of un-fused areas (shiny spots) or channels from the socket bottom to the outer lip of the fitting. No bond occurred at these shiny spots. This condition can increase to the point where almost the entire cemented area is shiny, and fittings can blow off at this point.

Un-fused areas can be attributed to one or a combination of the following causes:

1. Use of the wrong size applicator (insufficient cement application),
2. Use of a cement that has partially or completely dried prior to bottoming of the fitting,
3. Use of a gelled cement that will not bite into the pipe and fitting surfaces due to loss of the prime solvent,
4. Insufficient cement or cement applied to only one surface,
5. Excess gap, which cannot be satisfactorily filled,
6. Excess time taken to make the joint after the start of the cement application. In many of these cases, as well as condition 1 or 2 above, examination will show that it was impossible to bottom the fitting since the lubrication effect of the cement had dissipated,
7. Cementing with pipe surfaces above 110°F (43°C) caused too much of the prime solvent to evaporate,
8. Cementing with cement that has water added by one means or another, or excess humidity conditions coupled with low temperatures,

9. Joints that have been disturbed and the bond broken prior to a firm set, or readjusted for alignment after bottoming,
10. Cementing surface not properly primed and dissolved prior to applying solvent cement, and/or
11. Improper component preparation including
    a. Lack of a bevel on the pipe end, or an insufficient bevel, which will cause the inserted pipe to scrape solvent from the socket wall of the fitting during assembly,
    b. Failure to deburr; the presence of filings and shavings can create weak spots within the assembled components resulting in un-fused areas, and
    c. Failure to cut the pipe end square which will reduce the surface area of the solvent cemented assembly in the critical area of the joint (socket bottom).

Tolerances and Fits

GF Piping Systems PVC and CPVC pipe and fittings are manufactured in accordance with applicable ASTM Standards to produce an interference fit when assembled. Test the dry fit of the parts to be joined for proper interference fit. The pipe should insert easily into the fitting socket but become tight about ⅓ to ⅔ of socket depth. However, this condition can vary because of minimum and maximum allowable tolerances permitted by the standards to which the pipe and fittings are produced.

In the case of a fitting with a maximum diameter and a pipe with a minimum diameter, a loose fit could result. Applying two coats of solvent cement or using a heavier bodied cement under these conditions will help ensure a good joint. Conversely, if the pipe diameter is on the maximum side and the fitting on the minimum side, the interference may be too great, and sanding of the pipe outer diameter to permit entrance may be necessary. In either extreme case, it is recommended to contact GF technical support for possible corrective actions.

For these specific reasons, it is important to check dry fits prior to making a solvent welded joint. Schedule 40 pipe has a tendency to round itself within the Schedule 40 fittings, thus permitting a greater degree of interference. However, in the case of Schedule 80 and 120 fittings, the heavy wall on the pipe will cause the pipe to be non-roundable. Interference can be less on large diameter, Schedule 80 and 120 fittings (particularly fabricated fittings) which in many cases will allow the pipe to be dry fit to the pipe stop with very little interference. It is under these conditions that it may be necessary to use an extra heavy-bodied solvent cement and to apply more than one coat to the pipe and fitting if the dry-fit seems loose. Prior to assembly, all piping system components should be inspected for damage or irregularities. Mating components should be checked to assure that tolerances and engagements are compatible. Do not use any components that appear irregular or do not fit properly. Contact the appropriate manufacturer of the product in question to determine usability.

Belled End Pipe

In many installations, belled end pipe can be used to eliminate the need for couplings. Where belled end pipe is used, it is suggested that the interior surface of the bell be penetrated exceptionally well with the primer. Table 4-6 below gives the dimensions for GF Piping Systems belled end pipe.

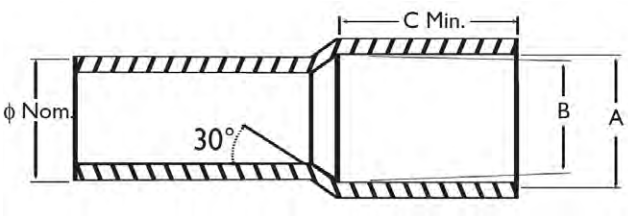


Table 4-6: Belled-end pipe dimensions

Imperial

	A		B		C
Nominal OD (in)	**Min. (in)**	**Max. (in)**	**Min. (in)**	**Max. (in)**	**Min. (in)**
1¼	1.675	1.680	1.648	1.658	1.870
1½	1.905	1.914	1.880	1.888	2.000
2	2.381	2.393	2.363	2.375	2.250
2½	2.882	2.896	2.861	2.875	2.500
3	3.508	3.524	3.484	3.500	3.250
4	4.509	4.527	4.482	4.500	4.000
5	5.573	5.593	5.543	5.563	4.000
6	6.636	6.658	6.603	6.625	6.000
8	8.640	8.670	8.595	8.625	6.000
10	10.761	10.791	10.722	10.752	8.000
12	12.763	12.793	12.721	12.751	8.500
14	14.030	14.045	13.985	14.000	9.000
16	16.037	16.052	15.985	16.000	10.000
18	18.041	18.056	17.985	18.000	12.000
20	20.045	20.060	19.985	20.000	12.000
24	24.060	24.075	24.000	24.015	14.000

Metric

	A		B		C
Nominal OD (in)	**Min. (mm)**	**Max. (mm)**	**Min. (mm)**	**Max. (mm)**	**Min. (mm)**
1¼	42.5	42.7	41.9	42.1	47.5
1½	48.4	48.6	47.8	48.0	50.8
2	60.5	60.8	60.0	60.3	57.2
2½	73.2	73.6	72.7	73.0	63.5
3	89.1	89.5	88.5	88.9	82.6
4	114.5	115.0	113.8	114.3	101.6
5	141.6	142.1	140.8	141.3	101.6
6	168.6	169.1	167.7	168.3	152.4
8	219.5	220.2	218.3	219.1	152.4
10	273.3	274.1	272.3	273.1	203.2
12	324.2	324.9	323.1	323.9	215.9
14	356.4	356.7	355.2	355.6	228.6
16	407.3	407.7	406.0	406.4	254.0
18	458.2	458.6	456.8	457.2	304.8
20	509.1	509.5	507.6	508.0	304.8
24	611.1	611.5	609.6	610.0	355.6

Note: GF Piping Systems does not use silicone lubricants in the belling process. However, some manufacturers use a silicone release agent on the belling plug, and a residue of this agent can remain inside the bell. This residue must be removed in the cleaning process prior to solvent cementing.

Large Diameter Pipe

The basic solvent cement instructions apply to all sizes of pipe, but when making joints 4 in and above, the use of two people to apply the solvent cement simultaneously to pipe and fitting is recommended. Additional people should also be in a position to help push the pipe into the fitting socket while the cemented surfaces are still wet and ready for insertion. Alignment of large diameter pipe and fittings is much more critical than when working with small diameter pipe. Specialty large diameter joining tools, developed specifically for joining large diameter PVC and CPVC piping products, are available.

It is imperative to use the appropriate size applicator for the application of primer and cement when working with large diameter pipe. Use a roller approximately one-half the size of the diameter of pipe being joined. As the pipe diameters increase, the range of tolerances also increases which can result in out-of-round and gap conditions. Speed in making the joint and applications of heavy coats of solvent cement in these cases is important. When working with pipe diameters such as 8 in through 24 in, checking the dry fit of the pipe and fittings is more critical on these large sizes. In many cases, where fabricated fittings are used, interference fits may not be present; consequently, it will be necessary to apply more than one coat of cement to the pipe and fitting. It is essential to use a heavy-bodied and/or extra heavy-bodied, slow drying cement on these large diameter sizes.

Joining by NPT Threads

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 4 in), they have two definite advantages. They can quickly be dismantled for temporary or take-down applications, and they can be used to join thermoplastic to non-plastic materials. Theoretically, it is possible to use any combination of threaded parts, such as:

1. Metal female to thermoplastic male
2. Thermoplastic male to thermoplastic female
3. Metal male to thermoplastic female (should not be used)

A male plastic thread can be inserted into a female metal thread if heat is not involved and both lines are anchored immediately adjacent to the joint. However, male metal threads should NOT be connected to a female plastic pipe thread, item 3 above. The reason for this is due to the incompressibility of metal in relation to thermoplastics.

Figure 4-1, Table 4-7, and Table 4-8 below and on the next page show thread dimensions for your reference.

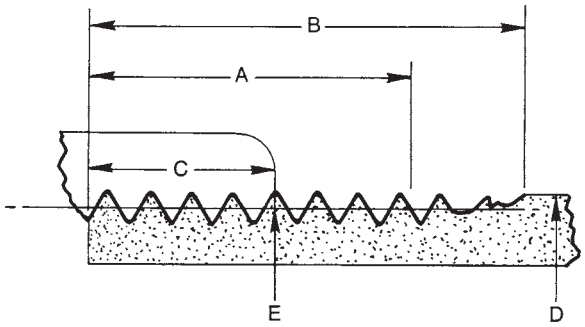
Table 4-7: American standard taper pipe thread dimensions in Imperial units

Pipe		Thread					
Nominal Size (in)	Outside Diameter (in)	Threads per inch	Normal engagement by Hand (in)	Length of Effective Thread (in)	Total Length end of pipe to Vanish Point (in)	Pitch Diameter at end of Internal Thread (in)	Depth of Thread (max.) (in)
	D		C	A	B	E	
½"	0.840	14	0.320	0.5337	0.7815	0.77843	0.05714
¾"	1.050	14	0.339	0.5457	0.7935	0.98887	0.05714
1"	1.315	11.5	0.400	0.6828	0.9845	1.23863	0.06957
1¼"	1.660	11.5	0.420	0.7068	1.0085	1.58338	0.06957
1½"	1.900	11.5	0.420	0.7235	1.0252	1.82234	0.06957
2"	2.375	11.5	0.436	0.7565	1.0582	2.29627	0.06957
2½"	2.875	8	0.682	1.1375	1.5712	2.76216	0.10000
3"	3.500	8	0.766	1.2000	1.6337	3.38850	0.10000
4"	4.500	8	0.844	1.3000	1.7337	4.38713	0.10000
6"	6.625	8	0.958	1.5125	1.9472	6.50597	0.10000
8"	8.625	8	1.063	1.7125	2.1462	8.50003	0.10000
10"	10.750	8	1.210	1.9250	2.3587	10.62094	0.10000
12"	12.750	8	1.360	2.1250	2.5587	12.61781	0.10000

Table 4-8: American standard taper pipe thread dimensions in Metric units

Pipe		Thread					
Nominal Size (in)	Outside Diameter (mm)	Threads per mm	Normal engagement by Hand (mm)	Length of Effective Thread (mm)	Total Length end of pipe to Vanish Point (mm)	Pitch Diameter at end of Internal Thread (mm)	Depth of Thread (max.)(mm)
	D		C	A	B	E	
½"	21.3	355.6	8.13	13.56	19.85	19.772	1.451
¾"	28.7	355.6	8.61	13.86	20.15	25.117	1.451
1"	33.4	292.1	10.16	17.34	25.01	31.461	1.767
1¼"	42.2	292.1	10.67	17.95	25.62	40.218	1.767
1½"	48.3	292.1	10.67	18.38	28.04	48.287	1.767
2"	60.3	292.1	11.07	19.22	28.88	58.325	1.767
2½"	73.0	203.2	17.32	28.89	39.91	70.159	2.540
3"	88.9	203.2	19.46	30.48	41.50	88.068	2.540
4"	114.3	203.2	21.44	33.02	44.04	111.433	2.540
6"	168.3	203.2	24.33	38.42	49.46	165.252	2.540
8"	219.1	203.2	27.00	43.50	54.51	215.901	2.540
10"	273.1	203.2	30.73	48.90	59.91	269.772	2.540
12"	323.9	203.2	34.54	53.98	64.99	320.492	2.540

Figure 4-1: Dimensions of pipe threads as shown in Tables 4-7 and 4-8



Threaded Connections

Please read all instructions before attempting to install threaded parts.

NPT threaded connections are not recommended for high pressure or high temperature systems, systems greater than 4" in diameter, or systems where leaks would be dangerous or costly. When properly installed, threaded connections offer the benefit of an easy and inexpensive transition to metal systems. They can also be used for joining plastic where the installation is expected to be modified or moved later.

Due to the difference in stiffness between plastic and metal, a metal male to thermoplastic female joint should be avoided if possible. Threading reduces the rated pressure of the pipe by one-half.

Thread Sealant

Use either a thread sealant (pipe dope) approved for use with thermoplastics, or PTFE tape, but not both, to seal threads. Use a thin, even coat of sealant. PTFE tape must be installed in a clockwise direction starting at the bottom of the thread and overlapping each pass. Do not employ more than three wraps.



Pipe Dope



PTFE Thread Sealant

Making the Connection

Start the threaded connection carefully by hand to avoid cross threading or damaging threads. Turn until hand tight. Mark the location with a marker. With a strap wrench on the plastic part, turn an additional half turn. **DO NOT OVER-TIGHTEN.**

If leakage occurs during pressure testing, consult Table 4-9 for next steps.

Table 4-9: Steps to compensate for leakage during pressure testing

Connection Type	Next Step
Thermoplastic to Thermoplastic	Tighten up to ½ turn
Thermoplastic Male to Metal Female	Tighten up to ½ turn
Metal Male to Thermoplastic Female	Consult Factory

Threaded connections are susceptible to fracture or leaking due to misalignment. Pipe should be installed without bending. See Page 67 for information on guides and support spacing and Page 23 for allowances for thermal expansion.

Installing Unions and True Union Ball Valves

Please read all instructions before attempting to install unions or valves.

Because unions and ball valves have similar threaded nut connectors, these instructions have been written with both of

these components in mind. GF Piping Systems unions and true union ball valves are designed to provide many years of service when installed properly.

As with any piping system components, unions and valves have particular considerations that must be kept in mind during installation in order to ensure best performance. Even experienced installers will benefit from reviewing these instructions before each installation.

Valve Support

Ball valves must be well supported. An unsupported or insufficiently supported valve body will twist when opened and closed, subjecting the union connection to torque stress that may cause cracking or distortion and subsequent leakage.

System Alignment

The major contributor to union nut failures is misalignment. Uneven compression of the O-ring will cause leaks to occur. Union nuts can be damaged by the stress of holding a misaligned system together. GF union connections use an O-ring as the sealing mechanism, which is highly effective under relatively low tightening force. An often overlooked issue is the presence of dirt and debris on the O-ring or sealing surface. This will prevent proper O-ring sealing; if it is present on the nut body threads, it will clog the threads and prevent proper tightening.

Note: Never use any foreign substance or object to hold the O-ring in place. Never use the union nuts to draw together any gaps between the mating faces of the components or to correct any system misalignment.

Installation

Understand and carefully follow these installation steps in order to ensure a seal that is sufficient to guard against leaks while avoiding excessive forces that can damage the union nut.

Always remove the union nut and end connectors from the ball valve for installation. Make sure that you slide the union nut onto the pipe with the thread facing the proper direction BEFORE installing the end connector.

Solvent cement the pipe into the union or ball valve sockets before the union nut connections are engaged. Be careful not to get any cement on the sealing surfaces, which can disrupt the seal and cause leaks. For best results, allow the cemented joint to properly cure prior to assembling the union nut connection in order to avoid damaging the uncured joint.

Once the cement has cured, ensure that the O-ring is securely seated in its groove. The O-ring should rest securely in place without adhesive or other aids.

There should be no gap between the mating components, so the threaded nut serves only to compress the O-ring, thus creating the seal. However, a small gap, less than ⅛ in (3.2 mm), between the mating components is acceptable.

Hand-Tightening for All Sizes

The next step is to hand-tighten the union nut. With the O-ring in place, engage the nut with its mating threads and turn clockwise with one hand. Continue turning with moderate force until the nut no longer turns. Be careful to use reasonable force when tightening the nut. Your grip should be firm but not aggressive. The nut should turn easily until it bottoms out and brings the mating faces into direct contact.

It is recommended that you place an indexing mark with a permanent marker on the union nut and bolt to identify the hand-tight position. See Figure 4-8 for more details. Union and true union ball valve sizes ⅜ in through 1½ in should be sufficiently sealed after hand-tightening for the hydrostatic pressure test of the system.

Note: Do not use any form of lubricant on the threads of the union nut.

Figure 4-2: Example of an indexing mark



Optional Further Tightening for Sizes 2 in. to 4 in.

Based on experience or system requirements, the installer may choose to turn the nut an additional 1/8 turn in order to ensure a better seal before hydrostatically pressure testing the system. To do this, use a strap wrench to turn the nut 1/8 turn past the index mark applied after assembly.

Do not use any metallic tools. Tool marks on the union nut will void the manufacturer's warranty. At this point, the system should be hydrostatically pressure tested before turning the union nut any further.

Post-Test Tightening (Sizes ½ in. to 1½ in. Only)

It is highly unlikely that any union nut connection, when tightened as instructed above, will leak under normal operating conditions. In the unlikely event that a leak occurs, the union nut at the leaking joint may be tightened an additional 1/8 turn as described in Table 4-13. The system should then be retested.

Table 4-10: Tightening guide for union and ball valve nuts

Size (in)	Initial	Additional, Pre-Test	Additional, Post-Test
½	Hand-Tight	None	⅛ Turn Max
¾	Hand-Tight	None	⅛ Turn Max
1	Hand-Tight	None	⅛ Turn Max
1¼	Hand-Tight	None	⅛ Turn Max
1½	Hand-Tight	None	⅛ Turn Max
2	Hand-Tight	⅛ Turn Max	Consult Factory
3	Hand-Tight	⅛ Turn Max	Consult Factory
4	Hand-Tight	⅛ Turn Max	Consult Factory

Note: If the joint still leaks after post-test tightening, do not continue to tighten the nut at the leaking joint. Disassemble the leaking joint, recheck the system alignment, and check for obstructions in the sealing area.

If the cause of a leak cannot be determined or if you suspect that the union or valve is defective, contact your GF Piping Systems representative for further instructions.

Quality Check after Assembly

To check if the union connections are installed in a stress-free manner, GF Piping Systems recommends that a random check of alignment be done by removing the nut on selected union connections one at a time. A properly installed system will not have any movement of the piping as the nut is loosened. If any springing action is noticed, steps should be taken to remove the stress prior to reinstalling the union nut.

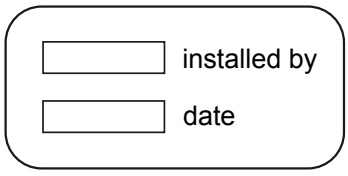
Documentation

Best practices include tagging each flange with installation tags including

1. Installer's initials
2. Installation date

The information can be recorded on pre-printed stickers as shown in Figure 4-9 and placed on each flange immediately after installation.

Figure 4-3: Example installation tag



Experience has shown that installation tags speed up the process of resolving system leaks and product failures, improve communication between the contractor and distributor or manufacturer, highlight training opportunities, and promote worker diligence.

Joining by Van Stone Flanges

Please read all instructions before attempting to install flanges.

Like all thermoplastic pipe and fittings, the flanges are light-weight, inexpensive, and easy to install. However, thermoplastics have different physical properties than metals; therefore, special care is required to ensure that your flanges have a long, reliable service life. Installers should study these instructions and follow them carefully in every installation in order to ensure satisfactory performance and enjoy the full benefits of the GF Piping Systems warranty.

Flanges are generally used when

1. The piping system may need to be dismantled,
2. The installation is temporary or mobile,
3. Transitioning between dissimilar materials that cannot be cemented together, and/or
4. The installation environment is not conducive to solvent cementing.

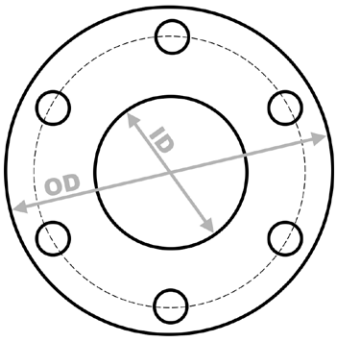
Gaskets

Visually inspect flanges for cracks, deformities, solvent cement, and other obstructions on the sealing surfaces.

Table 4-11: Gasket dimensions

	Minimum OD		Maximum ID	
Size (inch)	inch	mm	inch	mm
½"	3.5	88.9	0.88	22.4
¾"	3.88	98.6	1.10	27.9
1"	4.25	108.0	1.38	35.1
1¼"	4.63	118.0	1.60	40.6
1½"	5.00	127.0	1.93	49.0
2"	6.00	152.0	2.44	62.0
2½"	7.00	178.0	2.91	73.9
3"	7.50	191.0	3.59	91.2
4"	9.00	229.0	4.64	118.0
6"	11.00	279.0	6.82	173.0
8"	13.50	343.0	8.66	220.0
10"	16.00	406.0	10.81	275.0
12"	19.00	483.0	12.09	307.0

Figure 4-4: Dimension Labels



A rubber gasket must be used between the flange faces in order to ensure a good seal. For PVC and CPVC flanges, GF Piping Systems recommends a 0.125 in thick, full-face gasket with a Shore A scale hardness of 70±5, and the bolt torque values shown on the table (page 61) "Flange Bolt Torque" are based on this specification. For other hardness requirements, contact GF Technical Services. Select the gasket material based on the chemical resistance requirements of your system. A full-face gasket should cover the entire flange-to-flange interface without extending into the flow path. Table 4-10 gives required gasket dimensions for GF Piping Systems Van Stone Flanges.

Fasteners

It is critical to avoid excessive compression stress on the Van Stone Flange. Therefore, only low-friction fastener materials should be used. Low-friction materials allow torque to be applied easily and gradually, ensuring that the flanges are not subjected to sudden, uneven stress during installation which can lead to cracking.

Either the bolt or the nut, but preferably both, should be zinc-plated to ensure minimal friction. If using stainless steel bolts and nuts, lubricant must be used to prevent high friction and seizing. In summary, the following fastener combinations are acceptable:

1. Zinc-on-zinc, with or without lubricant;
2. Zinc-on-stainless steel, with or without lubricant; or
3. Stainless steel-on-Stainless steel, with lubricant only.

Cadmium plated fasteners, while becoming more difficult to obtain due to environmental concerns, are also acceptable with or without lubricant. Galvanized and carbon steel fasteners are not recommended. Use a copper-graphite anti-seize lubricant to ensure smooth engagement and the ability to disassemble and reassemble the system easily. Note the fastener specifications in Table 4-11.

Table 4-12: Fastener Specifications

Flange Size (in)	No. of Bolts	Length[1] (in)	Bolt Size (in)-Type	Washer Size (in)-Type[2]
½	4	2½	½-UNC	½ SAE[3]
¾	4	2½	½-UNC	½ SAE
1	4	2¾	½-UNC	½ SAE
1¼	4	2¾	½-UNC	½ SAE
1½	4	3¼	½-UNC	½ SAE
2	4	3½	⅝-UNC	⅝ SAE
2½	4	4	⅝-UNC	⅝ SAE
3	4	4	⅝-UNC	⅝ SAE
4	8	4¼	⅝-UNC	⅝ SAE
6	8	4½	¾-UNC	¾ SAE
8	8	5	¾-UNC	¾ SAE
10	12	5	⅞-UNC	⅞ SAE
12	12	5	⅞-UNC	⅞ SAE
14	12	5½	1-UNC	1 SAE[4]
16	16	5½	1-UNC	1 SAE[4]
18	16	5½	1⅛-UNC	1⅛ SAE[4]
20	20	6	1⅛-UNC	1⅛ SAE[4]
24	20	6½	1¼-UNC	1¼ SAE[4]

1. Suggested bolt length for flange-to-flange connection with 0.125" thick gasket. Adjust bolt length as required for other types of connections.
2. Minimum spec. Use of a stronger or thicker washer is always acceptable as long as published torque limits are observed.
3. Also known as Type A Plain Washers, Narrow Series.
4. ASTM F436 required for larger sizes to prevent warping at high torque.

Bolts must be long enough that two complete threads are exposed when the nut is tightened by hand. Using a longer bolt does not compromise the integrity of the flange connection, although it wastes material and may make tightening more difficult due to interference with nearby system components.

Figure 4-5: Illustration of exposed threads

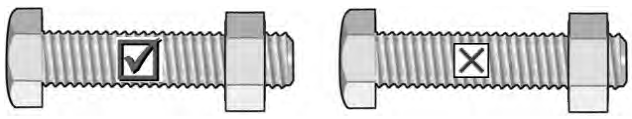
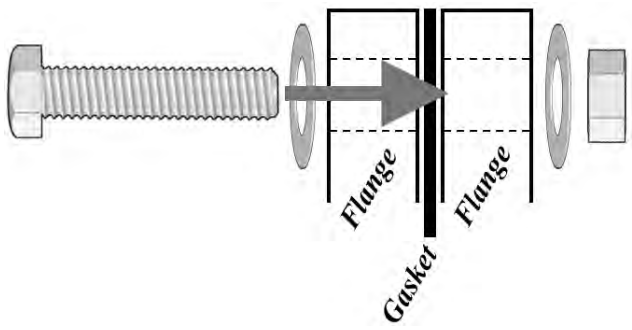


Figure 4-6: Bolt hole configurations



A washer must be used under each bolt head and nut. The purpose of the washer is to distribute pressure over a wider area, reducing the compression stress under the bolt head and nut. Failure to use washers voids the GF Piping Systems warranty.

Torque Wrench

Compared to metals, thermoplastics are relatively flexible and deform slightly under stress. Therefore, not only must bolt torque be controlled in order to avoid cracking the flange, but continuing to tighten the bolts beyond the recommended torque levels may actually make the seal worse, not better.

Because bolt torque is critical to the proper function of a flange, a current, calibrated torque wrench accurate to within ± 1 ft-lb must be used when installing flanges.

Experienced installers may be tempted to forego the use of a torque wrench, relying instead on feel. GF Piping Systems does not endorse this practice. Job-site studies have shown that experienced installers are only slightly better than new trainees at estimating bolt torque by feel. A torque wrench is always recommended.

Note: Never use an impact wrench to install a GF Piping Systems flange.

Checking System Alignment

Before assembling the flange, be sure that the two parts of the system being joined are properly aligned. GF Piping Systems has developed a "pinch test" that allows the installer to assess system alignment quickly and easily with minimal tools.

First, check the gap between flange faces by pinching the two mating components toward each other with one hand as shown in Figure 4-5. If the faces can be made to touch, then the gap between them is acceptable.

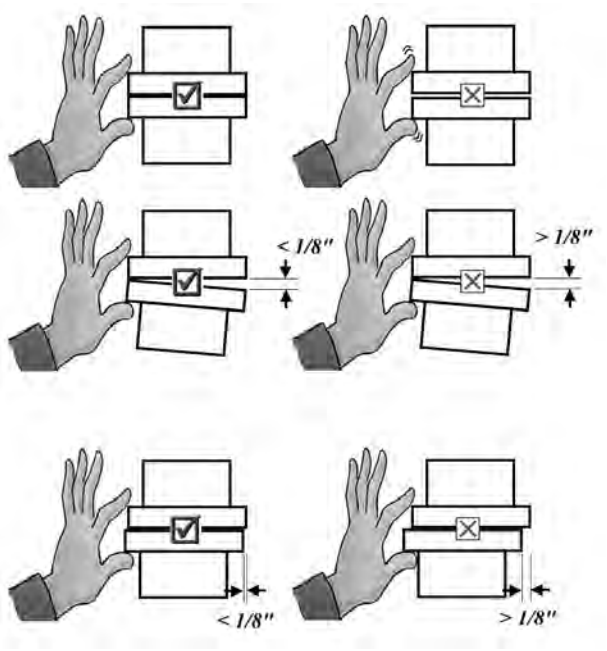
Next, check the angle between the flange faces. If the faces are completely flush when pinched together, as shown in Figure 4-5, then the alignment is perfect, and you may continue installation. Otherwise, pinch the faces together so that one side is touching; then, measure the gap between the faces on the opposite side. The gap should be no more than ⅛ in (3.2 mm).

To assess high-low misalignment, pull the flange faces flush together. If the faces are concentric within ⅛ in (3.2 mm), then the high-low misalignment is acceptable.

If the gap between the mating components cannot be closed by pinching them with one hand or if the angle or high-low misalignment between them is too large, then using the bolts to force the components together will result in excessive stress and possible failure during or after installation. In this case, inspect the system to find the greatest source of misalignment and refit the system with proper alignment before bolting.

The pinch test is a good rule of thumb, but always use common sense as well. If it seems difficult or awkward to pull the flange faces together, then stop the installation and either refit the system or consult your GF Piping Systems representative before proceeding.

Figure 4-7: Checking system alignment



The bolt holes of a Van Stone flange will align automatically when the bolts are inserted and tightened. No additional adjustment is necessary. To align the bolt holes of a fixed flange, use standard two-holing procedure.

Placing the Gasket

Center the gasket between the flange faces with the bolt holes aligned with corresponding holes in the gasket. A full-face gasket cut to the specified dimensions should come just to the inner edge of the flange face near the flow path or overlap the edge slightly. See Table 4-10 for the specified dimensions.

Inserting the Bolts

If using copper-graphite anti-seize lubricant as recommended, apply the lubricant evenly with a brush directly to the bolt threads, and to the nut if desired. Cover the bolt from its tip to the maximum extent to which the nut will be threaded. Insert bolts through washers and bolt holes as shown in Figure 4-4.

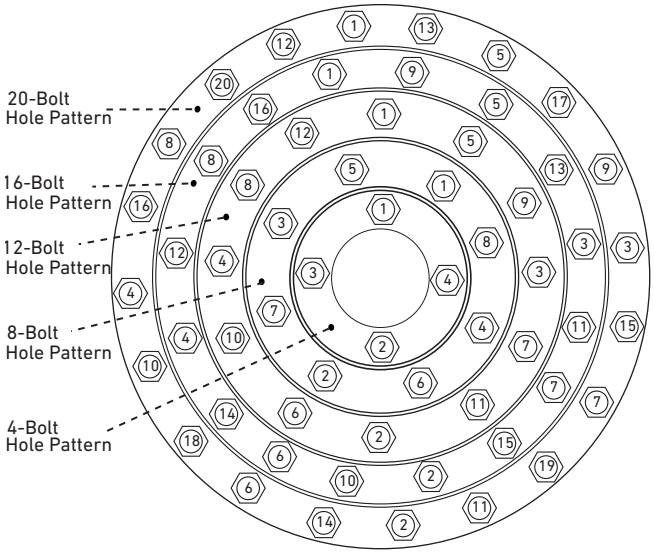
Tighten all nuts by hand. As you tighten each nut, the nuts on the other bolts will loosen slightly. Continue to hand-tighten all of the nuts until none remain loose. Now the flange assembly will remain in place as you prepare to fully tighten it.

Again, when hand-tightened, at least two threads beyond the nut should be exposed in order to ensure permanent engagement as shown in Figure 4-3. If less than two threads are exposed, disassemble the flange and use longer bolts.

Tightening the Bolts

PVC and CPVC flanges require gradual, even bolt tightening. Tightening one bolt to the maximum recommended torque while other bolts are only hand-tight or tightening bolts in the wrong order produces uneven stresses that may result in cracking or poor sealing. To ensure even distribution of stresses in the fully installed flange, tighten the bolts in a star pattern as described in ANSI B16.5 and shown in Figure 4-8.

Figure 4-8: Bolt tightening order



For the installer's convenience, the pattern is also indicated by numbers molded into the flange next to each bolt hole.

The torque required on each bolt in order to achieve the best seal with minimal mechanical stress has been carefully studied in laboratory and field installations and is given in Table 4-13.

Note that the torques listed in Table 4-13 are for flange-to-flange connections in which the full faces of the flanges are in contact. For other types of connections, such as between a flange and a butterfly valve, where the full face of the flange is not in contact with the mating component, less torque will be required. Do not apply the maximum listed torque to the bolts in such connections since the flange is not fully supported by the mating component. Doing so may cause deformation or cracking. Instead, start with approximately two-thirds of the listed maximum torque and increase as necessary to make the system leak-free after pressure testing.

Table 4-13: Multiple pass bolt torques

	Torque Sequence, ft-lb (N-m) lubed*			
Size (inch)	**1st**	**2nd**	**3rd**	**4th**
½	3	5	-	-
¾	3	5	-	-
1	3	5	-	-
1¼	3	5	-	-
1½	3	5	-	-
2	5	8	-	-
2½	5	8	10	-
3	8	15	25	-
4	10	15	20	-
6	12	24	30	-
8	15	35	40	-
10	25	50	60	-
12	30	60	72	-
14	22	44	88	110
16	22	44	88	110
18	22	44	88	110
20	22	44	88	110
24	22	44	88	110

	Torque Sequence, ft-lb unlubed			
Size (inch)	**1st**	**2nd**	**3rd**	**4th**
½	5	8	-	-
¾	5	8	-	-
1	5	8	-	-
1¼	5	8	-	-
1½	5	8	-	-
2	5	10	12	-
2½	10	15	18	-
3	15	25	39	-
4	15	25	32	-
6	20	32	42	-
8	20	40	50	60
10	20	40	60	70
12	20	50	65	80
14	28	55	110	138
16	28	55	110	138
18	28	55	110	138
20	28	55	110	138
24	28	55	110	138

To ensure even distribution of stresses and a uniform seal, tighten the bolts to the first torque value in the sequence using a star pattern; then, repeat the star pattern while tightening to the next torque value. Continue this pattern to the maximum torque value.

Thermoplastics deform slightly under stress. A final tightening after 24 hours is recommended, when practical, to ensure any bolts that have loosened due to relaxation of the polymer are fully engaged.

If a flange leaks when pressure tested, retighten the bolts to the full recommended torque and retest. Do not exceed the recommended torque before consulting an engineer or GF Piping Systems representative.

Documentation

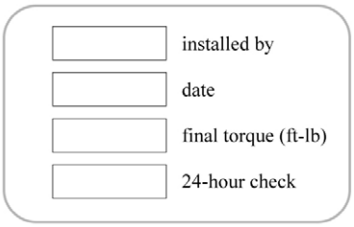
Keep instructions available and provide a copy of these instructions to every installer on the job site prior to beginning installation. Installers who have worked primarily with metal flanges often make critical mistakes when installing plastic flanges. Even experienced installers will benefit from a quick review of good installation practices before starting a new job.

Best practices include tagging each flange with installation tags including

1. Installer's initials
2. Installation date
3. Final torque value
4. Confirmation of 24 hour torque check

The information can be recorded on pre-printed stickers as shown in Figure 4-7 and placed on each flange immediately after installation.

Figure 4-9: Example installation tag



Experience has shown that installation tags speed up the process of resolving system leaks and product failures, improve communication between the contractor and distributor or manufacturer, highlight training opportunities, and promote worker diligence.

Specialty Adapters

Specialty reinforced molded female adapters are available in PVC and CPVC for use as transition fittings to change materials. Unlike conventional plastic female adapters, these fittings incorporate the use of a stainless steel restraining collar located on the exterior of the FIPT threads of the adapter. This design allows direct connection to male metal threads without the need for pressure derating normally associated with conventional FIPT adapters, as the radial stress generated by thread engagement is contained. In addition, this style of fitting also helps to compensate for stresses that may be generated as the result of differences in dissimilar material, thermal expansion/contraction rates, and related stresses.

Installing Expansion Joints

GF's expansion joint consists of two telescoping tubes designed with a triple O-ring system and is available in a variety of configurations. Expansion joints are necessary when standard expansion loops are not practical or not desired. Expansion joints allow for rigid mounting between two fixed points with the inner tube expanding and contracting like a piston against the anchored outer tube.

Thermoplastics have a high coefficient of thermal expansion. In many cases, this rate of expansion will be up to 10 times that of metals. Expansion and contraction need to be considered when designing and installing any plastic piping system. Dependent on the amount of expansion, design considerations to compensate for this pipe movement may be necessary. The stresses from an improperly designed and installed system can cause catastrophic failure or can significantly reduce the effective service life of the system.

Expansion joints are an effective means of designing for expansion or contraction and should be the preferred consideration when

1. The system has critical dimensions with no room for movement (i.e. manifold systems)
2. The system has significant space constraints
3. The system will experience frequent thermal cycling
4. The system will be exposed to a temperature change beyond 30°F (17°C), and/or
5. Physical appearance is critical

Normally expansion joints are not necessary indoors unless the temperature of the air and/or liquid is going to vary. Outdoor installations need to consider expansion and contraction. The amount of expansion is based on the temperature differential between the minimum and maximum of the air and/or liquid.

The expansion joint should be mounted so that the inner tube (piston) can travel freely in a straight line. Any misalignment may cause the expansion joint to bind. The outer tube (expansion joint barrel) should be well supported and clamped to allow all of the expansion to occur in the piston. If the expansion tube is to be used in the vertical position, the piston should be oriented in a downwards orientation so as to prevent dirt or debris from entering the O-ring seal. The alignment of expansion joints is critical to prevent binding due to the pipe being cocked. Ensure that any anticipated expansion is aligned with the expansion joint.

Cycle the piston several times prior to installation. It may be necessary to assist the piston by bumping it (or using a strap wrench for larger sizes) to begin movement if the expansion joint has been in storage for some time. Ensure the expansion joint piston has unrestricted travel. For notes on the piston position at the time of installation, see Section 3.2.3.3.

Caution: Do not test with air or air over water.

Gasket Design

GF Harvel gasketed pipe utilizes gaskets that are locked in place at the factory as part of the manufacturing process. Two styles of factory installed gaskets are used. Pipe sizes 2" through 8" incorporate the Rieber style gasket; 10" through 24"

diameter pipes utilize the Retained Ring style gasket. Both gasket styles are locked in place, and eliminate the need to install gaskets in the field. This technique also prevents fish mouthing or dislocation of the seal during assembly. The standard gasket material used for both factory-installed gasket systems is Styrene Butadiene Rubber (SBR) which offers excellent physical properties and good chemical resistance. Other gasket materials are available when necessary to meet demanding chemical resistance requirements. GF Harvel gasketed pipe offers low assembly force; flexibility to allow for variations in line pressure and changing working conditions; compensation for movement due to thermal expansion and contraction; a certain amount of allowable joint deflection; and positive, leak-free seals for both high- and low-pressure applications as well as vacuum service.

Installation-Gasketed Pipe

Low assembly force enables fast and simple field installation without the risk of gasket dislocation. Each spigot end of GF Harvel gasket pipe contains a 15° bevel for easy insertion, as well as a factory-placed reference mark to indicate proper insertion depth. The reference marks also provide a visual means to verify proper insertion if lines are assembled above ground, and lowered into the trench after assembly. Field-cut lengths must be cut square, beveled to the same 15° taper, and marked to the proper insertion depth.



Rieber style gasket
2" through 8"



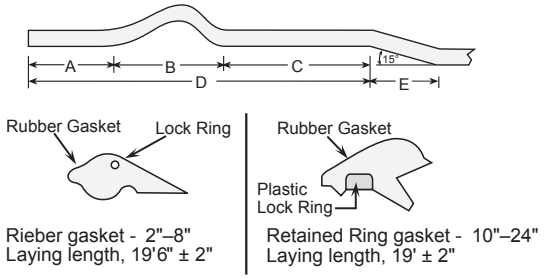
Retained Ring style gasket
10" through 24"

Dimensions

IPS (in.)	A	B	C	D	E (approx.)
Rieber Gasket					
2	0.590	1.329	2.820	4.739	0.474
2½	0.670	1.489	2.860	5.019	0.566
3	0.708	1.587	2.940	5.235	0.688
4	0.867	1.723	3.020	5.610	0.874
6	1.063	2.076	3.200	6.339	1.274
8	1.260	2.073	3.500	6.833	1.500
Retained Ring Gasket					
10	1.875	2.417	4.750	9.042	1.500
12	2.000	2.619	5.500	10.119	1.500
14	2.125	3.375	6.000	11.500	1.500
16	2.250	2.875	6.500	11.625	1.500
18	2.500	3.062	7.000	12.562	1.500
20	2.750	3.375	7.375	13.500	1.500
24	2.203	3.781	8.000	13.984	1.500

Deflection

GF Harvel gasketed joints permit an angular deflection of 2° at the joint. Adequate deflection can usually be achieved for gentle curves by using the inherent flexibility of the pipe itself, without using joint deflection.



Rieber gasket - 2"–8"
Laying length, 19'6" ± 2"

Retained Ring gasket - 10"–24"
Laying length, 19' ± 2"

Joining Techniques-Groove Style Connections

In many installations where transition to metal pipe, or where disassembly is a prime factor, metallic grooved style couplings can be used to join PVC and CPVC pipe to alternate IPS size piping materials. In addition to the ease of disassembly, this type of connection also allows for a certain degree of angular adjustment and expansion/contraction. In order to prepare the plastic pipe for adapting the grooved style couplings, it is necessary to roll or cut a groove onto the end of the pipe removing from the wall thickness. Where shock loads from intermittent operation are probable, particularly with large

diameter pipe, angular displacement should be avoided and the pipe aligned longitudinally to minimize high stress levels on the grooves. Grooved end pipe is available from GF Harvel.

Corrosion resistant grooved PVC piping in IPS sizes 2" through 24" is available as a fabrication option from the factory. Pressure rating of grooved end piping varies with schedule, pipe size, temperature, and the selected groove style coupling manufacturers' product specifications. As with all PVC piping, the maximum service temperature for grooved end PVC pipe is 140°F. The groove coupling manufacturer should be consulted for temperature and pressure limitations of the coupling used. This pipe is available from Georg Fischer Harvel LLC with grooved ends designed for use with Victaulic Style 75 or Style 77 or equivalent flexible style couplings. Only flexible style grooved couplings are recommended for use with GF Harvel grooved-end PVC pipe.

Rigid style couplings are not recommended for use on plastic pipe as they provide a compressive/shear load that can result in failure.

GF Harvel currently utilizes both the roll grooving method as well as the cut grooving method to provide grooved end pipe in the sizes below.

Only flexible style metallic grooved couplings are recommended for use with plastic pipe. Rigid style couplings can provide a compressive/ shear load to plastic pipe resulting in failure; as a result their use is not recommended. Care should be taken to investigate the compatibility of the grooved coupling gasket material for the intended application.

Groove Style (roll or cut)

Size (in)	SCH 40	SCH 80
2	ROLL	ROLL
2½	ROLL	ROLL
3	ROLL	ROLL
4	ROLL	ROLL
6	ROLL	ROLL
8	ROLL	ROLL
10	ROLL	CUT
12	ROLL	CUT
14	CUT	CUT
16	CUT	CUT
18	CUT	CUT
20	CUT	CUT
24	CUT	CUT

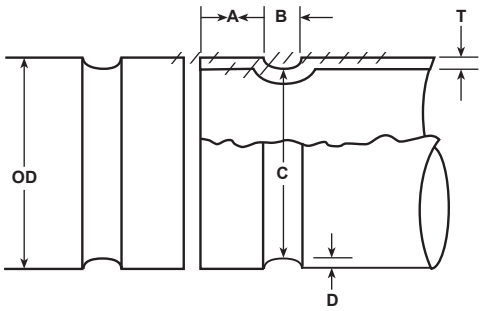
Roll Groove Specifications (IPS)

Size (in)	O.D.	A Gasket Seat +0.015, -0.030	B Groove Width +0.030, -0.015	C Groove Diameter Actual/Tolerance	D Nominal Groove Depth	T Min. Allowable Pipe Wall
2	2.375	0.625	0.344	2.250 +0.000, –0.015	0.063	0.065
2½	2.875	0.625	0.344	2.720 +0.000, –0.015	0.078	0.083
3	3.500	0.625	0.344	3.344 +0.000, –0.015	0.078	0.083
4	4.500	0.625	0.344	4.334 +0.000, –0.015	0.083	0.083
6	6.625	0.625	0.344	6.455 +0.000, –0.015	0.085	0.109
8	8.625	0.750	0.469	8.441 +0.000, –0.020	0.092	0.109
10	10.750	0.750	0.469	10.562 +0.000, –0.025	0.094	0.134
12	12.750	0.750	0.469	12.531 +0.000, –0.025	0.109	0.156

Cut Groove Specifications (IPS)

Size (in)	O.D.	A Gasket Seat	B Groove Width	C Groove Diameter	D Nominal Groove Depth	T Min. Allowable Pipe Wall
2	2.375	0.625	0.313	2.25	0.063	0.154
2½	2.875	0.625	0.313	2.72	0.078	0.188
3	3.5	0.625	0.313	3.344	0.078	0.188
4	4.5	0.625	0.375	4.334	0.083	0.203
6	6.625	0.625	0.375	6.455	0.085	0.219
8	8.625	0.75	0.438	8.441	0.092	0.238
10	10.75	0.75	0.5	10.562	0.094	0.25
12	12.75	0.75	0.5	12.531	0.109	0.279
14	14	0.938	0.5	13.781	0.109	0.281
16	16	0.938	0.5	15.781	0.109	0.312
18	18	1	0.5	17.781	0.109	0.312
20	20	1	0.5	19.781	0.109	0.312
24	24	1	0.563	23.656	0.172	0.375

Figure 4-10: Dimension of grooved pipe



NOTE: Temperature and Pressure ratings and limitations are dependant on the grooved coupling manufacturer's specifications.

NOTE: A gasket/joint lubricant is recommended to prevent pinching the gasket and to assist the seating and alignment processes during assembly of grooved couplings. Certain lubricants may contain a petroleum base or other chemicals,which will cause damage to the plastic pipe, gasket and adapter. Georg Fischer Harvel LLC suggests verifying the suitability for use of the selected lubricant with the lubricant manufacturer prior to use.

Support Installation

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 in Figure 4-12, spaced approximately as indicated in Table 4-14 and Table 4-15. Note that additional support is required as temperatures increase. Continuous support can be accomplished by the use of smooth structural angles or channels. Where the pipe is exposed to impact damage, protective shields should be installed.

Support spacing is a function of

1. Pipe size
2. Operating temperature
3. Location of heavy valves or fittings
4. Mechanical properties of the piping
5. Specific gravity of water 1g/cm^3

The supports should be close enough to maintain pipe alignment, prevent sagging, prevent grade reversal, and support changes in directions. Concentrated loads such as valves, heavy fittings and components, etc. should be supported directly when possible and as closely as possible otherwise. When dealing with expansion and contraction, supports should not restrict axial movement. File smooth any sharp edges or burrs in all supports. Plastic piping should not be placed near heated surfaces or open flame.

Table 4-14: Industrial Plus PVC support spacing (in feet)

	Schedule 40					Schedule 80					Schedule 120				
Size (inch)	**60°F**	**80°F**	**100°F**	**120°F**	**140°F**	**60°F**	**80°F**	**100°F**	**120°F**	**140°F**	**60°F**	**80°F**	**100°F**	**120°F**	**140°F**
¼	4.0	3.5	3.5	2.0	2.0	4.0	4.0	3.5	2.5	2.0	-	-	-	-	-
⅜	4.0	4.0	3.5	2.5	2.0	4.5	4.5	4.0	2.5	2.5	-	-	-	-	-
½	4.5	4.5	4.0	2.5	2.5	5.0	4.5	4.5	3.0	2.5	5.0	5.0	4.5	3.0	2.5
¾	5.0	4.5	4.0	2.5	2.5	5.5	5.0	4.5	3.0	2.5	5.5	5.0	4.5	3.0	3.0
1	5.5	5.0	4.5	3.0	2.5	6.0	5.5	5.0	3.5	3.0	6.0	5.5	5.0	3.5	3.0
1¼	5.5	5.5	5.0	3.0	3.0	6.0	6.0	5.5	3.5	3.0	6.5	6.0	5.5	3.5	3.5
1½	6.0	5.5	5.0	3.5	3.0	6.5	6.0	5.5	3.5	3.5	6.5	6.5	6.0	4.0	3.5
2	6.0	5.5	5.0	3.5	3.0	7.0	6.5	6.0	4.0	3.5	7.5	7.0	6.5	4.0	3.5
2½	7.0	6.5	6.0	4.0	3.5	7.5	7.5	6.5	4.5	4.0	8.0	7.5	7.0	4.5	4.0
3	7.0	7.0	6.0	4.0	3.5	8.0	7.5	7.0	4.5	4.0	8.5	8.0	7.5	5.0	4.5
3½	7.5	7.0	6.5	4.0	4.0	8.5	8.0	7.5	5.0	4.5	9.0	8.5	7.5	5.0	4.5
4	7.5	7.0	6.5	4.5	4.0	9.0	8.5	7.5	5.0	4.5	9.5	9.0	8.5	5.5	5.0
5	8.0	7.5	7.0	4.5	4.0	9.5	9.0	8.0	5.5	5.0	10.5	10.0	9.0	6.0	5.5
6	8.5	8.0	7.5	5.0	4.5	10.0	9.5	9.0	6.0	5.0	11.5	10.5	9.5	6.5	6.0
8	10.5	10 .5	10.0	8.5	7.5	12.0	12.0	11.5	9.0	8.0	12.0	11.5	10.0	7.0	6.5
10	12.0	11.8	11.5	9.0	8.0	13.5	13.5	12.5	9.5	8.5	-	-	-	-	-
12	13.0	12.8	12.5	9.5	8.5	15.0	15.0	14.0	11.5	9.0	-	-	-	-	-
14	14.0	13.8	13.5	10.0	9.0	16.0	16.0	15.0	13.5	9.5	-	-	-	-	-
16	15.0	14.8	14.5	10.5	9.5	17.0	17.0	16.0	14.0	10.0	-	-	-	-	-
18	16.0	15.8	15.5	11.0	10.0	18.0	18.0	17.0	15.0	10.5	-	-	-	-	-
20	17.0	16.5	16.0	11.5	10.5	19.0	19.0	18.0	16.0	11.0	-	-	-	-	-
24	19.0	18.5	18.0	13.0	11.0	20.0	20.0	19.0	16.5	14.0	-	-	-	-	-

Table 4-14: Industrial Plus PVC support spacing (in meters)

	Schedule 40					Schedule 80					Schedule 120				
Size (inch)	**16°C**	**27°C**	**38°C**	**49°C**	**60°C**	**16°C**	**27°C**	**38°C**	**49°C**	**60°C**	**16°C**	**27°C**	**38°C**	**49°C**	**60°C**
¼	1.22	1.07	1.07	0.61	0.61	1.22	1.22	1.07	0.76	0.61	-	-	-	-	-
⅜	1.22	1.22	1.07	0.76	0.61	1.37	1.37	1.22	0.76	0.76	-	-	-	-	-
½	1.37	1.37	1.22	0.76	0.76	1.52	1.37	1.37	0.91	0.76	1.52	1.52	1.37	0.91	0.76
¾	1.52	1.37	1.22	0.76	0.76	1.68	1.52	1.37	0.91	0.76	1.68	1.52	1.37	0.91	0.91
1	1.68	1.52	1.37	0.91	0.76	1.83	1.68	1.52	1.07	0.91	1.83	1.68	1.52	1.07	0.91
1¼	1.68	1.68	1.52	0.91	0.91	1.83	1.83	1.68	1.07	0.91	1.98	1.83	1.68	1.07	1.07
1½	1.83	1.68	1.52	1.07	0.91	1.98	1.83	1.68	1.07	1.07	1.98	1.98	1.83	1.22	1.07
2	1.83	1.68	1.52	1.07	0.91	2.13	1.98	1.83	1.22	1.07	2.29	2.13	1.98	1.22	1.07
2½	2.13	1.98	1.83	1.22	1.07	2.29	2.29	1.98	1.37	1.22	2.44	2.29	2.13	1.37	1.22
3	2.13	2.13	1.83	1.22	1.07	2.44	2.29	2.13	1.37	1.22	2.59	2.44	2.29	1.52	1.37
3½	2.29	2.13	1.98	1.22	1.22	2.59	2.44	2.29	1.52	1.37	2.74	2.59	2.29	1.52	1.37
4	2.29	2.13	1.98	1.37	1.22	2.74	2.59	2.29	1.52	1.37	2.90	2.74	2.59	1.68	1.52
5	2.44	2.29	2.13	1.37	1.22	2.90	2.74	2.44	1.68	1.52	3.20	3.05	2.74	1.83	1.68
6	2.59	2.44	2.29	1.52	1.37	3.05	2.90	2.74	1.83	1.52	3.51	3.20	2.90	1.98	1.83
8	3.20	3.20	3.05	2.59	2.29	3.66	3.66	3.51	2.74	2.44	3.66	3.51	3.05	2.13	1.98
10	3.66	3.58	3.51	2.74	2.44	4.11	4.11	3.81	2.90	2.59	-	-	-	-	-
12	3.96	3.89	3.81	2.90	2.59	4.57	4.57	4.27	3.51	2.74	-	-	-	-	-
14	4.27	4.19	4.11	3.05	2.74	4.88	4.88	4.57	4.11	2.90	-	-	-	-	-
16	4.57	4.50	4.42	3.20	2.90	5.18	5.18	4.88	4.27	3.05	-	-	-	-	-
18	4.88	4.80	4.72	3.35	3.05	5.49	5.49	5.18	4.57	3.20	-	-	-	-	-
20	5.18	5.03	4.88	3.51	3.20	5.79	5.79	5.49	4.88	3.35	-	-	-	-	-
24	5.79	5.64	5.49	3.96	3.35	6.10	6.10	5.79	5.03	4.27	-	-	-	-	-

Table 4-15: CPVC support spacing (in feet)

	Schedule 40						Schedule 80					
Size (inch)	**73°F**	**100°F**	**120°F**	**140°F**	**160°F**	**180°F**	**73°F**	**100°F**	**120°F**	**140°F**	**160°F**	**180°F**
½	5.0	4.5	4.5	4.0	2.5	2.5	5.5	5.0	4.5	4.5	3.0	2.5
¾	5.0	5.0	4.5	4.0	2.5	2.5	5.5	5.5	5.0	4.5	3.0	2.5
1	5.5	5.5	5.0	4.5	3.0	2.5	6.0	6.0	5.5	5.0	3.5	3.0
1¼	5.5	5.5	5.5	5.0	3.0	3.0	6.5	6.0	6.0	5.5	3.5	3.0
1½	6.0	6.0	5.5	5.0	3.5	3.0	7.0	6.5	6.0	5.5	3.5	3.5
2	6.0	6.0	5.5	5.0	3.5	3.0	7.0	7.0	6.5	6.0	4.0	3.5
2½	7.0	7.0	6.5	6.0	4.0	3.5	8.0	7.5	7.5	6.5	4.5	4.0
3	7.0	7.0	7.0	6.0	4.0	3.5	8.0	8.0	7.5	7.0	4.5	4.0
3½	7.5	7.5	7.0	6.5	4.0	4.0	8.5	8.5	8.0	7.5	5.0	4.5
4	7.5	7.5	7.0	6.5	4.5	4.0	9.0	8.5	8.5	7.5	5.0	4.5
5	8.5	8.0	7.5	7.0	5.0	4.5	10.0	9.5	9.0	8.0	5.5	5.0
6	8.5	8.0	7.5	7.0	5.0	4.5	10.0	9.5	9.0	8.0	5.5	5.0
8	10.5	10.0	8.5	7.5	5.5	5.0	12.0	11.5	9.0	8.0	6.0	5.5
10	11.9	11.5	9.0	8.0	6.5	5.5	13.5	12.5	9.5	8.5	7.5	6.5
12	12.9	12.5	9.5	8.5	7.5	6.0	15.0	14.0	11.5	9.0	8.0	7.0
14	13.9	13.5	10.0	9.0	8.0	6.5	16.0	15.0	13.5	9.5	9.0	8.0
16	14.9	14.5	10.5	9.5	8.5	7.0	17.0	16.0	14.0	10.0	9.5	8.5
18	15.9	15.5	11.0	10.0	9.0	7.5	18.0	17.0	15.0	10.5	10.0	9.0
20	16.8	16.0	11.5	10.5	9.0	7.5	19.0	18.0	16.0	11.0	10.5	9.5
24	18.8	18.0	13.0	11.0	9.5	8.0	20.0	19.0	16.5	14.0	11.0	10.0

Table 4-15: CPVC support spacing (in meters)

	Schedule 40						Schedule 80					
Size (inch)	**23°F**	**38°C**	**49°C**	**60°C**	**71°C**	**82°C**	**23°F**	**38°C**	**49°C**	**60°C**	**71°C**	**82°C**
½	1.52	1.37	1.37	1.22	0.76	0.76	1.68	1.52	1.37	1.37	0.91	0.76
¾	1.52	1.52	1.37	1.22	0.76	0.76	1.68	1.68	1.52	1.37	0.91	0.76
1	1.68	1.68	1.52	1.37	0.91	0.76	1.83	1.83	1.68	1.52	1.07	0.91
1¼	1.68	1.68	1.68	1.52	0.91	0.91	1.98	1.83	1.83	1.68	1.07	0.91
1½	1.83	1.83	1.68	1.52	1.07	0.91	2.13	1.98	1.83	1.68	1.07	1.07
2	1.83	1.83	1.68	1.52	1.07	0.91	2.13	2.13	1.98	1.83	1.22	1.07
2½	2.13	2.13	1.98	1.83	1.22	1.07	2.44	2.29	2.29	1.98	1.37	1.22
3	2.13	2.13	2.13	1.83	1.22	1.07	2.44	2.44	2.29	2.13	1.37	1.22
3½	2.29	2.29	2.13	1.98	1.22	1.22	2.59	2.59	2.44	2.29	1.52	1.37
4	2.29	2.29	2.13	1.98	1.37	1.22	2.74	2.59	2.59	2.29	1.52	1.37
5	2.59	2.44	2.29	2.13	1.52	1.37	3.05	2.90	2.74	2.44	1.68	1.52
6	2.59	2.44	2.29	2.13	1.52	1.37	3.05	2.90	2.74	2.44	1.68	1.52
8	3.20	3.05	2.59	2.29	1.68	1.52	3.66	3.51	2.74	2.44	1.83	1.68
10	3.62	3.51	2.74	2.44	1.98	1.68	4.11	3.81	2.90	2.59	2.29	1.98
12	3.93	3.81	2.90	2.59	2.29	1.83	4.57	4.27	3.51	2.74	2.44	2.13
14	4.23	4.11	3.05	2.74	2.44	1.98	4.88	4.57	4.11	2.90	2.74	2.44
16	4.54	4.42	3.20	2.90	2.59	2.13	5.18	4.88	4.27	3.05	2.90	2.59
18	4.84	4.72	3.35	3.05	2.74	2.29	5.49	5.18	4.57	3.20	3.05	2.74
20	5.12	4.88	3.51	3.20	2.74	2.29	5.79	5.49	4.88	3.35	3.20	2.90
24	5.73	5.49	3.96	3.35	2.90	2.44	6.10	5.79	5.03	4.27	3.35	3.05

Note: Common practice is to install suitable hangers within 2 ft (0.6 m) of each side of a pipe joint; changes in direction should be supported as close as possible to the fitting to reduce tensional stress without restricting movement. Heavy system components such as valves, flanged assemblies, tees, and other forms of concentrated stress loads must be independently supported. In addition, valves should be braced adequately to prevent movement and stress loads as the result of operational torque. Consideration should also be given for certain processes where solid accumulation within the line is a possibility.

Pipe Bracket Support Centers and Fixation of Plastic Pipelines

General Pipe Supports and Brackets

Pipelines need to be supported at specific intervals, depending upon the material, the average pipe wall temperature, the specific gravity of the medium, and the diameter and wall thickness of the pipe. The determination of the pipe support centers has been based on the permissible amount of deflection of the pipe between two brackets. The pipe bracket centers given on the next page are calculated on the basis of a permissible deflection of max. 0.25 cm (0.01 inch) between two brackets.

Pipe Bracket Spacing in the Case of Fluids with Specific Gravity ≤ 1.0 (62.4 Lb/Ft^3)

Where fluids with a specific gravity exceeding 1g/cm^3 are to be conveyed, pipe spacing can be adjusted by dividing the support spacing by the specific gravity.

Installation of Closely Spaced Pipe Brackets

A continuous support may be more advantageous and economical than pipe brackets for small diameter horizontal pipe work, especially in a higher temperature range. Installation in a "V"-or "U"-shaped support made of metal or heat-resistant plastic material has proven satisfactory.

Pipe Bracket Requirements

When mounted, the inside diameter of the bracket must be greater than the outside diameter of the pipe, in order to allow length changes of the pipe at the specified points. The inside edges of the pipe bracket must be formed in such a way that no damage to the pipe surface is possible. GF pipe brackets meet these requirements. They are made of plastic and may be used under rugged working conditions and also in areas where the pipe work is subjected to the external influence of aggressive atmospheres or media. GF pipe brackets are suitable for PVC, CPVC, PE, PP, and PVDF pipes.

GF has developed the Stress Less Pipe Guides product line, the first such clamps especially designed to eliminate stress transfer to pipe due to thermal expansion or seismic events. They have an engineered, designed gap of 3mm between the clamp insert and pipe OD. Excessive force can never be exerted on the pipe regardless of tightening of bolts by the installer.

Arrangement of Fixed Brackets

Fixed point should not be a compressive force to hold the pipe, but a design anchor that withstands the axial load. If the pipe bracket is positioned directly beside a fitting, the length change of the pipeline is limited to one direction only (one-sided fixed point).

If it is, as in most cases, necessary to control the length change of the pipeline in both directions, the pipe bracket must be positioned between two fittings. The pipe bracket must be robust and firmly mounted in order to take up the force arising from the length change in the pipeline. Hanger type brackets are not suitable as fixed points..

Vertical Supports

Vertical lines must also be supported at intervals so that the fittings at the lower end of a riser or column are not overloaded. The supports should not exert a compressive strain on the pipe such as riser-type clamps that squeeze the pipe. Hangers and clamps suitable for this purpose include riser clamps or double bolt type clamps installed in such a manner that will allow for movement of the pipe due to thermal expansion and contraction (i.e. floating system). Clamps and hangers used must not compress, distort, cut, or abrade the piping. Clamps used must not exert compressive stresses on the pipe; the use of riser clamps that utilize compression to support the pipe weight are not recommended.

If possible, the riser clamps should be located just below a fitting so that the shoulder of the fitting rests against the clamp to support the weight of the vertical column. Horizontal take-offs from the riser should be independently supported and located as close to the riser clamp as possible. Offset configurations utilizing at least one change in direction should be used to tie horizontal runs into the riser in close proximity to the riser clamp. Offset configurations used between the riser tee and the wall entry will minimize stress on the horizontal connection should movement of the riser occur. The use of a single horizontal run from the riser tee through the wall should not be used on systems conveying fluids at elevated temperatures.

Compared to horizontal runs, the effects of thermal expansion on fluid filled, vertical risers is typically minimized due to the weight of the fluid column in combination with the restraint provided at horizontal take-offs. The rate of thermal expansion must be calculated based on the temperature change anticipated. Vertical piping should be maintained in straight alignment with supports at proper intervals plus a mid-story guide, as specified by the design engineer, to allow for movement caused by thermal expansion and contraction of the piping. Mid-story guides should always be used on small diameter pipe (less than 2 in diameter), particularly on hot water lines, to minimize deflection caused by thermal expansion. The guidelines provided herein for vertical risers do not apply to horizontal runs. For horizontal runs, the use of expansion loops, offsets, bends, and other means are recommended to compensate for movement due to changes in temperature.

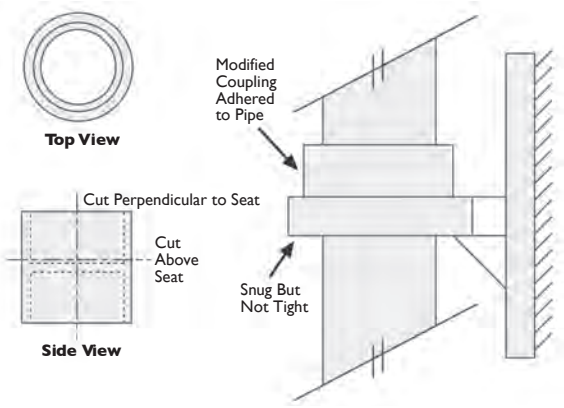
Vertical Riser Support When Riser Clamps Can't Be Installed

For vertical risers requiring support where horizontal take-offs may not be present, one common approach is to install

clamps just below a modified coupling so that the shoulder of the coupling rests on the clamp. Fittings can be modified in the field to achieve this by cutting a coupling in two, just above the stop at the socket bottom, and then cutting this piece in half lengthwise to provide two halves which do not contain the stop. The two halves are then solvent cemented to the pipe at the proper location so that the shoulder of the modified coupling rests on the clamp once the joint is allowed to cure properly. See Figure 4-11 for details.

Note: A modified coupling must only be used to provide support to the riser and must not be used to join two pieces of pipe. The load bearing strength of a modified coupling used for riser support is directly related to the surface area of the coupling and the integrity of the solvent weld.

Figure 4-11: Modified coupling installation



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, on long runs, and on directional changes in piping.

Figure 4-12: Continuous support arrangements

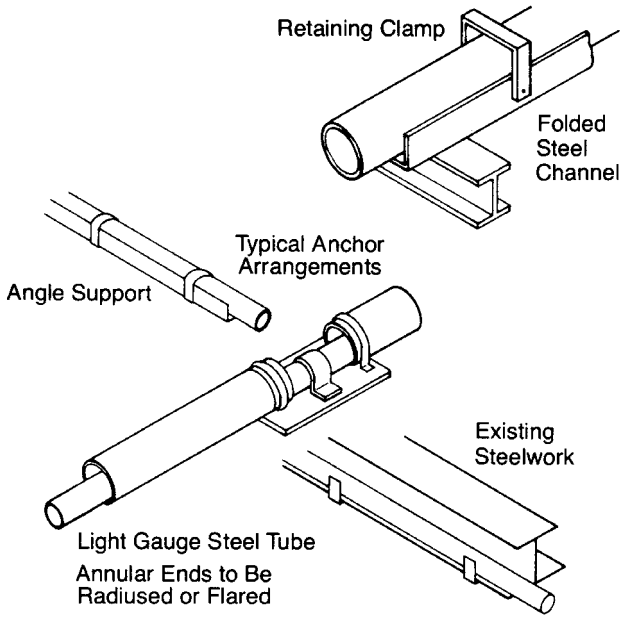
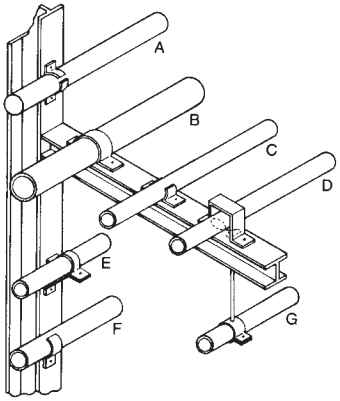


Figure 4-13: Typical support arrangements



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

Note:
Pipes must be free to move axially

Figure 4-14: Guides and anchors examples

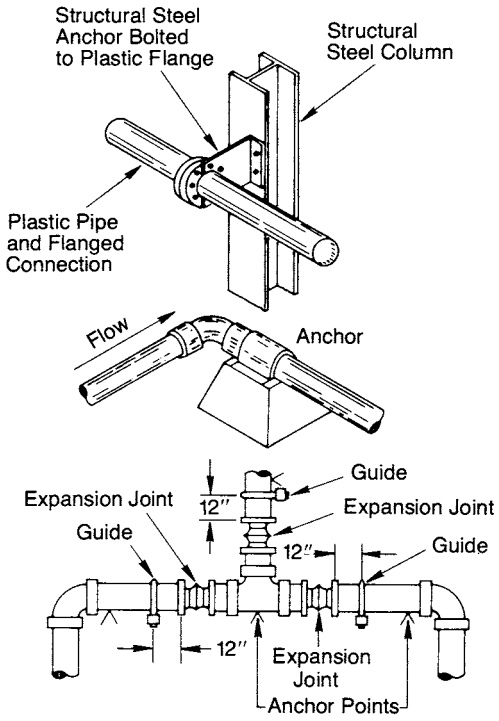


Figure 4-15: A typical method of anchorage of a change in direction

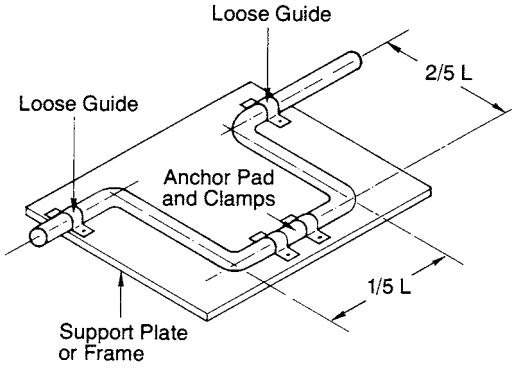
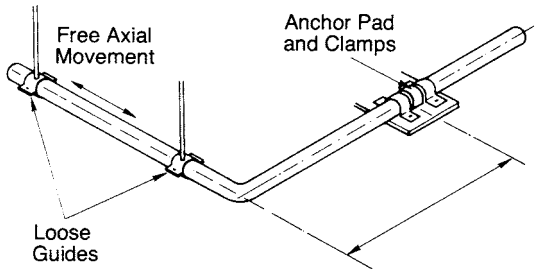


Figure 4-16: Typical method of anchorage



Typical Method of Anchorage

Underground Installation

Underground piping must be installed in accordance with any applicable regulations, ordinances, and codes. Since piping is installed in a wide range of sub-soils, attention should be given to local pipe laying techniques which may provide a solution to a particular pipe bedding issue. The follow information is applicable to PVC and CPVC piping joined via the solvent cementing method and may be considered as a general guide.

Storage, Handling, and Inspection

Thermoplastic pipe must not be exposed to elevated temperatures during shipping and/or storage. Exposure to excessive temperatures will result in distortion/deformation of the pipe. PVC and CPVC pipe should not be dropped, have objects dropped on them, nor be subjected to external loads. Thermoplastics can be damaged by abrasion and gouging. Pipe must not be dragged across the ground or over obstacles. Impacts such as dropping from sizable heights and rough handling should be avoided, particularly in cold weather. The product shall be inspected for any scratches, splits or gouges that may have occurred from improper handling or storage. If found, these sections must be cut out and discarded.

Before installation, PVC and CPVC piping products should be thoroughly inspected for cuts, scratches, gouges, or split ends which may have occurred to the products during shipping and handling. Do not use damaged sections. Damaged sections found must be cut out and discarded.

Trench Construction

For buried, non-pressure applications, trench construction, bedding, haunching, initial backfill, compaction, and final backfill shall be conducted as required by the project engineer or by following ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. For pressure applications, ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping shall be followed in conjunction with this information when details are not provided by the project engineer.

The trench should be of adequate width to allow convenient installation, while also be as narrow as possible. Minimum trench widths may be utilized by joining pipe outside the trench and lowering it into the trench after adequate joint strength has been achieved. Trench widths will have to be wider where pipe is joined in the trench or where thermal expansion and contraction is a factor.

Refer to Page 55 for recommended installation techniques and set and cure times for solvent cemented joints. Do not lower into the trench until adequate joint strength is achieved.

Trench depth is determined by intended service and local conditions. Pipe for conveying liquids susceptible to freezing

should be buried no less than 12 in (30 cm) below the maximum frost level. Permanent lines subjected to heavy traffic should have a minimum cover of 24 in (61 cm). For light traffic 12 in (30 cm) to 18 in (46 cm) is normally sufficient for small diameter pipe (typically less than 3 in diameter). With larger sizes, bearing stresses should be calculated to determine cover required. Reliability and safety should always be considered, as well as local, state, and national codes.

Note: Water filled pipe should be buried at least 12 in (30 cm) below the maximum expected frost line.

It is recommended that thermoplastic piping be run within a metal or concrete casing when it is installed beneath surfaces that are subject to heavy weight or constant traffic such as roadways and railroad tracks. Piping systems must be designed and installed to ensure they can handle anticipated loads. Refer to pages 13–14 for additional information on collapse pressures.

The trench bottom should be continuous, relatively smooth, and free of rocks. Where ledge rock, hardpan, or boulders are encountered, it is necessary to pad the trench bottom using a minimum of 4 in (10 cm) of tamped earth or sand beneath the pipe as a cushion and for protection of the pipe from damage.

Sufficient cover must be maintained to keep external stress levels below acceptable design stresses. Reliability and safety of service is of major importance in determining minimum cover. Local, state, and national codes may also govern.

Snaking of Pipe

For small diameter piping systems (typically less than 3 in diameter), snaking of pipe is particularly important to compensate for thermal expansion and contraction of the piping when installing pipe in hot weather. This may also apply to larger diameter piping under specific applications and site conditions. After the pipe has been solvent welded and allowed to set properly, it is advisable to snake the pipe according to the following recommendations beside the trench during its required drying time (cure time).

Note: Be especially careful not to apply any stress that will disturb the undried joint.

This snaking is necessary in order to allow for any anticipated thermal contraction that will take place in the newly joined pipeline. Refer to Page 23 for more information on thermal expansion/contraction.

Snaking is particularly necessary on the lengths that have been solvent welded during the late afternoon or a hot summer day, because their drying time will extend through the cool of the night when thermal contraction of the pipe could stress the joints to the point of pull out. This snaking is also especially necessary with pipe that is laid in its trench (necessitating wider trenches than recommended) and is backfilled with cool earth before the joints are thoroughly dry. See Figure 4-17 and Table 4-16 for information regarding loop lengths and loop offsets.

Figure 4-17: Loop offset in inches for contraction for pipe diameters of less than 3 in.

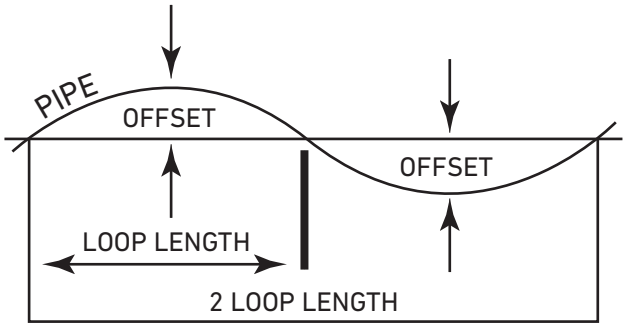


Table 4-16: Loop offset in relation to loop length and maximum temperature variation between solvent welding and final use

Loop Offset (in)	Maximum Temperature Variation Between Solvent Welding and Final Use (°F)									
Length (ft)	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
20	3	4	5	5	6	6	7	7	8	8
50	7	9	11	13	14	16	17	18	19	20
100	13	18	22	26	29	32	35	37	40	42

Loop Offset (cm)	Maximum Temperature Variation Between Solvent Welding and Final Use (°C)									
Length (m)	6°	11°	17°	22°	28°	33°	39°	44°	50°	56°
6	3	4	5	5	6	6	7	7	8	8
15	7	9	11	13	14	16	17	18	19	20
30	13	18	22	26	29	32	35	37	40	42

Note: Expansion and contraction could become excessive in systems operating at near or at the maximum allowable temperature ranges with intermittent flow and buried lines.

In the above noted cases, the lines should not be snaked. The use of properly installed expansion joints installed within suitable concrete pits is recommended for PVC and CPVC systems operating at or near upper temperature limits. A section of larger diameter PVC pipe or other suitable sleeve should be used over the carrier pipe to pass through the wall of the concrete. This will minimize the potential for damage (scratching and scarring) to the carrier pipe as the result of movement caused by thermal expansion/contraction. Expansion joints should be suitably anchored independently of the carrier line. Axial guides should be used to direct movement into the expansion joint.

Bedding and Haunching

The pipe must be uniformly and continuously supported over its entire length on firm, stable material. Proper bedding and haunching materials are dependent on local soil conditions and type. Follow classes of embedment and backfill materials called-out in ASTM D2321.

The trench bottom should be continuous, relatively smooth, and free of rocks. Where ledge rock, hardpan, or boulders are encountered, it is necessary to pad the trench bottom with proper bedding using a minimum of 6 in (15 cm) of suitable bedding beneath the pipe as a cushion and to protect the pipe from damage.

For belled end pipe, provide bell holes in bedding no larger than necessary to ensure uniform pipe support.

Note: Use of threaded connections should be avoided in underground applications.

Where a transition to alternate materials is required, the use of a flange component with a suitable gasket is recommended. At vertical transitions from below ground systems to connections above ground, follow above ground installation procedures with regard to compensating for thermal expansion/ contraction, weatherability, and proper support recommendations. Valves and other concentrated weight loads should be independently supported. Avoid excessive bending of pipe; excessive deflection of pipe and joints can reduce pressure bearing capability and cause failure.

Embedment materials (initial back-fill) shall be placed by methods that will not disturb or damage the pipe. The haunching material placed in the area between the bedding and the underside of the pipe shall be worked-in and hand tamped prior to placing and compacting the remainder of the embedment material in the pipe zone. Install and compact bedding materials in a maximum of 6 in (15 cm) thick layers within the pipe zone. Refer to Figure 4-18 and Figure 4-19 for clarification. Compaction techniques and equipment used must not contact or damage the pipe.

Figure 4-18: Illustration of bedding, haunching, and backfill layers

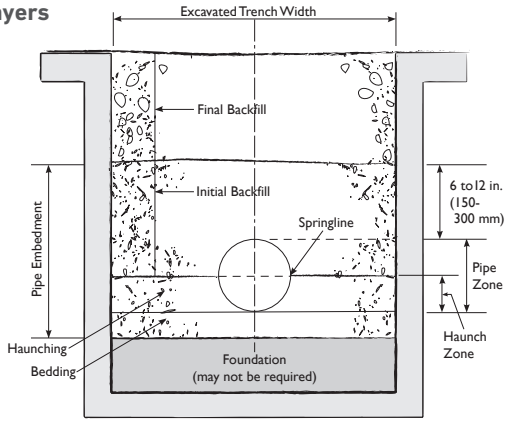
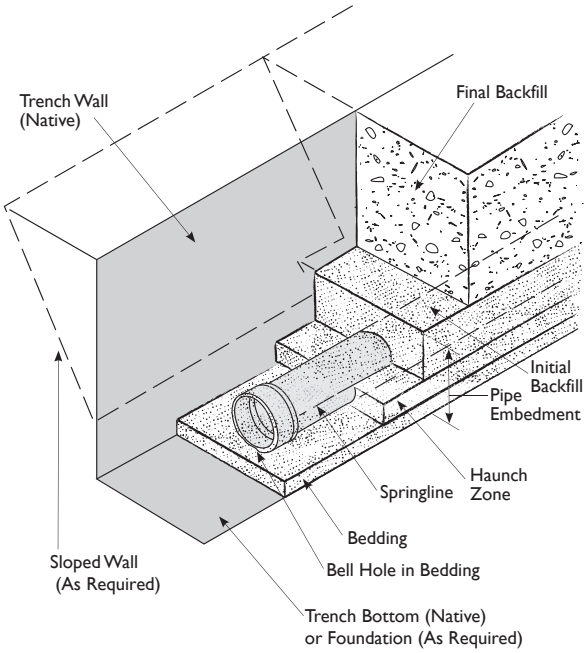


Figure 4-19: Illustration of fill layers in trench



Backfilling

Where possible, underground pipe should be thoroughly inspected and tested for leaks prior to backfilling. The pipe should be uniformly and continuously supported over its entire length on firm, stable material. Blocking should not be used to change pipe grade or to intermittently support pipe across excavated sections. Pipe is installed in a wide range of sub-soils. These soils should not only be stable, but applied in such a manner so as to physically shield the pipe from damage. Attention should be given to local pip laying experience that may indicate particular pipe bedding problems. Initial backfill materials free of rocks, with particle sizes ½ in (13 mm) or less, should be used to surround the pipe and should be placed and compacted in layers. Each layer should be sufficiently compacted to uniformly develop lateral passive soil forces during the backfill operations. It may be advisable to have the pipe under water pressure, 15 to 25 psi (1.0 to 1.7 bar), during

backfilling. Final backfill should be placed and spread in uniform layers in such a manner to fill the trench completely so there will be no unfilled spaces under or about rocks or lumps of earth in the backfill. Large or sharp rocks, frozen clods, and other debris greater than 3 in (8 cm) diameter should be removed.

Sufficient cover must be maintained to keep external stress levels below acceptable design stresses. Reliability and safety of service is of major importance in determining minimum cover. Rolling equipment or heavy tampers should only be used to consolidate the final backfill. Attention should be given to local pipe laying experience that may indicate particular pipe bedding problems. Local, state, and national codes may also govern.

Cold Temperature Installation

PVC and CPVC are rigid thermoplastic materials. As such, pipe stiffness increases and impact resistance decreases in colder temperature environments. PVC and CPVC can become more susceptible to physical damage when exposed to cold temperatures. Following the guidelines below will minimize the potential for damage. Impact resistance and ductility decrease at colder temperatures. In addition, a drop in temperature will cause the piping to contract, which must be addressed with proper system design. Due to PVC and CPVC's coefficient of thermal expansion, a 20 ft (6 m) length of pipe will contract approximately ¾ in (19 mm) and 7/8 in (22 mm), respectively, when cooled from 95°F (35°C) to -5°F (-21°C). Since pressure bearing capacity is not reduced with a decrease in temperature, PVC and CPVC piping are suitable for use at colder temperatures provided the fluid medium is protected from freezing, consideration is given to the effects of expansion and contraction, and additional care and attention are given during handling, installation, and operation of the system to prevent physical damage caused by impact or other mechanical forces.

Depth of Burial

When installed underground an external load is placed on a thermoplastic pipe; its diameter will begin to deflect, meaning its sides will move outward and slightly downward. If GF Piping Systems pipe is buried in supportive soil, the stiffness of the soil will help support the pipe. This action and reaction is the key to how a pipe carries external loads while buried.

The support from the embedded soil and the pipe stiffness form a combination to resist deflection from external loads. Thermoplastic pipe's resistance to deflection in an unburied state is measured by its pipe stiffness. Due to the excellent quality of GF Piping Systems thermoplastic piping, it has a high pipe stiffness value. In general, the greater the pipe stiffness values, the higher the load capacity. Table 4-17 contains values of pipe stiffness for your reference.

Table 4-17: Pipe stiffness for Industrial Plus PVC

Pipe Stiffness (PS) Values (lb/in²)			
Nominal OD (in)	**Schedule 40**	**Schedule 80**	**Schedule 120**
⅛	15424	54031	-
¼	13854	42399	-
⅜	7103	22696	-
½	6224	17919	30668
¾	3293	9532	13535
1	2675	7345	10835
1¼	1467	4127	6184
1½	1059	3057	4551
2	626	1938	3057
2½	823	2248	2969
3	534	1547	2575
3½	403	1209	-
4	323	996	2336
5	216	709	-
6	161	637	1495
8	110	438	1406
10	82	374	-
12	67	347	-
14	63	340	-
16	63	323	-
18	63	311	-
20	54	301	-
24	48	287	-

Table 4-17 (continued): Pipe stiffness for Industrial Plus PVC

Pipe Stiffness (PS) Values (MPa)			
Nominal OD (in)	**Schedule 40**	**Schedule 80**	**Schedule 120**
⅛	106.34	372.53	-
¼	95.52	292.33	-
⅜	48.97	156.48	-
½	42.91	123.55	211.45
¾	22.70	65.72	93.32
1	18.44	50.64	74.70
1¼	10.11	28.45	42.64
1½	7.30	21.08	31.38
2	4.32	13.36	21.08
2½	5.67	15.50	20.47
3	3.68	10.67	17.75
3½	2.78	8.34	-
4	2.23	6.87	16.11
5	1.49	4.89	-
6	1.11	4.39	10.31
8	0.76	3.02	9.69
10	0.57	2.58	-
12	0.46	2.39	-
14	0.43	2.34	-
16	0.43	2.23	-
18	0.43	2.14	-
20	0.37	2.08	-
24	0.33	1.98	-

Due to the ability of GF thermoplastics to flex before they break, a limit is placed on pipe diametric deflection. This limit is expressed in terms of percentage reduction in diameter due to external loading. The maximum allowable diametric deflection for GF Piping Systems PVC and CPVC piping is 5%. Any deflection greater than 5% could lead to the failure of a piping system.

One method that is commonly used to estimate pipe deflection based on its burial depth is the Modified Iowa Equation, shown in Equation (4-1). A simplified version of the equation is presented below where 5% deflection is the limiting factor. Table 4-18 through Table 4-20 give reference values of Prism Load Soil Pressures, Live Load, and Modulus of Soil Reaction factors for use in the below equation.

Equation (4-1) - Imperial and Metric

$$y = \frac{10\,(P + L)}{0.149\,(PS) + 0.061\,E'}$$

Where:

- y = Percent deflection of the buried pipe's outside diameter - % (%) (5% is the maximum allowable deflection per ASTM D2665)
- P = Prism load soil pressure on the buried pipe from the weight of the soil above it - lb/in² (MPa) (Values can be found in Table 4-18)
- L = Live load on buried pipe from traffic on the surface above it - lb/in² (MPa) (Values can be found in Table 4-19)
- PS = Pipe Stiffness to resist deflection in an unburied state per ASTM D2412 - lb/in² (MPa) (Values can be found in Table 4-17)
- E' = Modulus of soil reaction on top of buried pipe - lb/in² (MPa) (Values can be found in Table 4-20)

Equation (4-1) - Imperial

4" Industrial Plus PVC Schedule 80 pipe is to be buried 10ft under E80 railway traffic. The soil is coarse grained with little to no fines and with a high proctor and 110 lbs/ft³ soil density. WIll this be an appropriate application for 4" Schedule 80 Industrial Plus PVC Pipe?

P = 7.64 psi PS = 996 psi

L = 7.64 psi E' = 3000 psi

$$y = \frac{10\,(7.64\text{ psi} + 7.64\text{ psi})}{0.149\,(996\text{ psi}) + 0.061\,(3000\text{ psi})}$$

$y = 0.46\% \pm 0.5\%$

Table 4-18: Prism load soil pressure (soil density) (P)

Prism Load Soil Pressure (psi)						
Height of Soil Cover (ft)	**Soil Unit Weight (lb/ft3)**					
	100	**110**	**120**	**130**	**140**	**150**
1	0.69	0.76	0.83	0.90	0.97	1.04
2	1.39	1.53	1.67	1.81	1.94	2.08
3	2.08	2.29	2.50	2.71	2.92	3.13
4	2.78	3.06	3.33	3.61	3.89	4.17
5	3.47	3.82	4.17	4.51	4.86	5.21
6	4.17	4.58	5.00	5.42	5.83	6.25
7	4.86	5.35	5.83	6.32	6.81	7.29
8	5.56	6.11	6.67	7.22	7.78	8.33
9	6.25	6.88	7.50	8.13	8.75	9.38
10	6.94	7.64	8.33	9.03	9.72	10.42
12	8.33	9.17	10.00	10.83	11.67	12.50
14	9.72	10.69	11.67	12.64	13.61	14.58
16	11.11	12.22	13.33	14.44	15.56	16.67
18	12.50	13.75	15.00	16.25	17.50	18.75
20	13.89	15.28	16.67	18.06	19.44	20.83
25	17.36	19.10	20.83	22.57	24.31	26.04
30	20.83	22.92	25.00	27.08	29.17	31.25
35	24.31	26.74	29.17	31.60	34.03	36.46
40	27.78	30.56	33.33	36.11	38.89	41.67
45	31.25	34.38	37.50	40.63	43.75	46.88
50	34.72	38.19	41.67	45.14	48.61	52.08

Prism Load Soil Pressure (MPa)						
Height of Soil Cover (m)	**Soil Unit Weight (MPa/m)**					
	0.0100	**0.0150**	**0.020**	**0.0250**	**0.0300**	**0.0350**
0.25	0.0025	0.0038	0.0050	0.0063	0.0075	0.0088
0.5	0.0050	0.0075	0.0100	0.0125	0.0150	0.0175
0.75	0.0075	0.0113	0.0150	0.0188	0.0225	0.0263
1.0	0.0100	0.0150	0.0200	0.0250	0.0300	0.0350
1.5	0.0150	0.0225	0.0300	0.0375	0.0450	0.0525
2.0	0.0200	0.0300	0.0400	0.0500	0.0600	0.0700
2.5	0.0250	0.0375	0.0500	0.0625	0.0750	0.0875
3.0	0.0300	0.0450	0.0600	0.0750	0.0900	0.1050
3.5	0.0350	0.0525	0.0700	0.0875	0.1050	0.1225
4.0	0.0400	0.0600	0.0800	0.1000	0.1200	0.1400
4.5	0.0450	0.0675	0.0900	0.1125	0.1350	0.1575
5.0	0.0500	0.0750	0.1000	0.1250	0.1500	0.1750
6	0.0600	0.0900	0.1200	0.1500	0.1800	0.2100
7	0.0700	0.1050	0.1400	0.1750	0.2100	0.2450
8	0.0800	0.1200	0.1600	0.2000	0.2400	0.2800
9	0.0900	0.1350	0.1800	0.2250	0.2700	0.3150
10	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500
11	0.1100	0.1650	0.2200	0.2750	0.3300	0.3850
12	0.1200	0.1800	0.2400	0.3000	0.3600	0.4200
13	0.1300	0.1950	0.2600	0.3250	0.3900	0.4550
14	0.1400	0.2100	0.2800	0.3500	0.4200	0.4900
15	0.1500	0.2250	0.3000	0.3750	0.4500	0.5250

Table 4-19: Live load on buried pipe (traffic load) (L)

Live Load (psi)			
Height of Cover (ft)	**Highway H201**	**Railway E802**	**Airport 3**
1	12.50		
2	5.56	26.39	13.14
3	4.17	23.61	12.28
4	2.78	18.40	11.27
5	1.74	16.67	10.09
6	1.39	15.63	8.79
7	1.22	12.15	7.85
8	0.69	11.11	6.93
10	N	7.64	6.09
12	N	5.56	4.76
14	N	4.17	3.06
16	N	3.47	2.29
18	N	2.78	1.91
20	N	2.08	1.53
22	N	1.91	1.14
24	N	1.74	1.05
26	N	1.39	N
28	N	1.04	N
30	N	0.69	N

Live Load (MPa)			
Height of Cover (m)	**Highway H201**	**Railway E802**	**Airport 3**
0.3	0.086		
0.6	0.038	0.182	0.091
0.9	0.029	0.163	0.085
1.2	0.019	0.127	0.078
1.5	0.012	0.115	0.070
1.8	0.010	0.108	0.061
2.1	0.008	0.084	0.054
2.4	0.005	0.077	0.048
3.0	N	0.053	0.042
3.7	N	0.038	0.033
4.3	N	0.029	0.021
4.9	N	0.024	0.016
5.5	N	0.019	0.013
6.1	N	0.014	0.011
6.7	N	0.013	0.008
7.3	N	0.012	0.007
7.9	N	0.010	N
8.5	N	0.007	N
9.1	N	0.005	N

Table 4-20: Average values of modulus of soil reaction (soil type) (E')

Pipe Bedding Materials		E' For Degree of Compaction of Pipe Zone Backfill, psi (MPa)			
Soil Class	**Soil Type (United Classification System per ASTM D2487**	**Loose or Dumped**	**Slight <85% Proctor, <40% Relative density**	**Moderate 85%-90% Proctor, 40%-70% Relative density**	**High >95% Proctor, >70% Relative density**
Class V	Fine-grained Soils (LL<50b) Soils with medium to high plasticity, CH, MH, CH-MH	No data available; consult a professional soils engineer; otherwise, use E'=0			
Class IV	Fine-grained Soils (LL<50) Soils with medium to no plasticity, CL, ML, ML-CL, with less than 25% coarse-grained particles	50 (0.345)	200 (1.379)	400 (2.758)	1000 (6.895)
Class III	Fine-grained Soils (LL<50) Soils with medium to no plasticity, CL, ML, ML-CL, with more than 25% coarse-grained particles	100 (0.689)	400 (2.758)	1000 (6.895)	2000 (13.790)
Class II	Coarse-grained Soils with Little or no Fines GW, GP, SW, SPc contains less than 12% fines	200 (1.379)	1000 (6.895)	2000 (13.790)	3000 (20.684)
Class I	Crushed Rock	1000 (6.895)	3000 (20.684)	3000 (20.684)	3000 (20.684)
	Accuracy in Terms of Percentage Deflection	±2	±2	±1	±0.5

In order to determine the allowable pipe burial depth, the pipe dimension, soil density, traffic load, soil type, and compaction density of embedment soil will be obtained from the tables provided. The values obtained would then be used in the Modified Iowa Equation in order to determine the predicted percentage of pipe deflection. GF Piping Systems does not recommend the use of GF Piping Systems PVC or CPVC piping when the pipe diameter is deflected more than 5% due to the possibility of pipe failure. Therefore, it would not be recommended to use GF Piping Systems piping when the percentage of deflection, obtained through the Modified Iowa Equation, is greater than 5%.

Above-ground Installation

The system must be designed and installed to compensate for movement resulting from thermal expansion and contraction. This is particularly true for above ground applications installed outdoors and within unoccupied buildings where ambient temperature swings can be significant. For example, a system installed in an unoccupied (i.e. unheated) building during the winter months will expand considerably when temperatures rise. The direct opposite is true for systems installed at higher ambient temperatures where temperatures may fall considerably after installation. This fact must be addressed with proper system design to compensate for movement generated as the result of the effects of thermal expansion and/or contraction of the piping. Refer to Page 23 for additional information.

PVC and CPVC piping products have been used successfully in outdoor applications when proper recommendations are followed. As with any other piping, the system must be protected from freezing in applications subject to colder temperatures. Many standard cold weather piping design and installation practices can be used to protect the system from freezing such as the use of pipe insulation, anti-freeze solutions, and heat trace tapes. The manufacturers of these products should be consulted for suitability and compatibility of their products for use with PVC and CPVC prior to use.GF Piping Systems recommends that PVC and CPVC piping products exposed to the effects of sunlight (UV radiation) be painted with a light colored acrylic or latex paint that is chemically compatible with PVC and CPVC products. Compatibility information should be confirmed with the paint manufacturer. The use of oil-based paints is not recommended. When painted, the effects of exposure to sunlight are significantly reduced; however, consideration should be given to the effects of expansion/contraction of the system caused by heat absorption in outdoor applications. The use of a light colored, reflective paint coating will reduce this effect; however, the system must also be designed and installed in such a manner to reduce the effects of movement due to thermal expansion.

Sunlight and Thermoplastics

Thermoplastic pipe and fittings have been used extensively outdoors and are resistant to weathering but they may have some surface degradation from intense and prolonged exposure to ultraviolet (UV) rays in sunlight. This degradation is a surface effect which reduces the impact rating but has no effect on the temperature capability, chemical resistance, or pressure rating of the pipe. This reduced impact rating can be eliminated by removal of the affected surface area and covering with a good bonding exterior latex paint.

To guarantee maximum performance from Georg Fischer Piping Systems when exposed to specific conditions such as oxidation caused by exposure to direct sunlight, the recommendation for protection paint used in specific industrial applications is as follows:

1. Painting of Plastic Piping Systems is recommended if thermal expansion is not too great (i.e. ΔT not more than 50°F, 28°C).
2. The paint should be a high pigment content exterior grade latex paint.
3. The pipe should be clean. A light sanding will greatly aide bonding to pipe.
4. Avoid any chemical pretreatment procedure or ingredients being harmful to the plastic.

The latex paint must be applied thick enough (probably several coats) to create an opaque covering. If the pipe and fittings are prepared properly for painting, a good grade of exterior latex should last for many years. White or light colored pigment paint is suggested as it offers a more reflective surface.

Testing

Hydrostatic pressure testing (testing with water filled lines) is the only test method recommended and approved for pressure testing of GF Piping Systems piping products. During pressure testing, appropriate safety precautions must be taken to protect personnel and property from damage should a failure occur. The test pressure and duration of the pressure test performed should meet requirements of any local, state, or federal regulations as applicable. In the absence of any such requirements or regulations, the following procedures can be used to properly conduct a hydrostatic pressure test on newly installed PVC and CPVC piping systems.

Strict adherence to proper solvent cementing instructions and set and cure times is essential to ensure the highest system integrity prior to pressure testing. Particular attention should be paid to pipe sizes, temperature at time of installation, and any temperature variations over the set and cure period.

1. All solvent cemented connections in the system must be fully cured prior to filling the system with water.
2. Pipe must be adequately anchored/restrained to prevent movement during testing.
3. The system should not be tested until authorized and subsequently witnessed by the responsible inspector.
4. Extreme care shall be used to ensure complete venting of all entrapped air when filling the system with water. Entrapped air is a major cause of excessive surge pressures that result in burst failures of rigid plastic piping systems.
5. Air must be removed from the system to prevent it from being locked in the system when pressure is applied.
6. The system should include the use of air release and air/vacuum relief valves located at high points in the system to vent air during filling as well as during normal operation of the system.
7. The system must be filled slowly with water, venting air from valves at piping run ends and at elevations during the filling process. Whether a hydraulic hand pump or available water line pressure is used, any slow build-up of gauge pressure or any rapidly fluctuating gauge needle on a completely liquid filled system is a strong indication that entrapped air is present within the system. Should this occur, pressure should be immediately released and the line re-bled. Failure to do so can lead to a catastrophic failure when the water column is suddenly accelerated by the rapidly decompressing air should a faulty joint separate or other failure occur.
8. When testing thermoplastic piping systems, all tests should not exceed the pressure rating of the lowest rated component in the piping system (valve, union, or flange). Test the system at 150% of the designed operational pressure, i.e. if the system is designed to operate at 80 psi (5.5 bar), then the test will be done at 120 psi (8.25 bar).
9. Allow one hour for the system to stabilize after reaching the desired pressure. After the hour, in case of pressure drop, increase pressure back to the desired amount, and hold for 30 minutes. If the pressure drops by more than 6%, check the system for leaks.
10. A test period of two hours is usually considered satisfactory to demonstrate the integrity of the system.
11. If a leak is found, the pressure must be relieved and the failed section cut out, replaced, and allowed to cure properly prior to recharging and retesting the system.

GF Piping Systems recommends that large and/or complex systems be tested in segments as they are installed to permit evaluation and correction of improper installation techniques or other deficiencies as the project progresses.

Warning: Use of compressed air or gas in PVC or CPVC pipe and fittings can cause explosive failures resulting in system damage, severe bodily injury, or death.

Compressed air or gases must never be used for testing of PVC or CPVC piping systems. Improper installation, especially poor workmanship in solvent cementing techniques, can lead to an abrupt release of tremendous stored energy in the presence of compressed air or gas. This abrupt release of energy creates a whipping action of the piping where shattering of pipe and fittings is then apt to occur at directional changes and at points where the system is rigidly restricted. This scenario creates a substantial safety hazard to personnel. In addition, secondary hairline stress fractures caused by this effect can also be initiated, which will tend to propagate over

time resulting in additional failures. It is also known that certain additives present in air compressor lubricants are not chemically compatible with plastic materials and will initiate stress cracking of the plastic further increasing the potential for additional failures. Refer to caution areas for additional information.

Chemical Compatibility Awareness

Thermoplastic piping continues to gain wide acceptance and use. Occasionally certain chemicals found in construction products and specific site preparations can cause damage to thermoplastic piping systems such as thread sealants, lubricants, anti-freeze solutions, fire stop materials, etc. It is important to verify the compatibility of materials that come in contact with the piping system to ensure long-term performance.

Always check with GF if you have questions regarding chemical compatibility. If chemical compatibility with the thermoplastic remains in question, it is recommended to isolate the suspect product from direct contact with the thermoplastic piping system.

In general, thermoplastics may be more susceptible to stress cracking agents that can be found in certain ancillary products. The following list has been generated to create awareness that the potential for damage exists. Please note that a chemical compatibility program exists where a list of acceptable and unacceptable products is maintained. Please contact the GF Technical Services Department for the latest information.

Thread Sealants

Some thread paste sealants contain solvents or other chemical additives that can cause damage to thermoplastic pipe and fittings. Only compatible thread sealants and tapes should be used.

Fire Stop Materials

Some fire stop sealants contain solvents or other chemical additives that can cause damage to thermoplastic pipe and fittings. Only compatible fire stop materials should be used.

Anti-Freeze Solutions

DO NOT use glycol based antifreeze solutions. The use of improper anti-freeze solutions such as ethylene glycol, propylene glycol and/or contaminated glycerin solutions can cause stress cracking of thermoplastic pipe and fittings resulting in piping system failure.

Soldering/Hot Work

Soldering of metallic components in close proximity to thermoplastic piping systems will cause damage to the system. Direct contact with heat (open flame), solder, and soldering flux is not recommended. These types of products should be isolated from direct contact with thermoplastic piping products. Thermoplastic contact with solder flux can cause cracks, leaks, and breaks in the piping system. Any thermoplastic pipe or fittings that have solder flux on them, as identified by staining or discoloration of the pipe and fittings, should be removed and replaced with new materials.

Flexible Wire

Direct contact with flexible wire and cable should be avoided as the insulation for the wire and cable can contain plasticizers that can cause thermoplastic piping systems to crack, leak, or break. The finished installation should be inspected to verify that the thermoplastic piping system is not being used to support wire or cable and that runs of wire and cable have not been pulled over the installed thermoplastic system. Additionally, the thermoplastic piping systems should not be supported with electrical cable or flexible wiring, and all hanger support recommendations should be followed.

Steel Pipe Transitions

Transitions from steel pipe to thermoplastic pipe can be made through a variety of methods such as threaded, flanged, and grooved transition components. Occasionally steel pipe may contain residual oils that were used to aid in the metal cutting process. Some of the oils used for this purpose may be incompatible with thermoplastics. Cutting oils should be removed from steel pipe prior to connecting to thermoplastic pipe by fully cleaning the inside and outside of the pipe before it is assembled in the piping system. Care should be taken when selecting cleaning agents to avoid further contamination of the pipe with incompatible detergents. If cutting oil is used consult with the manufacturer of the cutting oil for a specific recommendation as to compatibility with thermoplastic systems.

Paint

Oil or solvent based paints may be chemically incompatible with thermoplastics. Water based acrylic or latex paint is the preferred paint to use on thermoplastic pipe and fittings. The installation contractor must take responsibility for obtaining approval from the authority having jurisdiction to cover the markings on the product (i.e. product identification, listing marks, etc.) and to change the color of the pipe and fittings from its identifiable color prior to use.

Cooking Oils and Grease

When thermoplastic pipe is installed in kitchen areas the pipe must be protected from contact with grease or cooking oils. Certain cooking oils can cause thermoplastics to crack, leak, or break when applied to the piping system. Consideration must be given to not only protecting the pipe from direct contact with cooking oils and/or grease but also contact that may occur from airborne grease or oil from the environment. Exposed piping in areas where thermoplastics might come in contact with cooking oils and grease should be protected using a

complete coating of high-quality, water-based paint that fully protects the piping system.

Rubber and Flexible Materials

Thermoplastics are typically not compatible with rubber and flexible plastic materials as these materials often contain certain types of plasticizers which when placed in contact with thermoplastics can cause the piping system to crack, leak, or break. Incompatible plasticizers include, but are not limited to, phthalates, adipates, trimellitates, and dibenzoates. Incompatible rubber and flexible plastic materials can be found in hoses and tank linings and in the fluids that come in contact with them.

Spray-On Coatings

Certain types of spray-on coatings that form a peel-able film to protect fixtures during construction may be incompatible with thermoplastics. Care should be used to protect exposed piping from over-spray when this type of protective coating is applied.

Termiticides and Insecticides

When performing installations where the presence of insecticides or termiticides is likely, care should be taken to isolate thermoplastic pipe from direct contact with large quantities of these chemicals. Thermoplastics can be damaged when termiticides or insecticides are injected into the annular space between the pipe wall and sleeving material, trapping the termiticides or insecticide against the pipe wall. Termiticide and insecticide applications per label instructions in an open-air environment should not pose a problem; however, puddling of termiticides on or near thermoplastic pipe may cause failures. In areas where puddling is more likely extra care should be taken to avoid puddling of termiticides. Before using an insecticide or termiticide, be sure to consult the manufacturer's installation guide for proper application instructions. A list of compatible insecticides or termiticides is available.

Mold Abatement and Fungicides

Thermoplastic piping can be damaged by mold abatement and fungicide products. These products can damage thermoplastic piping systems by causing cracks, leaks, or breaks in the system. When performing repairs or modifications, care should be taken to isolate the thermoplastic piping system from direct contact with fungicide products. When repairs are made to an existing system and the possibility exists that fungicides will be applied to treat damp drywall and wood framing surrounding the repair site, exposed piping should be sleeved with a compatible plastic sleeving or pipe insulation material to prevent direct contact of the fungicide with the thermoplastic piping system.

General Safety Information

Thermoplastic piping is a general term applied to a variety of different plastics. A user of thermoplastic piping should select the kind of thermoplastic best suited for his use. Special care must be used to apply proper engineering, design, and installation procedures.

GF Piping Systems recommends against the use of its thermoplastic piping systems for transport or storage of compressed air or gases. Entrapped air must be removed from liquid piping systems so that no air remains locked in the system when pressure is applied to the liquid. Excessive surge pressure must be avoided. Surge pressure can develop if liquid movement through the pipe is near maximum velocities and valves are closed abruptly. Recommended velocity is generally considered to be 5 ft/s (1.5 m/s), not to exceed 10 ft/s (3.2 m/s).

Failures can occur at the joints connecting the pipe and fittings. For example, threaded joints have a diminished wall thickness because of the cut of the thread into the wall. Also, improperly cemented joints will leave the strength of the joint impaired.

Temperature extremes, both hot and cold, or changes in temperature can result in failures of thermoplastic pipe in the following cases:

1. Breakage or other damage on the job site in cold weather can be caused by impact with tools, vehicles, or rocks.
2. Heat of solution of chemicals or heat from other sources can cause failure because the piping systems will be distorted.
3. Wide variations in temperature when the pipe is restrained as in concrete or is otherwise anchored can lead to cracking and breakage.
4. When heat is introduced by a pump, especially when on recirculation, the pipe or joints can fail.
5. Expansion and contraction can cause leakage or breaks at joints.

Crush strength of the thermoplastic pipe and fittings should not be exceeded. Similarly, excessive suction or vacuum must be avoided.

Since thermoplastics are relatively soft, they can be damaged using pipe wrenches on threaded connections.

Pipe should not be used as a ground for electrical systems and conditions of static electricity should not be created through excessive friction. Welding or torch cutting operations near thermoplastic pipe can cause damage to the pipe due to burning by sparks or overheating.

High chromic acid solutions and high nitric acids can lead to stress cracking; also, when certain chemicals and solvents are absorbed into the pipe and fittings surfaces, softness will

develop in the thermoplastic which can lead to weeping or rupture.

Safety Information on Primers and Solvent Cements

Over a period of 50 years, millions of solvent cemented joints have been made with only rare cases of mishap. However, since these products are flammable and contain chemical solvents, appropriate safety precautions should be taken.

Virtually all solvent cements and primers for thermoplastic pipe are flammable and should not be used or stored near heat, spark, or open flames. Do not smoke during use. Cement should be stored in closed containers at temperatures above 40°F (4.4°C). They should be used only with adequate ventilation. In confined for partially enclosed areas, a ventilating device should be used to remove vapors and minimize their inhalation.

Respirators specially designed to minimize the inhalation of organic vapors can also be used. They are commercially available. Containers should be kept tightly closed when not in use and covered as much as possible when in use. Use of an application can with applicator attached to a lid is especially recommended.

Avoid frequent contact with skin and eyes as it may be absorbed through the skin and may cause eye injury. In case of contact, flush with plenty of water for 15 minutes. If irritation persists, get medical attention. If swallowed, call a physician immediately and follow precautionary statements given on the side panel of the cement container. Keep out of reach of children.

Warning: Use Caution with Welding Torches

On projects where thermoplastics are being installed or have been recently solvent welded, special caution should be taken where using welding torches or other equipment where sparks might be involved. Flammable vapors from cemented joints sometimes linger within or around a piping system for some time.

Special care must be taken in situations where welding torches may be used in close proximity to thermoplastic piping. In all cases, lines should be purged to remove solvent vapors before welding.

Warning: Use Caution with Calcium Hypochlorite

Do not use a dry, granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introductions of granules or pellets of calcium hypochlorite with solvent cements and primers, including their vapors, may result in violent chemical reactions if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system; this solution will be nonvolatile. Furthermore, dry, granular calcium hypochlorite should not be stored or used near solvent cements or primers.

Accidents and injuries have seldom occurred in the use of our products. Help maintain and improve this excellent record by following the above recommendations.

Use of Compressed Air or Gas

GF Piping Systems PVC and CPVC piping systems are considered rigid thermoplastic materials. GF Piping Systems does not recommend the use of PVC or CPVC piping products for the testing, transport, or storage of compressed air or gases. The compressibility of air and/or other gases result in tremendous amounts of stored energy, even at lower pressures. Should a failure occur in a compressed air or gas system for any reason (i.e. improper assembly, mechanical damage, etc.) the failure mode will be very dramatic in nature due to the physical characteristics of the rigid piping in combination with the immediate release of this stored energy. Under these conditions the velocity created by rapidly escaping air and the resultant failure mode can throw shards of thermoplastic in multiple directions. This scenario creates a substantial hazard to personnel and property within the vicinity of the piping should a failure occur. Several cautionary statements and alerts against the use of rigid thermoplastic piping for use with compressed air or gases are available through the Plastic Pipe Institute (PPI), American Society for Testing and Materials (ASTM), various other trade organizations, manufacturers, safety codes, and several state and federal agencies.

Compressed air or other gases should never be used in testing. Extreme care should be used to assure complete venting of all entrapped air when filling the system with water or other liquids used in testing. Whether a hydraulic hand pump or available water line pressure is used, any slow build-up of gauge pressure on a completely liquid filled line shows some entrapped air in the system. Pressure should be immediately released and the line re-bled. Failure to do this can lead to catastrophic failure when the decompressing gas suddenly accelerates the solid water column if a faulty joint separates.

PVC and CPVC are not recommended for compressed air lines. Improper installation, especially poor cementing techniques, can lead to an abrupt release of tremendous stored energy. Shattering of pipe and fittings is then apt to occur at directional changes and at points where the system is rigidly restrained due to the instantaneous “whipping” action imparted by the escaping air. Internal surface cracks due to stress can be initiated which will tend to propagate and cause shattering, hairline cracks, or pinhole cracks over a period of time. There is also evidence that certain additives to system lubricants will initiate internal stress cracking which will lead to similar failure over extended periods of time.

Disclaimer of Liability

As the conditions or methods of use are beyond our control, we do not assume liability for any use of this material. Information contained herein is believed to be true and accurate, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable federal, state, and local laws and regulations remains the responsibility of the user.

Safety Alerts

Several varieties of safety alerts and related messages appear in this catalog. Please be sure you understand the meaning of the key words that identify each type of alert.

"Warning" signifies hazards or unsafe practices that can cause severe personal injury or death if instructions, including recommended precautions, are not followed.

"Caution" signifies hazards or unsafe practices that can cause minor injury or product or property damage if instructions, including recommended precautions, are not followed.

"Note" signifies important special instructions.

The data furnished herein is provided as a courtesy and is based on past experience, limited testing, and other information believed to be reliable. This information may be considered as a basis for recommendation only. No guarantee is made as to its accuracy or suitability for particular applications.

GF Harvel Clear™ PVC

Product Summary

GF Harvel Clear™ Rigid Schedule 40 & 80 PVC piping provides a versatile, cost-effective alternative for many piping applications, particularly those where visual monitoring of processes is critical.

The benefits of rigid PVC piping are well recognized: exceptional corrosion resistance; smooth interior walls for unimpeded flow and reduced sediment buildup; non-contaminating for purity applications; fast, reliable solvent-welded connections; good pressure-bearing capability; and ease of handling and installation, to name a few.

All of these important benefits are now available in a unique product with optimum clarity. This clarity provides the all-round visibility that specialized applications demand—whether it be clean room applications, sight glass, dual-containment or various other processing applications where continuous monitoring is necessary.

- Manufactured to Schedule 40 and Schedule 80 IPS dimensions
- Simple solvent-welded joining techniques
- Fully compatible with standard PVC pipe, fittings and valves
- Corrosion resistant
- Non-conductive
- Resists bacterial and biological activity
- Wide range of chemical resistance
- Lightweight, easy to handle and install
- Neatly boxed and packaged on-line, providing clean, scratch-free quality with every order
- Standard plain-end 10-foot lengths; belling and custom lengths available
- Lower overall installed cost than other alternatives

Material Data: Physical Properties

GF Harvel Clear™ PVC piping is produced from a rigid, virgin Polyvinyl Chloride (PVC) compound with a Cell Classification of 16443 per ASTM D1784. This material enables GF Harvel Clear piping to safely carry a maximum service temperature of 140 F when appropriate temperature/pressure de-rating factors are applied. In addition to exhibiting desirable physical properties and optimum transparency, this material is listed by the National Sanitation Foundation as being safe for use with potable water (NSF International Standard 61), and also complies with the provisions of Title 21 of the United States FDA Code of Federal Regulations as being safe for use in food contact applications. Due to the non-contaminating nature of GF Harvel Clear PVC piping products, extensive chemical extraction testing has been conducted to evaluate their use in critical applications. Details pertaining to extractable analysis is available from GF Harvel upon request.

GF Harvel Clear™ provides similar reliable chemical resistance properties that conventional PVC piping has demonstrated over the years. In general, it is resistant to most acids, bases, salts and oxidants; detailed chemical resistance data is available and should be referenced for proper material selection.

Clear PVC Pipe Physical Properties

GENERAL	Value	Test Method
Cell Classification	16443	ASTM D1784
Maximum Service Temp.	140°F	
Color	Transparent	
Specific Gravity, (g/cu.cm @ 73°F)	1.33	ASTM D792
Hardness, Shore D	84	ASTM D2240
Hazen-Williams Factor	C = 150	
MECHANICAL		
Tensile Strength, psi @ 73°F	7,260	ASTM D638
Tensile Modulus of Elasticity, psi @ 73°F	392,000	ASTM D638
Flexural Strength, psi @ 75°F	12,000	ASTM D790
Flexural Modulus, psi @ 75°F	389,000	ASTM D790
Compressive Strength, psi @ 75°F	8,300	ASTM D695
Compressive Modulus, psi @ 75°F	307,000	ASTM D695
Izod Impact notched - Method A, with Grain-Comp. Molded, .125 in. bars, 73°F	8.0 ft-lbs./in.	ASTM D256
Izod Impact notched - Method A, against Grain-Comp. Molded, .125 in. bars, 73°F	2.0 ft-lbs./in.	ASTM D256
THERMAL		
Coefficient of Linear Expansion (in/in/°F)	4.1×10^{-5}	ASTM D696
Heat Distortion Temp., Unannealed, 264 psi, .125 in. Bars	154°F	ASTM D648
Glass Transition Temp.	176°F	
FIRE PERFORMANCE		
Flammability Rating	V-0	UL-94

Since this material is a nonconductor, GF Harvel pipe is not subject to electrolytic or galvanic corrosion.

This material is compatible with conventional PVC pipe, fittings and valves, and can be incorporated into existing PVC systems via the solvent cement joining process. In addition to a full line of Schedule 40 clear fittings for most applications, an endless array of standard PVC components and accessories are readily available. GF Harvel Clear™ PVC exhibits excellent flammability characteristics as well.

Schedule 40 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI
¼	0.540	0.344	0.088	0.086	390
⅜	0.675	0.473	0.091	0.115	310
½	0.840	0.602	0.109	0.170	300
¾	1.050	0.804	0.113	0.226	240
1	1.315	1.029	0.133	0.333	220
1¼	1.660	1.360	0.140	0.450	180
1½	1.900	1.590	0.145	0.537	170
2	2.375	2.047	0.154	0.720	140
2½	2.875	2.445	0.203	1.136	150
3	3.500	3.042	0.216	1.488	130
3½	4.000	3.521	0.226	1.789	120
4	4.500	3.998	0.237	2.118	110
5	5.563	5.016	0.258	2.874	100
6	6.625	6.031	0.280	3.733	90
6 × ⅛	6.625	6.335	0.110	1.647	45
8	8.625	7.942	0.322	5.619	80
10	10.750	9.976	0.365	7.966	70
12	12.750	11.889	0.406	10.534	70

Schedule 80 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nom. Wt./Ft.	Max. W.P. PSI
¼	0.540	0.282	0.119	0.105	570
⅜	0.675	0.403	0.126	0.146	460
½	0.840	0.526	0.147	0.213	420
¾	1.050	0.722	0.154	0.289	340
1	1.315	0.936	0.179	0.424	320
1¼	1.660	1.255	0.191	0.586	260
1½	1.900	1.476	0.200	0.711	240
2	2.375	1.913	0.218	0.984	200
2½	2.875	2.289	0.276	1.419	210
3	3.500	2.864	0.300	2.010	190
4	4.500	3.786	0.337	2.938	160
6	6.625	5.709	0.432	5.610	140

De-rating Factor

Operating Temp (°F)	De-Rating Factor
73	1.00
80	0.88
90	0.75
100	0.62
110	0.51
120	0.40
130	0.31
140	0.22

EX: 4" PVC SCHEDULE 40 CLEAR @ 120°F = ?

110 psi x 0.40 = 44 psi max. @ 120°F

Critical Collapse Pressure PSI @73°F

Pipe Size (in.)	SCH 40	SCH 80
¼	7,504	22,172
⅜	3,714	11,869
½	3,255	9,370
¾	1,722	4,985
1	1,399	3,841
1¼	767	2,158
1½	554	1,599
2	327	1,014
2½	431	1,176
3	279	809
3½	211	632
4	169	521
6	84	333
8	57	-
10	43	-
12	35	-

THE MAXIMUM SERVICE TEMPERATURE FOR GF HARVEL CLEAR™ PVC IS 140°F.

Solvent cemented joints should be utilized when working at or near maximum temperatures. GF Harvel Plastics does not recommend the use of PVC for threaded connections at temperatures above 110°F; use flanged joints, unions, or roll grooved couplings where disassembly is necessary at elevated temperatures.

Threading of Schedule 40 PVC Clear pipe is not a recommended practice due to insufficient wall thickness.

NOTE: Although GF Harvel Clear maintains its physical properties when exposed to many substances, exposure to certain chemicals can affect the clarity of the product over time. Certain nitrogen containing organics, bleaches, oxidative agents and acids may result in discoloration. Testing under actual use conditions is recommended.

Exposure to sunlight (U.V.R.) will also affect clarity. Clear products do not contain U.V. stabilizers and are not recommended for outdoor use unless adequate protection is applied.

Installation Instructions

Joining Techniques

GF Harvel PVC Clear pipe is easily joined by the solvent cementing process, providing a quick, strong, leak-tight seal for pressure applications. To maintain the system's clarity, GF Piping Systems recommends the use of a clear, medium-bodied, fast-setting cement in conjunction with a clear primer for optimum joint integrity, such as IPS Weld-on 705 Clear cement and IPS Weld-on P-70 Clear primer. As an added advantage due to the product's transparency, joint integrity is readily identified during the solvent cement joining process. Details on proper solvent cementing techniques are available and must be reviewed for proper assembly and joint integrity.

Specialty clear female threaded transition fittings, incorporating a stainless steel retaining ring, reduce problems associated with overtightening and provide a strong, leak-tight seal for plastic-to-metal transitions. When used with clear male adapters, the reinforced female adapters provide an excellent threaded connection for disassembly while maintaining system transparency. The reinforced design reduces radial stress encountered with typical threaded connections, and eliminates the need for system pressure de-rating traditionally associated with non-reinforced plastic threaded joints. GF Harvel recommends the use of PTFE (polytetrafluoroethylene) thread tape for making reliable threaded connections. Generally, two to three wraps of tape in the direction of the threads on the male end, followed by one to two turns beyond finger tight is all that is required to make a leak-free connection.

NOTE: Certain thread paste compounds may contain stress cracking agents; contact the paste manufacturer for compatibility with PVC prior to use.

Where disassembly is required, GF Harvel Clear can be easily joined in the field using standard rigid thermoplastic pipe fittings and joining techniques such as flanges, molded grooved coupling adapters and unions. Joining options are limitless when overall system clarity is not a necessity.

Thermal Expansion and Contraction

As with other thermoplastic materials, consideration must be given to the effects of thermal expansion and contraction during the design and installation of the system. The coefficient of linear expansion for GF Harvel Clear pipe is 4.1×10^{-5} in./in./°F. The rate of expansion or contraction can be calculated as follows:

$\Delta L = 12yl(\Delta T)$

Where:

ΔL = expansion or contraction in inches
$y = 4.1 \times 10^{-5}$ (coefficient of linear expansion)
l = length of piping run in feet
T = temperature change °F
(T max. –T@ installation)

Refer to the engineering and design section under industrial pipe for additional information concerning thermal expansion and contraction.

Heat Bending

Bending of Clear PVC pipe may be desirable under certain conditions where long-radius bends and unusual configurations are required. Various sizes and wall thicknesses of rigid PVC pipe have been successfully heat-formed for many years into numerous angles, long-radius sweeps for conduit and flow conditions, U-bends for thermal compensation, and offsets in congested areas.

The following information is provided as a general guide for a better understanding of heat bending techniques commonly used in the field, and does not attempt to address specialized shop fabrication methods or procedures.

Successful bending requires that the appropriate amount of heat be applied uniformly to the required length of pipe to be bent. This presents the greatest challenge for field bending, as the heating method used must provide the necessary amount of heat over the required length of pipe in a reasonable amount of time. Several common pipe heating methods used in the field involve the use of hot air ovens, electric box heaters, electric pipe heating blankets, and flameless hot gas torches. Temperatures necessary to heat the pipe are dependent on pipe size and the severity of the desired bend radius. In general, PVC pipe should be heated from 225°F to 275°F for the minimum amount of time necessary to achieve uniform softening. Care should be taken to avoid exposing the pipe to bending temperatures for an excessive length of time, as irreparable distortion and deformation will occur. Localized overheating must be avoided. Successful minor bends (< 30°) can be achieved with minimum distortion in the lower temperature range (225°F) without internal support. Sharp bends (> 30°) require higher temperatures (250°–275°F) as well as internal support to prevent wall distortion/collapse.

Common methods used to provide internal support to the pipe during the bending process include using a filling medium such as sand or perlite (cat litter), inserting a coiled spring into the pipe, or in some cases providing internal pressure. Filling the pipe with fine grain sand or perlite prior to heating furnishes the internal support necessary to prevent collapse, while at the same time provides an excellent medium for uniform heat distribution during the heating process.

The filling medium used should be packed tightly into the pipe to achieve the desired bend radius with minimum distortion.

During this process, the pipe ends are capped or plugged and the filling medium is compacted as much as possible to remove any air pockets prior to heating. Once the bend is formed and cooled, the sand is emptied from the pipe and any remaining particles can be easily removed by rinsing with water.

To provide fabrication consistency in the field, standard pipe bending forms which provide the required radius and are sized (grooved) for the proper diameter can be used to bend plastic pipe. Plywood jigs constructed on site have also been used successfully in many applications. The minimum radius at bend should not be less than five times the pipe outside diameter to prevent flattening. Due to the recovery characteristics of the material, the pipe should be bent slightly beyond the desired radius and allowed to spring back to the required angle once uniformly heated at the correct temperature. When the bend is obtained, the pipe should be held in place and cooled quickly using a wet sponge or other application of water.

It should be noted that most bending procedures will induce stress into the pipe wall which can be retained in the material after the bend radius is formed. The amount of stress induced is dependent on the severity of the bend, the diameter and wall thickness of the pipe bent, and the bending method used. This residual stress will be added to the normal stresses created by internal pressure, installation procedures, and the effects of temperature. Therefore, pipe bending should be limited to applications for use at ambient temperatures or lower where maximum operating pressures are not utilized. It should also be noted that during the bending process of clear PVC pipe, the

material will become cloudy during the heating process but will regain clarity when cooled, provided excessive bending stresses are not retained. The use of a filling medium during the bending process can also cause slight pitting and other interior surface blemishes depending on the method used.

Attempting to form bends in rigid thermoplastic piping at temperatures too low (below 200°F) can induce excessive stress into the pipe, thereby jeopardizing its physical performance.

WARNING: GF Piping Systems does not recommend the use of this product or other rigid PVC/CPVC piping products for the transportation or storage of compressed air or gases, nor the testing of these systems using compressed air or gases.

CAUTION: properties when exposed to many substances, exposure to certain chemicals can affect the clarity of the product over time. Certain nitrogen- containing organics, bleaches, oxidative agents and acids may result in discoloration. Testing under actual use conditions is recommended.
Exposure to sunlight (U.V.R.) will also affect clarity. This can be addressed in sight glass applications exposed outdoors by simply providing an opaque cover attached to the pipe exterior such as a rubber flap or sleeve.
These facts should be considered if optimum clarity is required for the system by testing under actual use conditions at the initial design phase of the project.
Standard threading or grooving can be conducted with GF Harvel Schedule 80 Clear pipe. Threading or grooving of GF Harvel Schedule 40 Clear pipe is not recommended due to insufficient wall thickness. Use specialty clear transition fittings for threaded assemblies or standard PVC transition fittings where applicable.

Hangers and Supports

Support location and spacing is dependent on the pipe diameter, operating temperature of the system, and the location of any concentrated stress loads (i.e., valves, flanges, and any other heavy system components). Proper support spacing is critical to ensure that deflection is kept to a minimum. Hangers used must have an adequate load-bearing surface free of any rough or sharp edges that could damage the piping during use. They must also not restrict linear movement of the system due to the effects of expansion and contraction; overtightening must be avoided.

Schedule 40—Support Spacing

Nominal Pipe Size (in.)	Maximum Support Spacing in Feet				
	60°F	80°F	100°F	120°F	140°F
¼	4	3½	3½	2	2
⅜	4	4	3½	2½	2
½	4½	4½	4	2½	2½
¾	4	4½	4	2½	2½
1	5½	5	4½	3	2½
1¼	5½	5½	5	3	3
1½	6	5½	5	3½	3
2	6	5½	5	3½	3
2½	7	6½	6	4	3½
3	7	7	6	4	3½
3½	7½	7	6½	4	4
4	7½	7	6½	4½	4
6	8½	8	7½	5	4½
6 × ⅛	7½	7	6½	4½	4
8	9	8½	8	5	4½
10	10	9	8½	5½	5
12	11½	10½	9½	6½	5½

Schedule 80—Support Spacing

Nominal Pipe Size (in.)	Maximum Support Spacing in Feet				
	60°F	80°F	100°F	120°F	140°F
¼	4	4	3½	2½	2
⅜	4½	4½	4	2½	2½
½	5	4½	4½	3	2½
¾	5½	5	4½	3	2½
1	6	5½	5	3½	3
1¼	6	6	5½	3½	3
1½	6½	6	5½	3½	3½
2	7	6½	6	4	3½
2½	7½	7½	6½	4½	4
3	8	7½	7	4½	4
4	9	8½	7½	5	4½
6	10	9½	9	6	5

PVC & CPVC Corrosion Resistant Duct

GF Harvel PVC Duct, available in 2" through 24" diameters, and GF Harvel CPVC Duct, available in 6" through 24", provides long-lasting, cost-effective solutions for industrial and institutional corrosive fume exhaust and drain applications.

Physical Properties

GF Harvel PVC and CPVC Duct systems perform well in many aggressive environments that are not suitable for other types of materials. Due to the unique properties of the PVC and CPVC materials, GF Harvel PVC and CPVC Duct maintains high tensile strength and modulus over a moderate temperature range, low thermal conductivity, good electrical properties, and excellent chemical resistance to a variety of aggressive substances. Well-balanced physical properties are crucial to ensure the material selected can handle anticipated system requirements. Appropriate construction practices are determined and applied based on the physical properties of the material selected. GF Harvel PVC and CPVC Duct provides construction advantages due to the material's inherent corrosion resistance, light weight, ease of fabrication, and other labor-saving characteristics. When combined with the longevity of a properly designed system, significant cost savings can be recognized.

NOTE The physical properties shown at right are considered general physical properties. Please contact GF Piping Systems technical services for additional information if necessary.

Material Data

GF Harvel PVC Duct pipe is extruded from GF Harvel's own custom blend of dark-gray-colored Type I, Grade I, Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784 (PVC 1120); trade name H707 PVC. GF Harvel PVC Duct can safely carry a maximum service temperature of 140°F.

GF Harvel CPVC Duct pipe is extruded from a custom blend of gray-colored Type IV, Grade I, Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784 (PVC 1120); trade name CORZAN® CPVC. Harvel CPVC Duct can safely carry a maximum service temperature of 200°F.

GF Harvel PVC and CPVC Duct is chemically resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Unlike metallics, vapor phase or liquid-vapor phase corrosion is generally less aggressive with thermoplastics than the liquid phase corrosion. When in question, testing must be conducted under actual use conditions to verify compatibility. Detailed chemical resistance data is available and should be referenced for proper material selection.

Fire Performance

In addition to chemical inertness and mechanical strength, GF Harvel PVC and CPVC Duct also has good flammability properties when compared to many common building products. Unlike other types of plastics, GF Harvel PVC and CPVC Duct will not independently support combustion; it will not burn unless a flame is constantly applied and stops burning once the flame is removed. Refer to Physical Properties for a list of flammability properties and test methods.

Product Ratings and Capability

GF Harvel PVC and CPVC Duct performs well when exposed to harsh environments. GF Harvel PVC and CPVC Duct has been taken to extremes under both various negative and positive pressure conditions in applications as diverse as laboratory work and industrial metal finishing operations.

GF Harvel PVC and CPVC Duct can endure greater levels of positive pressure than negative pressure. Refer to Table I and Table II for maximum recommended pressure ratings of GF Harvel PVC and CPVC Duct at various temperatures for both positive pressure (psi) ,and negative pressure (inches of water), applications.

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PVC & CPVC Duct Physical Properties

GENERAL	PVC Value	CPVC Value	Test method
Cell Classification	12454	23447	ASTM DI784
Maximum Service Temp.	140°F	200°F	
Color	Dark Gray	Light Gray	
Specific Gravity, (g/cu.cm @ 73°F)	1.40 +/-.02	1.52 +1-.02	ASTM D792
Water Absorption, % increase 24 hrs @ 25°C	0.05	0.03	ASTM D570
Hardness, Rockwell	110 - 120	117	ASTM D785
Poisson's Ratio @ 73°F	0.410	0.386	
Hazen-Williams Factor	C =150	C = 150	
MECHANICAL			
Tensile Strength, psi @ 73°F	7,450	7,750	ASTM D638
Tensile Modulus of Elasticity,psi @ 73°F	420,000	360,000	ASTM D638
Flexural Strength, psi @ 73°F	14,450	13,000	ASTM D790
Flexural Modulus, psi @ 73°F	360,000	360,000	ASTM D790
Compressive Strength, psi @ 73°F	9,600	10,000	ASTM D695
Izod Impact, notched, ft-lb/in @ 73°F	0.75	2.0	ASTM D256
THERMAL			
Coefficient of Linear Expansion (in/in/°F)	2.9×10^{-5}	3.7×10^{-5}	ASTM D696
Coefficient of Thermal Conductivity (Cal.)(m)/(cm2)(Sec.)(°C) BTU/in/ hr/ft2/°F Watt/m/°K	 3.5×10^{-4} 1.02 0.147	 3.27×10^{-4} 0.95 0.137	ASTM C177
Heat Deflection Temperature Under Load (264 psi, annealed)	170°F	226°F	ASTM D648
Specific Heat, Cal./°C/gm	0.25		ASTM D2766
ELECTRICAL			
Dielectric Strength, volts/mil	1,413	1,250	ASTM DI49
Dielectric Constant, 60Hz, 30°F	3.70	3.70	ASTM DI50
Volume Resistivity, ohm/cm @ 95°C	1.2×10^{12}	3.4×MI5	ASTM D257
Power Factor, 1000Hz		0.007%	ASTM DI50
GF Harvel PVC & CPVC Pipe is non-electrolytic			
FIRE PERFORMANCE			
Flammability Rating	V-0	V-0, 5VB, 5VA	UL-94
Flame Spread Index	<10	<10	ASTM E I 62
Flame Spread	0-25	<25 <25	ASTM E-84/UL 723 ULC
Smoke Generation	80-225	<50 <50	ASTM E-84/UL 723 ULC
Flash Ignition Temp.	730°F	900°F	
Average Time of Burning (sec.)	<5	<5	ASTM D635
Average Extent of Burning (mm)	<10	<10	
Burning Rate (in/min)	Self Extinguishing		
Softening Starts (approx.)	250°F	295°F	
Material Becomes Viscous	350°F	395°F	
Material Carbonizes	425°F	450°F	
Limiting Oxygen Index (L01)	43	60	ASTM D2863
Clean Room Materials Flammability Test	N/A	FPI= 1.20 SDI = 0.09	FM 4910

System Design and Installation

Joining Techniques

GF Harvel PVC and CPVC Duct can be easily assembled in the field using standard thermoplastic pipe-joining techniques. The most common methods involve thermal hot-air welding or the solvent cementing process. Both of these methods provide reliable, cost-effective joints. Other methods of joining and fabricating GF Harvel PVC and CPVC Duct and system accessories include thermoforming, fusion welding, and hot-plate welding.

Solvent Cementing

Belled-end duct, couplings, flanges and other socket-style fittings can be joined using the solvent-cementing process. This process involves the application of a primer and solvent cement to join system components. This reliable field-proven joining technique has been used successfully for many years in tough corrosive pressure applications. When properly conducted, this method provides a strong, homogeneous joining area in which the mating surfaces are chemically fused together, producing a strong, leak-tight seal when cured. Detailed solvent-cementing procedures are available and should be referenced for proper installation techniques. Adequate surface-to-surface contact of the parts being joined is necessary for reliable solvent-cemented joints. Generally, a minimum socket depth of 3" (all sizes) will provide sufficient joint strength for most systems. Since duct dimensional tolerances can be appreciable when compared to heavy wall pipe, the use of extra-heavy-bodied PVC cement (such as IPS 719 or equivalent) is recommended due to the cement's excellent gap-filling properties. Care should be used when solvent-cementing duct diameters 18" and larger to ensure tightness of fit of matting components. The solvent cementing method is not recommended for any type of end-to-end joining.

Thermal Welding

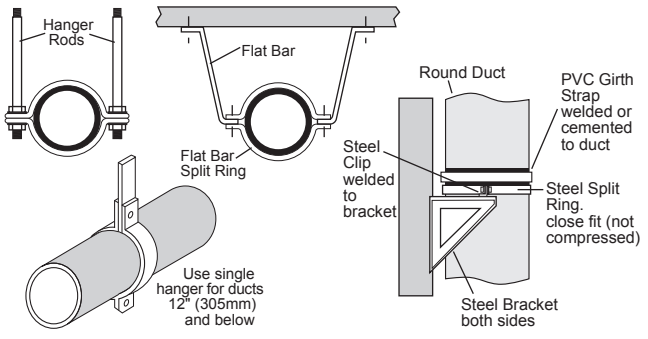
The hot-air welding technique utilizes clean hot air to preheat the duct material and PVC welding rod, while pressure is applied to the weld area as the rod is guided. This joining method results in the surface molecules of the parts being joined to fuse together at the weld seam. Only welding rod produced from the same virgin PVC material is recommended for this joining process to ensure the highest system integrity. Personnel adequately trained in the art of hot-air welding thermoplastics should conduct all welding.

Hangers and Supports

Proper support spacing is dependent on the duct diameter, the temperature parameters of the system, the location of concentrated stress loads, and the possibility of process solids accumulation within the system. As with all piping systems, proper support spacing is critical to ensure that deflection and sagging are kept to a minimum. This prevents unnecessary stress on the system, and reduces the possibility of creating fluid condensation/collection areas. Drains must be installed where accumulation of moisture is expected and at low points in the system; these locations shall be specified on the drawings. The values stated in the table are based on actual testing of air-filled duct at various temperatures, and incorporate a reasonable safety factor. Depending on the type of system service, consideration must be given to the possibility of solids accumulation within the line, particularly where two separate process lines intersect. (Solids can be created within a system as the result of a chemical reaction of the fumes being extracted.) Stress loads can be generated by the additional weight of accumulated solids, and this fact should be addressed with adequate system support where required. Proper system inspection, cleaning and maintenance should be enforced to prevent the formation of additional weight loads. See table for maximum support spacing of horizontal air-filled duct with an allowable ⅛" deflection at various temperatures.

As with any system, GF Harvel PVC and CPVC Duct must be independently supported at fans, flexible connections, hoods, scrubbers, tanks, and other system components to ensure the highest system integrity. In the case where flexible connections are installed as expansion joints, a suitable support or hanger shall be provided at each end of the flexible connection. Other heavy system components such as dampers, filters, etc. must also be independently supported to prevent high-stress concentration areas. Hangers and supports shall be securely fastened to the building structure to avoid vibration, and should be installed in such a manner as to prevent conditions of stress on the system (properly aligned). Seismic design and construction practices for hangers and supports shall be followed where applicable.

Hangers selected shall have an adequate load-bearing surface free of rough or sharp edges, and shall not cause damage to the duct during use. The hangers and hanger hardware shall be of a corrosive-resistant material suitable for use in the system environment. Hangers are to be of a type that will not restrict linear movement of the system due to expansion and contraction. Overtightening must be avoided to prevent duct deformation and restriction of movement.



PVC Duct Maximum Hanger Support Spacing In Feet

Size (in.)	Temperature °F							
	73	80	90	100	110	120	130	140
2	8	8	7.5	7	6.5	6	5.5	5
3	8	8	7.5	7	6.5	6	5.5	5
4	8	8	7.5	7	6.5	6	5.5	5
6×⅛	9.5	9	9	8.5	8	7.5	7	6.5
6	10	10	9.5	9	8.5	8	7.5	6.5
7	10	10	9.5	9	8.5	8	7.5	7
8	10	10	10	10	9	9	8	7.5
9	10	10	10	10	10	9	8.5	8
10	10	10	10	10	10	10	9	8.5
11	10	10	10	10	10	10	9.5	9
12	12	12	12	12	10	10	10	9.5
14	12	12	12	12	11.5	11.5	11	10
16	12	12	12	12	12	12	11	10
18	12	12	12	12	12	12	11.5	11
20	12	12	12	12	12	12	12	11.5
24	12	12	12	12	12	12	12	12

CPVC Duct Maximum Hanger Support Spacing In Feet

Size (in.)	Temperature °F						
	73	100	120	140	160	180	200
6	10	10	10	10	10	8	8
8	10	10	10	10	10	8	8
10	10	10	10	10	10	10	10
12	10	10	10	10	10	10	10
14	12	12	12	12	10	10	10
16	12	12	12	12	12	10	10
18	12	12	12	12	12	12	12
20	12	12	12	12	12	12	12
24	12	12	12	12	12	12	12

Reinforcement

Due to GF Harvel PVC and CPVC Duct's inherent rigidity, additional system reinforcements or flanges are not required for 2" through 24" sizes up to 100°F and 10" of negative internal static pressure, provided proper support spacing requirements are followed. Reinforcements are not required for systems under positive pressure when standard support spacing requirements are followed.

Thermal Expansion and Contraction

The coefficient of linear expansion (y) for GF Harvel PVC Duct is 2.8×10^{-5} in/in/°F and for Harvel CPVC Duct is 3.7×10^{-5} in/in/°F. As with all piping products, thermal expansion and contraction of the system must be considered and properly addressed during the design and installation of the system. The expansion or contraction rate of GF Harvel PVC and CPVC Duct can be calculated as follows:

$$\Delta L = 12\ y L (\Delta T)$$

where: **ΔL = expansion or contraction of duct in inches**
y = coefficient of thermal expansion
L = Length of duct run in feet
ΔT = Temperature change °F (T max. – T in.)
T max. = maximum change in operating temperature (°F)
T in. = temperature at time of installation (°F)

The most common means to compensate for changes in length is with the installation of in-line expansion joints, either flexible sleeve type or o-ring piston type being the most common. The effects of thermal expansion and contraction can also be compensated by using the inherent line flexibility of the system to construct expansion loops and offsets where required. Additional detailed information concerning the effects and control of thermal expansion and contraction, and other information pertaining to the design and installation of PVC and CPVC piping products is available from GF Piping Systems.

Storage and Handling

Reasonable care and common sense should be used when handling and storing Harvel Duct piping. Although GF Harvel Duct is tough and corrosion resistant, it should not be dropped nor have objects dropped on it. Care should be used when transporting and storing duct to prevent physical distortion. The duct should not be stored close to heat-producing sources, subjected to external loads (i.e., heavy objects, over-strapping etc.) or overstacked when stored. When stored outdoors, Harvel Duct must be covered with a non-transparent material to reduce the risk of heat absorption and discoloration. The product should be inspected for any scratches, splits or gouges that may have occurred from improper handling; if found, these sections must be cut out and discarded.

Large Diameter Dimensions

GF Harvel PVC seamless round duct is extruded in sizes 2" through 24" for PVC and 6" through 24" for CPVC to Iron Pipe Size (IPS) dimensions. GF's unique precision extrusion technology produces duct with consistent proportional stability, assuring that the mechanical integrity of the duct remains uniform. Produced in IPS diameters, GF Harvel PVC and CPVC Duct piping has large internal flow areas that can easily be adapted to other common IPS PVC fittings, reducing fabrication and installation time. GF Harvel PVC and CPVC Duct strictly conforms to the following dimensions:

Large Diameter Dimensions

Size (in.)	Avg. OD	Avg. OD Tol.	O of R Tol.	Min. Wall	Avg. Wall	Max. Wall	Wt. (lbs) Per Ft.
2	2.375	±0.006	0.060	0.091	0.101	0.111	0.432
3	3.500	±0.008	0.060	0.135	0.145	0.155	0.915
4	4.500	±0.009	0.100	0.173	0.183	0.193	1.494
6×⅛	6.625	+/-.020	+/-.050	0.105	0.122	0.140	1.530
6	6.625	+/-.020	+/-.050	0.172	0.187	0.202	2.275
7	7.375	+/-.020	+/-.050	0.172	0.187	0.202	2.534
8	8.625	+/-.020	+/-.075	0.172	0.187	0.202	2.982
9	9.375	+/-.025	+/-.075	0.172	0.187	0.202	3.239
10	10.750	+/-.025	+/-.075	0.172	0.187	0.202	3.733
11	11.375	+/-.025	+/-.075	0.172	0.187	0.202	3.944
12	12.750	+/-.025	+/-.075	0.172	0.187	0.202	4.440
14	14.000	+/-.030	+/-.075	0.172	0.187	0.202	4.884
16	16.000	+/-.030	+/-.075	0.172	0.187	0.202	5.586
18	18.000	+/-.040	+/-.080	0.172	0.187	0.202	6.750
20	20.000	+/-.070	+/-.140	0.199	0.219	0.239	8.144
24	24.000	+/-.090	+/-.180	0.230	0.250	0.270	11.163

O of R = Out of Roundness Factor at time of extrusion

Other Design Considerations

Proper system engineering, design, construction practices, and operation are the responsibility of the design authority. Consideration must be given to ensure the duct system is not exposed to any conditions that will exceed the product limitations regarding temperature, pressure, chemical compatibility and mechanical strength. Care must be taken to ensure that fume hood design, capture velocities, flow velocities, and flow volumes are adequate to properly convey the corrosive fumes being extracted while maintaining safety to personnel and protection of other equipment from corrosive attack. An optimum velocity for most systems is 1,500 feet per minute (FPM), which allows for future expansion of the system by increasing the fan size. With the exception of some heavy metals extraction, velocities exceeding 3,000 FPM are generally not recommended; particularly for solid particles as static electricity becomes a concern. Minimum exhaust volume requirements, usually expressed in cubic feet per minute (CFM), must be calculated based on the type and concentration of fumes being extracted. The system should also be designed and routed to provide sufficient access for inspection and future equipment maintenance. Size transition sections in mains and sub-mains should be tapered appropriately to maintain optimum flow conditions. A general recommendation is to provide a minimum taper of 5" in length for each 1" change in duct diameter. Branches shall enter the main at the large end of the transition at angles not exceeding 45°. Branches shall not enter the main diametrically opposite one another. It is the responsibility of the design authority to ensure the system is designed in compliance with any applicable pollution control and/or building codes.

System Components

Fittings fabricated from GF Harvel PVC and CPVC Duct are readily available in most configurations. To maintain system integrity, consistency, and compatibility, all duct fittings, fume hoods, fume scrubbers, fans, blast gates and other system components should be fabricated from PVC or CPVC sheet or duct of the same wall thickness, and from materials that conform to ASTM D1784. Additional information concerning PVC and CPVC Duct fittings and other system components can be obtained by contacting GF Piping Systems.

PVC Duct Sample Specification

All exhaust duct piping, sizes 2" through 24", shall be PVC seamless extruded type, as manufactured by Georg Fischer Harvel LLC— no equal. This duct pipe shall be extruded from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. All extruded PVC duct shall have a maximum flame spread rating of 25 or less per ULC S102.2. All PVC extruded duct pipe shall meet Georg Fischer Harvel published standards with regard to material and dimensions, and shall carry a maximum temperature rating of 140°F. All extruded duct pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer, and shall be stored indoors at the manufacturing site until shipped from the factory. All extruded PVC duct pipe shall be marked with the manufacturer's name or identifying symbol.

CPVC Duct Sample Specification

All exhaust duct piping, sizes 6" through 24", shall be CPVC seamless extruded type, as manufactured by Georg Fischer Harvel LLC— no equal. This duct pipe shall be from a Type IV, Grade I, Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784. All extruded CPVC duct shall have a maximum flame spread rating of 25 or less per ULC S102.2. All CPVC extruded duct pipe shall meet Georg Fischer Harvel published standards with regard to material and dimensions, and shall carry a maximum temperature rating of 200°F. All extruded duct pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer, and shall be stored indoors at the manufacturing site until shipped from the factory. All extruded CPVC duct pipe shall be marked with the manufacturer's name or identifying symbol.

Table I: MAX. Internal Negative Pressure Rating
Inches of Water @ Various Temperatures °F
PVC

Size	Temperature °F							
(in.)	73	80	90	100	110	120	130	140
2	74	65	56	46	38	30	23	16
3	74	65	56	46	38	30	23	16
4	74	65	56	46	38	30	23	16
6×⅛	115	101	86	71	59	46	36	25
6	415	365	311	257	212	166	129	91
7	301	265	226	187	153	120	93	66
8	188	166	141	117	96	75	58	41
9	146	129	110	91	75	59	45	32
10	97	85	73	60	50	39	30	21
11	82	72	61	51	42	33	25	18
12	58	51	44	36	30	23	18	13
14	44	39	33	27	22	18	14	10
16	29	26	22	18	15	12	9	6
18	21	18	16	13	11	8	6	4
20	24	21	18	15	12	10	7	5
24	21	18	16	13	11	8	6	4

CPVC

Size	Temperature °F										
(in.)	73–80	90	100	110	120	130	140	150	160	180	200
6	426	388	349	307	277	243	213	179	170	107	85
8	193	176	158	139	125	110	97	81	77	48	39
10	100	91	82	72	65	57	50	42	40	25	20
12	60	55	49	43	39	34	30	25	24	15	12
14	45	41	37	32	29	26	23	19	18	11	9
16	30	27	25	22	20	17	15	13	12	8	6
18	26	24	21	19	17	15	13	11	10	7	5
20	28	25	23	20	18	16	14	12	11	7	6
24	20	18	16	14	13	11	10	8	8	5	4

PSI = Inches of Water × .0361; Inches of Mercury = Inches of Water × .07355

Table II: MAX. Internal Positive Pressure Rating
PSI @ Various Temperatures °F
PVC

Size	Temperature °F							
(in.)	73	80	90	100	110	120	130	140
2	160	141	120	99	82	64	50	35
3	160	141	120	99	82	64	50	35
4	160	141	120	99	82	64	50	35
6×⅛	42	37	31	26	21	17	13	9
6	70	62	52	43	35	28	22	15
7	64	56	48	40	32	25	20	14
8	53	47	40	33	27	21	16	12
9	74	65	55	46	38	29	23	16
10	43	39	32	27	22	17	13	9
11	61	53	46	38	31	24	19	13
12	36	32	27	22	18	14	11	8
14	33	29	25	20	17	13	10	7
16	28	25	21	17	14	11	9	6
18	25	22	19	15	13	10	8	5
20	26	23	20	16	13	10	8	6
24	25	22	19	15	13	10	8	5

CPVC

Size	Temperature °F						
(in.)	73	100	120	140	160	180	200
6	70	56	45	35	26	16	13
8	53	43	33	26	20	13	10
10	43	35	28	21	16	10	8
12	36	30	23	18	15	8	6
14	33	26	21	16	13	8	6
16	28	23	18	13	11	6	5
18	25	20	15	11	10	5	5
20	26	21	16	13	10	6	5
24	25	20	15	11	10	5	5

Reference

List of Symbols

Symbols	Definition	Units
c	Distance from Neutral Axis	in (mm)
C	Constant for Inside Roughness	-
C_T	Thrust constant	-
D_{avg}	Average Pipe Diameter	in (mm)
D_i	Inside Pipe Diameter	in (mm)
D_o	Outside Pipe Diameter	in (mm)
DPL	Deflected Pipe Length	in (mm)
E	Modulus of Elasticity	psi (Mpa)
E'	Modulus of Soil Reaction	psi (MPa)
f	Friction Head in ft (m) of Water per 100 ft (100 m) of Pipe	ft/100 ft (m/100m)
F_R	Joint Resistance to Thrust	lb (N)
F_T	Thrust Force	lb (N)
I	Moment of Inertia	in4 (mm4)
L	Length of Straight Run at Installation	in (mm)
L	Live Load	psi (MPa)
L_E	Length of Expansion Joint	in (mm)
L_S	Support Spacing	in (mm)
M	Moment	lb-in (N-mm)
ó	Compressive Strength	psi (Mpa)
P	Internal Pressure	psi (bar)
P	Prism Load Soil Pressure	psi (MPa)
P_c	Critical Collapse Pressure	psi (bar)
P_s	Surge Pressure	psi (bar)
PS	Pipe Stiffness	psi (MPa)
P_W	Working Pressure	psi (bar)
P_x	Piston Installation Position	in (mm)
Q	Flow Rate	gal/min (L/min)
S	Circumferential Stress	psi (Mpa)
t	Wall Thickness	in (mm)
T_{amb}	Ambient Temperature	°F (°C)
T_{max}	Maximum Temperature	°F (°C)
T_{min}	Minimum Temperature	°F (°C)
V	Liquid Velocity	ft/s (m/s)
w	Weight per Unit Length	lb/in (N/mm)
y	Percent Deflection	% (%)
α	Coefficient of Thermal Linear Expansion	in/in-°F (mm/mm-°C)
γ	Specific Gravity	-
ΔL	Change in Length Due to Thermal Expansion	in (mm)
ΔT	Maximum Change in Temperature Between Installation and Operation	°F (°C)
τ_c	Shear Strength of Cement Bond	psi (MPa)
v	Poisson's Ratio	-

Glossary

ALLOWABLE STRESS The maximum force per unit area that may be safely applied to a pipe.

BELL END The enlarged portion of a pipe that resembles the socket portion of a fitting and that is intended to be used to make a joint by inserting a piece of pipe into it. Joining may be accomplished by solvent cements, adhesives, or mechanical techniques.

BEND A fitting either molded separately or formed from pipe for the purpose of accommodating a directional change.

BEVELED PIPE A pipe with an end chamfered to mate or adjust to another surface or to assist in assembly.

BOND To attach by means of an adhesive.

CEMENT A dispersion of "solution" of un-vulcanized rubber or a plastic in a volatile solvent and may or may not be an adhesive composition.

CHAMFERED PIPE A pipe with a conical surface (angle) made by cutting off the edge around the outside diameter on the end of a pipe.

COLLAPSE The buckling or crushing of a plastic pipe from external forces, such as earth loads or external hydrostatic load.

CORROSIVE SUBSTANCES Those substances, excluding seawater, that possess in their original stage the common property of being able through chemical action to cause damage by coming into contact with living tissues, the vessel, or its cargoes, when escaped from their containment.

CRACK Any narrow opening or fissure in the surface that is visible to the naked eye.

CURE The final stage in chemical bonding in which the chemically bonded polymer fully hardens and is ready to be pressure tested.

DEBURRED PIPE A pipe with the sharp edge and/or cutting remnants removed from the pipe end inner diameter or outer diameter edges.

DEGRADATION A deleterious change in the chemical structure of a plastic.

DESIGN PRESSURE The pressure to which each piping component of a piping system is designed.

DESIGN TEMPERATURE The maximum temperature at which each piping component is designed to operate.

DRY PIPE SYSTEM A system employing nozzles attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the nozzles or opened manually. When this valve opens, water flows into the piping system and discharges from all nozzles attached thereto.

DUCTILE FAILURE A pipe failure mode which exhibits material deformation (stretching, elongation, or necking down) in the area of the break.

ELASTICITY The property of plastic materials in which they tend to recover their original size and shape after deformation.

ELONGATION The capacity to take deformation before failure in tension and is expressed as a percentage of the original length.

FABRICATE Method of forming a plastic into a finished article by machining, drawing, and similar operations.

FITTING A piping component used to join or terminate sections of pipe or to provide changes of direction or branching in a pipe system.

FLEXURAL STRENGTH The outer fiber stress, which must be attained in order to produce a given deformation under a beam load.

FUSE To join two plastic parts by softening the material by heat or solvents.

GRAVITY DRAIN SYSTEM A piping system in which flow is accomplished solely by the difference between the height of the inlet end and the outlet end.

GRAVITY FLOW Liquefied medium conveyance that is induced by a positive elevation head such as a downward pipeline slope or a higher elevation reservoir.

HARDNESS A comparative gauge of resistance to indentation, not of surface hardness or abrasion resistance.

HOOP STRESS The circumferential stress imposed on a cylindrical wall by internal pressure loading.

HYDROSTATIC DESIGN STRESS The estimated maximum tensile stress in the wall of the pipe in the circumferential orientation due to internal hydrostatic pressure that can be applied continuously with a high degree of certainty that failure of the pipe will not occur.

IMPACT STRENGTH Resistance or mechanical energy absorbed by a plastic part to such shocks as dropping and hard blows.

JOINT The location at which two pieces of pipe or a pipe and a fitting are connected together. The joint may be made by an adhesive, a solvent-cement, electro-fusion, mechanical device, etc.

LONG-TERM HYDROSTATIC STRENGTH The estimated tensile stress in the wall of the pipe in the circumferential orientation (hoop stress) that when applied continuously will cause failure of the pipe at 100,000 hours (11.43 years). These strengths are usually obtained by extrapolation of log-log regression equations or plots.

LONGITUDINAL STRESS The stress imposed on the long axis of any shape. It can be either a compressive or tensile stress.

LUBRICANT A substance used to decrease the friction between solid faces and sometimes used to improve processing characteristics of plastic compositions.

MODULUS The load in pounds per square inch or kilograms per square centimeter of initial cross sectional area necessary to produce a stated percentage elongation which is used in the physical testing of plastics.

NON-FLAMMABLE Will not support combustion

NONRIGID PLASTIC A plastic which has a stiffness or apparent modulus of elasticity of not over 10,000 psi at 73°F (23°C) which is determined in accordance with the Standard Method of Test for Stiffness in Flexure of Plastics.

NON-TOXIC Not poisonous.

PIPE Pressure-tight cylinders used to contain and convey fluids.

PIPING SYSTEM A network of piping and any associated pumps, designed and assembled to serve a specific purpose. Piping systems interface with, but exclude, major equipment, such as boilers, pressure vessels, tanks, diesel engines, turbines, etc.

PLASTIC A material that contains as an essential ingredient an organic substance of large molecular weight, is solid in its finished state, and, at some stage in the manufacture or in its processing into finished articles, can be shaped by flow.

POLYMER A product resulting from a chemical change involving the successive addition of a large number of relatively small molecules (monomer) to form the polymer and whose molecular weight is usually a multiple of that of the original substance.

POLYVINYL CHLORIDE Polymerized vinyl chloride, a synthetic resin, which when plasticized or softened with other chemicals has some rubber-like properties. It is derived from acetylene and anhydrous hydrochloric acid.

PRESSURE When expressed with reference to pipe, the force per unit area exerted by the medium in the pipe.

PRESSURE PIPE Pipe designed to resist continuous pressure exerted by the conveyed medium.

PRESSURE RATING The estimated maximum pressure that the medium in the pipe can exert continuously with a high degree of certainty that failure of the pipe will not occur.

PRIMER An organic solvent or a blend of solvents, which enhances adhesion, applied to plastic pipe and fittings prior to application of a solvent cement.

RIGID PLASTIC A plastic which has a stiffness or apparent modulus of elasticity greater than 100,000 psi at 73°F (23°C) when determined in accordance with the Standard Method of Test for Stiffness in Flexure of Plastics.

SCHEDULE A pipe size system (outside diameters and wall thicknesses) originated by the steel pipe industry.

SELF-EXTINGUISHING The ability of a plastic to resist burning when the source of heat or flame that ignited it is removed.

SET To convert an adhesive into a fixed or hardened state by chemical or physical action, such as condensation, polymerization, oxidation, vulcanization, gelation, hydration, or evaporation of volatile constituents.

SOCKET The portion of a jointing system that is designed to accept a plain-end pipe or spigot-end pipe.

SOLVENT The medium within which a substance is dissolved most commonly applied to liquids used to bring particular solids into solution, e.g., acetone is a solvent for PVC.

SOLVENT CEMENT A solvent adhesive that contains a solvent that dissolves or softens the surfaces being bonded so that the bonded assembly becomes essentially one piece of the same type of plastic.

SPECIFIC GRAVITY Ratio of the mass of a body to the mass of an equal volume of water at 39°F (4°C), or some other specified temperature.

SPECIFIC HEAT Ratio of the thermal capacity of a substance to that of water at 59°F (15°C).

STRENGTH The mechanical properties of a plastic such as a load or weight carrying ability and ability to withstand sharp blows. Strength properties include tensile, flexural, and tear strength, toughness, flexibility, etc.

TENSILE STRENGTH The capacity of a material to resist a force tending to stretch it. Ordinarily the term is used to denote the force required to stretch a material to rupture and is known variously as “breaking load”, “breaking stress”, “ultimate tensile strength”, and sometimes erroneously as “breaking strain”. In plastics testing, it is the load in pounds per square inch or kilos per square centimeter of original cross-sectional area supported at the moment of rupture by a piece of test sample on being elongated.

THERMAL CONDUCTIVITY Capacity of a plastic material to conduct heat.

THERMAL EXPANSION The increase in length of a dimension under the influence of a change in temperature.

THERMOPLASTIC MATERIALS Materials which soften when heated to normal processing temperatures without the occurrence of appreciable chemical change but are quickly

hardened by cooling. Unlike the thermosetting materials they can be reheated to soften and retooled to "set" almost indefinitely; they may be formed and reformed many times by heat and pressure.

VINYL CHLORIDE PLASTICS Plastics based on resins made by the polymerization of vinyl chloride or copolymerization of vinyl chloride with minor amounts (not over 50%) of other unsaturated compounds.

VINYL PLASTICS Plastics based on resins made from vinyl monomers, except those specifically covered by other classifications such as acrylic and styrene plastics. Typical vinyl plastics are polyvinyl chloride, polyvinyl acetate, polyvinyl alcohol, polyvinyl butyral, and copolymers of vinyl monomers with unsaturated compounds.

WET PIPE SYSTEM A system employing nozzles attached to a piping system containing water and connected to a water supply so that water discharges immediately from the nozzles upon system activation.

YIELD STRESS The force which must be applied to a plastic to initiate flow.

Reference Tables

Pipe Dimensions

Table 7-1: Pipe Dimensions for Schedule 40 pipe

Nominal	Imperial			Metric		
(in)	OD (in)	t (in)	ID (in)	OD (mm)	t (mm)	ID (mm)
⅛	0.405	0.068	0.269	10.3	1.7	6.8
¼	0.540	0.088	0.364	13.7	2.2	9.2
⅜	0.675	0.091	0.493	17.1	2.3	12.5
½	0.840	0.109	0.622	21.3	2.8	15.8
¾	1.050	0.113	0.824	26.7	2.9	20.9
1	1.315	0.133	1.049	33.4	3.4	26.6
1¼	1.660	0.140	1.380	42.2	3.6	35.1
1½	1.900	0.145	1.610	48.3	3.7	40.9
2	2.375	0.154	2.067	60.3	3.9	52.5
2½	2.875	0.203	2.469	73.0	5.2	62.7
3	3.500	0.216	3.068	88.9	5.5	77.9
3½	4.000	0.226	3.548	101.6	5.7	90.1
4	4.500	0.237	4.026	114.3	6.0	102.3
5	5.563	0.258	5.047	141.3	6.6	128.2
6	6.625	0.280	6.065	168.3	7.1	154.1
8	8.625	0.322	7.981	219.1	8.2	202.7
10	10.750	0.365	10.020	273.1	9.3	254.5
12	12.750	0.406	11.938	323.9	10.3	303.2
14	14.000	0.437	13.126	355.6	11.1	333.4
16	16.000	0.500	15.000	406.4	12.7	381.0
18	18.000	0.562	16.876	457.2	14.3	428.7
20	20.000	0.593	18.814	508.0	15.1	477.9
24	24.000	0.687	22.626	609.6	17.4	574.7

Table 7-2: Pipe Dimensions for Schedule 80 pipe

Nominal	Imperial			Metric		
(in)	OD (in)	t (in)	ID (in)	OD (mm)	t (mm)	ID (mm)
⅛	0.405	0.095	0.215	10.3	2.4	5.5
¼	0.540	0.119	0.302	13.7	3.0	7.7
⅜	0.675	0.126	0.423	17.1	3.2	10.7
½	0.840	0.147	0.546	21.3	3.7	13.9
¾	1.050	0.154	0.742	26.7	3.9	18.8
1	1.315	0.179	0.957	33.4	4.5	24.3
1¼	1.660	0.191	1.278	42.2	4.9	32.5
1½	1.900	0.200	1.500	48.3	5.1	38.1
2	2.375	0.218	1.939	60.3	5.5	49.3
2½	2.875	0.276	2.323	73.0	7.0	59.0
3	3.500	0.300	2.900	88.9	7.6	73.7
3½	4.000	0.318	3.364	101.6	8.1	85.4
4	4.500	0.337	3.826	114.3	8.6	97.2
5	5.563	0.375	4.813	141.3	9.5	122.3
6	6.625	0.432	5.761	168.3	11.0	146.3
8	8.625	0.500	7.625	219.1	12.7	193.7
10	10.750	0.593	9.564	273.1	15.1	242.9
12	12.750	0.687	11.376	323.9	17.4	289.0
14	14.000	0.750	12.500	355.6	19.1	317.5
16	16.000	0.843	14.314	406.4	21.4	363.6
18	18.000	0.937	16.126	457.2	23.8	409.6
20	20.000	1.031	17.938	508.0	26.2	455.6
24	24.000	1.218	21.564	609.6	30.9	547.7

Table 7-3: Pipe Dimensions for Schedule 120 pipe

Nominal	Imperial			Metric		
(in)	OD (in)	t (in)	ID (in)	OD (mm)	t (mm)	ID (mm)
½	0.840	0.170	0.500	21.3	4.3	12.7
¾	1.050	0.170	0.710	26.7	4.3	18.0
1	1.315	0.200	0.915	33.4	5.1	23.2
1¼	1.660	0.215	1.230	42.2	5.5	31.2
1½	1.900	0.225	1.450	48.3	5.7	36.8
2	2.375	0.250	1.875	60.3	6.4	47.6
2½	2.875	0.300	2.275	73.0	7.6	57.8
3	3.500	0.350	2.800	88.9	8.9	71.1
4	4.500	0.437	3.626	114.3	11.1	92.1
6	6.625	0.562	5.501	168.3	14.3	139.7
8	8.625	0.718	7.189	219.1	18.2	182.6

Tolerances

Table 7-4: Outside diameters and tolerances for Schedule 40

	Imperial			Metric		
Nominal (in)	OD (in)	Average (in)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (in)	OD (mm)	Average (mm)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (mm)
⅛	0.405	0.004	0.016	10.3	0.10	0.41
¼	0.540	0.004	0.016	13.7	0.10	0.41
⅜	0.675	0.004	0.016	17.1	0.10	0.41
½	0.840	0.004	0.016	21.3	0.10	0.41
¾	1.050	0.004	0.020	26.7	0.10	0.51
1	1.315	0.005	0.020	33.4	0.13	0.51
1¼	1.660	0.005	0.024	42.2	0.13	0.61
1½	1.900	0.006	0.024	48.3	0.15	0.61
2	2.375	0.006	0.024	60.3	0.15	0.61
2½	2.875	0.007	0.030	73.0	0.18	0.76
3	3.500	0.008	0.030	88.9	0.20	0.76
3½	4.000	0.008	0.100	101.6	0.20	2.54
4	4.500	0.009	0.100	114.3	0.23	2.54
5	5.563	0.01	0.100	141.3	0.25	2.54
6	6.625	0.011	0.100	168.3	0.28	2.54
8	8.625	0.015	0.150	219.1	0.38	3.81
10	10.750	0.015	0.150	273.1	0.38	3.81
12	12.750	0.015	0.150	323.9	0.38	3.81
14	14.000	0.015	0.200	355.6	0.38	5.08
16	16.000	0.019	0.320	406.4	0.48	8.13
18	18.000	0.019	0.360	457.2	0.48	9.14
20	20.000	0.023	0.400	508.0	0.58	10.16
24	24.000	0.031	0.480	609.6	0.79	12.19

Table 7-5: Outside diameters and tolerances for Schedule 80

	Imperial			Metric		
Nominal (in)	OD (in)	Average (in)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (in)	OD (mm)	Average (mm)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (mm)
⅛	0.405	0.004	0.016	10.3	0.10	0.41
¼	0.540	0.004	0.016	13.7	0.10	0.41
⅜	0.675	0.004	0.016	17.1	0.10	0.41
½	0.840	0.004	0.016	21.3	0.10	0.41
¾	1.050	0.004	0.020	26.7	0.10	0.51
1	1.315	0.005	0.020	33.4	0.13	0.51
1¼	1.660	0.005	0.024	42.2	0.13	0.61
1½	1.900	0.006	0.024	48.3	0.15	0.61
2	2.375	0.006	0.024	60.3	0.15	0.61
2½	2.875	0.007	0.030	73.0	0.18	0.76
3	3.500	0.008	0.030	88.9	0.20	0.76
3½	4.000	0.008	0.030	101.6	0.20	0.76
4	4.500	0.009	0.030	114.3	0.23	0.76
5	5.563	0.01	0.060	141.3	0.25	1.52
6	6.625	0.011	0.070	168.3	0.28	1.78
8	8.625	0.015	0.150	219.1	0.38	3.81
10	10.750	0.015	0.150	273.1	0.38	3.81
12	12.750	0.015	0.150	323.9	0.38	3.81
14	14.000	0.015	0.200	355.6	0.38	5.08
16	16.000	0.019	0.320	406.4	0.48	8.13
18	18.000	0.019	0.360	457.2	0.48	9.14
20	20.000	0.023	0.400	508.0	0.58	10.16
24	24.000	0.031	0.480	609.6	0.79	12.19

Table 7-6: Outside diameters and tolerances for Schedule 120

	Imperial			Metric		
Nominal (in)	OD (in)	Average (in)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (in)	OD (mm)	Average (mm)	Maximum Out-of-Roundness (Maximum Minus Minimum Diameter) (mm)
½	0.840	0.004	0.016	21.3	0.10	0.41
¾	1.050	0.004	0.020	26.7	0.10	0.51
1	1.315	0.005	0.020	33.4	0.13	0.51
1¼	1.660	0.005	0.024	42.2	0.13	0.61
1½	1.900	0.006	0.024	48.3	0.15	0.61
2	2.375	0.006	0.024	60.3	0.15	0.61
2½	2.875	0.007	0.030	73.0	0.18	0.76
3	3.500	0.008	0.030	88.9	0.20	0.76
4	4.500	0.009	0.030	114.3	0.23	0.76
6	6.625	0.011	0.070	168.3	0.28	1.78
8	8.625	0.015	0.090	219.1	0.38	2.29

Table 7-7: Wall thickness and tolerances for Schedule 40 pipe

	Imperial		Metric	
Nominal (in)	Minimum (in)	Tolerance (in)	Minimum (mm)	Tolerance (mm)
⅛	0.068	0.020	1.730	0.510
¼	0.088	0.020	2.240	0.510
⅜	0.091	0.020	2.310	0.510
½	0.109	0.020	2.770	0.510
¾	0.113	0.020	2.870	0.510
1	0.133	0.020	3.380	0.510
1¼	0.140	0.020	3.560	0.510
1½	0.145	0.020	3.680	0.510
2	0.154	0.020	3.910	0.510
2½	0.203	0.024	5.160	0.610
3	0.216	0.026	5.490	0.660
3½	0.226	0.027	5.740	0.690
4	0.237	0.028	6.020	0.710
5	0.258	0.031	6.550	0.790
6	0.280	0.034	7.110	0.860
8	0.322	0.039	8.180	0.990
10	0.365	0.044	9.270	1.120
12	0.406	0.049	10.310	1.240
14	0.437	0.053	11.100	1.350
16	0.500	0.060	12.700	1.520
18	0.562	0.067	14.270	1.700
20	0.593	0.071	15.060	1.800
24	0.687	0.082	17.450	2.080

Table 7-8: Wall thickness and tolerances for Schedule 80 pipe

	Imperial		Metric	
Nominal (in)	Minimum (in)	Tolerance (in)	Minimum (mm)	Tolerance (mm)
⅛	0.095	0.020	2.41	0.51
¼	0.119	0.020	3.02	0.51
⅜	0.126	0.020	3.20	0.51
½	0.147	0.020	3.73	0.51
¾	0.154	0.020	3.91	0.51
1	0.179	0.021	4.55	0.53
1¼	0.191	0.023	4.85	0.58
1½	0.200	0.024	5.08	0.61
2	0.218	0.026	5.54	0.66
2½	0.276	0.033	7.01	0.84
3	0.300	0.036	7.62	0.91
3½	0.318	0.038	8.08	0.97
4	0.337	0.040	8.56	1.02
5	0.375	0.045	9.53	1.14
6	0.432	0.052	10.97	1.32
8	0.500	0.060	12.70	1.52
10	0.593	0.071	15.06	1.80
12	0.687	0.082	17.45	2.08
14	0.750	0.090	19.05	2.29
16	0.843	0.101	21.41	2.57
18	0.937	0.112	23.80	2.84
20	1.031	0.124	26.19	3.15
24	1.218	0.146	30.94	3.71

Table 7-9: Wall thickness and tolerances for Schedule 120 pipe

	Imperial		Metric	
Nominal (in)	Minimum (in)	Tolerance (in)	Minimum (mm)	Tolerance (mm)
½	0.170	0.020	4.32	0.51
¾	0.170	0.020	4.32	0.51
1	0.200	0.024	5.08	0.61
1¼	0.215	0.026	5.46	0.66
1½	0.225	0.027	5.72	0.69
2	0.250	0.030	6.35	0.76
2½	0.300	0.036	7.62	0.91
3	0.350	0.042	8.89	1.07
4	0.437	0.052	11.10	1.32
6	0.562	0.067	14.27	1.70
8	0.718	0.086	18.24	2.18

Skid Quantities

Table 7-10: Pallet and truck load quantities

Nominal (in)	Pieces per Skid	Feet per Skid	Skid Dimensions	Plain End Skids per Truck	Belled End Skids per Truck	Plain End Skids per Truck	Belled End Skids per Truck
½	285	5700	44 × 08	32	N/A	32	N/A
¾	263	5260	43 × 10	28	N/A	24	N/A
1	214	4280	44 × 12	24	N/A	20	N/A
1¼	118	2360	43 × 11	28	28	28	28
1½	103	2060	43 × 12	28	28	28	28
2	83	1660	44 × 14	28	28	24	24
2½	54	1080	44 × 14	28	28	24	24
3	42	840	42 × 16	24	24	24	24
4	26	520	44 × 16	24	24	24	24
5	20	400	42 × 19	20	20	20	20
6	17	340	43 × 21	16	16	16	16
8	11	220	36 × 27	12	12	12	12
10	7	140	43 × 23	12	12	12	12
12	5	100	36 × 27	12	12	12	12
14	5	100	42 × 31	12	12	12	12
16	3	60	28 × 19	10	10	10	10
18*	3	60	54 × 21	8	8	8	8
18*	2	40	36 × 21	8	8	8	8
20	2	40	40 × 23	16	16	16	16
24	2	40	48 × 28	12	12	12	12

Pipe Capacity - Schedule 40

		Imperial			Metric		
Pipe Size (in)	**ID (in)**	**in³**	**ft³**	**Gallons**	**cm³**	**mm³**	**L**
⅛	0.269	0.682	3.95×10^{-4}	2.95×10^{-3}	11.176	1.12×10^{4}	0.011
¼	0.364	1.249	7.23×10^{-4}	5.41×10^{-3}	20.463	2.05×10^{4}	0.020
⅜	0.493	2.291	1.33×10^{-3}	9.92×10^{-3}	37.538	3.75 x 104	0.038
½	0.622	3.646	2.11×10^{-3}	0.016	59.752	5.98 x 104	0.060
¾	0.824	6.399	3.70×10^{-3}	0.028	104.860	1.05×10^{5}	0.105
1	1.049	10.371	6.00×10^{-3}	0.045	169.950	1.70 x 105	0.170
1¼	1.380	17.949	0.010	0.078	294.120	2.94 x 105	0.294
1½	1.610	24.430	0.014	0.106	400.340	4.00 x 105	0.400
2	2.067	40.267	0.023	0.174	659.860	6.60 x 105	0.660
2½	2.469	57.453	0.033	0.249	941.490	9.41 x 105	0.941
3	3.068	88.712	0.051	0.384	1454.000	1.45×10^{6}	1.454
3½	3.548	118.642	0.069	0.514	1944.000	1.94×10^{6}	1.944
4	4.026	152.763	0.088	0.661	2503.000	2.50×10^{6}	2.503
5	5.047	240.070	0.139	1.039	3934.000	3.93×10^{6}	3.934
6	6.065	346.683	0.201	1.501	5681.000	5.68×10^{6}	5.681
8	7.981	600.324	0.347	2.599	9838.000	9.84×10^{6}	9.838
10	10.02	946.251	0.548	4.096	15506.000	1.55×10^{7}	15.506
12	11.938	1343.180	0.777	5.815	22011.000	2.20×10^{7}	22.011
14	13.126	1623.813	0.940	7.029	26610.000	2.66×10^{7}	26.610
16	15.000	2120.575	1.227	9.180	34750.000	3.48×10^{7}	34.750
18	16.876	2684.171	1.553	11.620	43986.000	4.40×10^{7}	43.986
20	18.814	3336.057	1.931	14.442	54668.000	5.47×10^{7}	54.668
24	22.626	4824.882	2.792	20.887	79066.000	7.91×10^{7}	79.066

Pipe Capacity - Schedule 80

		Imperial			Metric		
Pipe Size (in)	**ID (in)**	**in³**	**ft³**	**Gallons**	**cm³**	**mm³**	**L**
⅛	0.215	0.436	2.52×10^{-4}	1.89×10^{-3}	7.139	7.14×10^{3}	0.007
¼	0.302	0.860	4.97×10^{-4}	3.72×10^{-3}	14.086	1.41 x 104	0.014
⅜	0.423	1.686	9.76×10^{-4}	7.30×10^{-3}	27.635	2.76 x 104	0.028
½	0.546	2.810	1.63×10^{-3}	0.012	46.042	4.60 x 104	0.046
¾	0.742	5.189	3.00×10^{-3}	0.022	85.032	8.50×10^{4}	0.085
1	0.957	8.632	5.00×10^{-3}	0.037	141.450	1.41 x 105	0.141
1¼	1.278	15.393	0.009	0.067	252.250	2.52 x 105	0.252
1½	1.500	21.206	0.012	0.092	347.500	3.48 x 105	0.348
2	1.939	35.435	0.021	0.153	580.670	5.81 x 105	0.581
2½	2.323	50.859	0.029	0.220	833.430	8.33 x 105	0.833
3	2.900	79.262	0.046	0.343	1299.000	1.30×10^{6}	1.299
3½	3.364	106.655	0.062	0.462	1748.000	1.75 x 106	1.748
4	3.826	137.963	0.080	0.597	2261.000	2.26 x 106	2.261
5	4.813	218.325	0.126	0.945	3578.000	3.58 x 106	3.578
6	5.761	312.800	0.181	1.354	5126.000	5.13 x 106	5.126
8	7.625	547.962	0.317	2.372	8980.000	8.98 x 106	8.980
10	9.564	862.085	0.499	3.732	14127.000	1.41×10^{7}	14.127
12	11.376	1219.692	0.706	5.280	19987.000	2.00×10^{7}	19.987
14	12.500	1472.622	0.852	6.375	24132.000	2.41×10^{7}	24.132
16	14.314	1931.048	1.118	8.360	31644.000	3.16×10^{7}	31.644
18	16.126	2450.893	1.418	10.610	40163.000	4.02×10^{7}	40.163
20	17.938	3032.628	1.755	13.128	49696.000	4.97×10^{7}	49.696
24	21.564	4382.579	2.536	18.972	71818.000	7.18×10^{7}	71.818

Pipe Capacity - Schedule 120

		Imperial			Metric			
Pipe Size (in)	**ID (in)**	**in^3**	**ft^3**	**Gallons**	**cm^3**	**mm^3**	**L**
½	0.5	2.356	1.36×10^{-3}	0.010	38.611	3.86×10^{4}	0.039
¾	0.71	4.751	2.75×10^{-3}	0.021	77.856	7.79×10^{4}	0.078
1	0.915	7.891	4.57×10^{-3}	0.034	129.31	1.29×10^{5}	0.129
1¼	1.23	14.259	0.008	0.062	233.66	2.34×10^{5}	0.234
1½	1.45	19.816	0.011	0.086	324.72	3.25×10^{5}	0.325
2	1.875	33.134	0.019	0.143	542.97	5.43×10^{5}	0.543
2½	2.275	48.779	0.028	0.211	799.35	7.99×10^{5}	0.799
3	2.8	73.890	0.043	0.320	1211	1.21×10^{6}	1.211
4	3.626	123.916	0.072	0.536	2031	2.03×10^{6}	2.031
6	5.501	285.203	0.165	1.235	4674	4.67×10^{6}	4.674
8	7.189	487.089	0.282	2.109	7982	7.98×10^{6}	7.982

Weight of Water

Units	Pounds (lb)	Kilograms (kg)
1 gallon (gal)	8.35	3.79
1 liter (L)	2.21	1
1 cubic yard (yd^3)	1686	765
1 cubic foot (ft^3)	62.4	28.3
1 cubic inch (in^3)	0.036	0.016
1 cubic centimeter (cm^3)	0.002	0.001
1 cubic meter (m^3)	2210	1000

Conversions Tables

Length

		Convert To, Multiply By:							
		millimeters (mm)	**centimeters (cm)**	**meters (m)**	**kilometers (km)**	**inches (in)**	**feet (ft)**	**miles (mi)**	**nautical miles (nmi)**
Convert From	**millimeters (mm)**	1	0.1	0.001	1×10^{-6}	0.0394	3.28×10^{-3}	6.22×10^{-7}	5.40×10^{-7}
	centimeters (cm)	10	1	0.01	1×10^{-5}	0.394	0.0328	6.22×10^{-6}	5.40×10^{-6}
	meters (m)	1000	100	1	0.001	39.4	3.28	6.21×10^{-4}	5.40×10^{-4}
	kilometers (km)	1×10^{6}	1×10^{5}	1000	1	3.94×10^{4}	3281	0.621	0.540
	inches (in)	25.4	2.54	0.0254	2.54×10^{-5}	1	0.0833	1.58×10^{-5}	1.37×10^{-5}
	feet (ft)	305	30.5	0.305	3.05×10^{-4}	12	1	1.89×10^{-4}	1.65×10^{-4}
	nautical miles (nmi)	1.85×10^{6}	1.85×10^{5}	1852	1.85	7.29×10^{4}	6076	1.15	1

Area

		Convert To, Multiply By:						
		millimeters (mm^2)	**square centimeters (cm^2)**	**square meters (m^2)**	**square kilometers (km^2)**	**square inches (in^2)**	**square feet (ft^2)**	**square miles (mi^2)**
Convert From	**square millimeters (mm^2)**	1	0.01	1×10^{-6}	1×10^{-12}	1.55×10^{-3}	1.08×10^{-5}	3.86×10^{-13}
	square centimeters (cm^2)	100	1	1×10^{-4}	1×10^{-10}	0.155	1.08×10^{-3}	3.86×10^{-11}
	square meters (m^2)	1×10^{6}	1×10^{4}	1	1×10^{-6}	1550	10.8	3.86×10^{-7}
	square kilometers (km^2)	1×10^{12}	1×10^{10}	1×10^{6}	1	1.55×10^{9}	1.08×10^{7}	0.386
	square inches (in^2)	645	6.45	6.45×10^{-4}	6.45×10^{-10}	1	6.94×10^{-3}	2.49×10^{-10}
	square feet (ft^2)	9.29×10^{4}	929	0.0929	9.29×10^{-8}	144	1	3.59×10^{-8}
	square miles (mi^2)	2.59×10^{12}	2.59×10^{10}	2.59×10^{6}	2.59	4.01×10^{9}	2.79×10^{7}	1

Volume

		Convert To, Multiply By:							
		cubic inces (in^3)	cubic feet (ft^3)	cubic yards (yd^3)	gallons (gal)	cubic millimeters (mm^3)	cubic centime-ters (cm^3)	cubic meters (m^3)	liters (L)
Convert From	cubic inches (in^3)	1	5.79×10^{-4}	2.15×10^{-5}	4.33×10^{-3}	1.64×10^{4}	16.4	1.64×10^{-5}	0.0164
	cubic feet (ft^3)	1728	1	0.0370	7.46	2.83×10^{7}	2.83×10^{4}	0.0283	28.3
	cubic yards (yd^3)	4.66×10^{4}	27.0	1	202	7.63×10^{8}	7.63×10^{5}	0.763	763
	gallons (gal)	231	0.134	4.95×10^{-3}	1	3.79×10^{6}	3.79×10^{3}	3.79×10^{-3}	3.79
	cubic millimeters (mm^3)	6.10×10^{-5}	3.53×10^{-8}	1.31×10^{-9}	2.64×10^{-7}	1	1×10^{-3}	1×10^{-9}	1×10^{-6}
	cubic centimeters (cm^3)	0.0610	3.53×10^{-5}	1.31×10^{-6}	2.64×10^{-4}	1000	1	1×10^{-6}	0.001
	cubic meters (m^3)	6.10×10^{4}	35.3	1.31	264	1×10^{9}	1×10^{6}	1	1000
	liters (L)	61.0	0.0353	1.31×10^{-3}	0.264	1×10^{6}	1000	0.001	1

Mass

		Convert To, Multiply By:							
		ounce	pound	kilogram	metric slug	slug	short ton	metric ton	long ton
Convert From	ounce	1	0.0625	0.0283	2.89×10^{-3}	1.94×10^{-3}	3.13×10^{-5}	2.83×10^{-5}	2.79×10^{-5}
	pound	16.0	1	0.452	0.0463	0.0311	5.00×10^{-4}	4.54×10^{-4}	4.46×10^{-4}
	kilogram	35.3	2.21	1	0	0.0685	1.10×10^{-3}	1×10^{-3}	9.84×10^{-4}
	metric slug	346	21.6	9.81	1	0.671	0.0108	9.80×10^{-3}	9.62×10^{-3}
	slug	515	32.2	14.6	1.49	1	0.0161	0.0146	0.0144
	short ton	3.20×10^{4}	2000	907	92.5	62.2	1	0.909	0.893
	metric ton	3.53×10^{4}	2205	1000	102	68.5	1.1	1	0.98
	long ton	3.58×10^{4}	2240	1016	104	69.6	1.12	1.02	1

Density

		Convert To, Multiply By:					
		pounds per cubic inch (lbs/in3)	pounds per cubic foot (lbs/ft3)	pounds per gallon (lbs/gal)	grams per cubic centimeter (g/cm3)	grams per cubic millimeter (g/mm3)	grams per liter (g/L)
Convert From	pounds per cubic inch (lb/in^3)	1	1727	231	27.7	0.0277	2.77×10^{4}
	pounds per cubic feet (lb/ft^3)	5.79×10^{-4}	1	0.134	0.0160	1.60×10^{-5}	16
	pounds per gallon (lb/gal)	4.33×10^{-3}	7.48	1	0	0.0001	120
	grams per cubic centimeter (g/cm^3)	3.61×10^{-2}	62.4	8.35	1	1000	1000
	grams per cubic millimeter (g/mm^3)	36.1	6.20×10^{4}	8350	1×10^{-3}	1	1×10^{-6}
	grams per liter (g/L)	3.61×10^{-5}	6.24×10^{-2}	8.35×10^{-3}	0.001	1×10^{6}	1

Force

		Convert To, Multiply By:			
		dynes	newtons (N)	poundforce (lbf)	kilogramforce (kgf)
Convert From	dynes	1	1×10^{-5}	2.25×10^{-6}	1.02×10^{-6}
	newtons (N)	1×10^{5}	1	0.225	0.102
	poundforce (lbf)	4.45×10^{5}	4.45	1	0.454
	kilogramforce (kgf)	9.81×10^{5}	9.81	2.21	1

Mass

		Convert To, Multiply By:							
		ounce	**pound**	**kilogram**	**metric slug**	**slug**	**short ton**	**metric ton**	**long ton**
Convert From	**ounce**	1	0.0625	0.0283	2.89×10^{-3}	1.94×10^{-3}	3.13×10^{-5}	2.83×10^{-5}	2.79×10^{-5}
	pound	16.0	1	0.452	0.0463	0.0311	5.00×10^{-4}	4.54×10^{-4}	4.46×10^{-4}
	kilogram	35.3	2.21	1	0	0.0685	1.10×10^{-3}	1×10^{-3}	9.84×10^{-4}
	metric slug	346	21.6	9.81	1	0.671	0.0108	9.80×10^{-3}	9.62×10^{-3}
	slug	515	32.2	14.6	1.49	1	0.0161	0.0146	0.0144
	short ton	3.20×10^{4}	2000	907	92.5	62.2	1	0.909	0.893
	metric ton	3.53×10^{4}	2205	1000	102	68.5	1.1	1	0.98
	long ton	3.58×10^{4}	2240	1016	104	69.6	1.12	1.02	1

Energy

		Convert To, Multiply By:					
		British thermal unit (BTU)	**foot-pound (ft-lb)**	**horsepower-hour (hp-hr)**	**joules (J)**	**calorie (C)**	**kilowatt-hour (kW-hr)**
Convert From	British thermal unit (BTU)	1	0.0625	0.0283	2.89×10^{-3}	1.94×10^{-3}	3.13×10^{-5}
	foot-pound (ft-lb)	16.0	1	0.452	0.0463	0.0311	5.00×10^{-4}
	horsepower-hour (hp-hr)	35.3	2.21	1	0	0.0685	1.10×10^{-3}
	joules (J)	346	21.6	9.81	1	0.671	0.0108
	calorie (C)	515	32.2	14.6	1.49	1	0.0161
	kilowatt-hour (kW-hr)	3.58×10^{4}	2240	1016	104	69.6	1.12

Velocity

		Convert To, Multiply By:			
		feet per seconds (ft/s)	**miles per hour (mph)**	**meters per second (m/s)**	**kilometers per hour (km/hr)**
Convert From	feet per seconds (ft/s)	1	0.0625	0.0283	2.89×10^{-3}
	miles per hour (mph)	16.0	1	0.452	0.0463
	meters per second (m/s)	35.3	2.21	1	0
	kilometers per hour (km/hr)	3.58×10^{4}	2240	1016	104

Flow Rate

		Convert To, Multiply By:			
		gallons per minute (GPM)	**cubic feet per second (ft^3/s)**	**liters per second (L/s)**	**cubic meters per hour (m^3/hr)**
Convert From	gallons per minute (GPM)	1	0.0625	0.0283	2.89×10^{-3}
	cubic feet per second (ft^3/s)	16.0	1	0.452	0.0463
	liters per second (L/s)	35.3	2.21	1	0
	cubic meters per hour (m^3/hr)	3.58×10^{4}	2240	1016	104

Pressure

		Convert To, Multiply By:						
		pounds per square inch (psi)	**atmo-spheres (atm)**	**kilograms per square meter (kg/m^2)**	**feet of water (68°F)**	**millimeters of mercury (32°F)**	**bars**	**mega Pascals (MPa)**
Convert From	pounds per square inch (psi)	1	0.0680	703	2.31	51.8	0.0690	6897
	atmospheres (atm)	14.7	1	1.03×10^{4}	34.0	760	1.01	1.01×10^{5}
	kilograms per square meter (kg/m^2)	1.42×10^{-3}	9.68×10^{-5}	1	3.29×10^{-3}	0.0735	9.80×10^{-5}	9.80
	feet of water (68°F)	0.433	0.0295	304	1	22.4	0.0298	2984
	millimeters of mercury (32°F)	1.93×10^{-2}	1.32×10^{-3}	13.6	0.0447	1	1.33×10^{-3}	133
	bars	14.5	0.987	1.02×10^{4}	33.5	750	1	1×10^{5}
	megaPascals (MPa)	1.45×10^{-4}	9.87×10^{-6}	0.102	3.35×10^{-4}	7.50×10^{-3}	1×10-5	1

Useful Formulas and Symbols

Symbols

D = outside diameter of pipe, inches

d = inside diameter of pipe, inches (Average based on mean wall)

t = average wall thickness, inches

P = pressure, psi

S = stress, psi

Formulas

$A_0 = D \times \pi/12$ = outside pipe surface (ft^2/ft)

$A_1 = d \times \pi/12$ = inside surface (ft^2/ft)

$A = (D^2 - d^2) \times \pi/4$ = cross-sectional plastic area (in^2)

$A_f = d^2 \times \pi/4$ = cross sectional flow area (in^2).

$W_{pvc} = .632 \times A$ = weight of pipe (lb/ft)

$W_{cpvc} = .705 \times A$ = weight of pipe (lb/ft)

$W_w = 0.433\ A_f$ = weight of water filling, lb. Per ft. length

$r_g = \sqrt{\frac{I}{A}} = \frac{\sqrt{D^2 + d^2}}{4}$ = radius of gyration, inches

$I = Ar_g^2 = .0491\ (D^4 - d^4)$ = moment of inertia, inches fourth

$Z = 2I/D = 0.0982 \times (D^4 - d^4)/D$ = section modulus, inches cube

$W_{wfp} = W_{pvc}$ (or W_{cpvc}) + W_w = weight of water filled pipe (lb/ft)

Capacity

$V_G = V \times 0.004329$ = Volume capacity (gal/ft)

$V = 0.7854 \times d^2 \times 12$ = Volume capacity (in^3/ft)

Pressure Rating

$$S = \frac{P(D - t)}{2t}$$

Industry Standards

ASTM Standard Specifications

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2665	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2672	Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement
ASTM D2846	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D6263	Standard Specification for Extruded Rods and Bars Made From Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC)
ASTM F437	Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F442	Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F480	Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), Sch 40 and Sch 80
ASTM F493	Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F656	Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM F913	Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F1866	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings

ASTM Standard Methods

ASTM D1598	Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
ASTM D1599	Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
ASTM D2122	Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2152	Standard Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2444	Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM D2564	Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

ASTM Standard Practices

ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride)(PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
ASTM F402	Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F610	Standard Practice for Evaluating the Quality of Molded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings by the Heat Reversion Technique
ASTM F645	Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems
ASTM F690	Standard Practice for Underground Installation of Thermoplastic Pressure Piping Irrigation Systems
ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique

Toxicology

NSF/ANSI Std 61	Drinking Water System Components - Health Effects
NSF/ANSI Std 14	Plastics Piping System Components and Related Materials
US FDA CFR	Title 21 - Food and Drugs

Fire Performance

ASTM D2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM D635	Standard Test Method for Rate of Buring andor Extent and Time of Burning of Plastics in a Horizontal Position
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E162	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
FM 1635	Plastic Pipe and Fittings for Automatic Sprinkler Systems
ANSI/FM 4910	American National Standard for Cleanroom Materials Flammability Test Protocol
UL 94	Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 723	Standard for Test for Surface Burning Characteristics of Building Materials
UL 1821	Standard for Thermoplastic Sprinkler Pipe and Fittings for Fire Protection Service
UL 1887	Standard for Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics
ULC CAN-S102.2	Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

Other

CSA Standard B137.3-99	Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications

Product Specifications

PVC Industrial Plus Pipe: Schedule 40

Application

Corrosion resistant pressure pipe, IPS sizes 1/2" through 24", for use at temperatures up to and including 140°F (60°C). Pressure rating varies with schedule, pipe size, and temperature as stated in Section 3. Pipe is also suitable for PVC plastic drain, waste, and vent (DWV) applications. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Pipe exhibits excellent physical properties and flammability characteristics. Typical applications include chemical processing, plating, high purity applications, potable water systems, water and waste water treatment, drainage, irrigation, agricultural, and other applications involving corrosive fluid transfer.

Scope

This specification outlines minimum manufacturing requirements for polyvinyl chloride (PVC) Schedule 40 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F (60°C). This pipe meets or exceeds the industry standards and requirements as set forth by ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120, ASTM D2665 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings, NSF/ANSI Standard 61 Drinking Water System Components – Health Effects, and NSF/ANSI Standard 14 Plastics Piping System Components and Related Materials.

PVC Materials

The material used in the manufacture of the pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds, trade name designation H707 PVC. This compound shall be white or gray in color as specified, and shall be approved by NSF International for use with potable water (NSF Std 61).

Dimensions

All sizes of PVC Schedule 40 pipe shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. PVC Sch 40 pipe sizes 1¼" through 24" diameters shall also meet the requirements of ASTM D2665 and shall be dual marked as such. Each production run of pipe manufactured in compliance to the standard shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785 and ASTM D2665 as applicable. All belled end pipe shall have tapered sockets to create an interference type fit, which shall meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement. All PVC Schedule 40 pipe must also meet the requirements of NSF/ANSI Standard 14 and CSA Standard B137.3 Rigid polyvinyl chloride (PVC) pipe and fittings for pressure applications, and shall bear the mark of these listing agencies. This pipe shall have a flame spread rating of 0-25 when tested for surface burning characteristics in accordance with ULC CAN-S102.2 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies or equivalent.

Marking

Product marking shall meet the requirements of ASTM D1785 and ASTM D2665 as applicable and shall include the manufacturer's name (or the manufacturer's trademark when privately labeled), the nominal pipe size, the material designation code, the pipe schedule and pressure rating in psi for water at 73°F (23°C), the ASTM designation D1785, the ASTM designation D2665 (when dual marked), the independent laboratory's seal of approval for potable water usage, and the date and time of manufacture.

Sample Specification

All PVC Schedule 40 pipe shall be manufactured from a Type I, Grade I, Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality. The pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer. Standard lengths of pipe sizes 6" and larger shall be beveled on each end by the pipe manufacturer. All pipe shall be stored indoors after production at the manufacturing site until shipped from factory. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications. All pipe shall be manufactured by Georg Fischer Harvel LLC.

The pressure ratings given are for water, non-shock, at 73°F (23°C). The following temperature derating factors are to be applied to the working pressure ratings (WP) listed when operating at elevated temperatures.

Multiply the working pressure rating of the selected pipe at 73°F (23°C) by the appropriate derating factor to determine the maximum working pressure rating of the pipe at the elevated temperature chosen.

The maximum service temperature for PVC is 140°F (60°C).

Solvent cemented joints should be utilized when working at or near maximum temperatures. GF Piping Systems does not recommend the use of PVC for threaded connections at temperatures above 110°F (43°C); use flanged joints, unions, or roll grooved couplings where disassembly is necessary at elevated temperatures.

Threading of Schedule 40 PVC pipe is not a recommended practice due to insufficient wall thickness. Thread only Schedule 80 or heavier walls. Threading requires a 50% reduction in pressure rating stated for plain end pipe at 73°F (23°C).

Chemical resistance data should be referenced for proper material selection and possible derating when working with fluids other than water.

Cell Classification 12454 = PVC Type I Grade I = PVC 1120

Pipe sizes shown are manufactured in strict compliance with ASTM D1785 and ASTM D2665 where applicable.

PVC Industrial Plus Pipe: Schedule 80

Application

Corrosion resistant pressure pipe, IPS sizes 1/8" through 24", for use at temperatures up to and including 140°F (60°C). Pressure rating varies with schedule, pipe size, and temperature as stated in Section 3. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Pipe exhibits excellent physical properties and flammability characteristics. Typical applications include chemical processing, plating, high purity applications, potable water systems, water and waste water treatment, drainage, irrigation, agricultural, and other applications involving corrosive fluid transfer.

Scope

This specification outlines minimum manufacturing requirements for polyvinyl chloride (PVC) Schedule 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F (60°C). This pipe meets or exceeds the industry standards and requirements as set forth by ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120, NSF/ANSI Standard 61 Drinking Water System Components – Health Effects, and NSF/ANSI Standard 14 Plastics Piping System Components and Related Materials.

PVC Materials

The material used in the manufacture of the pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds, trade name designation H707 PVC. This compound shall be white or gray in color as specified, and shall be approved by NSF International for use with potable water (NSF Std 61).

Dimensions

All sizes of PVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to the standard shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785. All belled end pipe shall have tapered sockets to create an interference type fit, which shall meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement. All PVC Schedule 80 pipe must also meet the requirements of NSF/ANSI Standard 14 and CSA Standard B137.3 Rigid polyvinyl chloride (PVC) pipe and fittings for pressure applications, and shall bear the mark of these listing agencies. This pipe shall have a flame spread rating of 0-25 when tested for surface burning characteristics in accordance with ULC CAN-S102.2 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies or equivalent.

Marking

Product marking shall meet the requirements of ASTM D1785 and shall include the manufacturer's name (or the manufacturer's trademark when privately labeled), the nominal pipe size, the material designation code, the pipe schedule and pressure rating in psi for water at 73°F (23°C), the ASTM designation D1785, the independent laboratory's seal of approval for potable water usage, and the date and time of manufacture.

Sample Specification

All PVC Schedule 80 pipe shall be manufactured from a Type I, Grade I, Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785, consistently meeting or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality. The pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer. Standard lengths of pipe sizes 6" and larger shall be beveled on each end by the pipe manufacturer. All pipe shall be stored indoors after production at the manufacturing site until shipped from factory. This pipe shall carry the National Sanitation Foundation (NSF) seal of

approval for potable water applications. All pipe shall be manufactured by Georg Fischer Harvel LLC.

The pressure ratings given are for water, non-shock, at 73°F (23°C). The following temperature derating factors are to be applied to the working pressure ratings (WP) listed when operating at elevated temperatures.

Multiply the working pressure rating of the selected pipe at 73°F (23°C) by the appropriate derating factor to determine the maximum working pressure rating of the pipe at the elevated temperature chosen.

The maximum service temperature for PVC is 140°F (60°C).

Solvent cemented joints should be utilized when working at or near maximum temperatures. GF Piping Systems does not recommend the use of PVC for threaded connections at temperatures above 110°F (43°C); use flanged joints, unions, or roll grooved couplings where disassembly is necessary at elevated temperatures.

Thread only Schedule 80 or heavier walls. Threading requires a 50% reduction in pressure rating stated for plain end pipe at 73°F (23°C).

Chemical resistance data should be referenced for proper material selection and possible derating when working with fluids other than water.

Cell Classification 12454 = PVC Type I Grade I = PVC 1120

Pipe sizes shown are manufactured in strict compliance with ASTM D1785.

CPVC Pipe: Schedule 40 & 80

Application

Corrosion resistant pressure pipe, IPS sizes 1/4" through 24", for use at temperatures up to and including 200°F (93°C). Pressure rating varies with schedule, pipe size, and temperature as stated in Section 3. Pipe is also suitable for PVC plastic drain, waste, and vent (DWV) applications. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Pipe exhibits excellent physical properties and flammability characteristics. Typical applications include chemical processing, plating, high purity applications, hot and cold potable water systems, water and waste water treatment, and other industrial applications involving hot, corrosive fluid transfer.

Scope

This specification outlines minimum manufacturing requirements for chlorinated polyvinyl chloride (CPVC) Schedule 40 and 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 200°F (93°C). This pipe meets or exceeds the industry standards and requirements as set forth by ASTM F441 Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80, NSF/ANSI Standard 61 Drinking Water System Components – Health Effects, and NSF/ANSI Standard 14 Plastics Piping System Components and Related Materials.

PVC Materials

The material used in the manufacture of the pipe shall be domestically produced rigid chlorinated polyvinyl chloride (CPVC) compound, Type IV Grade I, with a Cell Classification of 23447 as defined in ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds. This compound shall be light gray in color, and shall be approved by NSF International for use with potable water (NSF Std 61).

Dimensions

All sizes of CPVC Schedule 40 and 80 pipe shall be manufactured in strict accordance to the requirements of ASTM F441 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to the standard shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM F441. All belled end pipe shall have tapered sockets to create an interference type fit, which shall meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672 Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.

Marking

Product marking shall meet the requirements of ASTM F441 and shall include the manufacturer's name (or the manufacturer's trademark when privately labeled), the nominal pipe size, the material designation code, the pipe schedule and pressure rating in psi for water at 73°F (23°C), the ASTM designation F441, the independent laboratory's seal of approval for potable water usage, and the date and time of manufacture. Marking shall also include the flame spread rating and smoke development rating when tested and listed for surface burning characteristics per ULC CAN-S102.2 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies (Flame Spread of < 25 and Smoke Development of < 50).

Sample Specification

All CPVC Schedule 40 and 80 pipe shall be manufactured from a Type IV, Grade I, Chlorinated Polyvinyl Chloride (CPVC) compound with a minimum Cell Classification of 23447 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM F441, consistently meeting or exceeding the Quality Assurance test requirements of these standards

with regard to material, workmanship, burst pressure, flattening, and extrusion quality. The pipe shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer. Standard lengths of pipe sizes 6" and larger shall be beveled on each end by the pipe manufacturer. All pipe shall be stored indoors after production at the manufacturing site until shipped from factory. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications. The pipe shall have a Flame Spread rating of < 25 and a Smoke Development rating of < 50 when tested and listed for Surface Burning Characteristics in accordance with ULC CAN-S102.2 or equivalent. All pipe shall be manufactured by Georg Fischer Harvel LLC.

The pressure ratings given are for water, non-shock, at 73°F (23°C). The following temperature derating factors are to be applied to the working pressure ratings (WP) listed when operating at elevated temperatures.

Multiply the working pressure rating of the selected pipe at 73°F (23°C) by the appropriate derating factor to determine the maximum working pressure rating of the pipe at the elevated temperature chosen.

The maximum service temperature for CPVC is 200°F (93°C).

Solvent cemented joints should be utilized when working at or near maximum temperatures. GF Piping Systems does not recommend the use of CPVC for threaded connections at temperatures above 150°F (66°C); use flanged joints, unions, or roll grooved couplings where disassembly is necessary at elevated temperatures.

Threading of Schedule 40 CPVC pipe is not a recommended practice due to insufficient wall thickness. Thread only Schedule 80 or heavier walls. Threading requires a 50% reduction in pressure rating stated for plain end pipe at 73°F (23°C).

Chemical resistance data should be referenced for proper material selection and possible derating when working with fluids other than water.

Cell Classification 23447 = CPVC Type IV Grade I = CPVC 4120

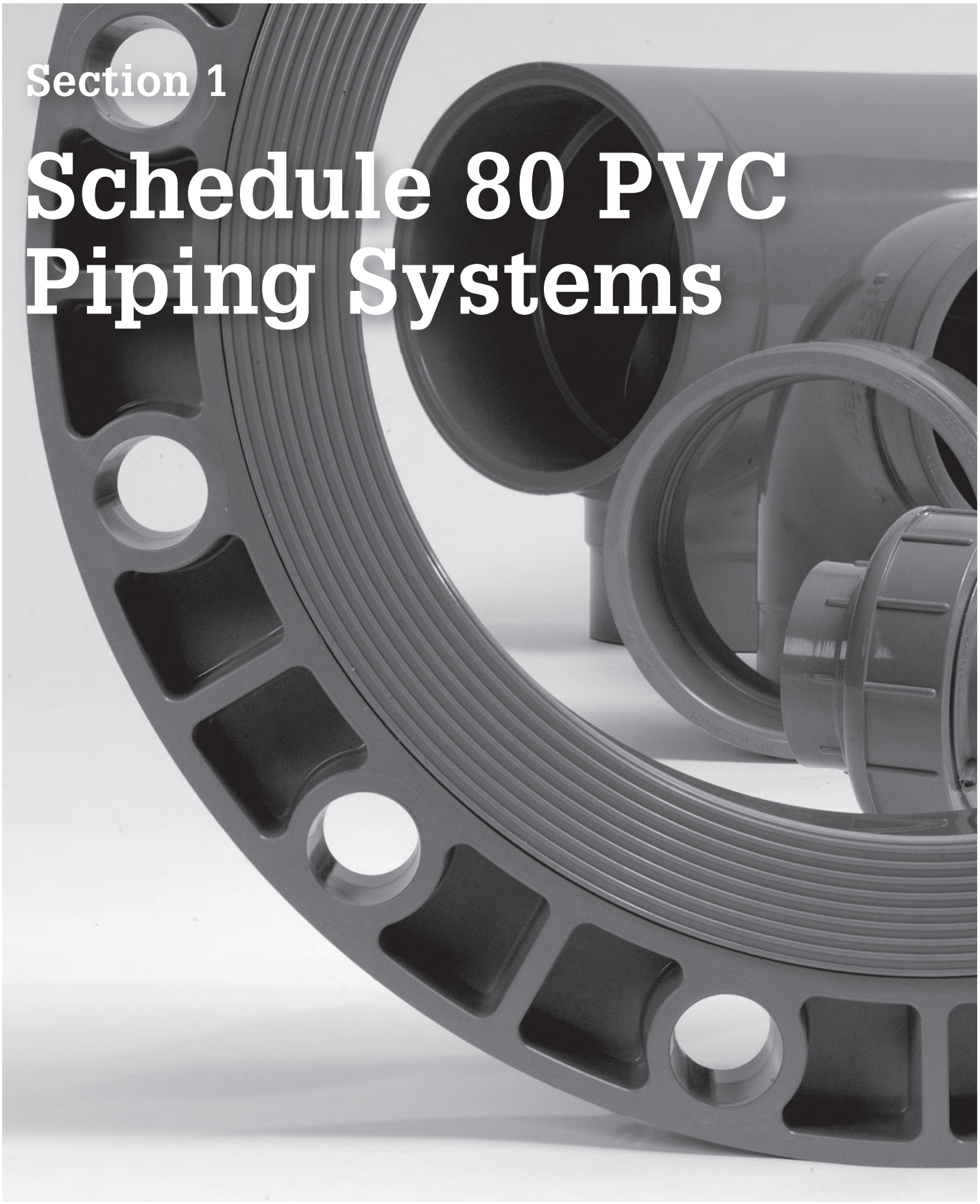
Pipe sizes shown are manufactured in strict compliance with ASTM F441.

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Section 1

Schedule 80 PVC Piping Systems



Glossary

FPT	=	**Female Pipe Thread**
MPT	=	**Male Pipe Thread**
S	=	**Tapered Socket**
SPG	=	**Spigot End (same dimension as pipe outside diameter)**
*****	=	**Non-Returnable / Non-cancellable**
^	=	**40% Restocking Fee**
HS	=	**High Strength Design**
SL	=	**Streamline Design**
BUSH	=	**Assembled Fitting from Molded Components**
FAB	=	**Fabricated Fitting**

The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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Specifications, Standards and Tolerances

Specifications and Standards

NSF/ANSI Standard 14

NSF/ANSI Standard 61

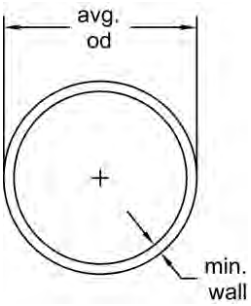
ASTM D 1784	:	Material PVC Type I, Grade I Gray (cell classification 12454)
ASTM D 1785	:	PVC Schedule 80 Pipe
ASTM D 2467	:	PVC Schedule 80 Socket & Threaded Fittings
ASTM D 2464	:	PVC Schedule 80 Threaded Fittings
ASTM F 1498	:	PVC Schedule 80 Taper Threads
ASTM D 2672	:	PVC Schedule 80 Tapered Sockets for Bell End Pipe
ASTM F 1970	:	PVC Schedule 80 Unions
ANSI B16.5	:	Outside Diameter & Flange Bolt Hole Patterns
ANSI B1.20.1	:	PVC Schedule 80 NPT Threads
CSA B137.3	:	PVC Schedule 80 Pipe

Molded Dimension Tolerances

A	Piston Position; Expansion Joints : ±0.03
D	Outside Diameter : ± 0.06
G, G1	Intersections of centerlines to bottom of socket; 90° Ells, Tees : up to 4" ±0.03; 6" and above ±0.06
GJ, GN	Intersections of centerlines to bottom of socket; 45° Wyes : up to 4" ±0.03; 6" and above ±0.06
H, HJ, HN	Intersections of centerlines to face of fitting; 90° Ells, 45° Ells, Tees, 45° Wyes : up to 4" ±0.03; 6" and above ±0.06
HL	Socket Bottom to Face of Fitting : up to 4" ±0.03; 6" and above ±0.06
J	Intersections of centerlines to bottom of socket; 45° & 30° Ells : up to 4" ±0.03; 6" and above ±0.06
L	Overall Length of fitting : ± 0.06
N	Socket Bottom to Socket Bottom; Couplings, Unions : ± 0.06
N1	Socket Bottom to Face of Flange : ± 0.06
R	Thickness on Plugs, Flanges : ± 0.03
T, T1	Effective Thread Length : Reference Only
W	Height of Cap : ± 0.06

Harvel® Industrial PLUS PVC Pressure Pipe

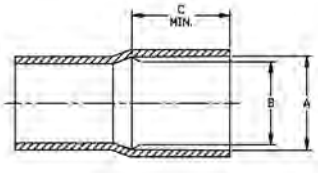




Harvel® Industrial PLUS Schedule 80 PVC Plain End Pipe 20 Ft Lengths - Gray

- Meets NSF®-pw-G
- Meets CAN/CSA B137.3 Requirements

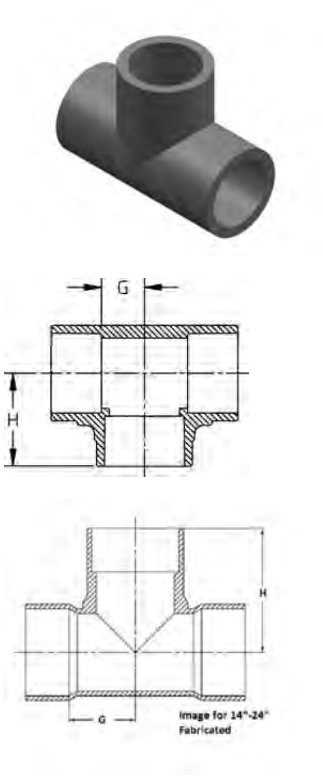
Size (inch)	P/L	Plain End Code	Lift Qty. (20ft Lgths) (ft)	Average O.D. (inch)	Min. Wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
⅛	H18	**H0800013PG2000**	5700	0.405	0.095	0.058	1230
¼	H18	**H0800025PG2000**	5700	0.540	0.119	0.100	1130
⅜	H18	**H0800038PG2000**	5700	0.675	0.126	0.138	920
½	H18	**H0800050PG2000**	5700	0.840	0.147	0.202	850
¾	H18	**H0800075PG2000**	5260	1.050	0.154	0.273	690
1	H18	**H0800100PG2000**	4280	1.315	0.179	0.402	630
1 ¼	H18	**H0800125PG2000**	2360	1.660	0.191	0.554	520
1 ½	H18	**H0800150PG2000**	2060	1.900	0.200	0.673	470
2	H18	**H0800200PG2000**	1660	2.375	0.218	0.932	400
2 ½	H18	**H0800250PG2000**	1080	2.875	0.276	1.419	420
3	H18	**H0800300PG2000**	840	3.500	0.300	1.903	370
3 ½	H18	**H0800350PG2000**	680	4.000	0.318	2.322	350
4	H18	**H0800400PG2000**	520	4.500	0.337	2.782	320
5	H18	**H0800500PG2000**	400	5.563	0.375	3.867	290
6	H18	**H0800600PG2000**	340	6.625	0.432	5.313	280
8	H18	**H0800800PG2000**	220	8.625	0.500	8.058	250
10	H18	**H0801000PG2000**	80	10.750	0.593	11.956	230
12	H18	**H0801200PG2000**	60	12.750	0.687	16.437	230
14	H50	**H0801400PG2000**	60	14.000	0.750	19.790	220
16	H50	**H0801600PG2000**	60	16.000	0.843	25.430	220
18	H50	**H0801800PG2000**	40	18.000	0.937	31.830	220
20	H50	**H0802000PG2000**	40	20.000	1.031	40.091	220
24	H50	**H0802400PG2000**	40	24.000	1.218	56.882	210



Harvel® Industrial PLUS Schedule 80 PVC Plain End Pipe 20 Ft Lengths Less Bell - Gray

Size (inch)	P/L	Belled End Code	A-Socket Entrance (Belled Pipe)	B-Socket Bottom (Belled Pipe)	C-Min. (Belled Pipe)
½	H18	**H0800050PG200B**	0.848±0.004	0.836±0.004	1.000
¾	H18	**H0800075PG200B**	1.058±0.004	1.046±0.004	1.250
1	H18	**H0800100PG200B**	1.325±0.005	1.310±0.005	1.500
1 ¼	H18	**H0800125PG200B**	1.670±0.005	1.655±0.005	1.750
1 ½	H18	**H0800150PG200B**	1.912±0.006	1.894±0.006	2.000
2	H18	**H0800200PG200B**	2.387±0.006	2.363±0.006	2.250
2 ½	H18	**H0800250PG200B**	2.889±0.007	2.861±0.007	2.500
3	H18	**H0800300PG200B**	3.516±0.008	3.484±0.008	3.250
3 ½	H18	**H0800350PG200B**	4.016±0.008	3.984±0.008	3.500
4	H18	**H0800400PG200B**	4.518±0.009	4.482±0.009	4.000
5	H18	**H0800500PG200B**	5.583±0.010	5.543±0.010	4.000
6	H18	**H0800600PG200B**	6.647±0.011	6.603±0.011	6.000
8	H18	**H0800800PG200B**	8.655±0.015	8.598±0.015	6.000
10	H18	**H0801000PG200B**	10.776±0.015	10.722±0.015	7.500
12	H18	**H0801200PG200B**	12.778±0.015	12.721±0.015	8.500
14	H50	**H0801400PG200B**	14.035±0.015	13.985±0.015	9.000
16	H50	**H0801600PG200B**	16.045±0.015	15.980±0.015	10.000
18	H50	**H0801800PG200B**	18.055±0.020	17.980±0.020	12.000
20	H50	**H0802000PG200B**	20.065±0.025	19.980±0.025	12.000
24	H50	**H0802400PG200B**	24.075±0.030	23.970±0.030	12.000

Schedule 80 PVC Pressure Fittings

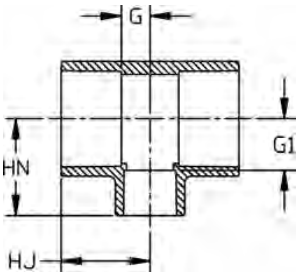


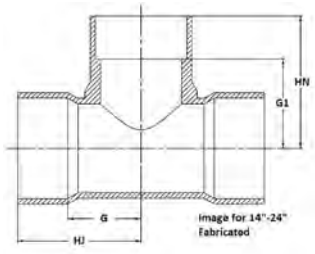
Tee (SxSxS) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
¼	608	**801-002**	50	0.95	0.27	HS
⅜	608	**801-003**	50	1.16	0.38	HS
½	608	**801-005**	25	1.41	0.51	SL
¾	608	**801-007**	25	1.60	0.58	SL
1	608	**801-010**	20	1.85	0.71	SL
1 ¼	608	**801-012**	10	2.17	0.91	SL
1 ½	608	**801-015**	10	2.43	1.04	SL
2	608	**801-020**	10	2.81	1.30	SL
2 ½	608	**801-025**	5	3.31	1.55	SL
3	608	**801-030**	5	3.71	1.81	SL
4	608	**801-040**	5	4.60	2.33	SL
6	608	**801-060**	2	6.53	3.51	SL
8	608	**801-080**	1	8.66	4.58	SL
10	602	**801-100**	1	10.79	5.78	SL
12	602	**801-120**	1	12.96	6.94	SL
14	A33	**801-140N**	1	19.50	10.88	FAB
16	A33	**801-160N**	1	22.75	12.13	FAB
18	A33	**801-180N**	1	26.00	13.38	FAB
20	A33	**801-200N**	1	28.25	14.63	FAB
24	A33	**801-240N**	1	34.50	17.13	FAB

Reducing Tee (SxSxS) Schedule 80 Harvel® PVC

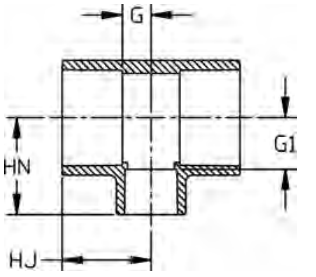


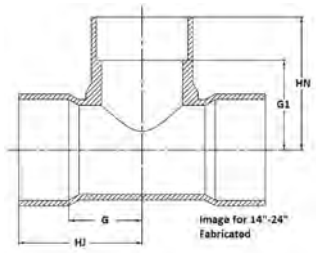




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
¾ x ½	608	**801-101**	25	1.62	1.62	0.60	0.72	SL
1 x ½	608	**801-130**	25	1.87	1.64	0.72	0.74	SL
1 x ¾	608	**801-131**	20	1.86	1.89	0.72	0.75	SL
1 ¼ x ½	608	**801-166FB**	20	1.99	2.35	0.73	1.47	BUSH
1 ¼ x ¾	608	**801-167FB**	20	1.99	2.35	0.73	1.33	BUSH
1 ¼ x 1	608	**801-168**	20	2.01	2.05	0.73	0.91	SL
1 ½ x ½	608	**801-209**	5	1.92	1.91	0.53	1.03	SL
1 ½ x ¾	608	**801-210**	5	1.99	2.07	0.60	1.05	SL
1 ½ x 1	608	**801-211**	5	2.12	2.17	0.72	1.03	SL
1 ½ x 1 ¼	608	**801-212FB**	5	2.44	2.74	1.04	1.47	BUSH
2 x ½	608	**801-247**	5	1.99	2.16	0.54	1.28	SL
2 x ¾	608	**801-248**	5	2.22	2.31	0.60	1.30	SL
2 x 1	608	**801-249**	5	2.24	2.42	0.72	1.27	SL
2 x 1 ¼	608	**801-250FB**	5	2.81	3.11	1.30	1.84	BUSH
2 x 1 ½	608	**801-251**	5	2.54	2.66	1.03	1.27	SL
2 ½ x ½	608	**801-287FB**	5	3.05	3.35	1.28	2.44	BUSH
2 ½ x ¾	608	**801-288FB**	5	3.05	3.35	1.28	2.33	BUSH
2 ½ x 1	608	**801-289FB**	5	3.05	3.36	1.28	2.22	BUSH
2 ½ x 1 ¼	608	**801-290FB**	5	3.05	3.34	1.28	2.07	BUSH
2 ½ x 1 ½	608	**801-291FB**	5	3.05	3.35	1.28	1.94	BUSH
2 ½ x 2	608	**801-292**	5	3.05	3.05	1.28	1.54	SL
3 x ½	608	**801-333FB**	5	3.20	3.68	1.30	2.77	BUSH
3 x ¾	608	**801-334FB**	5	3.20	3.68	1.30	2.66	BUSH
3 x 1	608	**801-335FB**	5	3.20	3.69	1.30	2.55	BUSH
3 x 1 ¼	608	**801-336FB**	5	3.20	3.67	1.30	2.40	BUSH
3 x 1 ½	608	**801-337FB**	5	3.20	3.68	1.30	2.27	BUSH
3 x 2	608	**801-338**	5	3.20	3.39	1.30	1.87	SL
3 x 2 ½	608	**801-339FB**	5	3.73	4.07	1.81	2.17	BUSH
4 x ½	608	**801-415FB**	5	3.52	4.19	1.27	3.28	BUSH
4 x ¾	608	**801-416FB**	5	3.52	4.19	1.27	3.17	BUSH
4 x 1	608	**801-417**	5	2.99	3.49	0.74	2.36	SL
4 x 1 ¼	608	**801-418FB**	5	3.52	4.18	1.27	2.91	BUSH
4 x 1 ½	608	**801-419FB**	5	3.52	4.19	1.27	2.78	BUSH
4 x 2	608	**801-420**	5	3.54	3.87	1.27	2.37	SL
4 x 2 ½	608	**801-421FB**	5	4.14	4.62	1.85	2.73	BUSH
4 x 3	608	**801-422**	5	4.13	4.26	1.85	2.35	SL
6 x ½	608	**801-523FB**	2	6.56	7.42	3.56	6.52	BUSH
6 x ¾	608	**801-524FB**	2	6.56	7.43	3.49	6.41	BUSH
6 x 1	608	**801-525FB**	2	6.56	7.44	3.49	6.29	BUSH
6 x 1 ¼	608	**801-526FB**	2	6.56	7.42	3.49	6.15	BUSH
6 x 1 ½	608	**801-527FB**	2	6.56	7.42	3.49	6.02	BUSH
6 x 2	608	**801-528**	2	4.45	5.25	1.43	3.74	SL
6 x 2 ½	608	**801-529FB**	2	6.56	7.52	3.49	5.62	BUSH
6 x 3	608	**801-530FB**	2	6.56	7.21	3.49	5.25	BUSH
6 x 4	608	**801-532**	2	6.57	6.80	3.49	4.47	HS
6 x 5	H04	**801-533FS**	1	9.00	9.50	5.75	6.50	FAB
8 x 4	608	**801-582**	2	8.41	8.53	4.29	6.30	SL
8 x 6	608	**801-585**	1	7.65	7.54	3.55	4.63	SL
10 x 1 ½	A33	**801-618N**	1	10.75	12.00	5.75	9.50	FAB
10 x 2	A33	**801-619N**	1	10.75	12.00	5.75	11.00	FAB
10 x 3	A33	**801-621N**	1	10.75	12.00	5.75	9.50	FAB
10 x 4	A33	**801-623N**	1	10.75	11.50	5.75	9.50	FAB
10 x 6	602	**801-626FB**	1	10.83	11.43	5.78	8.33	BUSH
10 x 6	A33	**801-626N**	1	11.88	12.50	6.88	9.50	FAB
10 x 8	602	**801-628FB**	1	10.83	11.46	5.78	7.36	BUSH
10 x 8	A33	**801-628N**	1	13.00	13.50	8.00	9.50	FAB
12 x 2	A33	**801-659N**	1	12.00	13.25	6.00	11.75	FAB
12 x 3	A33	**801-661N**	1	12.00	13.25	6.00	11.25	FAB
12 x 4	A33	**801-663N**	1	12.00	12.75	6.00	10.75	FAB
12 x 6	A33	**801-666N**	1	13.13	13.75	7.13	10.75	FAB

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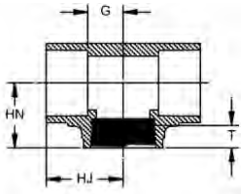




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
12 x 8	602	**801-668FB**	1	12.99	13.67	6.94	9.58	BUSH
12 x 8	A33	**801-668N**	1	14.13	14.75	8.13	10.75	FAB
12 x 10	602	**801-670FB**	1	12.99	13.68	6.94	8.57	BUSH
12 x 10	A33	**801-670N**	1	15.13	15.75	9.13	10.75	FAB
14 x 2	A33	**801-692N**	1	13.13	14.00	6.13	11.50	FAB
14 x 3	A33	**801-694N**	1	13.13	14.00	6.13	11.50	FAB
14 x 4	A33	**801-696N**	1	13.13	13.50	6.13	11.50	FAB
14 x 6	A33	**801-698N**	1	14.25	14.50	7.25	11.50	FAB
14 x 8	A33	**801-700N**	1	15.25	15.50	8.25	11.50	FAB
14 x 10	A33	**801-702N**	1	16.25	16.50	9.25	11.50	FAB
14 x 12	A33	**801-704N**	1	17.25	18.50	10.25	12.50	FAB
16 x 2	A33	**801-726N**	1	14.38	15.25	6.38	12.75	FAB
16 x 3	A33	**801-728N**	1	14.38	15.25	6.38	14.25	FAB
16 x 4	A33	**801-730N**	1	14.38	14.75	6.38	12.75	FAB
16 x 6	A33	**801-732N**	1	15.50	15.75	7.50	12.75	FAB
16 x 8	A33	**801-734N**	1	16.50	16.75	8.50	12.75	FAB
16 x 10	A33	**801-736N**	1	17.50	17.75	9.50	12.75	FAB
16 x 12	A33	**801-738N**	1	18.50	19.75	10.50	13.75	FAB
16 x 14	A33	**801-740N**	1	19.13	20.75	11.75	13.75	FAB
18 x 4	A33	**801-784N**	1	15.63	16.00	6.63	14.00	FAB
18 x 6	A33	**801-786N**	1	16.75	17.00	7.75	14.00	FAB
18 x 8	A33	**801-788N**	1	17.75	18.00	8.75	14.00	FAB
18 x 10	A33	**801-790N**	1	18.75	19.00	9.75	14.00	FAB
18 x 12	A33	**801-792N**	1	19.75	21.00	10.75	15.00	FAB
18 x 14	A33	**801-794N**	1	20.88	22.00	11.88	15.00	FAB
18 x 16	A33	**801-796N**	1	21.38	24.00	12.38	16.00	FAB
20 x 4	A33	**801-814N**	1	16.88	17.25	6.88	15.25	FAB
20 x 6	A33	**801-816N**	1	18.00	18.25	8.00	15.25	FAB
20 x 8	A33	**801-818N**	1	19.00	19.25	9.00	15.25	FAB
20 x 10	A33	**801-820N**	1	20.00	20.25	10.00	15.25	FAB
20 x 12	A33	**801-822N**	1	21.00	22.25	11.00	16.25	FAB
20 x 14	A33	**801-824N**	1	21.63	23.25	11.63	16.25	FAB
20 x 16	A33	**801-826N**	1	22.63	25.25	12.63	17.25	FAB
20 x 18	A33	**801-828N**	1	23.63	27.25	13.63	18.25	FAB
24 x 4	A33	**801-904N**	1	19.38	19.50	7.38	17.50	FAB
24 x 6	A33	**801-906N**	1	20.50	20.50	8.50	17.50	FAB
24 x 8	A33	**801-908N**	1	21.50	21.50	9.50	17.50	FAB
24 x 10	A33	**801-910N**	1	22.50	22.50	10.50	17.50	FAB
24 x 12	A33	**801-912N**	1	23.50	24.50	11.50	18.50	FAB
24 x 14	A33	**801-914N**	1	24.13	25.50	12.13	18.50	FAB
24 x 16	A33	**801-916N**	1	25.13	27.50	13.13	19.50	FAB
24 x 18	A33	**801-918N**	1	26.13	29.50	14.13	20.50	FAB
24 x 20	A33	**801-920N**	1	27.13	30.50	15.13	20.50	FAB

Tee (SxSxFPT) Schedule 80 Harvel® PVC

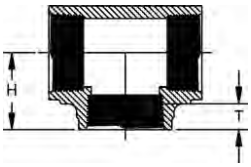




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)	Design
½	608	**802-005**	25	1.41	1.30	0.53	0.81	HS
¾	608	**802-007**	25	1.60	1.37	0.60	0.71	HS
1	608	**802-010**	15	1.83	1.73	0.69	0.99	HS
1 ½	608	**802-015**	5	2.41	2.08	1.02	1.04	HS
2	608	**802-020**	5	2.79	2.37	1.29	1.08	HS

Tee (FPTxFPTxFPT) Schedule 80 Harvel® PVC

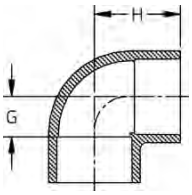


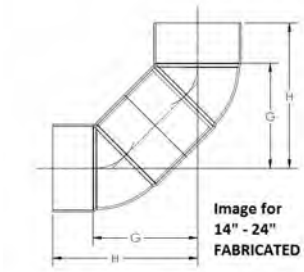


Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	608	**805-002**	50	0.94	0.59	HS
⅜	608	**805-003**	50	1.01	0.60	HS
½	608	**805-005**	25	1.26	0.76	HS
¾	608	**805-007**	25	1.36	0.72	HS
1	608	**805-010**	15	1.79	0.99	HS
1 ¼	608	**805-012**	10	1.93	1.01	HS
1 ½	608	**805-015**	5	2.08	1.03	HS
2	608	**805-020**	5	2.39	1.06	HS
2 ½	608	**805-025**	5	2.87	1.35	HS
3	608	**805-030**	5	3.52	1.65	HS
4	608	**805-040**	5	4.07	1.72	HS

90° Elbow (SxS) Schedule 80 Harvel® PVC



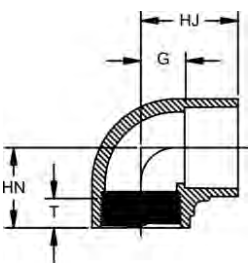




Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
¼	608	**806-002**	50	0.96	0.35	HS
⅜	608	**806-003**	50	1.15	0.39	HS
½	608	**806-005**	25	1.41	0.51	SL
¾	608	**806-007**	25	1.60	0.57	SL
1	608	**806-010**	10	1.83	0.68	SL
1 ¼	608	**806-012**	10	2.18	0.90	SL
1 ½	608	**806-015**	10	2.43	1.04	SL
2	608	**806-020**	20	2.80	1.27	SL
2 ½	608	**806-025**	5	3.33	1.53	SL
3	608	**806-030**	5	3.73	1.81	SL
4	608	**806-040**	5	4.63	2.32	SL
6	608	**806-060**	2	6.56	3.53	SL
8	608	**806-080**	1	8.68	4.55	SL
10	602	**806-100**	1	10.79	5.77	SL
12	602	**806-120**	1	12.92	6.87	SL
14	A33	**806-140N**	1	26.00	19.00	FAB
16	A33	**806-160N**	1	29.00	21.75	FAB
18	A33	**806-180N**	1	33.50	24.50	FAB
20	A33	**806-200N**	1	37.25	27.25	FAB
24	A33	**806-240N**	1	43.00	31.00	FAB

90° Elbow (SxFPT) Schedule 80 Harvel® PVC

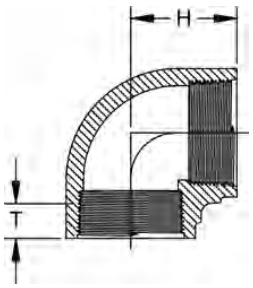




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)	Design
½	608	**807-005**	25	1.40	1.31	0.50	0.81	HS
¾	608	**807-007**	25	1.59	1.36	0.58	0.72	HS
1	608	**807-010**	10	1.81	1.70	0.67	1.00	HS
1 ¼	608	**807-012**	10	2.15	1.92	0.90	1.03	HS
1 ½	608	**807-015**	10	2.39	2.05	1.01	1.05	HS
2	608	**807-020**	5	2.77	2.36	1.24	1.09	HS
3	608	**807-030**	5	3.73	3.47	1.83	1.66	HS

90° Elbow (FPTxFPT) Schedule 80 Harvel® PVC

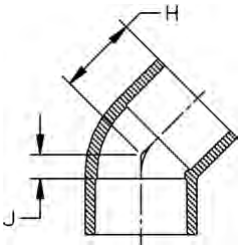




Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	608	**808-002**	50	0.94	0.61	HS
⅜	608	**808-003**	50	1.00	0.63	HS
½	608	**808-005**	25	1.27	0.78	HS
¾	608	**808-007**	25	1.36	0.72	HS
1	608	**808-010**	10	1.71	1.00	HS
1 ¼	608	**808-012**	10	1.92	1.01	HS
1 ½	608	**808-015**	10	2.08	1.06	HS
2	608	**808-020**	5	2.36	1.08	HS
2 ½	608	**808-025**	5	3.36	1.51	HS
3	608	**808-030**	5	3.53	1.63	HS
4	608	**808-040**	5	4.17	1.75	HS

45° Elbow (SxS) Schdule 80 Harvel® PVC



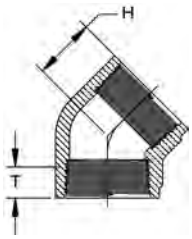




Size (inch)	P/L	Code	Pack Qty	H (inch)	J (inch)	Design
¼	608	**817-002**	50	0.81	0.18	HS
⅜	608	**817-003**	50	0.94	0.19	HS
½	608	**817-005**	25	1.22	0.30	SL
¾	608	**817-007**	20	1.29	0.28	SL
1	608	**817-010**	25	1.48	0.32	SL
1 ¼	608	**817-012**	15	1.78	0.47	SL
1 ½	608	**817-015**	10	1.88	0.45	SL
2	608	**817-020**	5	2.16	0.60	SL
2 ½	608	**817-025**	5	2.56	0.79	SL
3	608	**817-030**	5	2.67	0.77	SL
4	608	**817-040**	5	3.31	1.04	SL
6	608	**817-060**	2	4.86	1.77	SL
8	608	**817-080**	2	6.15	2.07	SL
10	602	**817-100**	1	7.51	2.46	SL
12	602	**817-120**	1	9.00	2.96	SL
14	A33	**817-140N**	1	10.25	3.50	FAB
16	A33	**817-160N**	1	11.75	3.75	FAB
18	A33	**817-180N**	1	13.25	4.25	FAB
20	A33	**817-200N**	1	14.75	4.75	FAB
24	A33	**817-240N**	1	17.75	5.75	FAB

45° Elbow (FPTxFPT) Schedule 80 Harvel® PVC

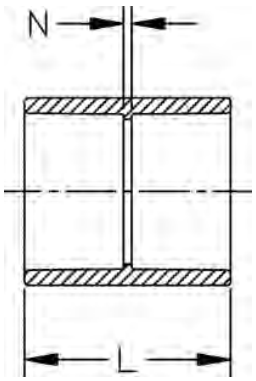


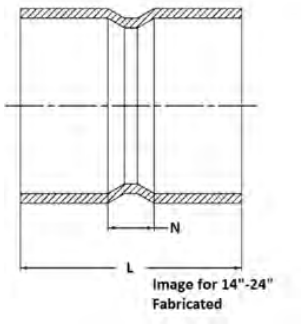


Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	608	**819-002**	50	0.69	0.59	HS
⅜	608	**819-003**	50	0.86	0.68	HS
½	608	**819-005**	25	1.02	0.76	SL
¾	608	**819-007**	20	1.14	0.81	SL
1	608	**819-010**	25	1.33	0.97	SL
1 ¼	608	**819-012**	15	1.42	1.01	SL
1 ½	608	**819-015**	10	1.47	1.07	SL
2	608	**819-020**	5	1.74	2.37	SL
3	608	**819-030**	5	2.43	1.66	SL
4	608	**819-040**	5	2.78	1.76	SL

Coupling (SxS) Schedule 80 Harvel® PVC

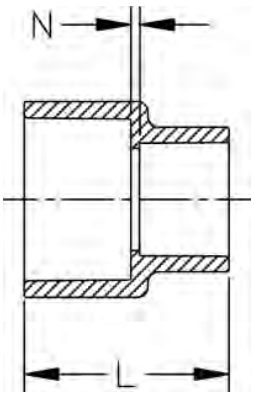


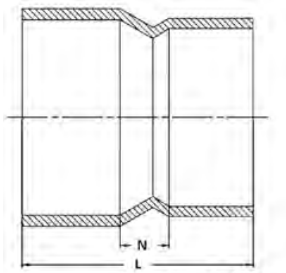




Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
⅜	608	**829-003**	50	1.65	0.11	HS
½	608	**829-005**	25	1.93	0.12	SL
¾	608	**829-007**	20	2.18	0.12	SL
1	608	**829-010**	25	2.41	0.12	SL
1 ¼	608	**829-012**	10	2.67	0.13	SL
1 ½	608	**829-015**	10	2.94	0.15	SL
2	608	**829-020**	20	3.18	0.13	SL
2 ½	608	**829-025**	5	3.77	0.19	SL
3	608	**829-030**	5	4.04	0.26	SL
4	608	**829-040**	5	4.80	0.26	SL
6	608	**829-060**	2	6.40	0.36	SL
8	608	**829-080**	2	8.40	0.35	SL
10	602	**829-100**	1	10.77	0.75	SL
12	602	**829-120**	1	12.82	0.75	SL
14	A33	**829-140N**	1	17.50	3.50	FAB
16	A33	**829-160N**	1	20.25	4.25	FAB
18	A33	**829-180N**	1	23.00	5.00	FAB
20	A33	**829-200N**	1	25.25	5.25	FAB
24	A33	**829-240N**	1	30.25	6.25	FAB





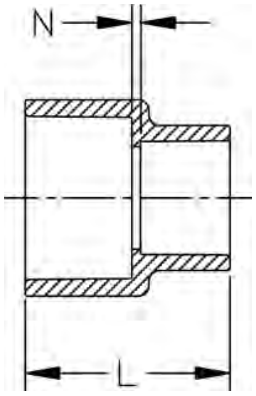


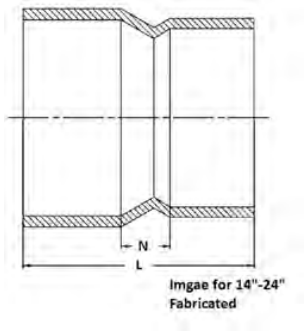
Imgae for 14"-24" Fabricated

Reducer Coupling (SxS) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
¾ x ½	608	**829-101**	20	2.13	0.13	HS
1 x ½	608	**829-130**	25	2.17	0.12	HS
1 x ¾	608	**829-131**	25	2.26	0.11	HS
1 ¼ x 1	608	**829-168**	10	2.52	0.10	HS
1 ½ x ½	608	**829-209FB**	10	2.94	0.66	BUSH
1 ½ x ¾	608	**829-210**	10	2.50	0.09	BUSH
1 ½ x 1	608	**829-211**	10	2.65	0.11	HS
1 ½ x 1 ¼	608	**829-212**	10	2.82	0.09	HS
2 x ½	608	**829-247FB**	5	3.44	0.87	BUSH
2 x ¾	608	**829-248**	5	3.14	0.34	HS
2 x 1	608	**829-249**	5	3.15	0.32	HS
2 x 1 ¼	608	**829-250**	5	3.05	0.14	HS
2 x 1 ½	608	**829-251**	5	3.06	0.07	HS
2 ½ x 1 ½	608	**829-291**	5	3.36	0.14	HS
2 ½ x 2	608	**829-292FB**	5	4.08	0.66	BUSH
3 x 1	608	**829-335FB**	5	4.56	1.53	BUSH
3 x 1 ¼	608	**829-336FB**	5	4.29	1.07	FAB
3 x 1 ½	608	**829-337FB**	5	4.58	1.15	BUSH
3 x 2	608	**829-338**	5	3.61	0.17	HS
3 x 2 ½	608	**829-339FB**	5	4.42	0.63	BUSH
4 x 2	608	**829-420FB**	5	4.94	1.08	BUSH
4 x 3	608	**829-422**	5	4.38	0.22	HS
6 x 2	608	**829-528FB**	2	10.61	4.60	BUSH
6 x 3	608	**829-530FB**	2	10.65	4.23	BUSH
6 x 4	608	**829-532**	2	10.17	3.46	HS
8 x 4	608	**829-582FB**	2	9.81	3.53	BUSH
8 x 6	608	**829-585**	2	9.18	2.11	HS
10 x 4	A33	**829-623N**	1	17.00	10.00	FAB
10 x 6	602	**829-626FB**	1	11.42	3.29	BUSH
10 x 6	A33	**829-626N**	1	13.00	5.00	FAB
10 x 8	602	**829-628FB**	1	11.45	2.32	BUSH
10 x 8	A33	**829-628N**	1	12.75	3.75	FAB
12 x 4	A33	**829-663N**	1	26.25	18.25	FAB
12 x 6	A33	**829-666N**	1	20.50	11.50	FAB
12 x 8	602	**829-668FB**	1	13.54	3.41	BUSH
12 x 8	A33	**829-668N**	1	15.50	5.50	FAB
12 x 10	602	**829-670FB**	1	13.24	2.13	BUSH
12 x 10	A33	**829-670N**	1	15.00	4.00	FAB
14 x 4	A33	**829-696N**	1	21.00	3.00	FAB
14 x 6	A33	**829-698N**	1	31.00	21.00	FAB
14 x 8	A33	**829-700N**	1	24.50	13.50	FAB
14 x 10	A33	**829-702N**	1	17.00	5.00	FAB
14 x 12	A33	**829-704N**	1	16.50	3.50	FAB
16 x 4	A33	**829-730N**	1	32.50	22.50	FAB
16 x 6	A33	**829-732N**	1	28.50	17.50	FAB
16 x 8	A33	**829-734N**	1	27.00	15.00	FAB
16 x 10	A33	**829-736N**	1	19.50	6.50	FAB
16 x 12	A33	**829-738N**	1	19.25	5.25	FAB
16 x 14	A33	**829-740N**	1	19.50	4.50	FAB
18 x 4	A33	**829-784N**	1	48.50	37.50	FAB
18 x 6	A33	**829-786N**	1	36.00	24.00	FAB
18 x 8	A33	**829-788N**	1	42.50	26.00	FAB
18 x 10	A33	**829-790N**	1	33.50	19.50	FAB
18 x 12	A33	**829-792N**	1	22.00	7.00	FAB
18 x 14	A33	**829-794N**	1	22.25	6.25	FAB
18 x 16	A33	**829-796N**	1	21.75	4.75	FAB
20 x 4	A33	**829-814N**	1	60.50	48.50	FAB
20 x 6	A33	**829-816N**	1	55.50	42.50	FAB
20 x 8	A33	**829-818N**	1	56.25	42.25	FAB
20 x 10	A33	**829-820N**	1	47.25	32.25	FAB
20 x 12	A33	**829-822N**	1	37.00	21.00	FAB

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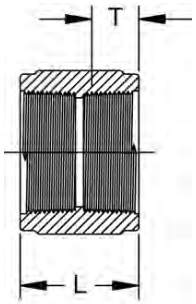




Imgae for 14"-24" Fabricated

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
20 x 14	A33	**829-824N**	1	37.25	20.25	FAB
20 x 16	A33	**829-826N**	1	24.50	6.50	FAB
20 x 18	A33	**829-828N**	1	24.00	5.00	FAB
24 x 4	A33	**829-904N**	1	66.00	52.00	FAB
24 x 6	A33	**829-906N**	1	61.00	46.00	FAB
24 x 8	A33	**829-908N**	1	52.00	36.00	FAB
24 x 10	A33	**829-910N**	1	52.75	35.75	FAB
24 x 12	A33	**829-912N**	1	42.50	24.50	FAB
24 x 14	A33	**829-914N**	1	42.75	23.75	FAB
24 x 16	A33	**829-916N**	1	42.25	22.25	FAB
24 x 18	A33	**829-918N**	1	29.50	8.50	FAB
24 x 20	A33	**829-920N**	1	29.25	7.25	FAB



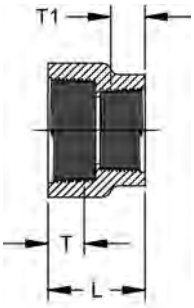


Coupling (FPTxFPT) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Design
¼	608	**830-002**	50	1.29	0.61	HS
⅜	608	**830-003**	50	1.35	0.62	HS
½	608	**830-005**	25	1.68	0.77	SL
¾	608	**830-007**	20	1.75	0.80	SL
1	608	**830-010**	25	2.13	0.99	SL
1 ¼	608	**830-012**	10	2.19	1.03	SL
1 ½	608	**830-015**	10	2.22	1.03	SL
2	608	**830-020**	5	2.29	1.08	SL
2 ½	608	**830-025**	5	3.33	1.51	SL
3	608	**830-030**	5	3.53	1.65	SL
4	608	**830-040**	5	3.76	1.75	SL

Reducer Coupling (FPTxFPT) Schedule 80 Harvel® PVC

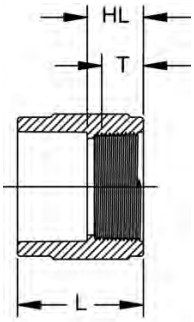




Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	T1 (inch)	Design
⅜ x ¼	608	**830-052**	50	1.29	0.60	0.59	HS
½ x ¼	608	**830-072**	50	1.44	0.75	0.59	HS
½ x ⅜	608	**830-073**	50	1.46	0.74	0.60	HS
¾ x ½	608	**830-101**	25	1.68	0.78	0.78	HS
1 x ½	608	**830-130**	25	1.84	0.98	0.77	HS
1 x ¾	608	**830-131**	25	1.88	0.98	0.80	HS
1 ¼ x ¾	608	**830-167**	25	1.90	1.00	0.79	HS
1 ½ x 1	608	**830-211**	20	2.06	1.02	0.95	HS
2 x 1 ½	608	**830-251**	10	2.18	1.05	1.02	HS

Female Adapter (SxFPT) Schedule 80 Harvel® PVC

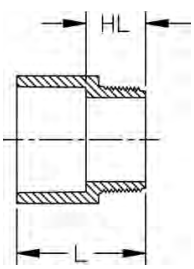




Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	Design
¼	608	**835-002**	50	0.75	1.43	0.58	HS
⅜	608	**835-003**	50	0.75	1.56	0.62	HS
½	608	**835-005**	25	0.91	1.80	0.75	HS
¾	608	**835-007**	25	0.95	1.96	0.79	HS
1	608	**835-010**	25	1.11	2.27	0.98	HS
1 ¼	608	**835-012**	10	1.18	2.44	1.02	HS
1 ½	608	**835-015**	10	1.19	2.59	1.03	HS
2	608	**835-020**	5	1.25	2.76	1.06	HS
2 ½	608	**835-025**	5	1.77	3.53	1.51	HS
3	608	**835-030**	5	1.91	3.80	1.65	HS
4	608	**835-040**	5	2.02	4.29	1.74	HS
6	608	**835-060**	2	3.27	6.37	2.37	SL
8	608	**835-080**	2	4.35	8.36	2.35	HS
10	602	**835-100**	2	5.68	10.78	2.68	HS
12	A33	**835-120N**	1	6.00	11.13	2.13	FAB

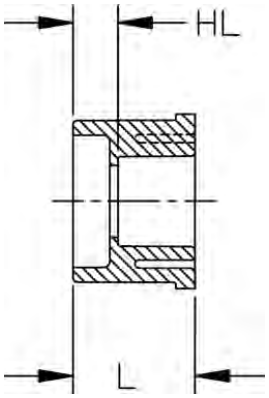
Male Adapter (SxMPT) Schedule 80 Harvel® PVC





Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
½	608	**836-005**	50	0.94	1.85	SL
¾	608	**836-007**	25	1.05	2.03	HS
1	608	**836-010**	25	1.22	2.38	HS
1 ¼	608	**836-012**	15	1.28	2.56	HS
1 ½	608	**836-015**	10	1.30	2.69	HS
2	608	**836-020**	5	1.32	2.83	HS
2 ½	608	**836-025**	5	1.87	3.70	HS
3	608	**836-030**	5	1.99	3.90	HS
4	608	**836-040**	5	2.15	4.40	HS
6	A33	**836-060N**	1	3.25	6.25	FAB
8	A33	**836-080N**	1	3.50	7.50	FAB
10	A33	**836-100N**	1	4.18	9.18	FAB
12	A33	**836-120N**	1	4.63	10.63	FAB

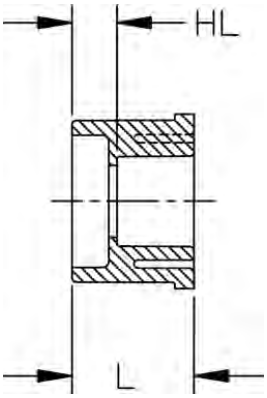




Flush Style Reducer Bushing (SPGxS) Schedule 80 Harvel® PVC

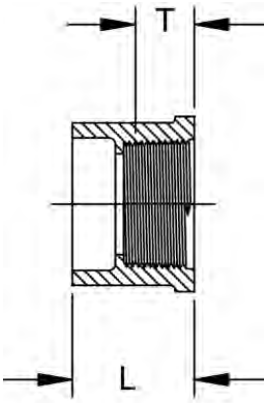
Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
½ x ¼	608	**837-072**	50	0.47	1.15	FLUSH
½ x ⅜	608	**837-073**	50	0.33	1.09	FLUSH
¾ x ½	608	**837-101**	50	0.42	1.30	FLUSH
1 x ½	608	**837-130**	50	0.55	1.44	FLUSH
1 x ¾	608	**837-131**	50	0.41	1.43	FLUSH
1 ¼ x ½	608	**837-166**	25	0.66	1.55	FLUSH
1 ¼ x ¾	608	**837-167**	25	0.56	1.57	FLUSH
1 ¼ x 1	608	**837-168**	25	0.44	1.59	FLUSH
1 ½ x ½	608	**837-209**	25	0.78	1.69	FLUSH
1 ½ x ¾	608	**837-210**	25	0.67	1.68	FLUSH
1 ½ x 1	608	**837-211**	25	0.55	1.69	FLUSH
1 ½ x 1 ¼	608	**837-212**	25	0.44	1.72	FLUSH
2 x ½	608	**837-247**	10	0.91	1.81	FLUSH
2 x ¾	608	**837-248**	10	0.79	1.82	FLUSH
2 x 1	608	**837-249**	10	0.68	1.83	FLUSH
2 x 1 ¼	608	**837-250**	10	0.54	1.81	FLUSH
2 x 1 ½	608	**837-251**	10	0.40	1.81	FLUSH
2 ½ x 1 ½	608	**837-291**	5	0.79	2.31	FLUSH
2 ½ x 2	608	**837-292**	5	0.47	2.10	FLUSH
3 x 1	608	**837-335**	5	1.27	2.42	FLUSH
3 x 1 ¼	608	**837-336FB**	5	1.43	2.71	BUSH
3 x 1 ½	608	**837-337**	5	0.89	2.43	FLUSH
3 x 2	608	**837-338**	5	0.86	2.42	FLUSH
3 x 2 ½	608	**837-339**	5	0.38	2.27	FLUSH
4 x 2	608	**837-420**	5	1.14	2.70	FLUSH
4 x 3	608	**837-422**	5	0.77	2.74	FLUSH
6 x 3	608	**837-530**	2	1.74	3.65	FLUSH
6 x 4	608	**837-532**	2	1.42	3.67	FLUSH
8 x 6	608	**837-585**	2	1.69	4.66	FLUSH
10 x 4	602	**837-623FB**	1	4.01	6.26	BUSH
10 x 6	602	**837-626**	1	2.59	5.69	FLUSH
10 x 8	602	**837-628**	1	1.62	5.72	FLUSH
12 x 6	602	**837-666FB**	1	4.26	7.35	BUSH
12 x 8	602	**837-668**	1	2.66	6.76	FLUSH
12 x 10	602	**837-670**	1	1.66	6.77	FLUSH
14 x 4	A33	**837-696N**	1	5.50	7.50	FAB
14 x 6	A33	**837-698N**	1	4.50	7.50	FAB
14 x 8	A33	**837-700N**	1	3.50	7.50	FAB
14 x 10	A33	**837-702N**	1	2.50	7.50	FAB
14 x 12	A33	**837-704N**	1	1.50	7.50	FAB
16 x 4	A33	**837-730N**	1	6.50	8.50	FAB
16 x 6	A33	**837-732N**	1	5.50	8.50	FAB
16 x 8	A33	**837-734N**	1	4.50	8.50	FAB
16 x 10	A33	**837-736N**	1	3.50	8.50	FAB
16 x 12	A33	**837-738N**	1	2.50	8.50	FAB
16 x 14	A33	**837-740N**	1	1.50	8.50	FAB
18 x 4	A33	**837-784N**	1	7.50	9.50	FAB
18 x 6	A33	**837-786N**	1	6.50	9.50	FAB
18 x 8	A33	**837-788N**	1	5.50	9.50	FAB
18 x 10	A33	**837-790N**	1	4.50	9.50	FAB
18 x 12	A33	**837-792N**	1	3.50	9.50	FAB
18 x 14	A33	**837-794N**	1	2.50	9.50	FAB
18 x 16	A33	**837-796N**	1	1.50	9.50	FAB
20 x 4	A33	**837-814N**	1	8.50	10.50	FAB
20 x 6	A33	**837-816N**	1	7.50	10.50	FAB
20 x 8	A33	**837-818N**	1	6.50	10.50	FAB
20 x 10	A33	**837-820N**	1	5.50	10.50	FAB
20 x 12	A33	**837-822N**	1	4.50	10.50	FAB
20 x 14	A33	**837-824N**	1	3.50	10.50	FAB
20 x 16	A33	**837-826N**	1	2.50	10.50	FAB

table continued on the next page



Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
20 x 18	A33	**837-828N**	1	1.50	10.50	FAB
24 x 4	A33	**837-904N**	1	10.50	12.50	FAB
24 x 6	A33	**837-906N**	1	9.50	12.50	FAB
24 x 8	A33	**837-908N**	1	8.50	12.50	FAB
24 x 10	A33	**837-910N**	1	7.50	12.50	FAB
24 x 12	A33	**837-912N**	1	6.50	12.50	FAB
24 x 14	A33	**837-914N**	1	5.50	12.50	FAB
24 x 16	A33	**837-916N**	1	4.50	12.50	FAB
24 x 18	A33	**837-918N**	1	3.50	12.50	FAB
24 x 20	A33	**837-920N**	1	2.50	12.50	FAB

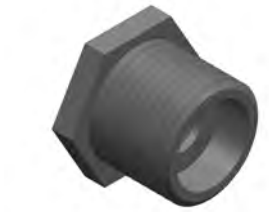


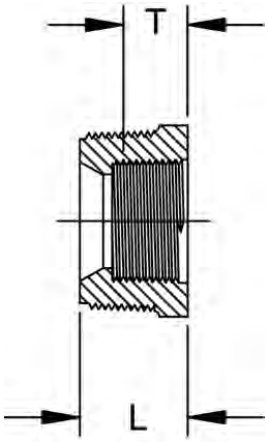


Flush Style Reducer Bushing (SPGxFPT) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Design
⅜ x ¼	608	**838-052E**	50	1.59	0.60	Extended
½ x ¼	608	**838-072**	50	1.14	0.61	FLUSH
½ x ⅜	608	**838-073**	50	1.21	0.60	FLUSH
¾ x ¼	608	**838-098**	50	1.13	0.61	FLUSH
¾ x ½	608	**838-101**	50	1.28	0.77	FLUSH
1 x ½	608	**838-130**	50	1.42	0.76	FLUSH
1 x ¾	608	**838-131**	50	1.41	0.81	FLUSH
1 ¼ x ½	608	**838-166**	15	1.56	0.75	FLUSH
1 ¼ x ¾	608	**838-167**	15	1.56	0.79	FLUSH
1 ¼ x 1	608	**838-168**	15	1.56	0.99	FLUSH
1 ½ x ½	608	**838-209**	15	1.68	0.76	FLUSH
1 ½ x ¾	608	**838-210**	15	1.69	0.79	FLUSH
1 ½ x 1	608	**838-211**	15	1.68	0.99	FLUSH
1 ½ x 1 ¼	608	**838-212**	15	1.69	1.10	FLUSH
2 x ½	608	**838-247**	10	1.80	0.77	FLUSH
2 x ¾	608	**838-248**	10	1.80	0.80	FLUSH
2 x 1	608	**838-249**	10	1.80	0.99	FLUSH
2 x 1 ¼	608	**838-250**	10	1.81	1.02	FLUSH
2 x 1 ½	608	**838-251**	10	1.88	1.04	FLUSH
2 ½ x 1 ½	608	**838-291**	5	2.24	1.07	FLUSH
2 ½ x 2	608	**838-292**	5	2.12	1.10	FLUSH
3 x 2	608	**838-338**	5	2.42	1.07	FLUSH
3 x 2 ½	608	**838-339**	5	2.25	1.61	FLUSH
4 x 2	608	**838-420**	5	2.71	1.10	FLUSH
4 x 3	608	**838-422**	5	2.75	1.62	FLUSH

Flush Style Reducer Bushing (MPTxFPT) Schedule 80 Harvel® PVC

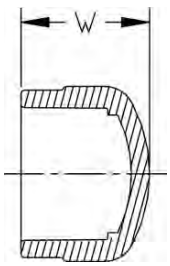




Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Style
⅜ x ¼	608	**839-052**	50	0.80	0.60	FLUSH
½ x ¼	608	**839-072**	50	0.95	0.60	FLUSH
½ x ⅜	608	**839-073**	50	0.96	0.61	FLUSH
¾ x ¼	608	**839-098**	50	1.01	0.61	FLUSH
¾ x ⅜	608	**839-099**	50	1.02	0.61	FLUSH
¾ x ½	608	**839-101**	50	1.08	0.75	FLUSH
1 x ¼	608	**839-128**	25	1.23	0.58	FLUSH
1 x ½	608	**839-130**	25	1.24	0.76	FLUSH
1 x ¾	608	**839-131**	25	1.28	0.80	FLUSH
1 ¼ x ½	608	**839-166**	25	1.29	0.76	FLUSH
1 ¼ x ¾	608	**839-167**	25	1.29	0.79	FLUSH
1 ¼ x 1	608	**839-168**	25	1.30	1.00	FLUSH
1 ½ x ¾	608	**839-210**	25	1.33	0.78	FLUSH
1 ½ x 1	608	**839-211**	25	1.34	0.98	FLUSH
1 ½ x 1 ¼	608	**839-212**	25	1.33	1.02	FLUSH
2 x ½	608	**839-247**	10	1.44	0.76	FLUSH
2 x ¾	608	**839-248**	10	1.44	0.80	FLUSH
2 x 1	608	**839-249**	10	1.42	0.97	FLUSH
2 x 1 ¼	608	**839-250**	10	1.43	1.01	FLUSH
2 x 1 ½	608	**839-251**	10	1.35	1.02	FLUSH
3 x 2	608	**839-338**	5	2.02	1.09	FLUSH
4 x 2	608	**839-420**	5	2.07	1.10	FLUSH
4 x 3	608	**839-422**	5	2.06	1.60	FLUSH

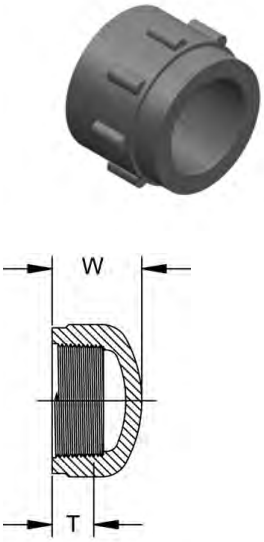
Cap (S) Schedule 80 Harvel® PVC





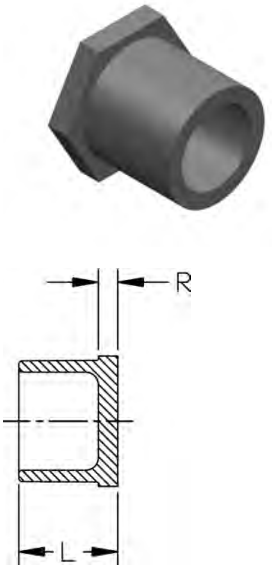
Size (inch)	P/L	Code	Pack Qty	W (inch)	Design
¼	608	**847-002**	50	0.96	HS
⅜	608	**847-003**	50	1.11	HS
½	608	**847-005**	50	1.30	HS
¾	608	**847-007**	50	1.46	HS
1	608	**847-010**	25	1.66	HS
1 ¼	608	**847-012**	15	1.89	HS
1 ½	608	**847-015**	10	2.08	HS
2	608	**847-020**	5	2.32	HS
2 ½	608	**847-025**	5	2.61	HS
3	608	**847-030**	5	3.06	HS
4	608	**847-040**	5	3.69	HS
6	608	**847-060**	2	4.86	HS
8	608	**847-080**	2	6.25	SL
10	602	**847-100**	1	7.92	SL
12	602	**847-120**	1	9.37	SL
14	A33	**847-140N**	1	5.75	FAB
16	A33	**847-160N**	1	7.00	FAB
18	A33	**847-180N**	1	8.25	FAB
20	A33	**847-200N**	1	8.75	FAB
24	A33	**847-240N**	1	10.25	FAB

Cap (FPT) Schedule 80 Harvel® PVC



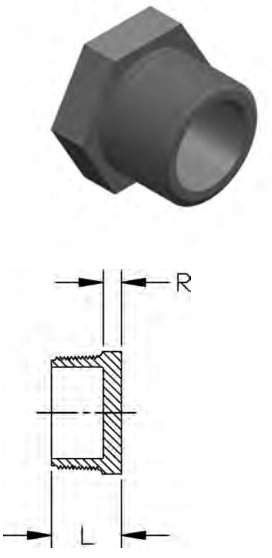
Size (inch)	P/L	Code	Pack Qty	W (inch)	T (inch)	Design
¼	608	**848-002**	50	0.93	0.54	HS
⅜	608	**848-003**	50	0.94	0.62	HS
½	608	**848-005**	50	1.14	0.74	HS
¾	608	**848-007**	25	1.25	0.80	HS
1	608	**848-010**	25	1.51	0.97	HS
1 ¼	608	**848-012**	15	1.59	1.00	HS
1 ½	608	**848-015**	10	1.70	1.01	HS
2	608	**848-020**	5	1.82	1.06	HS
2 ½	608	**848-025**	5	2.61	1.45	HS
3	608	**848-030**	5	2.80	1.83	HS
4	608	**848-040**	5	3.16	1.80	HS

Plug (SPG) Schedule 80 Harvel® PVC



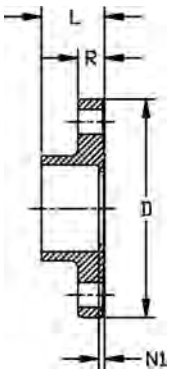
Size (inch)	P/L	Code	Pack Qty	L (inch)	R (inch)
½	608	**849-005**	50	1.08	0.18
¾	608	**849-007**	50	1.25	0.22
1	608	**849-010**	25	1.41	0.25
1 ½	608	**849-015**	20	1.72	0.31
2	608	**849-020**	10	1.90	0.38
4	608	**849-040**	5	2.65	0.39

Plug (MPT) Schedule 80 Harvel® PVC



Size (inch)	P/L	Code	Pack Qty	L (inch)	R (inch)	Design
¼	608	**850-002**	50	0.81	0.22	HS
⅜	608	**850-003**	50	0.83	0.22	HS
½	608	**850-005**	50	0.98	0.22	HS
¾	608	**850-007**	50	1.06	0.25	HS
1	608	**850-010**	25	1.24	0.27	HS
1 ¼	608	**850-012**	25	1.33	0.31	HS
1 ½	608	**850-015**	20	1.38	0.34	HS
2	608	**850-020**	10	1.47	0.39	HS
2 ½	608	**850-025**	10	1.95	0.38	HS
3	608	**850-030**	5	1.98	0.38	HS
4	608	**850-040**	5	2.16	0.39	HS
6	A33	**850-060N**	1	2.00	0.75	FAB
8	A33	**850-080N**	1	2.00	0.75	FAB
10	A33	**850-100N**	1	2.00	0.75	FAB
12	A33	**850-120N**	1	2.00	0.75	FAB



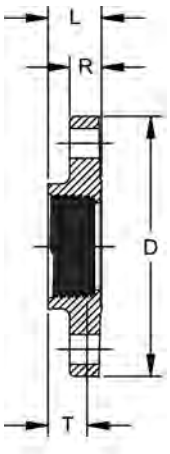


One Piece Flange (S) Schedule 80 Harvel® PVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	Design
½	608	**851-005**	5	4	½	2.38	3.50	1.02	0.13	0.39	HC
¾	608	**851-007**	5	4	½	2.75	3.89	1.14	0.13	0.45	HC
1	608	**851-010**	5	4	½	3.13	4.28	1.30	0.16	0.52	HC
1 ¼	608	**851-012**	5	4	½	3.50	4.64	1.45	0.14	0.59	HC
1 ½	608	**851-015**	5	4	½	3.88	5.01	1.54	0.16	0.68	HC
2	608	**851-020**	5	4	⅝	4.75	6.01	1.73	0.16	0.69	HC
2 ½	608	**851-025**	5	4	⅝	5.50	7.00	1.99	0.17	0.75	HC
3	608	**851-030**	5	4	⅝	6.00	7.51	2.46	0.57	1.10	HC
4	608	**851-040**	5	8	⅝	7.50	9.04	2.79	0.52	1.19	HC
6	608	**851-060**	2	8	¾	9.50	11.13	3.88	0.36	1.38	HC
8	608	**851-080**	2	8	¾	11.75	13.54	4.90	0.42	1.45	HC



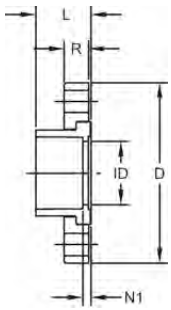


One Piece Flange (FPT) Schedule 80 Harvel® PVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	T (inch)	R (inch)	Design
½	608	**852-005**	5	4	½	2.38	3.51	0.89	0.77	0.39	HC
¾	608	**852-007**	5	4	½	2.75	3.89	0.91	0.79	0.45	HC
1	608	**852-010**	5	4	½	3.13	4.28	1.13	1.00	0.53	HC
1 ¼	608	**852-012**	5	4	½	3.50	4.62	1.20	1.06	0.58	HC
1 ½	608	**852-015**	5	4	½	3.88	4.99	1.19	1.03	0.68	HC
2	608	**852-020**	5	4	⅝	4.75	6.02	1.22	1.06	0.70	HC
2 ½	608	**852-025**	5	4	⅝	5.50	7.00	1.72	1.53	0.75	HC
3	608	**852-030**	5	4	⅝	6.00	7.50	2.15	1.63	1.15	HC
4	608	**852-040**	5	8	⅝	7.50	9.00	2.30	1.77	1.23	HC



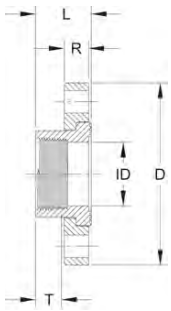


Van Stone Flange (S) Schedule 80 Harvel® PVC

- ANSI 150 Class according to ANSI B16.5
- 1/2" - 12" pressure rating is 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 14" - 24" pressure rating is 100 psi @ 73°F (6.9 bar @ 22.7°C) - Steel Ring
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	ID (inch)	Design
½	608	**854-005**	5	4	½	2.38	3.53	1.10	0.18	0.57	0.60	HC
¾	608	**854-007**	5	4	½	2.75	3.87	1.23	0.18	0.59	0.82	HC
1	608	**854-010**	5	4	½	3.13	4.25	1.38	0.20	0.66	1.03	HC
1 ¼	608	**854-012**	5	4	½	3.50	4.62	1.52	0.21	0.69	1.36	HC
1 ½	608	**854-015**	5	4	½	3.88	5.01	1.68	0.25	0.75	1.60	HC
2	608	**854-020**	5	4	⅝	4.75	6.02	1.84	0.29	0.82	2.06	HC
2 ½	608	**854-025**	5	4	⅝	5.50	7.01	2.15	0.33	0.98	2.49	HC
3	608	**854-030**	5	4	⅝	6.00	7.50	2.33	0.39	1.02	3.09	HC
4	608	**854-040**	5	8	⅝	7.50	8.99	2.75	0.24	1.10	4.06	HC
6	608	**854-060**	2	8	¾	9.50	10.98	3.55	0.48	1.25	6.11	HC
8	608	**854-080**	2	8	¾	11.75	13.51	4.60	0.51	1.71	8.00	HC
10	602	**854-100**	2	12	⅞	14.25	15.97	5.66	0.53	1.73	10.10	HC
12	602	**854-120**	2	12	⅞	17.00	18.95	6.71	0.57	1.72	11.96	HC
14	A33	**854-140N**	1	12	1 ⅛	18.75	21.00	11.50	4.50	0.50	12.50	FAB
16	A33	**854-160N**	1	16	1 ⅛	21.25	23.50	13.27	5.50	0.50	14.31	FAB
18	A33	**854-180N**	1	16	1 ¼	22.75	25.00	14.25	5.50	0.50	16.13	FAB
20	A33	**854-200N**	1	20	1 ¼	25.00	27.50	16.00	6.00	0.50	18.00	FAB
24	A33	**854-240N**	1	20	1 ⅜	29.50	32.00	19.00	7.00	0.50	21.56	FAB





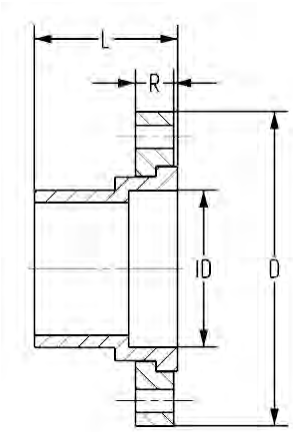
Van Stone Flange (FPT) Schedule 80 Harvel® PVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	T (inch)	R (inch)	ID (inch)	Design
½	608	**855-005**	5	4	½	2.38	3.53	1.10	0.79	0.57	0.63	HC
¾	608	**855-007**	5	4	½	2.75	3.87	1.23	0.82	0.59	0.83	HC
1	608	**855-010**	5	4	½	3.13	4.25	1.39	1.01	0.66	1.06	HC
1 ¼	608	**855-012**	5	4	½	3.50	4.62	1.50	1.02	0.69	1.38	HC
1 ½	608	**855-015**	5	4	½	3.88	5.01	1.67	1.06	0.75	1.61	HC
2	608	**855-020**	5	4	⅝	4.75	6.02	1.82	1.09	0.82	2.08	HC
2 ½	608	**855-025**	5	4	⅝	5.50	7.01	2.13	1.58	0.98	2.50	HC
3	608	**855-030**	5	4	⅝	6.00	7.50	2.36	1.71	1.02	3.08	HC
4	608	**855-040**	5	8	⅝	7.50	8.99	2.78	1.72	1.10	4.09	HC

Van Stone Flange (SPG) Schedule 80 Harvel® PVC





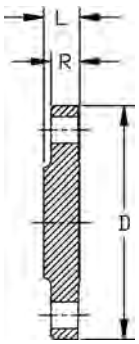
- ANSI 150 Class according to ANSI B16.5
- 1/2" - 12" pressure rating is 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 14" - 24" pressure rating is 100 psi @ 73°F (6.9 bar @ 22.7°C) - Steel Ring

HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	R (inch)	ID (inch)	Design
½	608	**856-005**	5	4	½	2.38	3.53	1.72	0.57	0.84	HC
¾	608	**856-007**	5	4	½	2.75	3.87	1.85	0.59	1.05	HC
1	608	**856-010**	5	4	½	3.13	4.25	2.10	0.66	1.32	HC
1 ¼	608	**856-012**	5	4	½	3.50	4.62	2.28	0.69	1.66	HC
1 ½	608	**856-015**	5	4	½	3.88	5.01	2.48	0.75	1.90	HC
2	608	**856-020**	5	4	⅝	4.75	6.02	2.80	0.82	2.38	HC
2 ½	608	**856-025**	5	4	⅝	5.50	7.01	3.27	0.98	2.86	HC
3	608	**856-030**	5	4	⅝	6.00	7.50	3.60	1.02	3.49	HC
4	608	**856-040**	5	8	⅝	7.50	8.99	4.10	1.10	4.49	HC
6	608	**856-060**	2	8	¾	9.50	10.98	5.10	1.25	6.60	HC
8	608	**856-080**	1	8	¾	11.75	13.51	6.88	1.71	8.62	HC
10	602	**856-100**	1	12	⅞	14.25	15.97	8.30	1.73	10.70	HC
12	602	**856-120**	1	12	⅞	17.00	18.95	9.55	1.72	12.69	HC
14	A33	**856-140N**	1	12	1	18.75	21.00	13.00	0.50	11.41	FAB
16	A33	**856-160N**	1	16	1	21.25	23.50	14.00	0.50	13.08	FAB
18	A33	**856-180N**	1	16	1 ⅛	22.75	25.00	16.00	0.50	14.76	FAB
20	A33	**856-200N**	1	20	1 ⅛	25.00	27.50	18.00	0.50	16.43	FAB
24	A33	**856-240N**	1	20	1 ¼	29.50	32.00	20.00	0.50	19.79	FAB

Flange (Blind) Schedule 80 Harvel® PVC

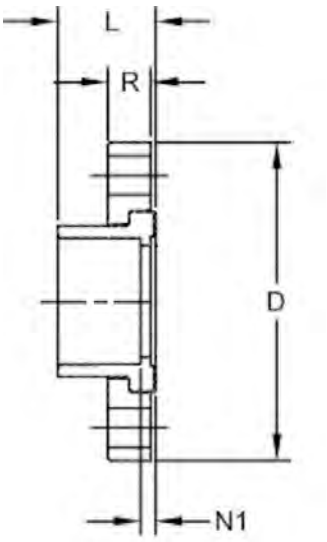




- ANSI 150 Class according to ANSI B16.5
- 1/2" - 8" 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 10" - 24" 50 psi @73°F (3.5 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	R (inch)	Design
½	608	**853-005**	5	4	½	2.38	3.51	0.48	0.39	HC
¾	608	**853-007**	5	4	½	2.75	3.90	0.55	0.45	HC
1	608	**853-010**	5	4	½	3.13	4.29	0.66	0.53	HC
1 ¼	608	**853-012**	5	4	½	3.50	4.62	0.73	0.59	HC
1 ½	608	**853-015**	5	4	½	3.88	5.01	0.81	0.68	HC
2	608	**853-020**	5	4	⅝	4.75	6.02	0.90	0.70	HC
2 ½	608	**853-025**	5	4	⅝	5.50	7.00	0.97	0.76	HC
3	608	**853-030**	5	4	⅝	6.00	7.45	1.03	1.03	HC
4	608	**853-040**	5	8	⅝	7.50	8.96	1.14	1.14	HC
6	608	**853-060**	2	8	¾	9.50	10.95	1.51	1.27	HC
8	608	**853-080**	2	8	¾	11.75	13.51	1.62	1.45	HC
10	A33	**853-100N**	1	12	⅞	14.25	16.00	1.00	1.00	SOLID
12	A33	**853-120N**	1	12	⅞	17.00	19.00	1.00	1.00	SOLID
14	A33	**853-140N**	1	12	1	18.75	21.00	1.00	1.00	SOLID
16	A33	**853-160N**	1	16	1	21.25	23.50	1.00	1.00	SOLID
18	A33	**853-180N**	1	16	1 ⅛	22.75	25.00	1.00	1.00	SOLID
20	A33	**853-200N**	1	20	1 ⅛	25.00	27.50	1.00	1.00	SOLID
24	A33	**853-240N**	1	20	1 ¼	29.50	32.00	1.00	1.00	SOLID



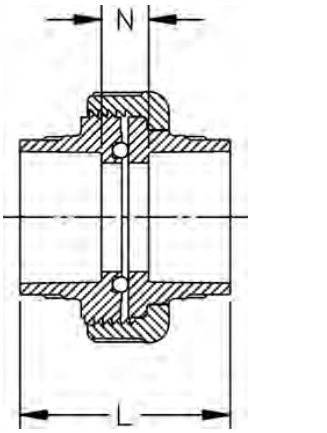


Van Stone Flange 300lb (S) Schedule 80 Harvel® PVC

- ANSI 300 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	Design
½	608	**854-005-300**	5	4	½	2.63	3.75	1.03	0.11	0.57	FAB
¾	608	**854-007-300**	5	4	⅝	3.25	4.63	1.15	0.13	0.59	FAB
1	608	**854-010-300**	5	4	⅝	3.50	4.88	1.38	0.11	0.66	FAB
1 ¼	608	**854-012-300**	5	4	⅝	3.88	5.25	1.45	0.14	0.69	FAB
1 ½	608	**854-015-300**	5	4	¾	4.50	6.13	1.59	0.15	0.75	FAB
2	608	**854-020-300**	5	8	⅝	5.00	6.50	1.76	0.20	0.82	FAB
2 ½	608	**854-025-300**	5	8	¾	5.88	7.50	2.05	0.22	0.98	FAB
3	608	**854-030-300**	5	8	¾	6.63	8.25	2.25	0.30	1.02	FAB
4	608	**854-040-300**	5	8	¾	7.88	10.00	2.65	0.34	1.10	FAB
6	608	**854-060-300**	2	12	¾	10.63	12.50	3.45	0.35	1.25	FAB
8	608	**854-080-300**	2	12	⅞	13.00	15.00	4.50	0.40	1.71	FAB
10	602	**854-100-300**	2	16	1	15.25	17.50	5.63	0.50	1.73	FAB
12	602	**854-120-300**	2	16	1 ⅛	17.75	20.50	6.69	0.56	1.72	FAB



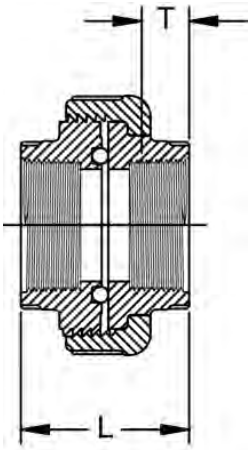


Union Type 375 (SxS) Schedule 80 Harvel® PVC

235 psi @ 73°F (16.2 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	N (inch)
½	608	**897-375-005**	**857-375-005**	5	2.56	0.78
¾	608	**897-375-007**	**857-375-007**	5	2.80	0.76
1	608	**897-375-010**	**857-375-010**	5	3.22	0.89
1 ¼	608	**897-375-012**	**857-375-012**	5	3.56	0.99
1 ½	608	**897-375-015**	**857-375-015**	5	3.76	0.92
2	608	**897-375-020**	**857-375-020**	2	4.18	1.11



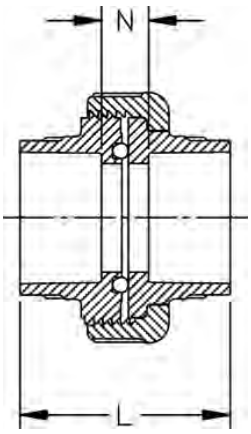


Union Type 375 (FPTxFPT) Schedule 80 Harvel® PVC

- 235 psi @ 73°F (16.2 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	T (inch)
½	608	**898-375-005**	**858-375-005**	5	2.06	0.75
¾	608	**898-375-007**	**858-375-007**	5	2.11	0.79
1	608	**898-375-010**	**858-375-010**	5	2.60	1.01
1 ¼	608	**898-375-012**	**858-375-012**	5	2.80	1.06
1 ½	608	**898-375-015**	**858-375-015**	5	2.76	1.06
2	608	**898-375-020**	**858-375-020**	2	2.93	1.09



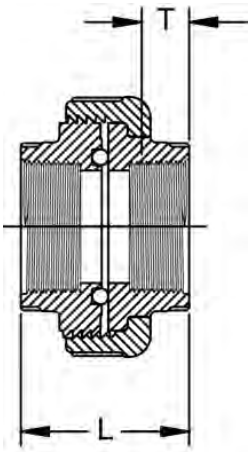


Union (SxS) Schedule 80 Harvel® PVC

150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	N (inch)
3	608	**897-030**	**857-030**	1	4.74	0.96
4	608	**897-040**	**857-040**	1	5.62	1.11



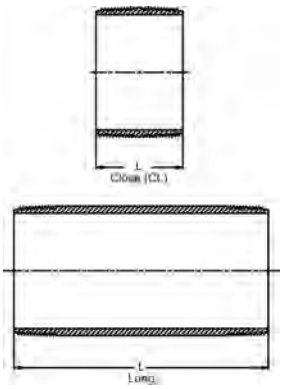


Union (FPTxFPT) Schedule 80 Harvel® PVC

- 150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	T (inch)
3	608	**898-030**	**858-030**	1	4.75	1.33
4	608	**898-040**	**858-040**	1	5.71	1.78

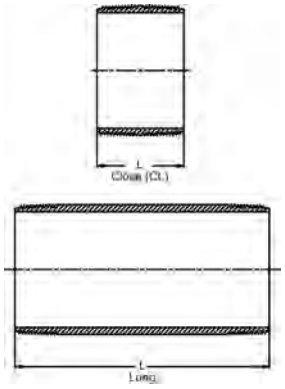




Nipple (MPTxMPT) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	Design
1/2 x CL	608	**861-077**	50	1.13	MOLD
1/2 x 2	608	**861-079**	25	2.00	MOLD
1/2 x 3	608	**861-081**	25	3.00	MOLD
1/2 x 4	608	**861-082**	25	4.00	MOLD
1/2 x 5	608	**861-083**	25	5.00	MOLD
1/2 x 6	608	**861-084**	25	6.00	MOLD
1/2 x 8	608	**861-086**	25	8.00	FAB
1/2 x 10	608	**861-087**	25	10.00	FAB
1/2 x 12	608	**861-088**	25	12.00	FAB
3/4 x CL	608	**861-104**	25	1.38	MOLD
3/4 x 2	608	**861-020**	25	2.00	MOLD
3/4 x 3	608	**861-106**	25	3.00	MOLD
3/4 x 4	608	**861-107**	25	4.00	MOLD
3/4 x 5	608	**861-108**	25	5.00	MOLD
3/4 x 6	608	**861-109**	25	6.00	MOLD
3/4 x 8	608	**861-110**	25	8.00	FAB
3/4 x 10	608	**861-111**	25	10.00	FAB
3/4 x 12	608	**861-112**	25	12.00	FAB
1 x CL	608	**861-133**	25	1.50	MOLD
1 x 2	608	**861-134**	25	2.00	MOLD
1 x 3	608	**861-135**	25	3.00	MOLD
1 x 4	608	**861-136**	25	4.00	MOLD
1 x 5	608	**861-137**	25	5.00	MOLD
1 x 6	608	**861-138**	25	6.00	MOLD
1 x 8	608	**861-139**	25	8.00	FAB
1 x 10	608	**861-140**	25	10.00	FAB
1 x 12	608	**861-141**	25	12.00	FAB
1 1/4 x CL	608	**861-170**	25	1.63	MOLD
1 1/4 x 2	608	**861-171**	25	2.00	MOLD
1 1/4 x 3	608	**861-172**	25	3.00	MOLD
1 1/4 x 4	608	**861-173**	25	4.00	MOLD
1 1/4 x 5	608	**861-174**	25	5.00	MOLD

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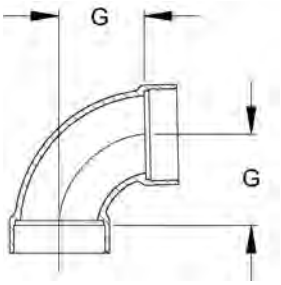
Size (inch)	P/L	Code	Pack Qty	L (inch)	Design
1 1/4 x 6	608	**861-175**	25	6.00	MOLD
1 1/4 x 8	608	**861-176**	25	8.00	FAB
1 1/4 x 10	608	**861-177**	25	10.00	FAB
1 1/4 x 12	608	**861-178**	25	12.00	FAB
1 1/2 x CL	608	**861-213**	25	1.75	MOLD
1 1/2 x 2	608	**861-214**	25	2.00	MOLD
1 1/2 x 3	608	**861-215**	25	3.00	MOLD
1 1/2 x 4	608	**861-216**	25	4.00	MOLD
1 1/2 x 5	608	**861-217**	25	5.00	MOLD
1 1/2 x 6	608	**861-218**	25	6.00	MOLD
1 1/2 x 8	608	**861-219**	25	8.00	FAB
1 1/2 x 10	608	**861-220**	25	10.00	FAB
1 1/2 x 12	608	**861-221**	25	12.00	FAB
2 x CL	608	**861-251**	25	2.00	MOLD
2 x 2 1/2	608	**861-252**	25	2.50	MOLD
2 x 3	608	**861-253**	25	3.00	MOLD
2 x 4	608	**861-254**	25	4.00	MOLD
2 x 5	608	**861-255**	25	5.00	MOLD
2 x 6	608	**861-256**	25	6.00	MOLD
2 x 8	608	**861-257**	25	8.00	FAB
2 x 10	608	**861-258**	25	10.00	FAB
2 x 12	608	**861-259**	25	12.00	FAB
2 1/2 x CL	608	**861-291**	10	2.50	FAB
2 1/2 x 4	608	**861-295**	10	4.00	FAB
2 1/2 x 3	608	**861-292**	10	3.00	FAB
2 1/2 x 5	608	**861-296**	10	5.00	FAB
2 1/2 x 6	608	**861-297**	10	6.00	FAB
2 1/2 x 8	608	**861-298**	10	8.00	FAB
2 1/2 x 10	608	**861-299**	10	10.00	FAB
2 1/2 x 12	608	**861-300**	10	12.00	FAB
3 x CL	608	**861-338**	10	2.63	FAB
3 x 3	608	**861-340**	10	3.00	FAB
3 x 4	608	**861-341**	10	4.00	FAB
3 x 5	608	**861-342**	10	5.00	FAB
3 x 6	608	**861-343**	10	6.00	FAB
3 x 8	608	**861-344**	10	8.00	FAB
3 x 10	608	**861-345**	10	10.00	FAB
3 x 12	608	**861-346**	10	12.00	FAB
4 x CL	608	**861-422**	10	2.88	FAB
4 x 4	608	**861-423**	10	4.00	FAB
4 x 5	608	**861-425**	10	5.00	FAB
4 x 6	608	**861-426**	10	6.00	FAB
4 x 8	608	**861-427**	5	8.00	FAB
4 x 10	608	**861-428**	5	10.00	FAB
4 x 12	608	**861-429**	5	12.00	FAB

Schedule 80 PVC DWV Fittings



1/4 Bend Short Sweep (SxS) Schedule 80 Harvel® PVC

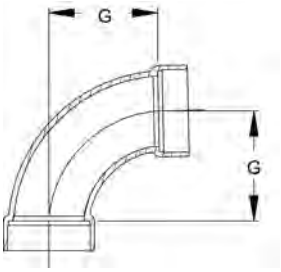
Size (inch)	P/L	Code	Pack Qty	G (inch)
1 1/2	608	**806-015SS**	4	1.75
2	608	**806-020SS**	4	2.31
3	608	**806-030SS**	1	3.06
4	608	**806-040SS**	1	3.88





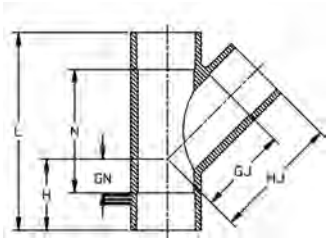
1/4 Bend Long Sweep (SxS) Schedule 80 Harvel® PVC - FAB

Size (inch)	P/L	Code	Pack Qty	G (inch)
1 1/2	A33	**806-015LSN**	4	4.13
2	A33	**806-020LSN**	4	4.75
3	A33	**806-030LSN**	1	7.00
4	A33	**806-040LSN**	1	9.00



45° Wye (SxSxS) Schedule 80 Harvel® PVC



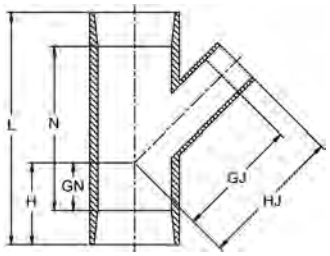


1-1/2" - 2" 235 psi @ 72°F (16.2 bar @ 22.7°C)
3" - 6" 150 psi @ 72°F (10.3 bar @ 22.7°C)
8" - 24" 100 psi @ 72°F (6.9 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
1 ½	608	**870-015**	20	2.79	1.20	2.60	4.18	6.80	4.02	SL
2	608	**870-020**	10	3.56	1.36	2.87	5.07	7.99	4.97	SL
2 ½	H02	**870-025S**	1	3.97	0.84	2.59	5.72	8.31	3.97	SL
3	608	**870-030**	4	4.91	1.82	3.73	6.83	10.45	6.62	SL
4	608	**870-040**	4	6.26	2.06	4.41	8.61	12.94	8.24	SL
6	608	**870-060**	2	8.38	1.85	4.90	11.44	16.50	10.39	HS
8	608	**870-080**	1	11.20	2.06	6.08	15.22	21.34	13.31	HS
10	A33	**875-100N**	1	19.75	5.50	11.25	24.75	31.75	21.75	FAB
12	A33	**875-120N**	1	22.63	6.50	12.50	28.63	37.50	25.50	FAB
14	A33	**875-140N**	1	25.75	7.00	14.00	32.75	41.75	27.75	FAB
16	A33	**875-160N**	1	28.88	7.75	16.00	36.88	47.25	31.25	FAB
18	A33	**875-180N**	1	32.50	8.50	17.50	41.50	53.00	35.00	FAB
20	A33	**875-200N**	1	35.50	9.50	19.50	45.50	58.75	38.75	FAB
24	A33	**875-240N**	1	42.00	11.00	23.00	54.00	70.00	46.00	FAB

Reducing 45° Wye (SxSxS) Schedule 80 Harvel® PVC

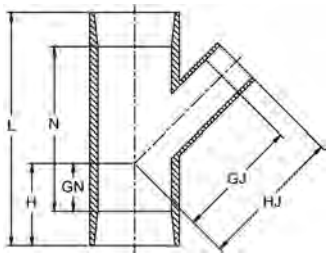




2" 235 psi @ 72°F (16.2 bar @ 22.7° C)
3" - 6" 150 psi @ 72°F (10.3 bar @ 22.7°C)
8" - 24" 100 psi @ 72°F (6.9 bar @ 22.7°C)

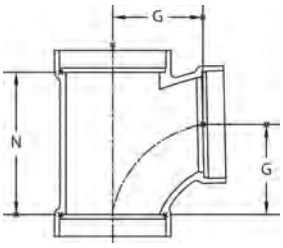
Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
2 x 1	608	**870-249FB**	10	4.27	1.38	2.88	5.41	8.02	5.00	BUSH
2 x 1 ½	608	**870-251FB**	10	3.96	1.36	2.87	5.37	7.99	4.97	BUSH
3 x 1 ½	608	**870-337FB**	4	5.80	1.82	3.73	7.34	10.45	6.62	BUSH
3 x 2	608	**870-338FB**	4	5.77	1.82	3.73	7.33	10.45	6.62	BUSH
4 x 2	608	**870-420FB**	4	7.40	2.06	4.41	9.00	12.94	8.24	BUSH
4 x 3	608	**870-422FB**	4	7.03	2.06	4.41	9.00	12.94	8.24	BUSH
6 x 2	608	**870-528FB**	2	8.24	1.87	4.91	8.24	16.49	10.42	BUSH
6 x 3	608	**870-530FB**	2	7.88	1.87	4.91	9.84	16.49	10.42	BUSH
6 x 4	608	**870-532**	2	7.14	1.87	4.91	9.36	16.49	10.42	HS
8 x 3	608	**870-580FB**	1	10.23	0.41	4.43	12.20	15.98	7.95	BUSH
8 x 4	608	**870-582**	1	9.53	0.38	4.39	11.73	16.03	7.63	HS
8 x 6	608	**870-585**	1	11.13	0.88	4.89	14.14	19.52	11.50	HS
10 x 4	A33	**875-623N**	1	14.00	1.25	6.25	16.00	23.00	13.00	FAB
10 x 6	A33	**875-626N**	1	16.13	2.75	7.50	19.13	26.00	16.00	FAB
10 x 8	A33	**875-628N**	1	17.50	4.00	9.25	21.50	28.00	18.75	FAB
12 x 4	A33	**875-663N**	1	15.50	0.50	6.00	17.50	25.75	13.75	FAB
12 x 6	A33	**875-666N**	1	16.68	2.00	8.00	20.50	28.68	16.68	FAB
12 x 8	A33	**875-668N**	1	19.00	3.50	9.50	23.00	31.50	19.50	FAB
12 x 10	A33	**875-670N**	1	21.25	5.00	11.00	26.25	34.50	22.50	FAB
14 x 4	A33	**875-696N**	1	16.25	0.25	7.25	18.25	28.25	14.25	FAB
14 x 6	A33	**875-698N**	1	18.50	1.75	8.63	21.50	31.25	17.25	FAB
14 x 8	A33	**875-700N**	1	19.75	3.00	10.00	23.75	34.00	20.00	FAB
14 x 10	A33	**875-702N**	1	22.00	4.50	11.50	27.00	37.00	23.00	FAB
14 x 12	A33	**875-704N**	1	23.50	6.00	13.00	29.50	39.75	25.75	FAB
16 x 4	A33	**875-730N**	1	17.75	-0.75	7.50	19.75	31.00	15.00	FAB
16 x 6	A33	**875-732N**	1	19.88	1.00	9.00	22.88	34.00	18.00	FAB
16 x 8	A33	**875-734N**	1	21.25	2.50	10.25	25.25	36.75	20.75	FAB
16 x 10	A33	**875-736N**	1	23.50	4.00	12.00	28.50	39.75	23.75	FAB
16 x 12	A33	**875-738N**	1	25.00	5.50	14.25	31.00	42.75	26.75	FAB
16 x 14	A33	**875-740N**	1	27.25	6.25	14.25	34.25	44.50	28.50	FAB
18 x 4	A33	**875-784N**	1	19.00	-1.25	8.00	21.00	34.00	16.00	FAB
18 x 6	A33	**875-786N**	1	21.25	0.50	9.50	24.25	37.00	19.00	FAB
18 x 8	A33	**875-788N**	1	22.75	2.00	11.00	26.75	39.75	21.75	FAB

table continued on the next page



Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
18 x 10	A33	**875-790N**	1	25.00	3.50	12.50	30.00	42.75	24.75	FAB
18 x 12	A33	**875-792N**	1	26.25	4.75	13.75	32.50	45.50	27.50	FAB
18 x 14	A33	**875-794N**	1	28.75	5.75	14.75	35.75	47.50	29.50	FAB
18 x 16	A33	**875-796N**	1	30.25	7.25	16.00	38.25	50.25	32.25	FAB
20 x 4	A33	**875-814N**	1	20.50	-1.75	8.50	22.50	36.75	16.75	FAB
20 x 6	A33	**875-816N**	1	22.75	-0.25	10.00	25.75	39.75	19.75	FAB
20 x 8	A33	**875-818N**	1	24.25	1.50	11.50	28.25	42.75	22.75	FAB
20 x 10	A33	**875-820N**	1	26.50	3.00	13.00	31.50	45.75	25.75	FAB
20 x 12	A33	**875-822N**	1	28.00	4.25	14.25	34.00	48.50	28.50	FAB
20 x 14	A33	**875-824N**	1	30.25	5.25	15.00	37.25	50.25	30.25	FAB
20 x 16	A33	**875-826N**	1	31.75	6.50	16.50	39.75	53.00	33.00	FAB
20 x 18	A33	**875-828N**	1	34.00	8.00	18.00	43.00	56.00	36.00	FAB
24 x 4	A33	**875-904N**	1	23.25	-3.00	9.25	25.25	42.50	18.50	FAB
24 x 6	A33	**875-906N**	1	25.50	-1.50	10.75	28.50	45.50	21.54	FAB
24 x 8	A33	**875-908N**	1	27.00	0.00	12.00	31.00	48.25	24.25	FAB
24 x 10	A33	**875-910N**	1	29.25	1.75	13.50	34.25	51.25	27.25	FAB
24 x 12	A33	**875-912N**	1	30.50	3.25	15.00	36.50	54.25	30.25	FAB
24 x 14	A33	**875-914N**	1	33.00	4.00	16.00	40.00	56.00	32.00	FAB
24 x 16	A33	**875-916N**	1	34.50	5.50	17.50	42.50	58.75	34.75	FAB
24 x 18	A33	**875-918N**	1	36.75	6.75	18.75	45.75	61.50	37.50	FAB
24 x 20	A33	**875-920N**	1	38.25	8.25	20.25	48.25	64.50	40.50	FAB





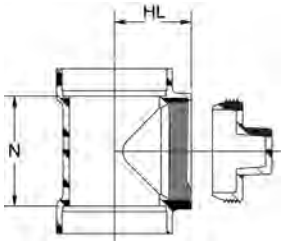
Sanitary Tee (SxSxS) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	G (inch)	N (inch)
1 1/2	608	**37R461501**	5	1.75	2.75
2	608	**37R461502**	5	2.31	3.69
3	608	**37R461503**	5	3.06	4.88
4	608	**37R461504**	5	3.88	6.13



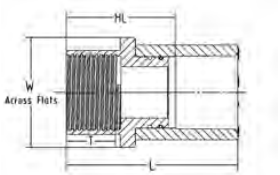
Cleanout Tee with Plug (SxSxFPT) Schedule 80 Harvel® PVC

Size (inch)	P/L	Code	Pack Qty	HL (inch)	N (inch)
1 1/2	608	**37R461101**	2	2.07	1.80
2	608	**37R461102**	2	2.35	2.32
3	608	**37R461103**	2	3.51	3.63
4	608	**37R461104**	2	4.07	4.25



Schedule 80 PVC Metal Transition Fittings

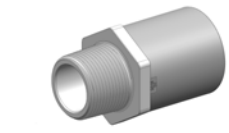


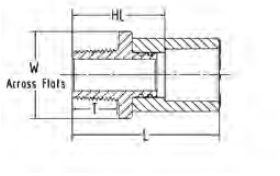


Female Adapter (SxFPT) Schedule 80 Harvel® PVC-to-316SS

- 150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**868-005SS**	10	1.49	2.38	0.84	1.25
¾	A35	**868-007SS**	10	1.67	2.68	0.92	1.50
1	A35	**868-010SS**	6	1.98	3.11	0.96	1.75
1 ¼	A35	**868-012SS**	5	2.19	3.45	1.04	2.12
1 ½	A35	**868-015SS**	5	2.35	3.73	1.04	2.50
2	A35	**868-020SS**	4	2.63	4.14	1.29	3.00





Male Adapter (SxMPT) Schedule 80 Harvel® PVC-to-316SS

- 150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**869-005SS**	10	1.49	2.38	0.70	1.25
¾	A35	**869-007SS**	10	1.67	2.68	0.74	1.50
1	A35	**869-010SS**	6	1.98	3.11	0.92	1.75
1 ¼	A35	**869-012SS**	5	2.19	3.45	0.95	2.12
1 ½	A35	**869-015SS**	5	2.35	3.73	0.99	2.50
2	A35	**869-020SS**	4	2.64	4.14	1.03	3.00



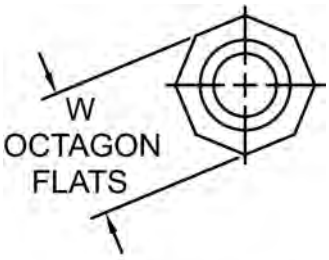
Metal Union End Connector Type 375 (316 SS)

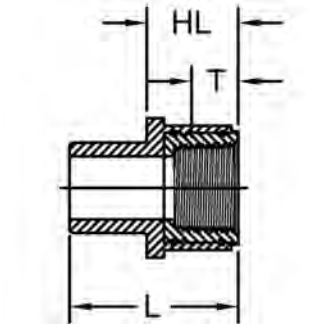
150 psi @ 73°F (10.3 bar @ 22.7°C)
Union Sold Separately

Size (inch)	P/L	Code	Pack Qty
½	A35	**37X003314**	1
¾	A35	**37X003315**	1
1	A35	**37X003316**	1
1 ¼	A35	**37X003317**	1
1 ½	A35	**37X003318**	1
2	A35	**37X003319**	1

Transition Fittings (SPGxFPT) Schedule 80 Harvel® PVC-to-Brass



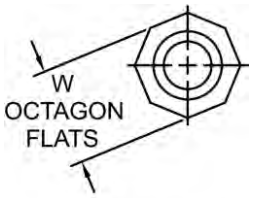


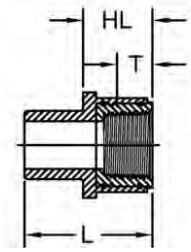


150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**878-005BR**	25	1.02	1.75	0.70	1.27
¾	A35	**878-007BR**	15	1.07	2.07	0.74	1.52
1	A35	**878-010BR**	15	1.32	2.44	0.81	1.93
1 ¼	A35	**878-012BR**	15	1.38	2.49	0.85	2.29
1 ½	A35	**878-015BR**	10	1.44	2.74	0.87	2.60
2	A35	**878-020BR**	5	1.43	2.81	1.11	3.36







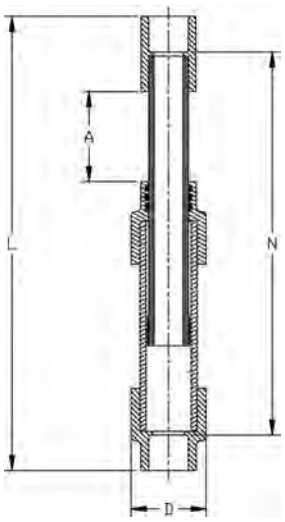
Transition Fittings (SPGxFPT) Schedule 80 Harvel® PVC-to-316SS

150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**878-005SS**	25	1.02	1.75	0.70	1.27
¾	A35	**878-007SS**	15	1.07	2.07	0.74	1.52
1	A35	**878-010SS**	15	1.32	2.44	0.81	1.93
1 ¼	A35	**878-012SS**	15	1.38	2.49	0.85	2.29
1 ½	A35	**878-015SS**	10	1.45	2.74	0.87	2.60
2	A35	**878-020SS**	5	1.43	2.81	1.11	3.36

Schedule 80 PVC Expansion Joints



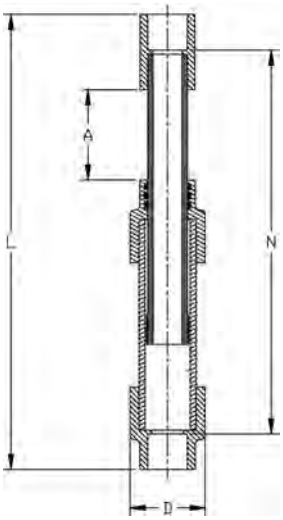


Expansion Joint 6" Travel (SxS) Schedule 80 Harvel® PVC

To order SxSPG add "P" to end of part number.
To order FxF add "F" to end of part number.

Size (inch)	P/L	EPDM Code	FKM Code	A (inch)	D (inch)	L (inch)	N (inch)
½	634	**826-005X6**	**836-005X6**	3.00	1.86	13.97	12.17
¾	634	**826-007X6**	**836-007X6**	3.00	2.23	14.44	12.40
1	634	**826-010X6**	**836-010X6**	3.00	2.50	14.98	12.69
1 ¼	634	**826-012X6**	**836-012X6**	3.00	2.89	15.56	12.98
1 ½	634	**826-015X6**	**836-015X6**	3.00	3.51	16.00	13.21
2	634	**826-020X6**	**836-020X6**	3.00	4.40	18.05	15.01
3	634	**826-030X6**	**836-030X6**	3.00	5.52	19.75	16.00
4	634	**826-040X6**	**836-040X6**	3.00	7.92	28.29	23.76
6	634	**826-060X6**	**836-060X6**	3.00	9.80	27.79	21.73
8	634	**826-080X6**	**836-080X6**	3.00	10.75	25.35	17.31
10	634	**826-100X6**	**836-100X6**	3.00	12.75	29.64	19.60





Expansion Joint 12" Travel (SxS) Schedule 80 Harvel® PVC

To order SxSPG add "P" to end of part number.
To order FxF add "F" to end of part number.

Size (inch)	P/L	EPDM Code	FKM Code	A (inch)	D (inch)	L (inch)	N (inch)
½	634	**826-005X12**	**836-005X12**	6.00	1.86	23.10	21.30
¾	634	**826-007X12**	**836-007X12**	6.00	2.23	23.57	21.52
1	634	**826-010X12**	**836-010X12**	6.00	2.50	24.11	21.81
1 ¼	634	**826-012X12**	**836-012X12**	6.00	2.89	24.69	22.11
1 ½	634	**826-015X12**	**836-015X12**	6.00	3.51	25.12	22.34
2	634	**826-020X12**	**836-020X12**	6.00	4.40	27.05	24.01
3	634	**826-030X12**	**836-030X12**	6.00	5.52	28.75	25.00
4	634	**826-040X12**	**836-040X12**	6.00	7.92	37.28	32.76
6	634	**826-060X12**	**836-060X12**	6.00	9.80	26.79	30.73
8	634	**826-080X12**	**836-080X12**	6.00	10.75	28.35	20.31
10	634	**826-100X12**	**836-100X12**	6.00	12.75	32.64	22.60

Section 2

ChlorFIT® Schedule 80 CPVC Piping Systems



Glossary

FPT	=	**Female Pipe Thread**
MPT	=	**Male Pipe Thread**
S	=	**Tapered Socket**
SPG	=	**Spigot End (same dimension as pipe outside diameter)**
*****	=	**Non-Returnable / Non-cancellable**
^	=	**40% Restocking Fee**
HS	=	**High Strength Design**
SL	=	**Streamline Design**
BUSH	=	**Assembled Fitting from Molded Components**
FAB	=	**Fabricated Fitting**

The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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	ChlorFIT® Pressure Pipe	40
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	ChlorFIT® DWV Fittings	60
	ChlorFIT® Metal Transition Fittings	63
	ChlorFIT® Expansion Joints	66

Specifications, Standards and Tolerances

Specifications and Standards

NSF/ANSI Standard 14

NSF/ANSI Standard 61

ASTM D 1784	:	Material CPVC Type IV, Grade I Gray (cell classification 23447) – Pipe
		Material CPVC Type IV, Grade I Gray (cell classification 23447) – Fittings
ASTM F 441	:	CPVC Schedule 40 and Schedule 80 Pipe
ASTM F 439	:	CPVC Schedule 80 Socket & Threaded Fittings
ASTM F 437	:	CPVC Schedule 80 Threaded Fittings
ASTM F 1970	:	CPVC Schedule 80 Unions
ANSI B16.5	:	Flange Bolt Hole Patterns
ANSI B1.20.1	:	CPVC Schedule 80 NPT Threads
CSA B137.6	:	CPVC Schedule 80 Pipe (1¼"–2½" only)
ULC S102.2	:	CPVC Schedule 40 Pipe (½"–24"); Schedule 80 Pipe (½"–12")

Molded Dimension Tolerances

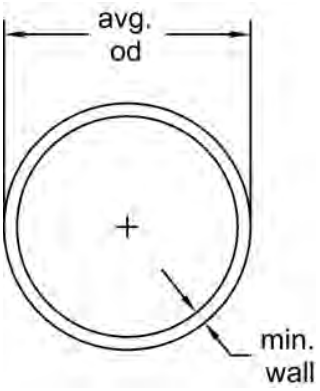
A	Piston Position; Expansion Joints : ±0.03
D	Outside Diameter : ± 0.06
G, G1	Intersections of centerlines to bottom of socket; 90° Ells, Tees : up to 4" ±0.03; 6" and above ±0.06
GJ, GN	Intersections of centerlines to bottom of socket; 45° Wyes : up to 4" ±0.03; 6" and above ±0.06
H, HJ, HN	Intersections of centerlines to face of fitting; 90° Ells, 45° Ells, Tees, 45° Wyes : up to 4" ±0.03; 6" and above ±0.06
HL	Socket Bottom to Face of Fitting : up to 4" ±0.03; 6" and above ±0.06
J	Intersections of centerlines to bottom of socket; 45° & 30° Ells : up to 4" ±0.03; 6" and above ±0.06
L	Overall Length of fitting : ± 0.06
N	Socket Bottom to Socket Bottom; Couplings, Unions : ± 0.06
N1	Socket Bottom to Face of Flange : ± 0.06
R	Thickness on Plugs, Flanges : ± 0.03
T, T1	Effective Thread Length : Reference Only
W	Height of Cap : ± 0.06

Fabricated Dimension Tolerances

D	Outside Diameter : ± 0.50
E	Drive Pin Diameter : ± 0.50
G, G1	Intersections of centerlines to bottom of socket; 90° Ells, Tees, Crosses : ± 0.25
GJ, GN	Intersections of centerlines to bottom of socket; 45° Wyes : ± 0.25
H, HJ, HN	Intersections of centerlines to face of fitting; 90° Ells, 45° Ells, Tees, 45° Wyes, True Wyes : ± 0.50
HL	Socket Bottom to Face of Fitting : ± 0.25
J	Intersections of centerlines to bottom of socket; 11¼°, 15°, 30°, 22½°, 45° Ells, True Wyes : ± 0.25
L	Overall Length of fitting : ± 0.50
N	Socket Bottom to Socket Bottom; Couplings : ± 0.50
N1	Socket Bottom to Face of Flange : ± 0.50
R	Thickness on Plugs, Flanges : ± 0.25
T, T1	Effective Thread Length : Reference Only
W	Height of Cap : ± 0.25

Schedule 40 CORZAN® CPVC Pipe

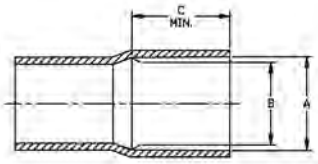




Schedule 40 CORZAN® CPVC Plain End Pipe - 20 Ft Lengths

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints

Size (inch)	P/L	Plain End Code	Lift Qty. (20ft Lgths) (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
¼	H23	**H0400025CG2000**	5700	0.540	0.088	0.091	780
⅜	H23	**H0400038CG2000**	5700	0.675	0.091	0.122	620
½	H23	**H0400050CG2000**	5700	0.840	0.109	0.180	600
¾	H23	**H0400075CG2000**	5260	1.050	0.113	0.239	480
1	H23	**H0400100CG2000**	4280	1.315	0.133	0.352	450
1 ¼	H23	**H0400125CG2000**	2360	1.660	0.140	0.475	370
1 ½	H23	**H0400150CG2000**	2060	1.900	0.145	0.568	330
2	H23	**H0400200CG2000**	1660	2.375	0.154	0.761	280
2 ½	H23	**H0400250CG2000**	1080	2.875	0.203	1.201	300
3	H23	**H0400300CG2000**	840	3.500	0.216	1.572	260
3 ½	H23	**H0400350CG2000**	680	4.000	0.226	1.905	240
4	H23	**H0400400CG2000**	520	4.500	0.237	2.239	220
5	H23	**H0400500CG2000**	400	5.563	0.258	3.095	190
6	H23	**H0400600CG2000**	340	6.625	0.280	3.945	180
8	H23	**H0400800CG2000**	220	8.625	0.322	5.958	160
10	H23	**H0401000CG2000**	80	10.750	0.365	8.458	140
12	H23	**H0401200CG2000**	60	12.750	0.406	11.172	130
14	H23	**H0401400CG2000**	60	14.000	0.437	13.262	130
16	H23	**H0401600CG2000**	60	16.000	0.500	17.312	130
18	H23	**H0401800CG2000**	40	18.000	0.562	0.586	130
20	H23	**H0402000CG2000**	40	20.000	0.593	26.530	120
24	H23	**H0402400CG2000**	40	24.000	0.687	36.916	120

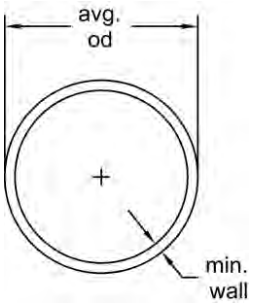


Schedule 40 CORZAN® CPVC Belled End Pipe - 20 Ft Length Less Bell

Size (inch)	P/L	Belled End Code	A-Socket Entrance (Belled Pipe)	B-Socket Bottom (Belled Pipe)	C-Min. (Belled Pipe)
½	H23	**H0400050CG200B**	0.848±0.004	0.836±0.004	1.000
¾	H23	**H0400075CG200B**	1.058±0.004	1.046±0.004	1.250
1	H23	**H0400100CG200B**	1.325±0.005	1.310±0.005	1.500
1 ¼	H23	**H0400125CG200B**	1.670±0.005	1.655±0.005	1.750
1 ½	H23	**H0400150CG200B**	1.912±0.005	1.894±0.006	2.000
2	H23	**H0400200CG200B**	2.387±0.006	2.363±0.006	2.250
2 ½	H23	**H0400250CG200B**	2.889±0.007	2.861±0.007	2.500
3	H23	**H0400300CG200B**	3.516±0.008	3.484±0.008	3.250
3 ½	H23	**H0400350CG200B**	4.016±0.008	3.984±0.008	3.500
4	H23	**H0400400CG200B**	4.518±0.009	4.482±0.009	4.000
5	H23	**H0400500CG200B**	5.583±0.010	5.543±0.010	4.000
6	H23	**H0400600CG200B**	6.647±0.011	6.603±0.011	6.000
8	H23	**H0400800CG200B**	8.655±0.015	8.598±0.015	6.000
10	H23	**H0401000CG200B**	10.776±0.015	10.722±0.015	7.500
12	H23	**H0401200CG200B**	12.778±0.015	12.721±0.015	8.500
14	H23	**H0401400CG200B**	14.035±0.015	13.985±0.015	9.000
16	H23	**H0401600CG200B**	16.045±0.015	15.980±0.015	10.000
18	H23	**H0401800CG200B**	18.055±0.020	17.980±0.020	12.000
20	H23	**H0402000CG200B**	20.065±0.025	19.980±0.025	12.000
24	H23	**H0402400CG200B**	24.075±0.030	23.970±0.030	12.000

ChlorFIT® Pressure Pipe

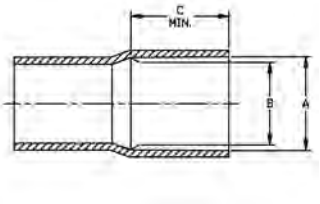




ChlorFIT Schedule 80 CORZAN® CPVC Plain End Pipe - 20 Ft Lengths

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints

Size (inch)	P/L	Plain End Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
¼	H06	**H0800025CG2000**	5700	0.540	0.119	0.112	1130
⅜	H06	**H0800038CG2000**	5700	0.675	0.126	0.154	920
½	H06	**H0800050CG2000**	5700	0.840	0.147	0.225	850
¾	H06	**H0800075CG2000**	5260	1.050	0.154	0.305	690
1	H06	**H0800100CG2000**	4280	1.315	0.179	0.449	630
1 ¼	H06	**H0800125CG2000**	2360	1.660	0.191	0.618	520
1 ½	H06	**H0800150CG2000**	2060	1.900	0.200	0.751	470
2	H06	**H0800200CG2000**	1660	2.375	0.218	1.040	400
2 ½	H06	**H0800250CG2000**	1080	2.875	0.276	1.584	420
3	H06	**H0800300CG2000**	840	3.500	0.300	2.124	370
3 ½	H06	**H0800350CG2000**	680	4.000	0.318	2.607	350
4	H06	**H0800400CG2000**	520	4.500	0.337	3.105	320
5	H06	**H0800500CG2000**	400	5.563	0.375	4.343	290
6	H06	**H0800600CG2000**	340	6.625	0.432	5.929	280
8	H06	**H0800800CG2000**	220	8.625	0.500	9.051	250
10	H06	**H0801000CG2000**	80	10.750	0.593	13.429	230
12	H06	**H0801200CG2000**	60	12.750	0.687	18.458	230
14	H06	**H0801400CG2000**	60	14.000	0.750	22.224	220
16	H06	**H0801600CG2000**	60	16.000	0.843	28.557	220
18	H06	**H0801800CG2000**	40	18.000	0.937	35.745	220
20	H06	**H0802000CG2000**	40	20.000	1.031	45.022	220
24	H06	**H0802400CG2000**	40	24.000	1.218	63.878	210

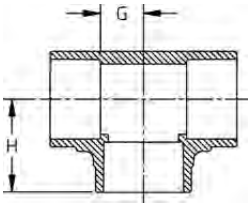


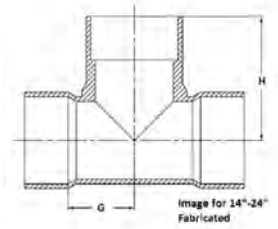
ChlorFIT Schedule 80 CORZAN® CPVC Belled End Pipe - 20 Ft. Length Less Bell

Size (inch)	P/L	Belled End Code	A-Socket Entrance (Belled Pipe)	B-Socket Bottom (Belled Pipe)	C-Min. (Belled Pipe)
½	H06	**H0800050CG200B**	0.848±0.004	0.836±0.004	1.000
¾	H06	**H0800075CG200B**	1.058±0.004	1.046±0.004	1.250
1	H06	**H0800100CG200B**	1.325±0.005	1.310±0.005	1.500
1 ¼	H06	**H0800125CG200B**	1.670±0.005	1.655±0.005	1.750
1 ½	H06	**H0800150CG200B**	1.912±0.006	1.894±0.006	2.000
2	H06	**H0800200CG200B**	2.387±0.006	2.363±0.006	2.250
2 ½	H06	**H0800250CG200B**	2.889±0.007	2.861±0.007	2.500
3	H06	**H0800300CG200B**	3.516±0.008	3.484±0.008	3.250
3 ½	H06	**H0800350CG200B**	4.016±0.008	3.984±0.008	3.500
4	H06	**H0800400CG200B**	4.518±0.009	4.482±0.009	4.000
5	H06	**H0800500CG200B**	5.583±0.010	5.543±0.010	4.000
6	H06	**H0800600CG200B**	6.647±0.011	6.603±0.011	6.000
8	H06	**H0800800CG200B**	8.655±0.015	8.598±0.015	6.000
10	H06	**H0801000CG200B**	10.776±0.015	10.722±0.015	7.500
12	H06	**H0801200CG200B**	12.778±0.015	12.721±0.015	8.500
14	H06	**H0801400CG200B**	14.035±0.015	13.985±0.015	9.000
16	H06	**H0801600CG200B**	16.045±0.015	15.980±0.015	10.000
18	H06	**H0801800CG200B**	18.055±0.020	17.980±0.020	12.000
20	H06	**H0802000CG200B**	20.065±0.025	19.980±0.025	12.000
24	H06	**H0802400CG200B**	24.075±0.030	23.970±0.030	12.000

ChlorFIT® Pressure Fittings



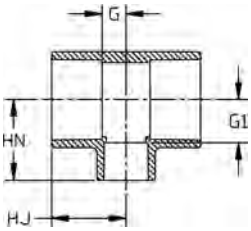


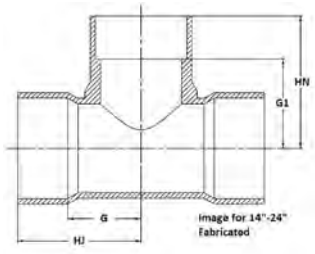


ChlorFIT Tee (SxSxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
½	625	**9801-005**	25	1.41	0.51	SL
¾	625	**9801-007**	15	1.60	0.58	SL
1	625	**9801-010**	20	1.85	0.71	SL
1 ¼	625	**9801-012**	5	2.17	0.91	SL
1 ½	625	**9801-015**	5	2.43	1.04	SL
2	625	**9801-020**	5	2.81	1.30	SL
2 ½	625	**9801-025**	5	3.31	1.55	SL
3	625	**9801-030**	5	3.71	1.81	SL
4	625	**9801-040**	5	4.60	2.33	SL
6	625	**9801-060**	2	6.53	3.51	SL
8	625	**9801-080**	1	8.66	4.58	SL
10	B10	**9801-100**	1	10.79	5.78	SL
12	B10	**9801-120**	1	12.96	6.94	SL
14	A34	**9801-140N**	1	19.50	10.88	FAB
16	A34	**9801-160N**	1	22.75	12.13	FAB
18	A34	**9801-180N**	1	26.00	13.38	FAB
20	A34	**9801-200N**	1	28.25	14.63	FAB
24	A34	**9801-240N**	1	34.50	17.13	FAB



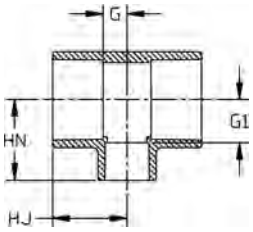


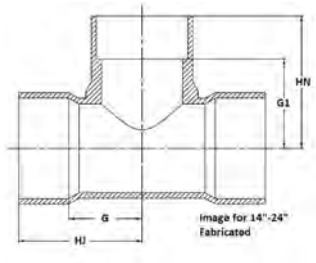


ChlorFIT Reducing Tee (SxSxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
¾ x ½	625	**9801-101**	25	1.62	1.62	0.60	0.72	SL
1 x ½	625	**9801-130**	25	1.87	1.64	0.72	0.74	SL
1 x ¾	625	**9801-131**	25	1.86	1.89	0.72	0.75	SL
1 ¼ x ½	625	**9801-166FB**	20	1.99	2.35	0.73	1.47	BUSH
1 ¼ x ¾	625	**9801-167FB**	20	1.99	2.35	0.73	1.33	BUSH
1 ¼ x 1	625	**9801-168**	20	2.01	2.05	0.73	0.91	SL
1 ½ x ½	625	**9801-209**	5	1.92	1.91	0.53	1.03	SL
1 ½ x ¾	625	**9801-210**	5	1.99	2.07	0.60	1.05	SL
1 ½ x 1	625	**9801-211**	5	2.12	2.17	0.72	1.03	SL
1 ½ x 1 ¼	625	**9801-212FB**	5	2.44	2.74	1.04	1.47	BUSH
2 x ½	625	**9801-247**	5	1.99	2.16	0.54	1.28	SL
2 x ¾	625	**9801-248**	5	2.22	2.31	0.60	1.30	SL
2 x 1	625	**9801-249**	5	2.24	2.42	0.72	1.27	SL
2 x 1 ¼	625	**9801-250FB**	5	2.81	3.11	1.30	1.84	BUSH
2 x 1 ½	625	**9801-251**	5	2.54	2.66	1.03	1.27	SL
2 ½ x ½	625	**9801-287FB**	5	3.05	3.35	1.28	2.44	BUSH
2 ½ x ¾	625	**9801-288FB**	5	3.05	3.35	1.28	2.33	BUSH
2 ½ x 1	625	**9801-289FB**	5	3.05	3.36	1.28	2.22	BUSH
2 ½ x 1 ¼	625	**9801-290FB**	5	3.05	3.34	1.28	2.07	BUSH
2 ½ x 1 ½	625	**9801-291FB**	5	3.05	3.35	1.28	1.94	BUSH
2 ½ x 2	625	**9801-292**	5	3.05	3.05	1.28	1.54	SL
3 x ½	625	**9801-333FB**	5	3.20	3.68	1.30	2.77	BUSH
3 x ¾	625	**9801-334FB**	5	3.20	3.68	1.30	2.66	BUSH
3 x 1	625	**9801-335FB**	5	3.20	3.69	1.30	2.55	BUSH
3 x 1 ¼	625	**9801-336FB**	5	3.20	3.67	1.30	2.40	BUSH
3 x 1 ½	625	**9801-337FB**	5	3.20	3.68	1.30	2.27	BUSH
3 x 2	625	**9801-338**	5	3.20	3.39	1.30	1.87	SL
3 x 2 ½	625	**9801-339FB**	5	3.73	4.07	1.81	2.17	BUSH
4 x ½	625	**9801-415FB**	5	3.52	4.19	1.27	3.28	BUSH
4 x ¾	625	**9801-416FB**	5	3.52	4.19	1.27	3.17	BUSH

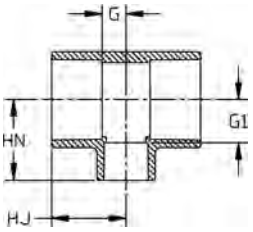
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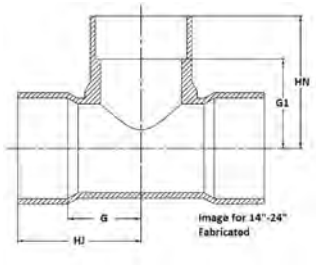




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
4 x 1	625	**9801-417FB**	5	3.53	4.12	1.26	3.00	BUSH
4 x 1 ¼	625	**9801-418FB**	5	3.52	4.18	1.27	2.91	BUSH
4 x 1 ½	625	**9801-419FB**	5	3.52	4.19	1.27	2.78	BUSH
4 x 2	625	**9801-420**	5	3.54	3.87	1.27	2.37	SL
4 x 2 ½	625	**9801-421FB**	5	4.14	4.62	1.85	2.73	BUSH
4 x 3	625	**9801-422**	5	4.13	4.26	1.85	2.35	SL
6 x ½	625	**9801-523FB**	1	6.56	7.42	3.56	6.52	BUSH
6 x ¾	625	**9801-524FB**	1	6.56	7.43	3.49	6.41	BUSH
6 x 1	625	**9801-525FB**	2	6.56	7.44	3.49	6.29	BUSH
6 x 1 ¼	625	**9801-526FB**	2	6.56	7.42	3.49	6.15	BUSH
6 x 1 ½	625	**9801-527FB**	1	6.56	7.42	3.49	6.02	BUSH
6 x 2	625	**9801-528**	2	4.45	5.25	1.43	3.74	SL
6 x 2 ½	625	**9801-529FB**	2	6.56	7.52	3.49	5.62	BUSH
6 x 3	625	**9801-530FB**	2	6.56	7.21	3.49	5.25	BUSH
6 x 4	625	**9801-532**	2	6.57	6.80	3.49	4.47	HS
8 x ¾	625	**9801-574FB**	1	7.61	8.89	3.55	7.90	BUSH
8 x 1 ½	625	**9801-577FB**	1	7.61	8.63	3.55	7.17	BUSH
8 x 2	625	**9801-578FB**	1	8.61	8.69	4.52	7.13	BUSH
8 x 3	625	**9801-580FB**	1	8.61	8.26	4.52	6.37	
8 x 4	625	**9801-582FB**	1	7.63	8.09	3.59	5.84	BUSH
8 x 5	625	**9801-583FB**	1	7.58	8.01	3.49	5.37	FAB
8 x 6	625	**9801-585**	1	7.65	7.54	3.55	4.63	SL
10 x 2	A34	**9801-619N**	1	10.75	12.00	5.75	11.00	FAB
10 x 3	A34	**9801-621N**	1	10.75	12.00	5.75	10.75	FAB
10 x 4	A34	**9801-623N**	1	10.75	11.50	5.75	9.50	FAB
10 x 6	B10	**9801-626FB**	1	10.83	11.43	5.78	8.33	BUSH
10 x 6	A34	**9801-626N**	1	11.88	12.50	6.88	9.50	FAB
10 x 8	B10	**9801-628FB**	1	10.83	11.46	5.78	7.36	BUSH
10 x 8	A34	**9801-628N**	1	13.00	13.50	8.00	9.50	FAB
12 x 2	A34	**9801-659N**	1	12.00	13.25	6.00	12.00	FAB
12 x 3	A34	**9801-661N**	1	12.00	13.25	6.00	11.50	FAB
12 x 4	A34	**9801-663N**	1	12.00	12.75	6.00	10.75	FAB
12 x 6	A34	**9801-666N**	1	13.13	13.75	7.13	10.75	FAB
12 x 8	B10	**9801-668FB**	1	12.99	13.67	6.94	9.58	BUSH
12 x 8	A34	**9801-668N**	1	14.13	14.75	8.13	10.75	FAB
12 x 10	B10	**9801-670FB**	1	12.99	13.68	6.94	8.57	BUSH
12 x 10	A34	**9801-670N**	1	15.13	15.75	9.13	10.75	FAB
14 x 2	A34	**9801-692N**	1	13.13	14.00	6.13	11.50	FAB
14 x 3	A34	**9801-694N**	1	13.13	14.00	6.13	11.50	FAB
14 x 4	A34	**9801-696N**	1	13.13	13.50	6.13	11.50	FAB
14 x 6	A34	**9801-698N**	1	14.25	14.50	7.25	11.50	FAB
14 x 8	A34	**9801-700N**	1	15.25	15.50	8.25	11.50	FAB
14 x 10	A34	**9801-702N**	1	16.25	16.50	9.25	11.50	FAB
14 x 12	A34	**9801-704N**	1	17.25	18.50	10.25	12.50	FAB
16 x 2	A34	**9801-726N**	1	14.38	15.25	6.38	12.75	FAB
16 x 3	A34	**9801-728N**	1	14.38	15.25	6.38	14.25	FAB
16 x 4	A34	**9801-730N**	1	14.38	14.75	6.38	12.75	FAB
16 x 6	A34	**9801-732N**	1	15.50	15.75	7.50	12.75	FAB
16 x 8	A34	**9801-734N**	1	16.50	16.75	8.50	12.75	FAB
16 x 10	A34	**9801-736N**	1	17.50	17.75	9.50	12.75	FAB
16 x 12	A34	**9801-738N**	1	18.50	19.75	10.50	13.75	FAB
16 x 14	A34	**9801-740N**	1	19.13	20.75	11.75	13.75	FAB
18 x 4	A34	**9801-784N**	1	15.63	16.00	6.63	14.00	FAB
18 x 6	A34	**9801-786N**	1	16.75	17.00	7.75	14.00	FAB
18 x 8	A34	**9801-788N**	1	17.75	18.00	8.75	14.00	FAB
18 x 10	A34	**9801-790N**	1	18.75	19.00	9.75	14.00	FAB
18 x 14	A34	**9801-794N**	1	20.88	22.00	11.88	15.00	FAB
18 x 12	A34	**9801-792N**	1	19.75	21.00	10.75	15.00	FAB
18 x 16	A34	**9801-796N**	1	21.38	24.00	12.38	16.00	FAB
20 x 4	A34	**9801-814N**	1	16.88	17.25	6.88	15.25	FAB
20 x 6	A34	**9801-816N**	1	18.00	18.25	8.00	15.25	FAB
20 x 8	A34	**9801-818N**	1	19.00	19.25	9.00	15.25	FAB
20 x 10	A34	**9801-820N**	1	20.00	20.25	10.00	15.25	FAB

table continued on the next page

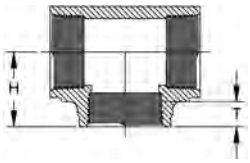




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
20 x 12	A34	**9801-822N**	1	21.00	22.25	11.00	16.25	FAB
20 x 14	A34	**9801-824N**	1	21.63	23.25	11.63	16.25	FAB
20 x 16	A34	**9801-826N**	1	22.63	25.25	12.63	17.25	FAB
20 x 18	A34	**9801-828N**	1	23.63	27.25	13.63	18.25	FAB
24 x 4	A34	**9801-904N**	1	19.38	19.50	7.38	17.50	FAB
24 x 6	A34	**9801-906N**	1	20.50	20.50	8.50	17.50	FAB
24 x 8	A34	**9801-908N**	1	21.50	21.50	9.50	17.50	FAB
24 x 10	A34	**9801-910N**	1	22.50	22.50	10.50	17.50	FAB
24 x 12	A34	**9801-912N**	1	23.50	24.50	11.50	18.50	FAB
24 x 14	A34	**9801-914N**	1	24.13	25.50	12.13	18.50	FAB
24 x 16	A34	**9801-916N**	1	25.13	27.50	13.13	19.50	FAB
24 x 18	A34	**9801-918N**	1	26.13	29.50	14.13	20.50	FAB
24 x 20	A34	**9801-920N**	1	27.13	30.50	15.13	20.50	FAB

ChlorFIT Tee (FPTxFPTxFPT) Schedule 80 CORZAN® CPVC

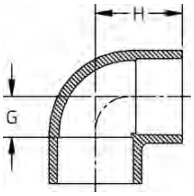


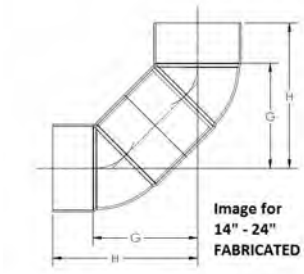


Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	625	**9805-002**	50	0.94	0.59	HS
⅜	625	**9805-003**	50	1.01	0.60	HS
½	625	**9805-005**	25	1.26	0.76	HS
¾	625	**9805-007**	15	1.36	0.72	HS
1	625	**9805-010**	15	1.79	0.99	HS
1 ¼	625	**9805-012**	10	1.93	1.01	HS
1 ½	625	**9805-015**	10	2.08	1.03	HS
2	625	**9805-020**	5	2.39	1.06	HS
2 ½	625	**9805-025**	5	2.87	1.35	HS
3	625	**9805-030**	5	3.52	1.65	HS
4	625	**9805-040**	5	4.07	1.72	HS

ChlorFIT 90° Elbow (SxS) Schedule 80 CORZAN® CPVC



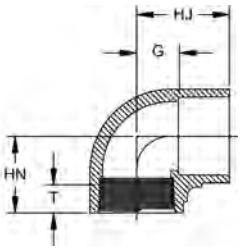




Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
¼	625	**9806-002**	50	0.96	0.35	HS
½	625	**9806-005**	25	1.41	0.51	SL
¾	625	**9806-007**	25	1.60	0.57	SL
1	625	**9806-010**	10	1.83	0.68	SL
1 ¼	625	**9806-012**	10	2.18	0.90	SL
1 ½	625	**9806-015**	10	2.43	1.04	SL
2	625	**9806-020**	20	2.80	1.27	SL
2 ½	625	**9806-025**	5	3.33	1.53	SL
3	625	**9806-030**	5	3.73	1.81	SL
4	625	**9806-040**	5	4.63	2.32	SL
6	625	**9806-060**	2	6.56	3.53	SL
8	625	**9806-080**	1	8.68	4.55	SL
10	B10	**9806-100**	1	10.79	5.77	SL
12	B10	**9806-120**	1	12.92	6.87	SL
14	A34	**9806-140N**	1	26.00	19.00	FAB
16	A34	**9806-160N**	1	29.00	21.00	FAB
18	A34	**9806-180N**	1	33.50	24.50	FAB
20	A34	**9806-200N**	1	35.75	25.75	FAB
24	A34	**9806-240N**	1	43.00	31.00	FAB

ChlorFIT 90° Elbow (SxFPT) Schedule 80 CORZAN® CPVC

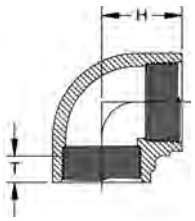




Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)	Design
½	625	**9807-005**	25	1.40	1.31	0.50	0.81	HS
¾	625	**9807-007**	25	1.59	1.36	0.58	0.72	HS
1	625	**9807-010**	10	1.81	1.70	0.67	1.00	HS
1 ¼	625	**9807-012**	10	2.15	1.92	0.89	1.03	HS
1 ½	625	**9807-015**	10	2.39	2.05	1.01	1.05	HS
2	625	**9807-020**	5	2.77	2.36	1.24	1.09	HS
3	625	**9807-030**	5	3.73	3.47	1.83	1.66	HS

ChlorFIT 90° Elbow (FPTxFPT) Schedule 80 CORZAN® CPVC

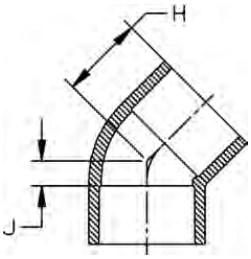


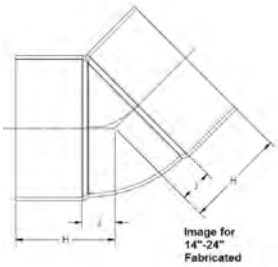


Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	625	**9808-002**	50	0.94	0.61	HS
⅜	625	**9808-003**	50	1.00	0.63	HS
½	625	**9808-005**	25	1.27	0.78	HS
¾	625	**9808-007**	20	1.36	0.72	HS
1	625	**9808-010**	10	1.71	1.00	HS
1 ¼	625	**9808-012**	10	1.92	1.01	HS
1 ½	625	**9808-015**	10	2.08	1.06	HS
2	625	**9808-020**	5	2.36	1.08	HS
2 ½	625	**9808-025**	5	3.36	1.51	HS
3	625	**9808-030**	5	3.53	1.63	HS
4	625	**9808-040**	5	4.17	1.75	HS

ChlorFIT 45° Elbow (SxS) Schedule 80 CORZAN® CPVC



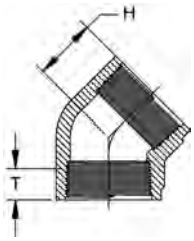




Size (inch)	P/L	Code	Pack Qty	H (inch)	J (inch)	Design
½	625	**9817-005**	25	1.22	0.30	SL
¾	625	**9817-007**	20	1.29	0.28	SL
1	625	**9817-010**	25	1.48	0.32	SL
1 ¼	625	**9817-012**	15	1.78	0.47	SL
1 ½	625	**9817-015**	10	1.88	0.45	SL
2	625	**9817-020**	5	2.16	0.60	SL
2 ½	625	**9817-025**	5	2.56	0.79	SL
3	625	**9817-030**	5	2.67	0.77	SL
4	625	**9817-040**	5	3.31	1.04	SL
6	625	**9817-060**	2	4.86	1.77	SL
8	625	**9817-080**	2	6.15	2.07	SL
10	B10	**9817-100**	1	7.51	2.46	SL
12	B10	**9817-120**	1	9.00	2.96	SL
14	A34	**9817-140N**	1	10.25	3.50	FAB
16	A34	**9817-160N**	1	11.75	3.75	FAB
18	A34	**9817-180N**	1	13.25	4.25	FAB
20	A34	**9817-200N**	1	14.75	4.75	FAB
24	A34	**9817-240N**	1	17.75	5.75	FAB

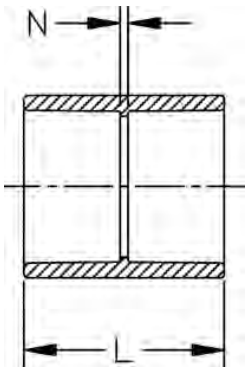
ChlorFIT 45° Elbow (FPTxFPT) Schedule 80 CORZAN® CPVC

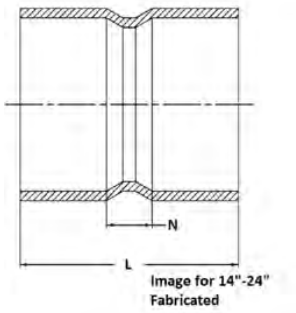




Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)	Design
¼	625	**9819-002**	50	0.69	0.59	HS
½	625	**9819-005**	25	1.02	0.76	SL
¾	625	**9819-007**	20	1.14	0.81	SL
1	625	**9819-010**	25	1.33	0.97	SL
1 ¼	625	**9819-012**	15	1.42	1.01	SL
1 ½	625	**9819-015**	10	1.47	1.07	SL
2	625	**9819-020**	5	1.74	2.37	SL
3	625	**9819-030**	5	2.43	1.66	SL
4	625	**9819-040**	5	2.78	1.76	SL



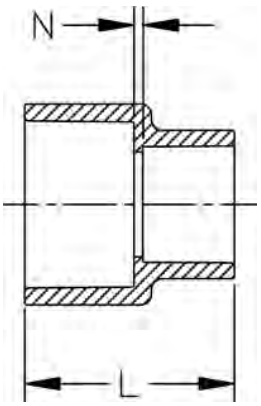


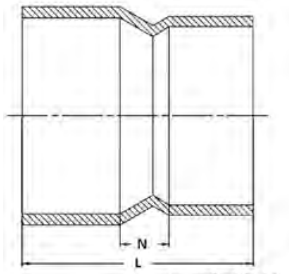


ChlorFIT Coupling (SxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
½	625	**9829-005**	25	1.93	0.12	SL
¾	625	**9829-007**	20	2.18	0.12	SL
1	625	**9829-010**	25	2.41	0.12	SL
1 ¼	625	**9829-012**	25	2.67	0.13	SL
1 ½	625	**9829-015**	10	2.94	0.15	SL
2	625	**9829-020**	5	3.18	0.13	SL
2 ½	625	**9829-025**	5	3.77	0.19	SL
3	625	**9829-030**	5	4.04	0.26	SL
4	625	**9829-040**	5	4.80	0.26	SL
6	625	**9829-060**	2	6.40	0.36	SL
8	625	**9829-080**	2	8.40	0.35	SL
10	B10	**9829-100**	1	10.77	0.75	SL
12	B10	**9829-120**	1	12.82	0.75	SL
14	A34	**9829-140N**	1	17.75	3.75	FAB
16	A34	**9829-160N**	1	20.25	4.25	FAB
18	A34	**9829-180N**	1	22.75	4.75	FAB
20	A34	**9829-200N**	1	25.25	5.25	FAB
24	A34	**9829-240N**	1	30.25	6.25	FAB





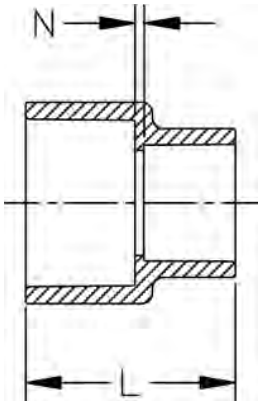


Imgae for 14"-24" Fabricated

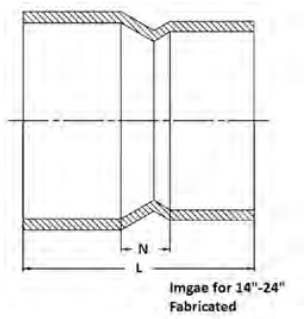
ChlorFIT Reducer Coupling (SxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
¾ x ½	625	**9829-101**	25	2.13	0.13	HS
1 x ½	625	**9829-130**	25	2.17	0.12	HS
1 x ¾	625	**9829-131**	25	2.26	0.11	HS
1 ¼ x ¾	625	**9829-167FB**	15	2.94	0.66	BUSH
1 ¼ x 1	625	**9829-168FB**	15	2.52	0.10	BUSH
1 ½ x ½	625	**9829-209FB**	15	2.94	0.64	BUSH
1 ½ x ¾	625	**9829-210FB**	15	2.50	0.54	BUSH
1 ½ x 1	625	**9829-211**	15	2.65	0.11	HS
1 ½ x 1 ¼	625	**9829-212**	20	2.82	0.09	HS
2 x ½	625	**9829-247FB**	5	3.44	0.87	BUSH
2 x ¾	625	**9829-248FB**	5	3.39	0.77	BUSH
2 x 1	625	**9829-249**	5	3.15	0.32	HS
2 x 1 ¼	625	**9829-250**	5	3.05	0.14	HS
2 x 1 ½	625	**9829-251**	5	3.06	0.07	HS
2 ½ x 1 ½	625	**9829-291**	5	3.36	0.14	HS
2 ½ x 2	625	**9829-292FB**	5	4.08	0.66	BUSH
3 x 1	625	**9829-335FB**	5	4.56	1.53	BUSH
3 x 1 ½	625	**9829-337FB**	5	4.58	1.15	BUSH
3 x 2	625	**9829-338**	5	3.61	0.17	HS
3 x 2 ½	625	**9829-339FB**	5	4.42	0.63	BUSH
4 x 2	625	**9829-420FB**	5	4.94	1.08	BUSH
4 x 2 ½	625	**9829-421FB**	5	4.92	0.65	BUSH
4 x 3	625	**9829-422**	5	4.38	0.22	HS
6 x 3	625	**9829-530FB**	2	10.65	4.23	BUSH
6 x 4	625	**9829-532**	2	10.17	3.46	HS
8 x 4	625	**9829-582FB**	2	9.81	3.53	BUSH
8 x 6	625	**9829-585**	2	9.18	2.11	HS
10 x 4	A34	**9829-623N**	1	17.00	10.00	FAB
10 x 6	B10	**9829-626FB**	1	11.42	3.29	BUSH
10 x 6	A34	**9829-626N**	1	13.00	5.00	FAB
10 x 8	B10	**9829-628FB**	1	11.45	2.32	BUSH
10 x 8	A34	**9829-628N**	1	12.75	3.75	FAB
12 x 4	A34	**9829-663N**	1	26.25	18.25	FAB
12 x 6	A34	**9829-666N**	1	20.50	11.50	FAB
12 x 8	B10	**9829-668FB**	1	13.54	3.41	BUSH
12 x 8	A34	**9829-668N**	1	15.50	5.50	FAB
12 x 10	B10	**9829-670FB**	1	13.24	2.13	BUSH
12 x 10	A34	**9829-670N**	1	15.00	4.00	FAB
14 x 4	A34	**9829-696N**	1	13.00	3.00	FAB
14 x 6	A34	**9829-698N**	1	31.00	21.00	FAB
14 x 8	A34	**9829-700N**	1	21.00	10.00	FAB
14 x 10	A34	**9829-702N**	1	17.00	5.00	FAB
14 x 12	A34	**9829-704N**	1	16.50	3.50	FAB
16 x 4	A34	**9829-730N**	1	16.50	3.50	FAB
16 x 6	A34	**9829-732N**	1	16.50	4.50	FAB
16 x 8	A34	**9829-734N**	1	18.05	5.00	FAB
16 x 10	A34	**9829-736N**	1	19.00	5.10	FAB
16 x 12	A34	**9829-738N**	1	19.25	5.25	FAB
16 x 14	A34	**9829-740N**	1	19.50	4.50	FAB
18 x 4	A34	**9829-784N**	1	48.50	37.50	FAB
18 x 6	A34	**9829-786N**	1	36.00	24.00	FAB
18 x 8	A34	**9829-788N**	1	42.50	29.50	FAB
18 x 10	A34	**9829-790N**	1	33.50	19.50	FAB
18 x 12	A34	**9829-792N**	1	22.00	7.00	FAB
18 x 14	A34	**9829-794N**	1	22.25	6.25	FAB
18 x 16	A34	**9829-796N**	1	21.75	4.75	FAB
20 x 4	A34	**9829-814N**	1	60.50	48.50	FAB
20 x 6	A34	**9829-816N**	1	55.50	42.50	FAB
20 x 8	A34	**9829-818N**	1	56.25	42.25	FAB
20 x 10	A34	**9829-820N**	1	47.25	32.25	FAB
20 x 12	A34	**9829-822N**	1	37.00	21.00	FAB

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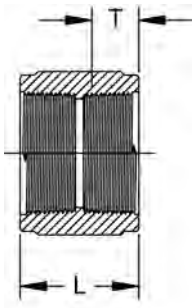


Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
20 x 14	A34	**9829-824N**	1	37.25	20.25	FAB
20 x 16	A34	**9829-826N**	1	24.50	6.50	FAB
20 x 18	A34	**9829-828N**	1	24.00	5.00	FAB
24 x 4	A34	**9829-904N**	1	66.00	52.00	FAB
24 x 6	A34	**9829-906N**	1	61.00	46.00	FAB
24 x 8	A34	**9829-908N**	1	52.00	36.00	FAB
24 x 10	A34	**9829-910N**	1	52.75	35.75	FAB
24 x 12	A34	**9829-912N**	1	42.50	24.50	FAB
24 x 14	A34	**9829-914N**	1	42.75	23.75	FAB
24 x 16	A34	**9829-916N**	1	42.25	22.25	FAB
24 x 18	A34	**9829-918N**	1	29.50	8.50	FAB
24 x 20	A34	**9829-920N**	1	29.25	7.25	FAB



ChlorFIT Coupling (FPTxFPT) Schedule 80 CORZAN® CPVC

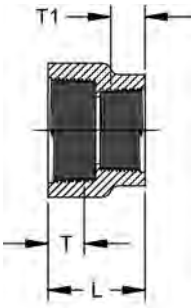




Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Design
¼	625	**9830-002**	50	1.29	0.61	HS
⅜	625	**9830-003**	50	1.35	0.62	HS
½	625	**9830-005**	25	1.68	0.77	SL
¾	625	**9830-007**	25	1.75	0.80	SL
1	625	**9830-010**	25	2.13	0.99	SL
1 ¼	625	**9830-012**	25	2.19	1.03	SL
1 ½	625	**9830-015**	10	2.22	1.03	SL
2	625	**9830-020**	5	2.29	1.08	SL
2 ½	625	**9830-025**	5	3.33	1.51	SL
3	625	**9830-030**	5	3.53	1.65	SL
4	625	**9830-040**	5	3.76	1.75	SL

ChlorFIT Reducer Coupling (FPTxFPT) Schedule 80 CORZAN® CPVC

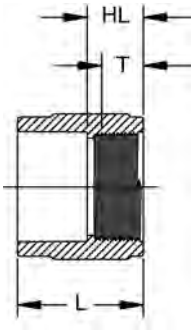




Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	T1 (inch)	Design
⅜ x ¼	625	**9830-052**	50	1.29	0.60	0.59	HS
½ x ¼	625	**9830-072**	50	1.45	0.75	0.59	HS
½ x ⅜	625	**9830-073**	50	1.46	0.74	0.60	HS
¾ x ½	625	**9830-101**	25	1.69	0.78	0.78	HS
1 x ½	625	**9830-130**	25	1.84	0.98	0.77	HS
1 x ¾	625	**9830-131**	25	1.88	0.98	0.80	HS
1 ¼ x ¾	625	**9830-167**	25	1.90	1.00	0.79	HS
1 ½ x 1	625	**9830-211**	20	2.06	1.02	0.95	HS

ChlorFIT Female Adapter (SxFPT) Schedule 80 CORZAN® CPVC

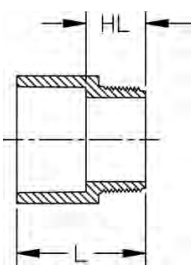




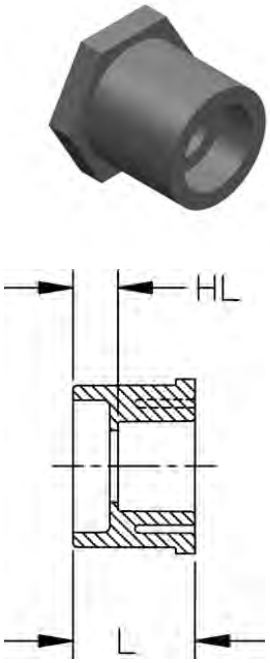
Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	Design
¼	625	**9835-002**	50	0.75	1.43	0.58	HS
½	625	**9835-005**	25	0.91	1.80	0.75	HS
¾	625	**9835-007**	20	0.95	1.96	0.79	HS
1	625	**9835-010**	25	1.11	2.27	0.98	HS
1 ¼	625	**9835-012**	10	1.18	2.44	1.02	HS
1 ½	625	**9835-015**	10	1.19	2.59	1.03	HS
2	625	**9835-020**	5	1.25	2.76	1.06	HS
3	625	**9835-030**	5	1.91	3.80	1.65	HS
4	625	**9835-040**	5	2.02	4.29	1.74	HS
6	A34	**9835-060N**	1	4.50	7.50	1.51	FAB
8	A34	**9835-080N**	1	4.25	8.50	1.71	FAB
10	A34	**9835-100N**	1	5.00	10.00	2.00	FAB
12	A34	**9835-120N**	1	6.00	11.13	2.13	FAB

ChlorFIT Male Adapter (SxMPT) Schedule 80 CORZAN® CPVC





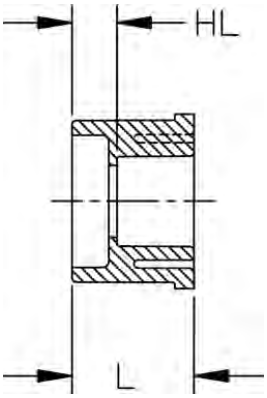
Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
½	625	**9836-005**	50	0.94	1.85	SL
¾	625	**9836-007**	25	1.05	2.03	HS
1	625	**9836-010**	25	1.22	2.38	HS
1 ¼	625	**9836-012**	15	1.28	2.56	HS
1 ½	625	**9836-015**	15	1.30	2.69	HS
2	625	**9836-020**	5	1.32	2.83	HS
3	625	**9836-030**	5	1.99	3.90	HS
4	625	**9836-040**	5	2.15	4.40	HS
6	A34	**9836-060N**	1	3.25	6.25	FAB
8	A34	**9836-080N**	1	3.50	7.50	FAB
10	A34	**9836-100N**	1	4.18	9.18	FAB
12	A34	**9836-120N**	1	4.63	10.63	FAB



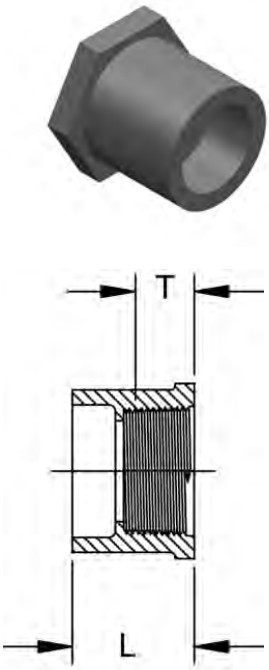
ChlorFIT Flush Style Reducer Bushing (SPGxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
½ x ¼	625	**9837-072**	50	0.47	1.15	FLUSH
½ x ⅜	625	**9837-073**	50	0.33	1.09	FLUSH
¾ x ½	625	**9837-101**	50	0.42	1.30	FLUSH
1 x ½	625	**9837-130**	50	0.55	1.44	FLUSH
1 x ¾	625	**9837-131**	50	0.41	1.43	FLUSH
1 ¼ x ½	625	**9837-166**	25	0.66	1.55	FLUSH
1 ¼ x ¾	625	**9837-167**	25	0.56	1.57	FLUSH
1 ¼ x 1	625	**9837-168**	25	0.44	1.59	FLUSH
1 ½ x ½	625	**9837-209**	25	0.78	1.69	FLUSH
1 ½ x ¾	625	**9837-210**	25	0.67	1.68	FLUSH
1 ½ x 1	625	**9837-211**	25	0.55	1.69	FLUSH
1 ½ x 1 ¼	625	**9837-212**	25	0.44	1.72	FLUSH
2 x ½	625	**9837-247**	10	0.91	1.81	FLUSH
2 x ¾	625	**9837-248**	10	0.79	1.82	FLUSH
2 x 1	625	**9837-249**	10	0.68	1.83	FLUSH
2 x 1 ¼	625	**9837-250**	10	0.54	1.81	FLUSH
2 x 1 ½	625	**9837-251**	10	0.40	1.81	FLUSH
2 ½ x 1 ½	625	**9837-291**	5	0.79	2.31	FLUSH
2 ½ x 2	625	**9837-292**	5	0.47	2.10	FLUSH
3 x 1	625	**9837-335**	5	1.27	2.42	FLUSH
3 x 1 ¼	A34	**9837-336FB**	5	1.43	2.71	FAB
3 x 1 ½	625	**9837-337**	5	0.89	2.43	FLUSH
3 x 2	625	**9837-338**	5	0.86	2.42	FLUSH
3 x 2 ½	625	**9837-339**	5	0.38	2.27	FLUSH
4 x 2	625	**9837-420**	5	1.14	2.70	FLUSH
4 x 2 ½	625	**9837-421FB**	5	1.40	2.96	BUSH
4 x 3	625	**9837-422**	5	0.77	2.74	FLUSH
6 x ¾	625	**9837-524FB**	2	1.79	4.38	BUSH
6 x 1	625	**9837-525FB**	2	1.79	4.10	BUSH
6 x 1 ½	625	**9837-527FB**	2	1.79	4.10	BUSH
6 x 2	625	**9837-528FB**	2	1.13	4.03	BUSH
6 x 2 ½	625	**9837-529FB**	2	1.79	3.95	BUSH
6 x 3	625	**9837-530**	2	1.74	3.65	FLUSH
6 x 4	625	**9837-532**	2	1.42	3.67	FLUSH
8 x 1 ½	625	**9837-577FB**	1	1.56	5.66	BUSH
8 x 2	625	**9837-578FB**	1	1.56	5.59	BUSH
8 x 3	625	**9837-580FB**	1	1.56	5.15	BUSH
8 x 4	625	**9837-582FB**	1	1.56	5.15	BUSH
8 x 5	625	**9837-583FB**	1	2.44	5.09	FAB
8 x 6	625	**9837-585**	1	1.69	4.66	FLUSH
10 x 2	B10	**9837-619FB**	1	2.57	6.66	BUSH
10 x 3	B10	**9837-621FB**	1	2.57	6.15	BUSH
10 x 4	B10	**9837-623FB**	1	4.01	6.26	BUSH
10 x 6	B10	**9837-626**	1	2.59	5.69	FLUSH
10 x 8	B10	**9837-628**	1	1.62	5.72	FLUSH
12 x 3	B10	**9837-662FB**	1	1.63	7.78	BUSH
12 x 4	B10	**9837-663FB**	1	1.63	7.78	BUSH
12 x 6	B10	**9837-666FB**	1	4.26	7.35	BUSH
12 x 8	02	**9837-668**	1	2.66	6.76	FLUSH
12 x 10	B10	**9837-670**	1	1.66	6.77	FLUSH
14 x 4	A34	**9837-696N**	1	5.50	7.50	FAB
14 x 6	A34	**9837-698N**	1	4.50	7.50	FAB
14 x 8	A34	**9837-700N**	1	3.50	7.50	FAB
14 x 10	A34	**9837-702N**	1	2.50	7.50	FAB
14 x 12	A34	**9837-704N**	1	1.50	7.50	FAB
16 x 4	A34	**9837-730N**	1	6.50	8.50	FAB
16 x 6	A34	**9837-732N**	1	5.50	8.50	FAB
16 x 8	A34	**9837-734N**	1	4.50	8.50	FAB
16 x 10	A34	**9837-736N**	1	3.50	8.50	FAB
16 x 12	A34	**9837-738N**	1	2.50	8.50	FAB
16 x 14	A34	**9837-740N**	1	1.50	8.50	FAB

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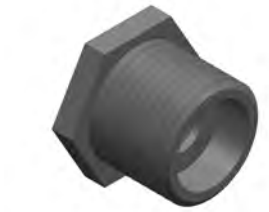


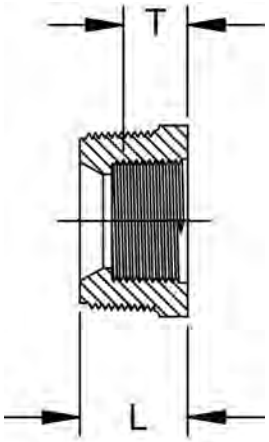
Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	Design
18 x 4	A34	**9837-784N**	1	7.50	9.50	FAB
18 x 6	A34	**9837-786N**	1	6.50	9.50	FAB
18 x 8	A34	**9837-788N**	1	5.50	9.50	FAB
18 x 10	A34	**9837-790N**	1	4.50	9.50	FAB
18 x 12	A34	**9837-792N**	1	3.50	9.50	FAB
18 x 14	A34	**9837-794N**	1	2.50	9.50	FAB
18 x 16	A34	**9837-796N**	1	1.50	9.50	FAB
20 x 4	A34	**9837-814N**	1	8.50	10.50	FAB
20 x 6	A34	**9837-816N**	1	7.50	10.50	FAB
20 x 8	A34	**9837-818N**	1	6.50	10.50	FAB
20 x 10	A34	**9837-820N**	1	5.50	10.50	FAB
20 x 12	A34	**9837-822N**	1	4.50	10.50	FAB
20 x 14	A34	**9837-824N**	1	3.50	10.50	FAB
20 x 16	A34	**9837-826N**	1	2.50	10.50	FAB
20 x 18	A34	**9837-828N**	1	1.50	10.50	FAB
24 x 4	A34	**9837-904N**	1	10.50	12.50	FAB
24 x 6	A34	**9837-906N**	1	9.50	12.50	FAB
24 x 8	A34	**9837-908N**	1	8.50	12.50	FAB
24 x 10	A34	**9837-910N**	1	7.50	12.50	FAB
24 x 12	A34	**9837-912N**	1	6.50	12.50	FAB
24 x 14	A34	**9837-914N**	1	5.50	12.50	FAB
24 x 16	A34	**9837-916N**	1	4.50	12.50	FAB
24 x 18	A34	**9837-918N**	1	3.50	12.50	FAB
24 x 20	A34	**9837-920N**	1	2.50	12.50	FAB



ChlorFIT Flush Style Reducer Bushing (SPGxFPT) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Design
½ x ¼	625	**9838-072**	50	1.14	0.61	FLUSH
½ x ⅜	625	**9838-073**	50	1.13	0.61	FLUSH
¾ x ¼	625	**9838-098**	50	1.21	0.60	FLUSH
¾ x ½	625	**9838-101**	50	1.28	0.77	FLUSH
1 x ½	625	**9838-130**	50	1.42	0.76	FLUSH
1 x ¾	625	**9838-131**	50	1.41	0.81	FLUSH
1 ¼ x ½	625	**9838-166**	15	1.56	0.75	FLUSH
1 ¼ x ¾	625	**9838-167**	15	1.56	0.79	FLUSH
1 ¼ x 1	625	**9838-168**	15	1.56	0.99	FLUSH
1 ½ x ½	625	**9838-209**	15	1.68	0.76	FLUSH
1 ½ x ¾	625	**9838-210**	15	1.69	0.79	FLUSH
1 ½ x 1	625	**9838-211**	15	1.68	0.99	FLUSH
1 ½ x 1 ¼	625	**9838-212**	15	1.69	1.02	FLUSH
2 x ½	625	**9838-247**	10	1.80	0.77	FLUSH
2 x ¾	625	**9838-248**	10	1.80	0.80	FLUSH
2 x 1	625	**9838-249**	10	1.80	0.99	FLUSH
2 x 1 ¼	625	**9838-250**	10	1.81	1.02	FLUSH
2 x 1 ½	625	**9838-251**	10	1.88	1.04	FLUSH
2 ½ x 1 ½	625	**9838-291**	5	2.24	1.07	FLUSH
2 ½ x 2	625	**9838-292**	5	2.12	1.10	FLUSH
3 x 2	625	**9838-338**	5	2.42	1.07	FLUSH
4 x 2	625	**9838-420**	5	2.71	1.10	FLUSH
4 x 3	625	**9838-422**	5	2.75	1.62	FLUSH

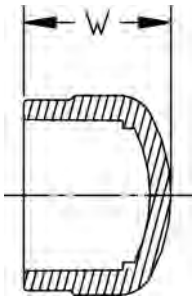




ChlorFIT Flush Style Reducer Bushing (MPTxFPT) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)	Style
⅜ x ¼	625	**9839-052**	50	0.80	0.60	FLUSH
½ x ¼	625	**9839-072**	50	0.95	0.60	FLUSH
½ x ⅜	625	**9839-073**	50	0.96	0.61	FLUSH
¾ x ⅜	625	**9839-099**	50	1.02	0.61	FLUSH
¾ x ½	625	**9839-101**	50	1.08	0.75	FLUSH
1 x ½	625	**9839-130**	25	1.24	0.76	FLUSH
1 x ¾	625	**9839-131**	25	1.28	0.80	FLUSH
1 ¼ x 1	625	**9839-168**	25	1.30	1.00	FLUSH
1 ½ x ¾	625	**9839-210**	25	1.33	0.78	FLUSH
1 ½ x 1	625	**9839-211**	25	1.34	0.98	FLUSH
1 ½ x 1 ¼	625	**9839-212**	25	1.33	1.02	FLUSH
2 x 1	625	**9839-249**	10	1.42	0.97	FLUSH
2 x 1 ¼	625	**9839-250**	10	1.43	1.01	FLUSH
2 x 1 ½	625	**9839-251**	10	1.35	1.02	FLUSH



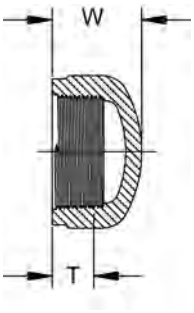


ChlorFIT Cap (S) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	W (inch)	Design
½	625	**9847-005**	50	1.30	HS
¾	625	**9847-007**	25	1.46	HS
1	625	**9847-010**	25	1.66	HS
1 ¼	625	**9847-012**	15	1.89	HS
1 ½	625	**9847-015**	10	2.08	HS
2	625	**9847-020**	5	2.32	HS
2 ½	625	**9847-025**	5	2.61	HS
3	625	**9847-030**	5	3.06	HS
4	625	**9847-040**	5	3.69	HS
6	625	**9847-060**	2	4.86	HS
8	625	**9847-080**	2	6.25	SL
10	B10	**9847-100**	1	7.92	SL
12	B10	**9847-120**	1	9.37	SL
14	A34	**9847-140N**	1	5.75	FAB
16	A34	**9847-160N**	1	7.00	FAB
18	A34	**9847-180N**	1	8.25	FAB
20	A34	**9847-200N**	1	8.75	FAB
24	A34	**9847-240N**	1	10.25	FAB

ChlorFIT Cap (FPT) Schedule 80 CORZAN® CPVC

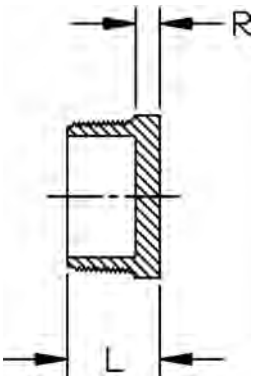




Size (inch)	P/L	Code	Pack Qty	W (inch)	T (inch)	Design
¼	625	**9848-002**	50	0.93	0.54	HS
⅜	625	**9848-003**	50	0.94	0.62	HS
½	625	**9848-005**	50	1.14	0.74	HS
¾	625	**9848-007**	25	1.25	0.80	HS
1	625	**9848-010**	25	1.51	0.97	HS
1 ¼	625	**9848-012**	15	1.59	1.00	HS
1 ½	625	**9848-015**	10	1.70	1.01	HS
2	625	**9848-020**	5	1.82	1.06	HS
2 ½	625	**9848-025**	5	2.61	1.45	HS

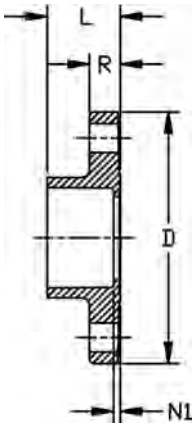
ChlorFIT Plug (MPT) Schedule 80 CORZAN® CPVC





Size (inch)	P/L	Code	Pack Qty	L (inch)	R (inch)	Design
¼	625	**9850-002**	50	0.81	0.22	HS
⅜	625	**9850-003**	50	0.83	0.22	HS
½	625	**9850-005**	50	0.98	0.22	HS
¾	625	**9850-007**	50	1.06	0.25	HS
1	625	**9850-010**	25	1.24	0.27	HS
1 ¼	625	**9850-012**	25	1.33	0.31	HS
1 ½	625	**9850-015**	20	1.38	0.34	HS
2	625	**9850-020**	10	1.47	0.39	HS
3	625	**9850-030**	5	1.98	0.38	HS
4	625	**9850-040**	5	2.16	0.39	HS
6	A34	**9850-060N**	1	2.00	0.75	FAB
8	A34	**9850-080N**	1	2.00	0.75	FAB
10	A34	**9850-100N**	1	2.00	0.75	FAB
12	A34	**9850-120N**	1	2.00	0.75	FAB



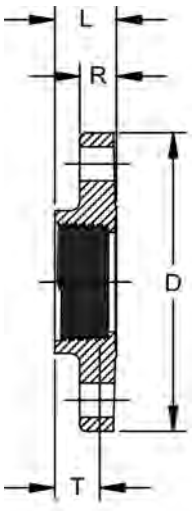


ChlorFIT One Piece Flange (S) Schedule 80 CORZAN® CPVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	Design
½	625	**9851-005**	5	4	½	2.38	3.50	1.03	0.13	0.39	HC
¾	625	**9851-007**	5	4	½	2.75	3.89	1.14	0.13	0.45	HC
1	625	**9851-010**	5	4	½	3.13	4.28	1.29	0.16	0.52	HC
1 ¼	625	**9851-012**	5	4	½	3.50	4.64	1.45	0.14	0.59	HC
1 ½	625	**9851-015**	5	4	½	3.88	5.01	1.54	0.16	0.68	HC
2	625	**9851-020**	5	4	⅝	4.75	6.01	1.73	0.16	0.69	HC
2 ½	625	**9851-025**	5	4	⅝	5.50	7.00	1.99	0.17	0.75	HC
3	625	**9851-030**	5	4	⅝	6.00	7.51	2.46	0.57	1.10	HC
4	625	**9851-040**	5	8	⅝	7.50	9.04	2.79	0.52	1.19	HC
6	625	**9851-060**	2	8	¾	9.50	11.13	3.86	0.36	1.38	HC



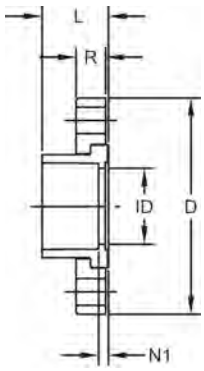


ChlorFIT One Piece Flange (FPT) Schedule 80 CORZAN® CPVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	T (inch)	R (inch)	Design
½	625	**9852-005**	5	4	½	2.38	3.51	0.89	0.77	0.39	HC
¾	625	**9852-007**	5	4	½	2.75	3.89	0.91	0.79	0.45	HC
1	625	**9852-010**	5	4	½	3.13	4.28	1.13	1.00	0.53	HC
1 ¼	625	**9852-012**	5	4	½	3.50	4.62	1.20	1.06	0.58	HC
1 ½	625	**9852-015**	5	4	½	3.88	4.99	1.19	1.03	0.68	HC
2	625	**9852-020**	5	4	⅝	4.75	6.02	1.22	1.06	0.70	HC
2 ½	625	**9852-025**	5	4	⅝	5.50	7.00	1.72	1.53	0.75	HC
3	625	**9852-030**	5	4	⅝	6.00	7.50	2.15	1.63	1.15	HC
4	625	**9852-040**	5	8	⅝	7.50	9.00	2.30	1.77	1.23	HC



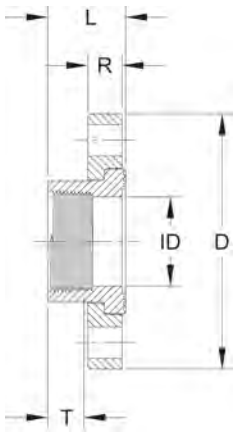


ChlorFIT Van Stone Flange (S) Schedule 80 CORZAN® CPVC

- ANSI 150 Class according to ANSI B16.5
- 1/2" - 12" pressure rating is 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 14" - 24" pressure rating is 100 psi @ 73°F (6.9 bar @ 22.7°C) - Steel Ring
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	ID (inch)	Design
½	625	**9854-005**	5	4	½	2.38	3.53	1.10	0.18	0.57	0.60	HC
¾	625	**9854-007**	5	4	½	2.75	3.87	1.23	0.18	0.59	0.82	HC
1	625	**9854-010**	5	4	½	3.13	4.25	1.38	0.20	0.66	1.03	HC
1 ¼	625	**9854-012**	5	4	½	3.50	4.62	1.52	0.21	0.69	1.36	HC
1 ½	625	**9854-015**	5	4	½	3.88	5.01	1.68	0.25	0.75	1.60	HC
2	625	**9854-020**	5	4	⅝	4.75	6.02	1.84	0.29	0.82	2.06	HC
2 ½	625	**9854-025**	5	4	⅝	5.50	7.01	2.15	0.33	0.98	2.49	HC
3	625	**9854-030**	5	4	⅝	6.00	7.50	2.33	0.39	1.02	3.09	HC
4	625	**9854-040**	5	8	⅝	7.50	8.99	2.75	0.24	1.10	4.06	HC
6	625	**9854-060**	2	8	¾	9.50	10.98	3.55	0.48	1.25	6.11	HC
8	625	**9854-080**	2	8	¾	11.75	13.51	4.60	0.51	1.71	8.00	HC
10	B10	**9854-100**	2	12	⅞	14.25	15.97	5.66	0.53	1.73	10.10	HC
12	B10	**9854-120**	2	12	⅞	17.00	18.95	6.71	0.57	1.72	11.96	HC
14	A34	**9854-140N**	1	12	1 ⅛	18.75	21.00	11.50	4.50	0.50	12.50	FAB
16	A34	**9854-160N**	1	16	1 ⅛	21.25	23.50	13.27	5.50	0.50	14.31	FAB
18	A34	**9854-180N**	1	16	1 ¼	22.75	25.00	14.25	5.50	0.50	16.13	FAB
20	A34	**9854-200N**	1	20	1 ¼	25.00	27.50	16.00	6.00	0.50	18.00	FAB
24	A34	**9854-240N**	1	20	1 ⅜	29.50	32.00	19.00	7.00	0.50	21.56	FAB





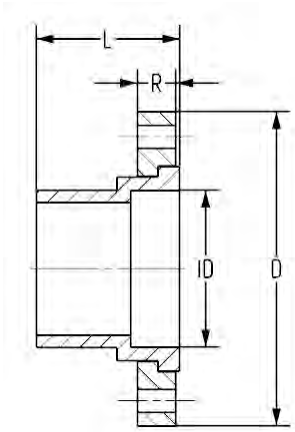
ChlorFIT Van Stone Flange (FPT) Schedule 80 CORZAN® CPVC

- ANSI 150 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	T (inch)	R (inch)	ID (inch)	Design
1	625	**9855-010**	5	4	½	3.13	4.25	1.39	1.01	0.66	1.06	HC
1 ¼	625	**9855-012**	5	4	½	3.50	4.62	1.50	1.02	0.69	1.38	HC
1 ½	625	**9855-015**	5	4	½	3.88	5.01	1.67	1.06	0.75	1.61	HC
2	625	**9855-020**	5	4	⅝	4.75	6.02	1.82	1.09	0.82	2.08	HC

ChlorFIT Van Stone Flange (SPG) Schedule 80 CORZAN® CPVC



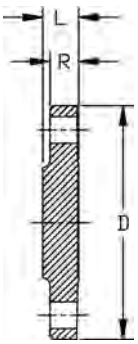


- ANSI 150 Class according to ANSI B16.5
- 1/2" - 12" pressure rating is 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 14" - 24" pressure rating is 100 psi @ 73°F (6.9 bar @ 22.7°C) - Steel Ring
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	R (inch)	ID (inch)	Design
½	625	**9856-005**	5	4	½	2.38	3.53	1.72	0.57	0.84	HC
¾	625	**9856-007**	5	4	½	2.75	3.87	1.85	0.59	1.05	HC
1	625	**9856-010**	5	4	½	3.13	4.25	2.10	0.66	1.32	HC
1 ¼	625	**9856-012**	5	4	½	3.50	4.62	2.28	0.69	1.66	HC
1 ½	625	**9856-015**	5	4	½	3.88	5.01	2.48	0.75	1.90	HC
2	625	**9856-020**	5	4	⅝	4.75	6.02	2.80	0.82	2.38	HC
2 ½	625	**9856-025**	5	4	⅝	5.50	7.01	3.27	0.98	2.86	HC
3	625	**9856-030**	5	4	⅝	6.00	7.50	3.60	1.02	3.49	HC
4	625	**9856-040**	5	8	⅝	7.50	8.99	4.10	1.10	4.49	HC
6	625	**9856-060**	2	8	¾	9.50	10.98	5.10	1.25	6.60	HC
8	625	**9856-080**	1	8	¾	11.75	13.51	6.88	1.71	8.62	HC
10	B10	**9856-100**	1	12	⅞	14.25	15.97	8.30	1.73	10.70	HC
12	B10	**9856-120**	1	12	⅞	17.00	18.95	9.55	1.72	12.69	HC
14	A34	**9856-140N**	1	12	1	18.75	21.00	13.00	0.50	11.41	FAB
16	A34	**9856-160N**	1	16	1	21.25	23.50	14.00	0.50	13.08	FAB
18	A34	**9856-180N**	1	16	1 ⅛	22.75	25.00	16.00	0.50	14.76	FAB
20	A34	**9856-200N**	1	20	1 ⅛	25.00	27.50	18.00	0.50	16.43	FAB
24	A34	**9856-240N**	1	20	1 ¼	29.50	32.00	20.00	0.50	19.79	FAB

ChlorFIT Blind Flange Schedule 80 CORZAN® CPVC

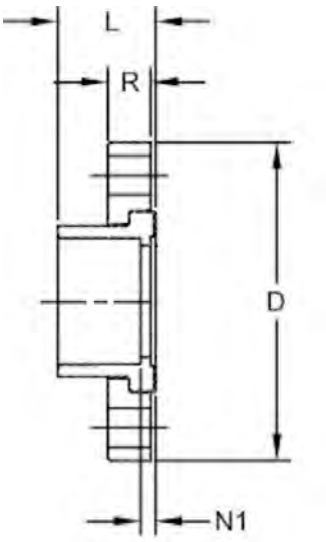




- ANSI 150 Class according to ANSI B16.5
- 1/2" - 8" 150 psi @ 73°F (10.3 bar @ 22.7°C)
- 10" - 24" 50 psi @73°F (3.5 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	R (inch)	Design
½	625	**9853-005**	5	4	½	2.38	3.51	0.48	0.39	HC
¾	625	**9853-007**	5	4	½	2.75	3.90	0.55	0.45	HC
1	625	**9853-010**	5	4	½	3.13	4.29	0.66	0.53	HC
1 ¼	625	**9853-012**	5	4	½	3.50	4.62	0.73	0.59	HC
1 ½	625	**9853-015**	5	4	½	3.88	5.01	0.81	0.68	HC
2	625	**9853-020**	5	4	⅝	4.75	6.02	0.90	0.70	HC
2 ½	625	**9853-025**	5	4	⅝	5.50	7.00	0.97	0.76	HC
3	625	**9853-030**	5	4	⅝	6.00	7.47	0.96	1.03	HC
4	625	**9853-040**	5	8	⅝	7.50	8.87	1.05	1.00	HC
6	625	**9853-060**	2	8	¾	9.50	10.89	1.42	1.17	HC
8	625	**9853-080**	2	8	¾	11.75	13.51	1.51	1.31	HC
10	A34	**9853-100N**	1	12	⅞	14.25	16.00	1.00	1.00	SOLID
12	A34	**9853-120N**	1	12	⅞	17.00	19.00	1.00	1.00	SOLID
14	A34	**9853-140N**	1	12	1	18.75	21.00	1.00	1.00	SOLID
16	A34	**9853-160N**	1	16	1	21.25	23.50	1.00	1.00	SOLID
18	A34	**9853-180N**	1	16	1 ⅛	22.75	25.00	1.00	1.00	SOLID
20	A34	**9853-200N**	1	20	1 ⅛	25.00	27.50	1.00	1.00	SOLID
24	A34	**9853-240N**	1	20	1 ¼	29.50	32.00	1.00	1.00	SOLID



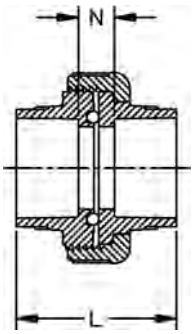


ChlorFIT Van Stone Flange (S) Class 300 Schedule 80 CORZAN® CPVC

- ANSI 300 Class according to ANSI B16.5
- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- HC = Honeycomb (Face)

Size (inch)	P/L	Code	Pack Qty	# holes	Bolt Dia. (inch)	bolt cir. dia. (inch)	D (inch)	L (inch)	N1 (inch)	R (inch)	Design
½	25	**9854-005-300**	1	4	½	2.63	3.75	1.10	0.18	0.57	FAB
¾	25	**9854-007-300**	1	4	⅝	3.25	4.63	1.23	0.18	0.59	FAB
1	25	**9854-010-300**	1	4	⅝	3.50	4.88	1.38	0.20	0.66	FAB
1 ¼	25	**9854-012-300**	1	4	⅝	3.88	5.25	1.52	0.21	0.69	FAB
1 ½	25	**9854-015-300**	1	4	¾	4.50	6.13	1.68	0.25	0.75	FAB
2	25	**9854-020-300**	1	8	⅝	5.00	6.50	1.84	0.29	0.82	FAB
2 ½	25	**9854-025-300**	1	8	¾	5.88	7.50	2.15	0.33	0.98	FAB
3	25	**9854-030-300**	1	8	¾	6.63	8.25	2.33	0.39	1.02	FAB
4	25	**9854-040-300**	1	8	¾	7.88	10.00	2.75	0.24	1.10	FAB
6	25	**9854-060-300**	1	12	¾	10.63	12.50	3.55	0.48	1.25	FAB
8	25	**9854-080-300**	1	12	⅞	13.00	15.00	4.60	0.51	1.71	FAB
10	02	**9854-100-300**	1	16	1	15.25	17.50	5.66	0.53	1.73	FAB
12	02	**9854-120-300**	1	16	1 ⅛	17.75	20.50	6.71	0.57	1.72	FAB



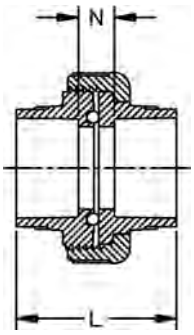


ChlorFIT Union Type 375 (SxS) Schedule 80 CORZAN® CPVC

235 psi @ 73°F (16.2 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	N (inch)
½	625	**9897-375-005**	**9857-375-005**	5	2.56	0.78
¾	625	**9897-375-007**	**9857-375-007**	5	2.80	0.76
1	625	**9897-375-010**	**9857-375-010**	5	3.22	0.89
1 ¼	625	**9897-375-012**	**9857-375-012**	5	3.56	0.99
1 ½	625	**9897-375-015**	**9857-375-015**	5	3.76	0.92
2	625	**9897-375-020**	**9857-375-020**	2	4.18	1.11



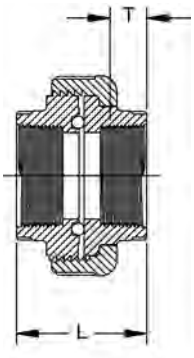


ChlorFIT Union (SxS) Schedule 80 CORZAN® CPVC

150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	N (inch)
3	625	**9897-030**	**9857-030**	1	4.74	0.96
4	625	**9897-040**	**9857-040**	1	5.62	1.11



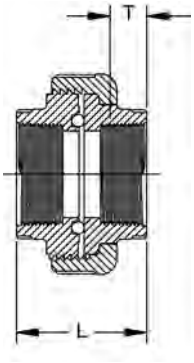


ChlorFIT Union Type 375 (FPTxFPT) Schedule 80 CORZAN® CPVC

- 235 psi @ 73°F (16.2 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	T (inch)
½	625	**9898-375-005**	**9858-375-005**	5	2.06	0.75
¾	625	**9898-375-007**	**9858-375-007**	5	2.11	0.79
1	625	**9898-375-010**	**9858-375-010**	5	2.60	1.01
1 ¼	625	**9898-375-012**	**9858-375-012**	5	2.80	1.06
1 ½	625	**9898-375-015**	**9858-375-015**	5	2.76	1.06
2	625	**9898-375-020**	**9858-375-020**	2	2.93	1.09



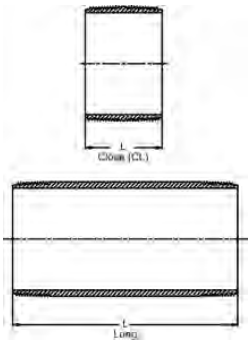


ChlorFIT Union (FPTxFPT) Schedule 80 CORZAN® CPVC

- 150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	EPDM Code	FKM Code	Pack Qty	L (inch)	T (inch)
3	625	**9898-030**	**9858-030**	1	4.75	1.33
4	625	**9898-040**	**9858-040**	1	5.71	1.78



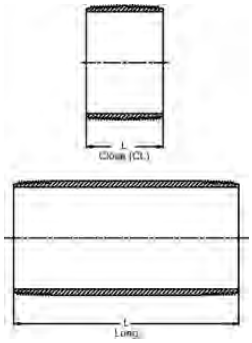


ChlorFIT Nipple (MPTxMPT) Schedule 80 CORZAN® CPVC

- Nipples fabricated from pipe

Size (inch)	P/L	Code	Pack Qty	L (inch)
1/2 x CL	625	**9861-077**	25	1.13
1/2 x 2	625	**9861-079**	25	2.00
1/2 x 3	625	**9861-081**	25	3.00
1/2 x 4	625	**9861-082**	25	4.00
1/2 x 5	625	**9861-083**	25	5.00
1/2 x 6	625	**9861-084**	25	6.00
1/2 x 8	625	**9861-086**	25	8.00
3/4 x CL	625	**9861-104**	25	1.38
3/4 x 2	625	**9861-020**	25	2.00
3/4 x 3	625	**9861-106**	25	3.00
3/4 x 4	625	**9861-107**	25	4.00
3/4 x 5	625	**9861-108**	25	5.00
3/4 x 6	625	**9861-109**	25	6.00
3/4 x 8	625	**9861-112**	25	8.00
1 x CL	625	**9861-133**	25	1.50
1 x 2	625	**9861-134**	25	2.00
1 x 3	625	**9861-135**	25	3.00
1 x 4	625	**9861-136**	25	4.00
1 x 5	625	**9861-137**	25	5.00
1 x 6	625	**9861-138**	25	6.00
1 1/4 x CL	625	**9861-170**	25	1.63
1 1/4 x 2	625	**9861-171**	25	2.00
1 1/4 x 3	625	**9861-172**	25	3.00
1 1/4 x 4	625	**9861-173**	25	4.00
1 1/4 x 5	625	**9861-174**	25	5.00
1 1/4 x 6	625	**9861-175**	25	6.00
1 1/2 x CL	625	**9861-213**	25	1.75
1 1/2 x 2	625	**9861-214**	25	2.00
1 1/2 x 3	625	**9861-215**	25	3.00
1 1/2 x 4	625	**9861-216**	25	4.00
1 1/2 x 5	625	**9861-217**	25	5.00
1 1/2 x 6	625	**9861-218**	25	6.00
1-1/2 x 12	625	**9861-221**	25	12.00
2 x CL	625	**9861-251**	25	2.00

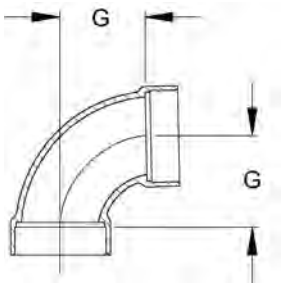
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Size (inch)	P/L	Code	Pack Qty	L (inch)
2 x 2 1/2	625	**9861-252**	25	2.50
2 x 3	625	**9861-253**	25	3.00
2 x 4	625	**9861-254**	25	4.00
2 x 5	625	**9861-255**	25	5.00
2 x 6	625	**9861-256**	25	6.00
2 x 12	625	**9861-259**	25	12.00
2 1/2 x CL	625	**9861-291**	10	2.50
2 1/2 x 3	625	**9861-292**	10	3.00
2 1/2 x 4	625	**9861-295**	10	4.00
2 1/2 x 5	625	**9861-296**	10	5.00
2 1/2 x 6	625	**9861-297**	10	6.00
3 x CL	625	**9861-338**	10	2.63
3 x 3	625	**9861-340**	10	3.00
3 x 4	625	**9861-341**	10	4.00
3 x 5	625	**9861-342**	10	5.00
3 x 6	625	**9861-343**	10	6.00
4 x CL	625	**9861-422**	10	2.88
4 x 4	625	**9861-423**	10	4.00
4 x 5	625	**9861-425**	10	5.00
4 x 6	625	**9861-426**	10	6.00

ChlorFIT® DWV Fittings



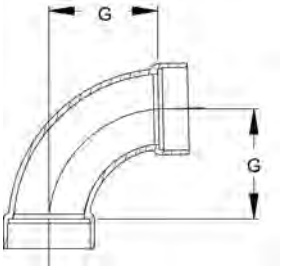


ChlorFIT 1/4 Bend (SxS) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	G (inch)
1 1/2	625	**9806-015SS**	4	1.75
2	625	**9806-020SS**	4	2.31
3	625	**9806-030SS**	1	3.06
4	625	**9806-040SS**	1	3.88

ChlorFIT 1/4 Bend Long Sweep (SxS) Schedule 80 CORZAN® CPVC - FAB

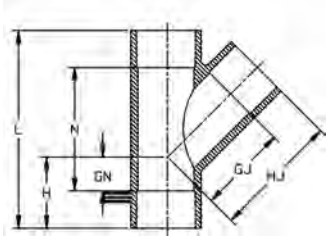




Size (inch)	P/L	Code	Pack Qty	G (inch)
1 1/2	A34	**9806-015LSN**	4	4.13
2	A34	**9806-020LSN**	4	4.75
3	A34	**9806-030LSN**	1	7.00
4	A34	**9806-040LSN**	1	9.00

ChlorFIT 45° Wye (SxSxS) Schedule 80 CORZAN® CPVC



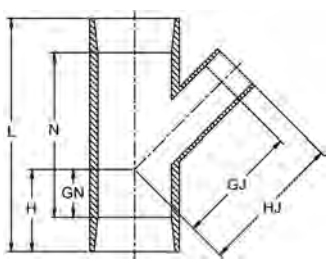


1-1/2" - 2" 235 psi @ 72°F (16.2 bar @ 22.7°C)
3" - 6" 150 psi @ 72°F (10.3 bar @ 22.7°C)
8" - 24" 100 psi @ 72°F (6.9 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
1 ½	625	**9870-015**	20	2.79	1.20	2.60	4.18	6.80	4.02	SL
2	625	**9870-020**	10	3.56	1.36	2.87	5.07	7.99	4.97	SL
3	625	**9870-030**	4	4.91	1.82	3.73	6.83	10.45	6.62	SL
4	625	**9870-040**	4	6.26	2.06	4.41	8.61	12.94	8.24	SL
6	625	**9870-060**	2	8.38	1.85	4.90	11.44	16.50	10.39	HS
10	A34	**9875-100N**	1	19.75	5.50	11.25	24.75	31.75	21.75	FAB
12	A34	**9875-120N**	1	22.63	6.50	12.50	28.63	37.50	25.50	FAB
14	A34	**9875-140N**	1	25.75	7.00	14.00	32.75	41.75	27.75	FAB
16	A34	**9875-160N**	1	28.88	7.75	16.00	36.88	47.25	31.25	FAB
18	A34	**9875-180N**	1	32.50	8.50	17.50	41.50	53.00	35.00	FAB
20	A34	**9875-200N**	1	35.50	9.50	19.50	45.50	58.75	38.75	FAB
24	A34	**9875-240N**	1	42.00	11.00	23.00	54.00	70.00	46.00	FAB

ChlorFIT Reducing 45° Wye (SxSxS) Schedule 80 CORZAN® CPVC

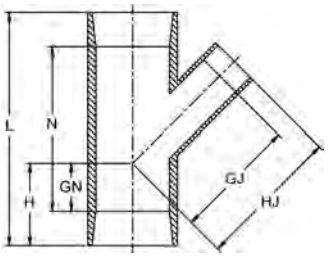




2" 235 psi @ 72°F (16.2 bar @ 22.7° C)
3" - 6" 150 psi @ 72°F (10.3 bar @ 22.7°C)
8" - 24" 100 psi @ 72°F (6.9 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
2 x 1 ½	625	**9870-251FB**	10	3.96	1.36	2.87	5.37	7.99	4.97	BUSH
3 x 1 ½	625	**9870-337FB**	4	5.80	1.82	3.73	7.34	10.45	6.62	BUSH
3 x 2	625	**9870-338FB**	4	5.77	1.82	3.73	7.33	10.45	6.62	BUSH
4 x 2	625	**9870-420FB**	4	7.40	2.06	4.41	7.40	12.94	8.24	BUSH
4 x 3	625	**9870-422FB**	4	7.03	2.06	4.41	9.00	12.94	8.24	BUSH
6 x 2	625	**9870-528FB**	1	8.24	1.87	4.91	8.24	16.49	10.42	BUSH
6 x 3	625	**9870-530FB**	2	7.88	1.87	4.91	9.84	16.49	10.42	BUSH
6 x 4	625	**9870-532**	2	7.14	1.87	4.91	9.36	16.49	10.42	HS
8 x 3	625	**9870-580FB**	1	10.23	0.41	4.43	12.20	15.98	7.95	BUSH
8 x 4	625	**9870-582FB**	1	13.95	2.06	6.06	16.21	21.25	13.31	BUSH
8 x 6	625	**9870-585FB**	1	12.78	1.90	5.92	15.76	21.35	13.30	BUSH
10 x 4	A34	**9875-623N**	1	14.00	1.25	6.25	16.00	23.00	13.00	FAB
10 x 6	A34	**9875-626N**	1	16.13	2.75	7.50	19.13	26.00	16.00	FAB
10 x 8	A34	**9875-628N**	1	17.50	4.00	9.25	21.50	28.00	18.75	FAB
12 x 4	A34	**9875-663N**	1	15.50	0.50	6.00	17.50	25.75	13.75	FAB
12 x 6	A34	**9875-666N**	1	16.68	2.00	8.00	20.50	28.68	16.68	FAB

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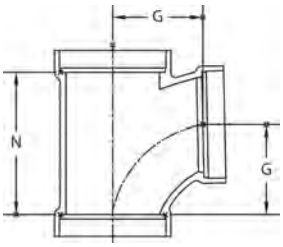


Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)	Design
12 x 8	A34	**9875-668N**	1	19.00	3.50	9.50	23.00	31.50	19.50	FAB
12 x 10	A34	**9875-670N**	1	21.25	5.00	11.00	26.25	34.50	22.50	FAB
14 x 4	A34	**9875-696N**	1	16.25	0.25	7.25	18.25	28.25	14.25	FAB
14 x 6	A34	**9875-698N**	1	18.50	1.75	8.63	21.50	31.25	17.25	FAB
14 x 8	A34	**9875-700N**	1	19.75	3.00	10.00	23.75	34.00	20.00	FAB
14 x 10	A34	**9875-702N**	1	22.00	4.50	11.50	27.00	37.00	23.00	FAB
14 x 12	A34	**9875-704N**	1	23.50	6.00	13.00	29.50	39.75	25.75	FAB
16 x 4	A34	**9875-730N**	1	17.75	-0.75	7.50	19.75	31.00	15.00	FAB
16 x 6	A34	**9875-732N**	1	19.88	1.00	9.00	22.88	34.00	18.00	FAB
16 x 8	A34	**9875-734N**	1	21.25	2.50	10.25	25.25	36.75	20.75	FAB
16 x 10	A34	**9875-736N**	1	23.50	4.00	12.00	28.50	39.75	23.75	FAB
16 x 12	A34	**9875-738N**	1	25.00	5.50	14.25	31.00	42.75	26.75	FAB
16 x 14	A34	**9875-740N**	1	27.25	6.25	15.25	34.25	44.50	28.50	FAB
18 x 4	A34	**9875-784N**	1	19.00	-1.25	8.00	21.00	34.00	16.00	FAB
18 x 6	A34	**9875-786N**	1	21.25	0.50	9.50	24.25	37.00	19.00	FAB
18 x 8	A34	**9875-788N**	1	22.75	2.00	11.00	26.75	39.75	21.75	FAB
18 x 10	A34	**9875-790N**	1	25.00	3.50	12.50	30.00	42.75	24.75	FAB
18 x 12	A34	**9875-792N**	1	26.25	4.75	13.75	32.50	45.50	27.50	FAB
18 x 14	A34	**9875-794N**	1	28.75	5.75	14.75	35.75	48.50	29.50	FAB
18 x 16	A34	**9875-796N**	1	30.25	7.25	16.00	38.25	50.25	32.25	FAB
20 x 4	A34	**9875-814N**	1	20.50	-1.75	8.50	22.50	36.75	16.75	FAB
20 x 6	A34	**9875-816N**	1	22.75	-0.25	10.00	25.75	39.75	19.75	FAB
20 x 8	A34	**9875-818N**	1	24.25	1.50	11.50	28.25	42.75	22.75	FAB
20 x 10	A34	**9875-820N**	1	26.50	3.00	13.00	31.50	45.75	25.75	FAB
20 x 12	A34	**9875-822N**	1	28.00	4.25	14.25	34.00	48.50	28.50	FAB
20 x 14	A34	**9875-824N**	1	30.25	5.25	15.00	37.25	50.25	30.25	FAB
20 x 16	A34	**9875-826N**	1	31.75	6.50	16.50	39.75	53.00	33.00	FAB
20 x 18	A34	**9875-828N**	1	34.00	8.00	18.00	43.00	56.00	36.00	FAB
24 x 4	A34	**9875-904N**	1	23.25	-3.00	9.25	25.25	42.50	18.50	FAB
24 x 6	A34	**9875-906N**	1	25.50	-1.50	10.75	28.50	45.50	21.54	FAB
24 x 8	A34	**9875-908N**	1	27.00	0.00	12.00	31.00	48.25	24.25	FAB
24 x 10	A34	**9875-910N**	1	29.25	1.75	13.50	34.25	51.25	27.25	FAB
24 x 12	A34	**9875-912N**	1	30.50	3.25	15.00	36.60	54.25	30.25	FAB
24 x 14	A34	**9875-914N**	1	33.00	4.00	16.00	40.00	56.00	32.00	FAB
24 x 16	A34	**9875-916N**	1	34.50	5.50	17.50	42.50	58.75	34.75	FAB
24 x 18	A34	**9875-918N**	1	36.75	6.75	18.75	45.75	61.50	37.50	FAB
24 x 20	A34	**9875-920N**	1	38.25	8.25	20.25	48.25	64.50	40.50	FAB



ChlorFIT Sanitary Tee (SxSxS) Schedule 80 CORZAN® CPVC

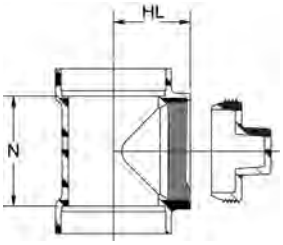
Size (inch)	P/L	Code	Pack Qty	G (inch)	N (inch)
1 1/2	625	**37S461501**	5	1.75	2.75
2	625	**37S461502**	5	2.31	3.69
3	625	**37S461503**	5	3.06	4.88
4	625	**37S461504**	5	3.88	6.13





ChlorFIT Cleanout Tee with Plug (SxSxFPT) Schedule 80 CORZAN® CPVC

Size (inch)	P/L	Code	Pack Qty	HL (inch)	N (inch)
1 1/2	625	**37S461101**	2	2.07	1.80
2	625	**37S461102**	2	2.35	2.32
3	625	**37S461103**	2	3.51	3.63
4	625	**37S461104**	2	4.07	4.25



ChlorFIT® Metal Transition Fittings



ChlorFIT Full Pressure Flange Kit Schedule 80 CORZAN® CPVC

- Kit includes: 1 Van Stone Flange, 1 304SS Backing Ring, 1 Garlock Stress Saver XP Gasket, and appropriate number of bolts, nuts, and washers depending on the size.

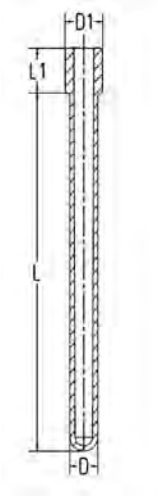
Size (inch)	P/L	Code	Pack Qty	Max Pressure at 73°F (22.7°C) (psi)	Weight (lb)
½	607	**37Z000261**	1	850	0.58
¾	607	**37Z000262**	1	690	0.73
1	607	**37Z000263**	1	630	0.88
1 ¼	607	**37Z000264**	1	520	1.16
1 ½	607	**37Z000265**	1	470	1.45
2	607	**37Z000266**	1	400	2.57
2 ½	607	**37Z000267**	1	420	5.44
3	607	**37Z000268**	1	370	6.40
4	607	**37Z000269**	1	320	8.03
6	607	**37Z000270**	1	280	11.40

CTS-to-IPS CPVC STUB OUT (SPGXSPG)



For availability call

Size (inch)	P/L	Code	Pack Qty	L (inch)	L1 (inch)	D (inch)	D1 (inch)
½	A35	**37Z000081**	25	8.00	1.00	0.625	0.84

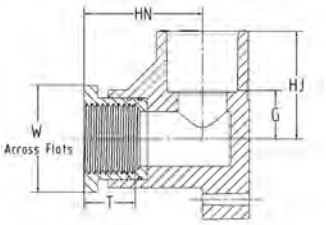


ChlorFIT Drop Ear (SxFPT) Schedule 80 CORZAN® CPVC-to-316SS



- 400 psi @ 73°F (27.6 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	G (inch)	HJ (inch)	HN (inch)	T (inch)	W (inch)
½	A35	**9832-005SS**	5	0.62	1.50	1.52	0.90	1.125
¾	A35	**9832-007SS**	5	0.76	1.77	1.65	0.95	1.313
1	A35	**9832-010SS**	5	0.87	2.00	2.20	1.00	1.750

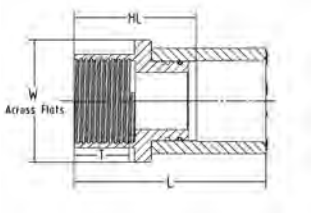


ChlorFIT Female Adapter (SxFPT) Schedule 80 Adapter CPVC-316SS

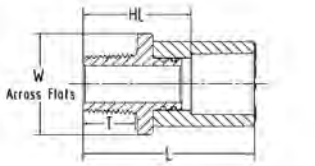


- 400 psi @ 73°F (27.6 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**9868-005SS**	10	1.49	2.38	0.84	1.25
¾	A35	**9868-007SS**	10	1.67	2.68	0.92	1.50
1	A35	**9868-010SS**	6	1.98	3.11	0.96	1.75
1 ¼	A35	**9868-012SS**	5	2.19	3.45	1.04	2.12
1 ½	A35	**9868-015SS**	5	2.35	3.73	1.04	2.50
2	A35	**9868-020SS**	4	2.63	4.14	1.29	3.00







ChlorFIT Male Adapter (SxMPT) Schedule 80 CPVC-to-316SS

- 400 psi @ 73°F (27.6 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**9869-005SS**	10	1.49	2.38	0.70	1.25
¾	A35	**9869-007SS**	10	1.67	2.68	0.74	1.50
1	A35	**9869-010SS**	6	1.98	3.11	0.92	1.75
1 ¼	A35	**9869-012SS**	5	2.19	3.45	0.95	2.12
1 ½	A35	**9869-015SS**	5	2.35	3.73	0.99	2.50
2	A35	**9869-020SS**	4	2.64	4.14	1.03	3.00

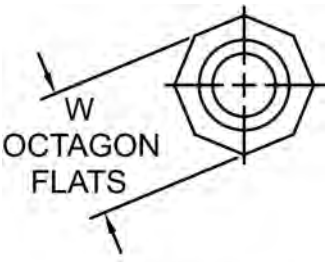


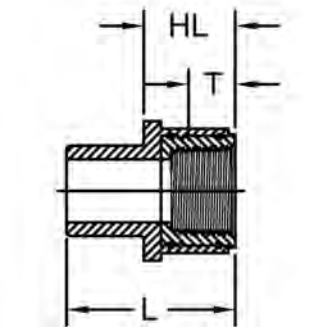
Metal Union End Connector for Type 375 Union or Ball Valve (316SS)

Not Fully Pressure Rated
150 psi @ 73°F (10.3 bar @ 22.7°C)
Union Sold Separately

Size (inch)	P/L	Code	Pack Qty
½	A35	**37X003314**	1
¾	A35	**37X003315**	1
1	A35	**37X003316**	1
1 ¼	A35	**37X003317**	1
1 ½	A35	**37X003318**	1
2	A35	**37X003319**	1







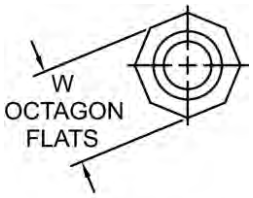
ChlorFIT Transition Fitting (SPGxFPT) Schedule 80 CORZAN® CPVC-to-Brass

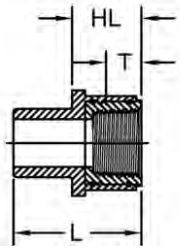
150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**9878-005BR**	25	1.02	1.75	0.70	1.27
¾	A35	**9878-007BR**	15	1.07	2.07	0.74	1.52
1	A35	**9878-010BR**	15	1.32	2.44	0.81	1.93
1 ¼	A35	**9878-012BR**	15	1.38	2.49	0.85	2.29
1 ½	A35	**9878-015BR**	10	1.44	2.74	0.87	2.60
2	A35	**9878-020BR**	5	1.43	2.81	1.11	3.36

ChlorFIT Transition Fitting (SPGxFPT) Schedule 80 CORZAN® CPVC-to-316SS





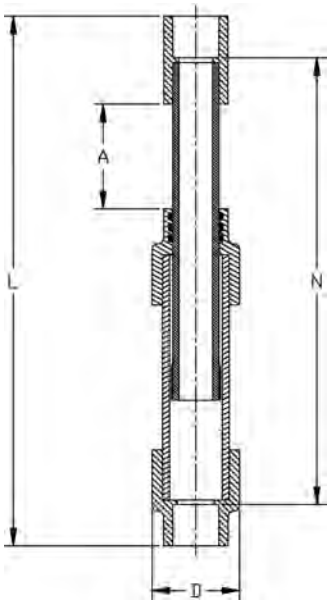


150 psi @ 73°F (10.3 bar @ 22.7°C)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)	W (inch)
½	A35	**9878-005SS**	25	1.02	1.75	0.70	1.27
¾	A35	**9878-007SS**	15	1.07	2.07	0.74	1.52
1	A35	**9878-010SS**	15	1.32	2.44	0.81	1.93
1 ¼	A35	**9878-012SS**	15	1.38	2.49	0.85	2.29
1 ½	A35	**9878-015SS**	10	1.45	2.74	0.87	2.60
2	A35	**9878-020SS**	5	1.43	2.81	1.11	3.36

ChlorFIT® Expansion Joints



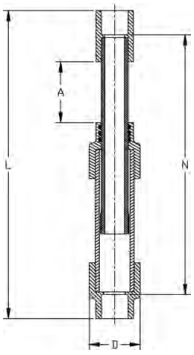


ChlorFIT Expansion Joint 6" Travel (SxS) Schedule 80 CORZAN® CPVC

To order SxSPG add "P" to end of part number.
To order FxF add "F" to end of part number.

Size (inch)	P/L	EPDM Code	FKM Code	A (inch)	D (inch)	L (inch)	N (inch)
½	634	**9826-005X6**	**9836-005X6**	3.00	1.86	13.97	12.17
¾	634	**9826-007X6**	**9836-007X6**	3.00	2.23	14.44	12.40
1	634	**9826-010X6**	**9836-010X6**	3.00	2.50	14.98	12.69
1 ¼	634	**9826-012X6**	**9836-012X6**	3.00	2.89	15.56	12.98
1 ½	634	**9826-015X6**	**9836-015X6**	3.00	3.51	16.00	13.21
2	634	**9826-020X6**	**9836-020X6**	3.00	4.40	18.05	15.01
3	634	**9826-030X6**	**9836-030X6**	3.00	5.52	19.75	16.00
4	634	**9826-040X6**	**9836-040X6**	3.00	7.92	28.29	23.76
6	634	**9826-060X6**	**9836-060X6**	3.00	9.80	27.79	21.73
8	634	**9826-080X6**	**9836-080X6**	3.00	10.75	25.35	17.31
10	634	**9826-100X6**	**9836-100X6**	3.00	12.75	29.64	19.60

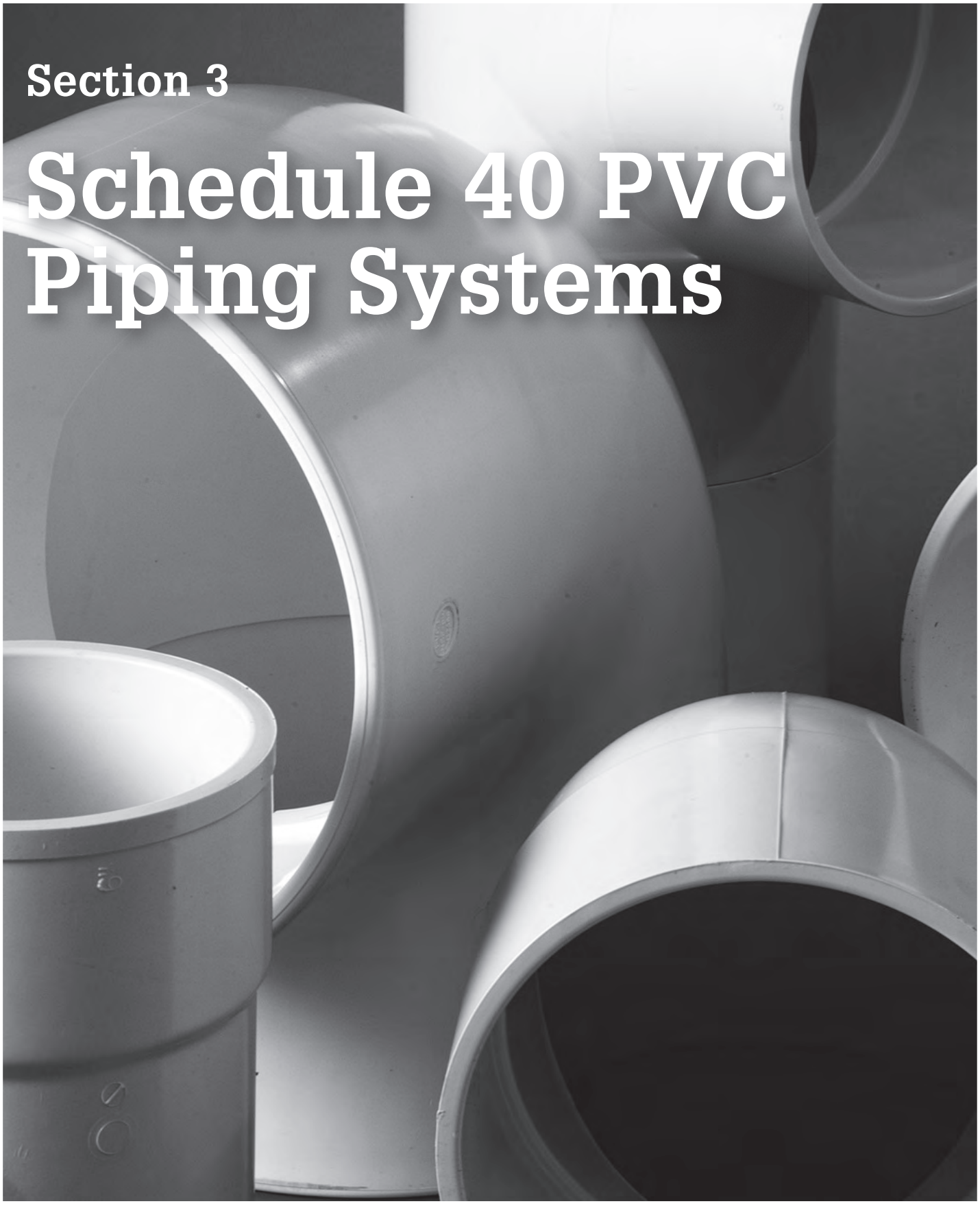




ChlorFIT Expansion Joint 12" Travel (SxS) Schedule 80 CORZAN® CPVC

To order SxSPG add "P" to end of part number.
To order FxF add "F" to end of part number.

Size (inch)	P/L	EPDM Code	FKM Code	A (inch)	D (inch)	L (inch)	N (inch)
½	634	**9826-005X12**	**9836-005X12**	6.00	1.86	23.10	21.30
¾	634	**9826-007X12**	**9836-007X12**	6.00	2.23	23.57	21.52
1	634	**9826-010X12**	**9836-010X12**	6.00	2.50	24.11	21.81
1 ¼	634	**9826-012X12**	**9836-012X12**	6.00	2.89	24.69	22.11
1 ½	634	**9826-015X12**	**9836-015X12**	6.00	3.51	25.12	22.34
2	634	**9826-020X12**	**9836-020X12**	6.00	4.40	27.05	24.01
3	634	**9826-030X12**	**9836-030X12**	6.00	5.52	28.75	25.00
4	634	**9826-040X12**	**9836-040X12**	6.00	7.92	37.28	32.76
6	634	**9826-060X12**	**9836-060X12**	6.00	9.80	26.79	30.73
8	634	**9826-080X12**	**9836-080X12**	6.00	10.75	28.35	20.31
10	634	**9826-100X12**	**9836-100X12**	6.00	12.75	32.64	22.60



Section 3

Schedule 40 PVC Piping Systems

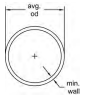
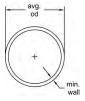
Glossary

FPT	=	**Female Pipe Thread**
MPT	=	**Male Pipe Thread**
S	=	**Tapered Socket**
SPG	=	**Spigot End (same dimension as pipe outside diameter)**
*	=	**Non-Returnable / Non-cancellable**
^	=	**40% Restocking Fee**
BUSH	=	**Assembled Fitting from Molded Components**
FAB	=	**Fabricated Fitting**

The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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	Harvel® Schedule 40 PVC Pressure Pipe - Gray	74
	Schedule 40 PVC Pressure Fittings	75

Specifications and Standards

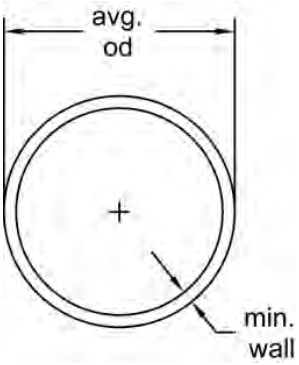
Specifications and Standards

NSF/ANSI Standard 14

NSF/ANSI Standard 61

ASTM D 1784	:	Material PVC Type I, Grade I White or Gray (cell classification 12454)
ASTM D 1785	:	PVC Schedule 40 Pipe
ASTM D 2665	:	PVC Schedule 40 Drain, Waste, and Vent (DWV)
ASTM D 2466	:	PVC Schedule 40 Socket and Threaded Fittings
ASTM F 1498	:	PVC Schedule 40 Taper Threads
ASTM D 2672	:	PVC Schedule 40 Tapered Sockets for Bell End Pipe
ANSI B1.20.1	:	PVC Schedule 40 NPT Threads

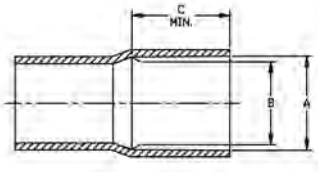
Harvel® Industrial PLUS PVC Pressure Pipe



Harvel® Industrial PLUS Schedule 40 PVC Plain End Pipe 20 Ft Lengths - White

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Meets NSF®-pw-G
- Meets CAN/CSA B137.3 Requirements

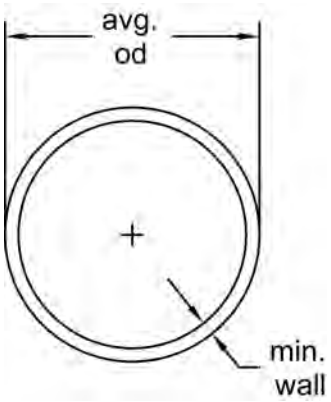
Size (inch)	P/L	Plain End Code	Lift Qty (ft)	Average O.D. (inch)	Min. Wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
½	H17	**H0400050PW2000**	5700	0.840	0.109	0.161	600
¾	H17	**H0400075PW2000**	5260	1.050	0.113	0.214	480
1	H17	**H0400100PW2000**	4280	1.315	0.133	0.315	450
1 ¼	H17	**H0400125PW2000**	2360	1.660	0.140	0.426	370
1 ½	H17	**H0400150PW2000**	2060	1.900	0.145	0.509	330
2	H17	**H0400200PW2000**	1660	2.375	0.154	0.682	280
2 ½	H17	**H0400250PW2000**	1080	2.875	0.203	1.076	300
3	H17	**H0400300PW2000**	840	3.500	0.216	1.409	260
3 ½	H17	**H0400350PW2000**	680	4.000	0.226	1.697	240
4	H17	**H0400400PW2000**	520	4.500	0.237	2.006	220
5	H17	**H0400500PW2000**	400	5.563	0.258	2.726	190
6	H17	**H0400600PW2000**	340	6.625	0.280	3.535	180
8	H17	**H0400800PW2000**	220	8.625	0.322	5.305	160
10	H17	**H0401000PW2000**	80	10.750	0.365	7.532	140
12	H17	**H0401200PW2000**	60	12.750	0.406	9.949	130
14	H51	**H0401400PW2000**	60	14.000	0.437	11.810	130
16	H51	**H0401600PW2000**	60	16.000	0.500	15.416	130
18	H51	**H0401800PW2000**	60	18.000	0.562	20.112	130
20	H51	**H0402000PW2000**	40	20.000	0.593	23.624	120
24	H51	**H0402400PW2000**	40	24.000	0.687	32.873	120



Harvel® Industrial PLUS Schedule 40 PVC Belled End Pipe 20 ft length Less Bell - White

Size (inch)	P/L	Belled End Code	A-Socket Entrance (Belled Pipe)	B-Socket Bottom (Belled Pipe)	C-Min. (Belled Pipe)
½	H17	**H0400050PW200B**	0.484±0.004	0.836±0.004	1.000
¾	H17	**H0400075PW200B**	1.058±0.004	1.046±0.004	1.250
1	H17	**H0400100PW200B**	1.325±0.005	1.310±0.005	1.500
1 ¼	H17	**H0400125PW200B**	1.670±0.005	1.655±0.005	1.750
1 ½	H17	**H0400150PW200B**	1.912±0.006	1.894±0.006	2.000
2	H17	**H0400200PW200B**	2.387±0.006	2.363±0.006	2.250
2 ½	H17	**H0400250PW200B**	2.889±0.007	2.861±0.007	2.500
3	H17	**H0400300PW200B**	3.516±0.008	3.484±0.008	3.250
3 ½	H17	**H0400350PW200B**	4.016±0.008	3.984±0.008	3.500
4	H17	**H0400400PW200B**	4.518±0.009	4.482±0.009	4.000
5	H17	**H0400500PW200B**	5.583±0.010	5.543±0.010	4.000
6	H17	**H0400600PW200B**	6.647±0.011	6.603±0.011	6.000
8	H17	**H0400800PW200B**	8.655±0.015	8.598±0.015	6.000
10	H17	**H0401000PW200B**	10.776±0.015	10.722±0.015	7.500
12	H17	**H0401200PW200B**	12.778±0.015	12.721±0.015	8.500
14	H51	**H0401400PW200B**	14.035±0.015	13.985±0.015	9.000
16	H51	**H0401600PW200B**	16.045±0.015	15.980±0.015	10.000
18	H51	**H0401800PW200B**	18.055±0.020	17.980±0.020	12.000
20	H51	**H0402000PW200B**	20.065±0.025	19.980±0.025	12.000
24	H51	**H0402400PW200B**	24.075±0.030	23.970±0.030	12.000

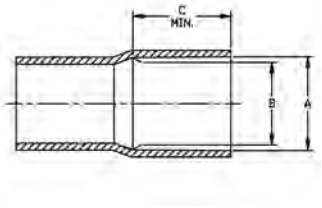
Harvel® Schedule 40 PVC Pressure Pipe - Gray



Harvel® Schedule 40 PVC Plain End Pipe 20 Ft Lengths - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Meets NSF®-pw-G
- Non - CSA Approved

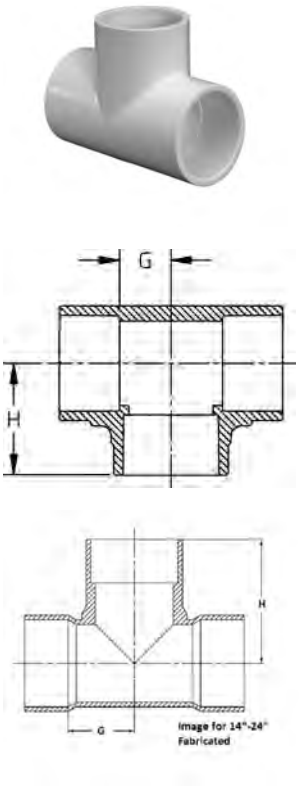
Size (inch)	P/L	Plain End Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
⅛	H16	**H0400013PG2000**	5700	0.405	0.068	0.045	810
¼	H16	**H0400025PG2000**	5700	0.540	0.088	0.081	780
⅜	H16	**H0400038PG2000**	5700	0.675	0.091	0.109	620
½	H16	**H0400050PG2000**	5700	0.840	0.109	0.161	600
¾	H16	**H0400075PG2000**	5260	1.050	0.113	0.214	480
1	H16	**H0400100PG2000**	4280	1.315	0.133	0.315	450
1 ¼	H16	**H0400125PG2000**	2360	1.660	0.140	0.426	370
1 ½	H16	**H0400150PG2000**	2060	1.900	0.145	0.509	330
2	H16	**H0400200PG2000**	1660	2.375	0.154	0.682	280
2 ½	H16	**H0400250PG2000**	1080	2.875	0.203	1.076	300
3	H16	**H0400300PG2000**	840	3.500	0.216	1.409	260
3 ½	H16	**H0400350PG2000**	680	4.000	0.226	1.697	240
4	H16	**H0400400PG2000**	520	4.500	0.237	2.006	220
5	H16	**H0400500PG2000**	400	5.563	0.258	2.726	190
6	H16	**H0400600PG2000**	340	6.625	0.280	3.535	180
8	H16	**H0400800PG2000**	220	8.625	0.332	5.305	160
10	H16	**H0401000PG2000**	80	10.750	0.365	7.532	140
12	H16	**H0401200PG2000**	60	12.750	0.406	9.949	130
14	H16	**H0401400PG2000**	60	14.000	0.437	11.810	130
16	H16	**H0401600PG2000**	60	16.000	0.500	15.416	130
18	H16	**H0401800PG2000**	40	18.000	0.562	20.112	130
20	H16	**H0402000PG2000**	40	20.000	0.593	23.624	120
24	H16	**H0402400PG2000**	40	24.000	0.687	32.873	120



Harvel® Schedule 40 PVC Belled End Pipe 20 ft length Less Bell - Gray

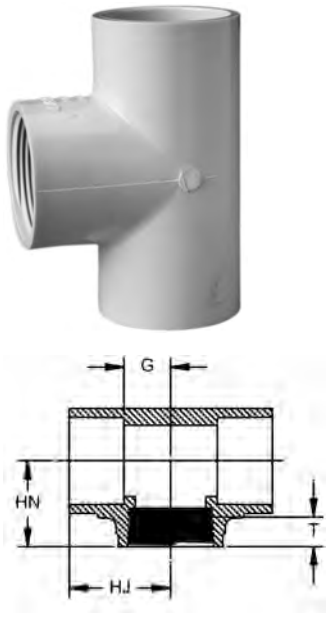
Size (inch)	P/L	Belled End Code	A-Socket Entrance (Belled Pipe)	B-Socket Bottom (Belled Pipe)	C-Min. (Belled Pipe)
½	H16	**H0400050PG200B**	0.848±0.004	0.836±0.004	1.000
¾	H16	**H0400075PG200B**	1.058±0.004	1.046±0.004	1.250
1	H16	**H0400100PG200B**	1.325±0.005	1.310±0.005	1.500
1 ¼	H16	**H0400125PG200B**	1.670±0.005	1.655±0.005	1.750
1 ½	H16	**H0400150PG200B**	1.912±0.005	1.894±0.006	2.000
2	H16	**H0400200PG200B**	2.387±0.006	2.363±0.006	2.250
2 ½	H16	**H0400250PG200B**	2.889±0.007	2.861±0.007	2.500
3	H16	**H0400300PG200B**	3.516±0.008	3.484±0.008	3.250
4	H16	**H0400400PG200B**	4.518±0.009	4.482±0.009	4.000
5	H16	**H0400500PG200B**	5.583±0.010	5.543±0.010	4.000
6	H16	**H0400600PG200B**	6.647±0.011	6.603±0.011	6.000
8	H16	**H0400800PG200B**	8.655±0.015	8.598±0.015	6.000
10	H16	**H0401000PG200B**	10.776±0.015	10.722±0.015	7.500
12	H16	**H0401200PG200B**	12.778±0.015	12.721±0.015	8.500
14	H16	**H0401400PG200B**	14.035±0.015	13.985±0.015	9.000
16	H16	**H0401600PG200B**	16.045±0.015	15.980±0.015	10.000
18	H16	**H0401800PG200B**	18.055±0.020	17.980±0.020	12.000
20	H16	**H0402000PG200B**	20.065±0.025	19.980±0.025	12.000
24	H16	**H0402400PG200B**	24.075±0.030	23.970±0.030	12.000

Schedule 40 PVC Pressure Fittings



Tee (SxSxS) Schedule 40 PVC

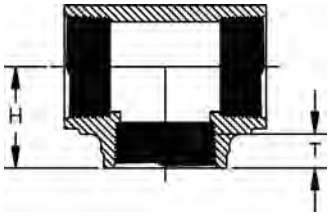
Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
½	601	**401-005**	50	1.25	0.38	
¾	601	**401-007**	50	1.38	0.56	
1	601	**401-010**	50	1.69	0.69	
1 ¼	601	**401-012**	25	2.13	0.88	
1 ½	601	**401-015**	25	2.31	1.00	
2	601	**401-020**	25	2.63	1.25	
2 ½	601	**401-025**	10	3.50	1.50	
3	601	**401-030**	10	3.81	1.81	
4	601	**401-040**	5	4.31	2.31	
6	601	**401-060**	4	7.06	3.50	
8	601	**401-080**	2	9.00	4.50	
10	B09	**401-100**	1	10.94	5.88	
12	B09	**401-120**	1	13.06	7.00	
14	A32	**401-140N**	1	19.38	10.06	FAB
16	A32	**401-160N**	1	21.63	11.75	FAB
18	A32	**401-180N**	1	24.50	12.88	FAB
20	A32	**401-200N**	1	26.25	14.31	FAB
24	A32	**401-240N**	1	33.13	16.75	FAB



Tee (SxSxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	601	**402-005**	50	1.25	1.25	0.50	0.75
¾	601	**402-007**	50	1.38	1.38	0.56	0.81
1	601	**402-010**	50	1.69	1.69	0.69	1.00
1 ¼	601	**402-012**	25	2.13	2.13	0.88	0.94
1 ½	601	**402-015**	25	2.31	2.31	1.00	0.88
2	601	**402-020**	10	2.63	2.19	1.25	0.94
3	601	**402-030**	10	3.81	3.19	1.81	1.44
4	601	**402-040**	5	4.31	4.00	2.31	1.69

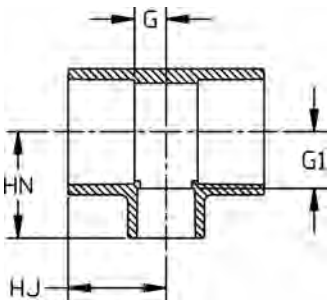


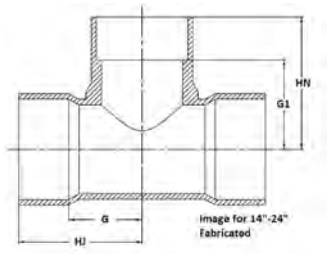


Tee (FPTxFPTxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)
½	601	**405-005**	50	1.25	0.72
¾	601	**405-007**	50	1.38	0.81
1	601	**405-010**	50	1.69	1.00
1 ¼	601	**405-012**	25	2.13	0.88
1 ½	601	**405-015**	25	2.31	1.31



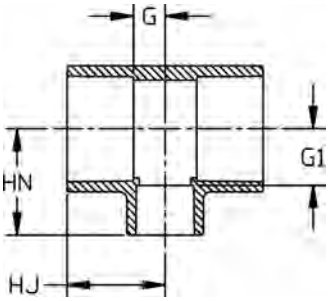


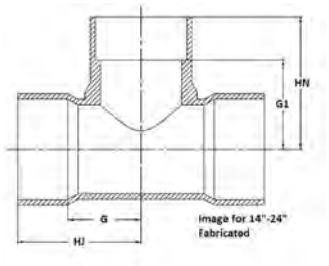


Reducing Tee (SxSxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
¾ x ½ x ½	601	**401-094**	50	1.31	1.31	0.50	0.56	
¾ x ½ x ¾	601	**401-095**	50	1.31	1.31	0.56	0.56	
¾ x ¾ x ½	601	**401-101**	50	1.31	1.38	0.50	0.63	
¾ x ¾ x 1	601	**401-102**	50	1.50	1.56	0.69	0.56	
1 x ½ x 1	601	**401-122**	50	1.69	1.69	0.69	0.75	
1 x ¾ x ¾	601	**401-125**	50	1.56	1.44	0.53	0.69	
1 x ¾ x 1	601	**401-126**	50	1.69	1.69	0.75	0.69	
1 x 1 x ½	601	**401-130**	50	1.50	1.50	0.50	0.69	
1 x 1 x ¾	601	**401-131**	50	1.56	1.50	0.56	0.69	
1 x 1 x 1 ¼	601	**401-132**	50	1.88	1.94	0.88	0.69	
1 x 1 x 1 ½	601	**401-133**	25	2.00	2.00	1.00	0.69	
1 ¼ x 1 x ¾	601	**401-157**	25	2.06	1.63	0.88	0.88	
1 ¼ x 1 x 1	601	**401-158**	25	2.06	2.00	0.88	0.88	
1 ¼ x 1 ¼ x ½	601	**401-166**	25	1.75	1.63	1.25	0.88	
1 ¼ x 1 ¼ x ¾	601	**401-167**	25	1.88	1.69	0.56	0.88	
1 ¼ x 1 ¼ x 1	601	**401-168**	25	1.94	1.88	0.69	0.88	
1 ½ x 1 ½ x ½	601	**401-209**	25	1.81	1.81	0.50	1.00	
1 ½ x 1 ½ x ¾	601	**401-210**	25	1.94	1.81	0.63	1.00	
1 ½ x 1 ½ x 1	601	**401-211**	25	2.00	2.00	0.69	1.00	
1 ½ x 1 ½ x 1 ¼	601	**401-212**	25	2.19	2.25	0.88	1.06	
2 x 1 ½ x ¾	601	**401-238**	10	2.00	2.06	0.56	1.25	
2 x 1 ½ x 1	601	**401-239**	10	2.63	2.25	1.25	1.19	
2 x 2 x ½	601	**401-247**	10	1.88	2.00	0.50	1.25	
2 x 2 x ¾	601	**401-248**	10	2.00	2.00	0.56	1.25	
2 x 2 x 1	601	**401-249**	10	2.06	2.25	0.69	1.25	
2 x 2 x 1 ¼	601	**401-250**	10	2.25	2.50	0.88	1.25	
2 x 2 x 1 ½	601	**401-251**	10	2.38	2.56	1.00	1.25	
2 ½ x 2 ½ x ¾	601	**401-288**	10	2.44	2.31	0.56	1.50	
2 ½ x 2 ½ x 1	601	**401-289**	10	2.56	2.63	0.69	1.50	
2 ½ x 2 ½ x 1 ¼	601	**401-290**	10	2.88	2.75	0.88	1.50	
2 ½ x 2 ½ x 1 ½	601	**401-291**	10	3.13	2.75	1.00	1.50	
2 ½ x 2 ½ x 2	601	**401-292**	10	3.13	2.88	1.25	1.50	
3 x 3 x ¾	601	**401-334**	10	2.56	2.56	0.56	1.81	
3 x 3 x 1	601	**401-335**	10	2.69	2.88	0.69	1.81	
3 x 3 x 1 ¼	601	**401-336**	10	2.88	3.06	0.88	1.81	
3 x 3 x 1 ½	601	**401-337**	10	3.00	3.19	1.00	1.81	
3 x 3 x 2	601	**401-338**	10	3.25	3.19	1.25	1.81	
4 x 4 x ¾	601	**401-416**	4	2.56	3.00	0.56	2.31	
4 x 4 x 1	601	**401-417**	4	2.75	3.31	0.69	2.31	
4 x 4 x 1 ¼	601	**401-418**	5	2.88	3.56	0.88	2.31	
4 x 4 x 2	601	**401-420**	5	3.25	3.69	1.25	2.31	
4 x 4 x 1 ½	601	**401-419**	5	3.00	3.63	1.00	2.31	
4 x 4 x 3	601	**401-422**	5	3.81	4.38	1.81	2.31	

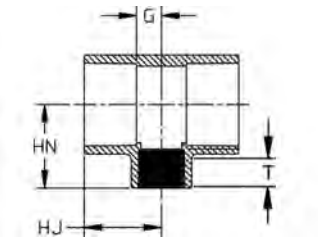
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Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)	Design
6 x 6 x 2	601	**401-528**	5	4.75	4.94	1.25	3.50	
6 x 6 x 3	601	**401-530**	5	5.38	5.56	1.81	3.56	
6 x 6 x 4	601	**401-532**	5	5.88	5.56	2.38	3.50	
8 x 8 x 4	601	**401-582**	2	6.81	6.94	2.31	4.88	
8 x 8 x 6	601	**401-585**	2	8.00	8.06	3.50	4.50	
10 x 10 x 4	B09	**401-624**	1	10.50	7.94	5.44	5.94	
10 x 10 x 6	B09	**401-626**	1	10.50	8.94	5.44	5.94	
10 x 10 x 8	B09	**401-628**	1	10.50	9.88	5.44	5.88	
12 x 12 x 4	B09	**401-664**	1	11.50	9.00	5.44	6.94	
12 x 12 x 6	B09	**401-666**	1	11.50	10.00	5.44	6.94	
12 x 12 x 8	B09	**401-668**	1	11.50	11.00	5.44	7.00	
12 x 12 x 10	B09	**401-670**	1	13.06	13.50	7.00	8.44	
14 x 14 x 4	A32	**401-696N**	1	12.18	12.00	5.18	10.00	FAB
14 x 14 x 6	A32	**401-698N**	1	13.12	13.63	6.12	10.63	FAB
14 x 14 x 8	A32	**401-700N**	1	14.25	15.25	7.25	11.75	FAB
14 x 14 x 10	A32	**401-702N**	1	15.31	16.75	8.31	11.75	FAB
14 x 14 x 12	A32	**401-704N**	1	16.00	18.00	9.00	12.00	FAB
16 x 16 x 4	A32	**401-730N**	1	14.00	13.38	6.00	11.38	FAB
16 x 16 x 6	A32	**401-732N**	1	15.00	14.50	7.00	11.50	FAB
16 x 16 x 8	A32	**401-734N**	1	16.00	16.25	8.00	12.25	FAB
16 x 16 x 10	A32	**401-736N**	1	16.50	17.75	8.50	12.75	FAB
16 x 16 x 12	A32	**401-738N**	1	19.25	19.50	9.63	13.50	FAB
16 x 16 x 14	A32	**401-740N**	1	19.18	20.50	11.18	13.50	FAB
18 x 18 x 6	A32	**401-786N**	1	15.63	15.75	6.63	12.75	FAB
18 x 18 x 8	A32	**401-788N**	1	16.63	17.00	7.63	13.00	FAB
18 x 18 x 10	A32	**401-790N**	1	17.75	18.38	8.75	13.38	FAB
18 x 18 x 12	A32	**401-792N**	1	18.75	20.50	9.75	14.50	FAB
18 x 18 x 14	A32	**401-794N**	1	19.56	21.38	10.56	14.38	FAB
18 x 18 x 16	A32	**401-796N**	1	20.63	22.50	11.63	14.50	FAB
20 x 20 x 8	A32	**401-818N**	1	18.94	18.13	8.94	14.13	FAB
20 x 20 x 10	A32	**401-820N**	1	19.69	19.75	9.69	14.75	FAB
20 x 20 x 12	A32	**401-822N**	1	21.00	21.13	11.00	15.13	FAB
20 x 20 x 14	A32	**401-824N**	1	21.63	22.75	11.63	15.75	FAB
20 x 20 x 16	A32	**401-826N**	1	23.00	24.50	13.00	16.50	FAB
20 x 20 x 18	A32	**401-828N**	1	23.81	24.50	13.81	15.50	FAB
24 x 24 x 6	A32	**401-906N**	1	27.75	18.50	7.88	15.50	FAB
24 x 24 x 8	A32	**401-908N**	1	20.69	20.50	8.69	16.50	FAB
24 x 24 x 10	A32	**401-910N**	1	21.88	21.63	9.88	16.63	FAB
24 x 24 x 12	A32	**401-912N**	1	23.00	23.00	11.00	17.00	FAB
24 x 24 x 14	A32	**401-914N**	1	23.88	25.00	11.88	18.00	FAB
24 x 24 x 16	A32	**401-916N**	1	24.94	26.31	12.94	18.31	FAB
24 x 24 x 18	A32	**401-918N**	1	25.88	27.75	13.88	18.75	FAB
24 x 24 x 20	A32	**401-920N**	1	26.94	30.00	14.94	20.00	FAB

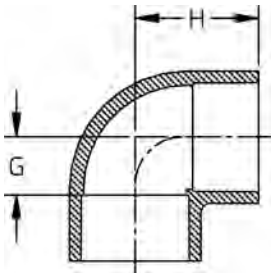


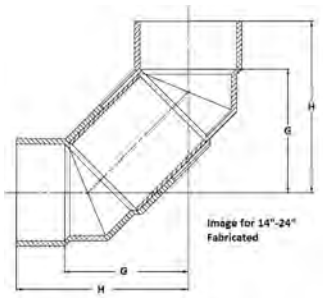


Reducing Tee (SxSxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
¾ x ¾ x ½	601	**402-101**	50	1.31	1.31	0.50	0.75
1 x 1 x ½	601	**402-130**	50	1.50	1.43	0.50	0.69
1 x 1 x ¾	601	**402-131**	50	1.56	1.50	0.56	0.75
1 ¼ x 1 ¼ x ¾	601	**402-167**	25	1.81	1.63	0.56	0.69
1 ¼ x 1 ¼ x 1	601	**402-168**	25	1.94	1.88	0.69	0.88
1 ½ x 1 ½ x ½	601	**402-209**	25	1.81	1.75	0.50	0.75
1 ½ x 1 ½ x ¾	601	**402-210**	25	1.88	1.81	0.56	0.69
1 ½ x 1 ½ x 1	601	**402-211**	25	2.00	2.00	0.69	1.00
1 ½ x 1 ½ x 1 ¼	601	**402-212**	25	2.19	2.25	0.88	1.25
2 x 2 x ½	601	**402-247**	10	1.88	2.00	0.50	0.75
2 x 2 x ¾	601	**402-248**	10	2.00	2.06	0.56	0.81
2 x 2 x 1	601	**402-249**	10	2.06	2.25	0.69	1.00
2 x 2 x 1 ¼	601	**402-250**	10	2.25	2.50	0.88	0.94
2 x 2 x 1 ½	601	**402-251**	10	2.38	2.56	1.00	0.94
2 ½ x 2 ½ x 1 ½	601	**402-291**	10	3.00	2.50	1.00	1.00
2 ½ x 2 ½ x 2	601	**402-292**	10	3.25	2.88	1.25	1.06
3 x 3 x 1 ½	601	**402-337**	10	6.00	2.81	1.00	0.94
3 x 3 x 2	601	**402-338**	10	6.56	2.88	1.25	1.06
4 x 4 x 1 ½	601	**402-419**	5	6.06	3.69	1.00	1.38
4 x 4 x 2	601	**402-420**	5	6.50	3.38	1.25	1.13
4 x 4 x 3	601	**402-422**	5	7.63	4.63	1.81	1.63
6 x 6 x 3	601	**402-530**	5	10.69	5.50	2.31	2.00
6 x 6 x 4	601	**402-532**	5	11.69	5.50	2.31	2.00

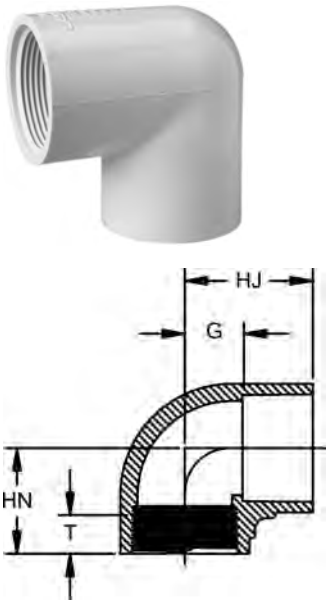






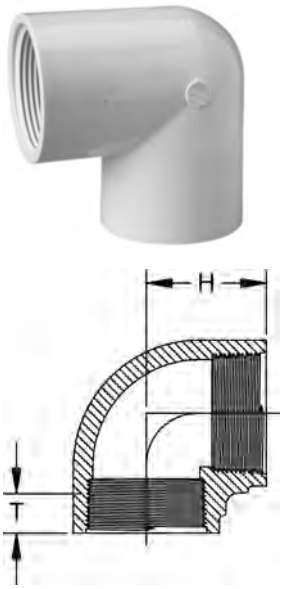
90° Elbow (SxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)	Design
½	601	**406-005**	50	1.25	0.50	
¾	601	**406-007**	50	1.38	0.56	
1	601	**406-010**	50	1.69	0.69	
1 ¼	601	**406-012**	25	2.13	0.88	
1 ½	601	**406-015**	25	2.25	1.00	
2	601	**406-020**	25	2.56	1.25	
2 ½	601	**406-025**	10	3.50	1.50	
3	601	**406-030**	10	3.81	1.81	
4	601	**406-040**	5	4.38	2.31	
6	601	**406-060**	4	7.00	3.50	
8	601	**406-080**	3	9.00	4.50	
10	B09	**406-100**	1	11.19	6.19	
12	B09	**406-120**	1	13.25	7.19	
14	A32	**406-140N**	1	23.88	16.88	FAB
16	A32	**406-160N**	1	26.50	18.50	FAB
18	A32	**406-180N**	1	30.38	21.38	FAB
20	A32	**406-200N**	1	34.00	24.00	FAB
24	A32	**406-240N**	1	39.63	27.63	FAB



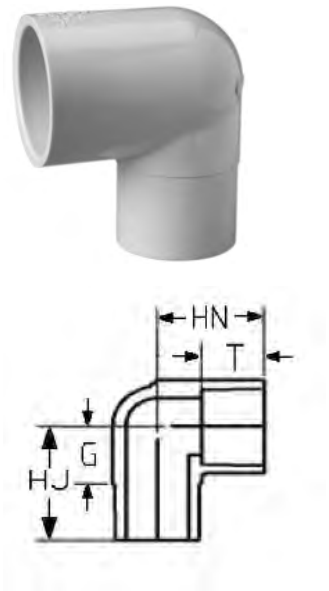
90° Elbow (SxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	601	**407-005**	50	1.25	1.19	0.50	0.75
¾	601	**407-007**	50	1.38	1.38	0.63	0.81
1	601	**407-010**	50	1.63	1.69	0.69	1.00
1 ¼	601	**407-012**	25	2.19	1.81	0.88	0.88
1 ½	601	**407-015**	25	2.31	2.31	1.00	1.31
2	601	**407-020**	10	2.63	2.63	1.25	1.38
2 ½	601	**407-025**	10	3.38	2.75	1.50	1.25
3	601	**407-030**	10	3.75	3.19	1.75	1.56
4	601	**407-040**	5	4.38	4.19	2.38	0.88



90° Elbow (FPTxFPT) Schedule 40 PVC

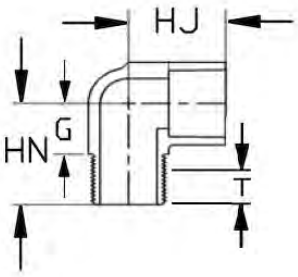
Size (inch)	P/L	Code	Pack Qty	H (inch)	T (inch)
½	601	**408-005**	50	1.31	0.81
¾	601	**408-007**	50	1.38	0.81
1	601	**408-010**	50	1.69	1.00
1 ¼	601	**408-012**	25	2.13	1.19
1 ½	601	**408-015**	25	2.31	1.38
2	601	**408-020**	10	2.63	1.38



90° Street Elbow (SxSPG) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	601	**409-005**	50	1.31	1.13	0.56	0.81
¾	601	**409-007**	50	1.63	1.25	0.81	0.75
1	601	**409-010**	50	1.88	1.44	0.88	0.88
1 ¼	601	**409-012**	25	2.38	2.13	1.06	1.31
1 ½	601	**409-015**	25	2.63	2.31	1.25	1.31
2	601	**409-020**	10	2.88	2.63	1.44	1.38
2 ½	601	**409-025**	10	4.06	3.38	2.00	1.94
3	601	**409-030**	10	4.44	4.19	2.31	2.00

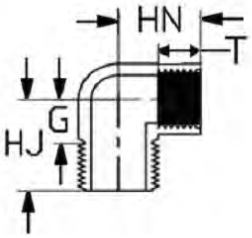




90° Street Elbow (SxMPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	601	**410-005**	50	1.25	1.31	0.69	0.63
¾	601	**410-007**	50	1.25	1.56	0.75	0.81
1	601	**410-010**	50	1.56	1.88	1.00	0.88
1 ¼	601	**410-012**	25	2.06	1.94	1.13	0.81
1 ½	601	**410-015**	25	2.31	2.31	1.25	1.06
2	601	**410-020**	10	2.69	2.25	1.50	0.75

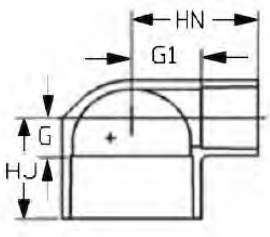




90° Street Elbow (FPTxMPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	601	**412-005**	50	1.44	1.06	0.81	0.31
¾	601	**412-007**	50	1.63	1.19	0.81	0.44
1	601	**412-010**	50	1.88	1.44	0.88	0.56
1 ¼	601	**412-012**	25	1.94	2.13	1.13	1.19
1 ½	601	**412-015**	25	2.31	2.31	1.25	1.31
2	601	**412-020**	10	2.75	2.31	1.56	1.06

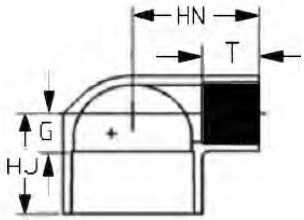




Reducing 90° Elbow (SxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	G1 (inch)
¾ x ½	601	**406-101**	50	1.31	1.31	0.50	0.56
1 x ½	601	**406-130**	50	1.50	1.38	0.50	0.69
1 x ¾	601	**406-131**	50	1.56	1.50	0.56	0.69

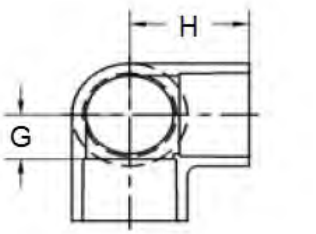




Reducing 90° Elbow (SxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
¾ x ½	601	**407-101**	50	1.38	1.25	0.56	0.68
1 x ½	601	**407-130**	50	1.56	1.38	0.56	0.69
1 x ¾	601	**407-131**	50	1.56	1.50	0.56	0.81
1 ¼ x 1	601	**407-168**	25	1.94	1.88	0.69	1.00
1 ½ x 1	601	**407-211**	25	1.94	2.75	1.06	1.00
1 ½ x 1 ¼	601	**407-212**	25	2.19	2.25	0.88	0.94
2 x 1	601	**407-249**	25	2.19	2.44	0.81	0.88
2 x 1 ¼	601	**407-250**	10	2.25	2.44	0.88	0.88
2 x 1 ½	601	**407-251**	10	2.44	2.63	1.06	0.94

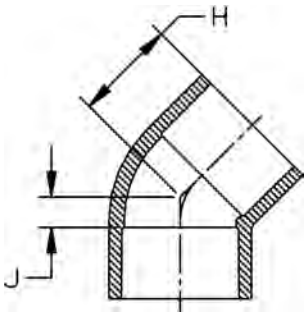


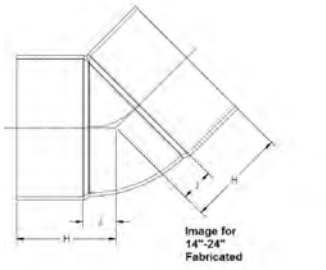


Side Outlet Elbow (SxSxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)
½	601	**413-005**	50	1.31	0.56
¾	601	**413-007**	50	1.38	0.56
1	601	**413-010**	25	1.69	0.69
1 ½	601	**413-015**	25	2.44	1.00
2	601	**413-020**	10	2.63	1.25



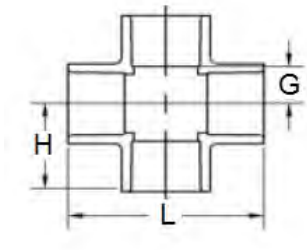




45° Elbow (SxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	J (inch)	Design
½	601	**417-005**	50	1.06	0.25	
¾	601	**417-007**	50	1.19	0.38	
1	601	**417-010**	50	1.44	0.31	
1 ¼	601	**417-012**	25	1.63	0.38	
1 ½	601	**417-015**	25	1.69	0.44	
2	601	**417-020**	25	2.00	0.69	
2 ½	601	**417-025**	10	2.69	0.69	
3	601	**417-030**	10	2.75	0.75	
4	601	**417-040**	5	3.00	1.00	
5	601	**417-050**	5	4.38	1.38	
6	601	**417-060**	4	5.38	1.81	
8	601	**417-080**	4	6.50	2.00	
10	B09	**417-100**	1	8.06	3.06	
12	B09	**417-120**	1	9.56	3.50	
14	A32	**417-140N**	1	10.00	3.00	FAB
16	A32	**417-160N**	1	11.63	3.63	FAB
18	A32	**417-180N**	1	13.13	4.13	FAB
20	A32	**417-200N**	1	14.50	4.50	FAB
24	A32	**417-240N**	1	16.75	4.75	FAB

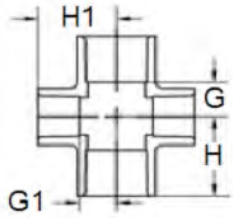




Cross (SxSxSxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	H (inch)	G (inch)
½	601	**420-005**	50	2.44	1.19	0.50
¾	601	**420-007**	50	2.63	1.31	0.56
1	601	**420-010**	50	3.38	1.69	0.69
1 ¼	601	**420-012**	25	4.25	2.13	0.88
1 ½	601	**420-015**	25	4.63	2.31	1.00
2	601	**420-020**	10	5.25	2.63	1.25
2 ½	601	**420-025**	8	7.00	3.50	1.50
3	601	**420-030**	10	7.63	3.81	1.81
4	601	**420-040**	5	8.69	4.31	2.31

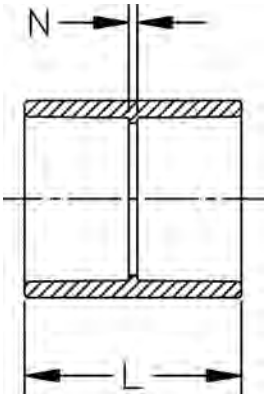


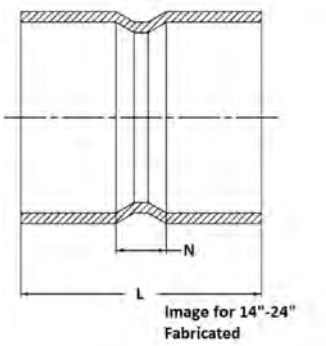


Reducing Cross (SxSxSxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	H (inch)	H1 (inch)	G (inch)	G1 (inch)
3 x 1 ½	601	**420-337**	10	3.00	3.13	1.00	1.81
3 x 2	601	**420-338**	10	3.25	3.19	1.25	1.81
4 x 1 ½	601	**420-419**	5	3.00	3.63	1.00	2.31
4 x 2	601	**420-420**	5	3.25	3.69	1.25	2.31



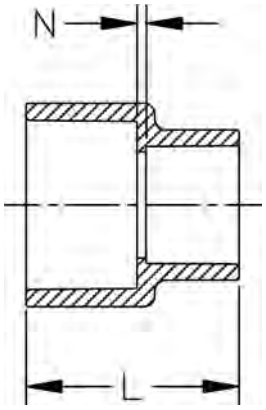


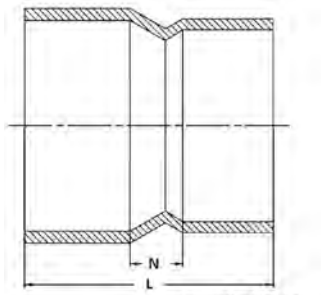


Coupling (SxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
½	601	**429-005**	100	1.69	0.13	
¾	601	**429-007**	50	1.69	0.13	
1	601	**429-010**	50	2.06	0.13	
1 ¼	601	**429-012**	25	2.63	0.13	
1 ½	601	**429-015**	25	2.75	0.13	
2	601	**429-020**	25	2.88	0.13	
2 ½	601	**429-025**	10	4.06	0.19	
3	601	**429-030**	10	4.19	0.19	
4	601	**429-040**	5	4.25	0.19	
5	601	**429-050**	4	6.25	0.19	
6	601	**429-060**	5	7.31	0.31	
8	601	**429-080**	4	9.25	0.25	
10	B09	**429-100**	1	10.31	0.31	
12	B09	**429-120**	1	12.38	0.31	
14	A32	**429-140N**	1	16.50	2.50	FAB
16	A32	**429-160N**	1	19.00	3.00	FAB
18	A32	**429-180N**	1	21.75	3.75	FAB
20	A32	**429-200N**	1	24.13	4.13	FAB
24	A32	**429-240N**	1	28.00	4.00	FAB





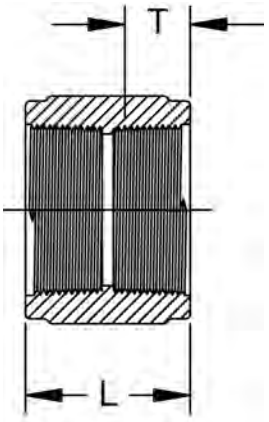


Imgae for 14"-24" Fabricated

Reducing Coupling (SxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	Design
¾ x ½	601	**429-101**	50	1.63	0.13	
1 x ¾	601	**429-131**	50	2.13	0.25	
1 ¼ x 1	601	**429-168**	25	2.56	0.31	
1 ½ x 1 ¼	601	**429-212**	25	2.75	0.25	
2 x 1 ½	601	**429-251**	10	3.13	0.44	
3 x 2	601	**429-338**	5	4.06	0.63	
4 x 3	601	**429-422**	4	4.63	0.63	
6 x 4	601	**429-532**	4	6.63	1.19	
8 x 4	601	**429-582**	4	8.94	2.38	
8 x 6	601	**429-585**	4	9.06	1.06	
10 x 6	B09	**429-626**	1	10.81	2.69	
10 x 8	B09	**429-628**	1	10.75	1.69	
12 x 8	B09	**429-668**	1	12.88	2.69	
12 x 10	B09	**429-670**	1	13.06	1.94	
14 x 4	A32	**429-696N**	1	10.50	4.75	FAB
14 x 6	A32	**429-698N**	1	11.50	4.50	FAB
14 x 8	A32	**429-700N**	1	13.25	5.50	FAB
14 x 10	A32	**429-702N**	1	17.00	5.00	FAB
14 x 12	A32	**429-704N**	1	17.00	4.00	FAB
16 x 4	A32	**429-730N**	1	10.75	4.50	FAB
16 x 6	A32	**429-732N**	1	11.75	4.50	FAB
16 x 8	A32	**429-734N**	1	12.25	6.00	FAB
16 x 10	A32	**429-736N**	1	20.00	7.00	FAB
16 x 12	A32	**429-738N**	1	18.38	4.38	FAB
16 x 14	A32	**429-740N**	1	18.50	3.50	FAB
18 x 6	A32	**429-786N**	1	12.75	5.00	FAB
18 x 8	A32	**429-788N**	1	14.00	6.00	FAB
18 x 10	A32	**429-790N**	1	15.75	6.00	FAB
18 x 12	A32	**429-792N**	1	22.38	7.38	FAB
18 x 14	A32	**429-794N**	1	22.25	6.25	FAB
18 x 16	A32	**429-796N**	1	22.38	5.38	FAB
20 x 8	A32	**429-818N**	1	14.00	5.75	FAB
20 x 10	A32	**429-820N**	1	34.50	19.25	FAB
20 x 12	A32	**429-822N**	1	34.75	17.00	FAB
20 x 14	A32	**429-824N**	1	33.00	15.75	FAB
20 x 16	A32	**429-826N**	1	23.75	5.75	FAB
20 x 18	A32	**429-828N**	1	23.50	4.50	FAB
24 x 6	A32	**429-906N**	1	14.50	5.25	FAB
24 x 8	A32	**429-908N**	1	16.00	6.00	FAB
24 x 10	A32	**429-910N**	1	18.00	7.00	FAB
24 x 12	A32	**429-912N**	1	40.50	21.75	FAB
24 x 14	A32	**429-914N**	1	40.50	21.50	FAB
24 x 16	A32	**429-916N**	1	40.50	20.25	FAB
24 x 18	A32	**429-918N**	1	29.75	8.75	FAB
24 x 20	A32	**429-920N**	1	28.50	6.50	FAB

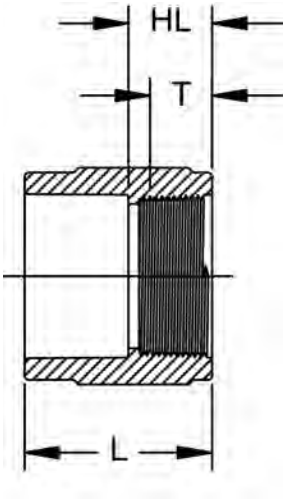




Coupling (FPTxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)
½	601	**430-005**	100	1.56	0.69
¾	601	**430-007**	50	1.81	0.97
1	601	**430-010**	50	1.56	1.00
2	601	**430-020**	25	1.75	0.94

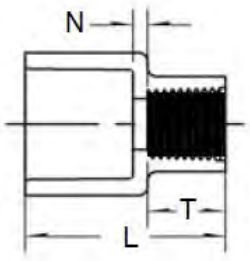




Female Adapter (SxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)
½	601	**435-005**	100	1.75	0.31
¾	601	**435-007**	50	1.75	0.31
1	601	**435-010**	50	2.19	0.13
1 ¼	601	**435-012**	25	2.25	0.06
1 ½	601	**435-015**	25	2.25	0.06
2	601	**435-020**	25	2.44	0.06
2 ½	601	**435-025**	10	3.75	0.19
3	601	**435-030**	10	3.75	0.19
4	601	**435-040**	5	4.00	0.19
6	601	**435-060**	4	5.75	0.25
8	601	**435-080**	4	6.94	0.25

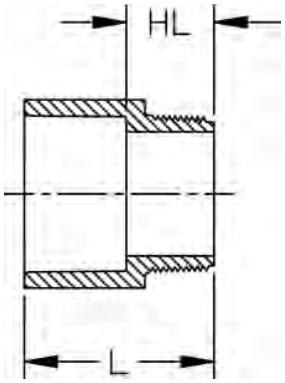




Reducing Female Adapter (SxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)	T (inch)
¾ x ½	601	**435-101**	50	1.56	0.13	0.69
¾ x 1	601	**435-102**	50	1.75	0.06	1.00
1 x ¾	601	**435-131**	50	1.88	0.00	0.88
1 x 1 ½	601	**435-211**	25	2.19	0.19	1.00

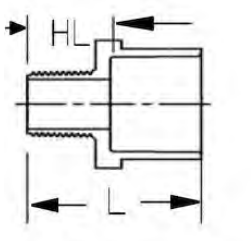




Male Adapter (MPTxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)
½	601	**436-005**	100	0.75	1.56
¾	601	**436-007**	50	0.81	1.56
1	601	**436-010**	50	1.00	2.00
1 ¼	601	**436-012**	25	1.25	2.50
1 ½	601	**436-015**	25	1.19	2.50
2	601	**436-020**	25	1.31	2.69
2 ½	601	**436-025**	10	1.88	3.88
3	601	**436-030**	10	1.94	3.94
4	601	**436-040**	5	2.06	4.06
6	601	**436-060**	4	2.38	5.88
8	601	**436-080**	4	2.56	7.13
12	A32	**436-120N**	1	5.00	10.50

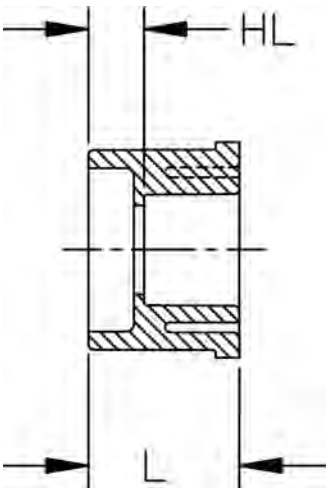




Reducing Male Adapter (MPTxS) Schedule 40 PVC

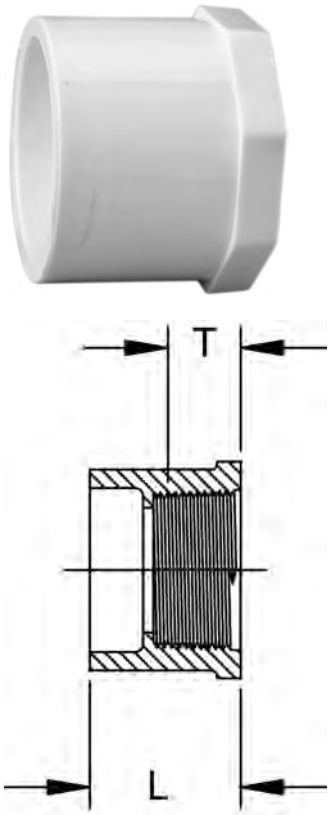
Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)
½ x ¾	601	**436-074**	50	0.88	1.75
¾ x ½	601	**436-101**	50	0.94	1.69
¾ x 1	601	**436-102**	50	0.81	1.81
1 x ¾	601	**436-131**	50	1.00	2.31
1 x 1 ¼	601	**436-132**	25	1.19	2.88
1 ¼ x 1	601	**436-168**	25	1.00	2.00
1 ¼ x 1 ½	601	**436-169**	25	0.94	2.31
1 ½ x 1 ¼	601	**436-212**	25	1.19	2.50
1 ½ x 2	601	**436-213**	10	1.25	2.63
2 x 1 ½	601	**436-251**	10	1.25	2.56





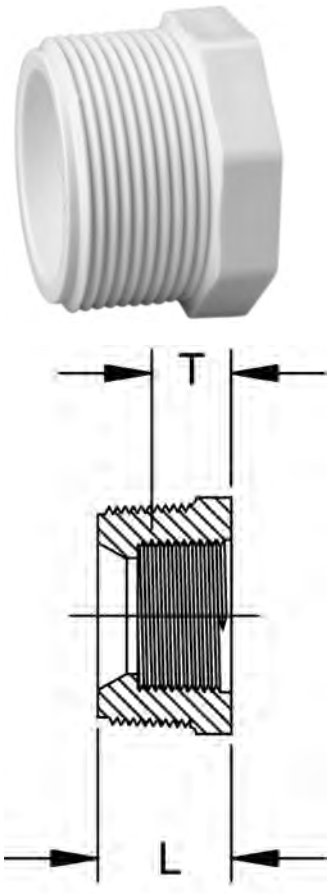
Reducer Bushing (SPGxS) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)
¾ x ½	601	**437-101**	100	0.25	1.06
1 x ½	601	**437-130**	100	0.50	1.25
1 x ¾	601	**437-131**	100	0.44	1.25
1 ¼ x ½	601	**437-166**	25	0.81	1.56
1 ¼ x ¾	601	**437-167**	25	0.75	1.50
1 ¼ x 1	601	**437-168**	25	0.44	1.50
1 ½ x ½	601	**437-209**	25	0.88	1.63
1 ½ x ¾	601	**437-210**	25	0.81	1.63
1 ½ x 1	601	**437-211**	25	0.69	1.69
1 ½ x 1 ¼	601	**437-212**	25	0.38	1.56
2 x ½	601	**437-247**	10	0.94	1.69
2 x 1	601	**437-249**	10	0.56	1.63
2 x ¾	601	**437-248**	10	0.88	1.69
2 x 1 ¼	601	**437-250**	10	0.44	1.69
2 x 1 ½	601	**437-251**	25	0.38	1.69
2 ½ x 1	601	**437-289**	10	1.31	2.31
2 ½ x 1 ¼	601	**437-290**	10	1.00	2.25
2 ½ x 1 ½	601	**437-291**	10	1.00	2.31
2 ½ x 2	601	**437-292**	10	0.88	2.25
3 x 1	601	**437-335**	10	1.44	2.38
3 x 1 ¼	601	**437-336**	10	1.25	2.44
3 x 1 ½	601	**437-337**	10	1.13	2.38
3 x 2	601	**437-338**	10	1.00	2.38
3 x 2 ½	601	**437-339**	10	0.38	2.38
4 x 2	601	**437-420**	5	1.00	2.38
4 x 2 ½	601	**437-421**	5	0.56	2.44
4 x 3	601	**437-422**	5	0.38	2.38
6 x 3	601	**437-530**	5	2.06	4.06
6 x 4	601	**437-532**	5	2.00	4.00
8 x 4	601	**437-582**	5	3.25	5.25
8 x 6	601	**437-585**	5	1.75	5.25
10 x 4	B09	**437-624**	1	4.38	6.38
10 x 6	B09	**437-626**	1	2.44	5.44
10 x 8	B09	**437-628**	1	1.38	5.44
12 x 3	B09	**437-661**	1	5.38	7.38
12 x 4	B09	**437-664**	1	5.63	7.63
12 x 6	B09	**437-666**	1	4.13	7.69
12 x 8	B09	**437-668**	1	2.38	6.44
12 x 10	B09	**437-670**	1	1.44	6.50



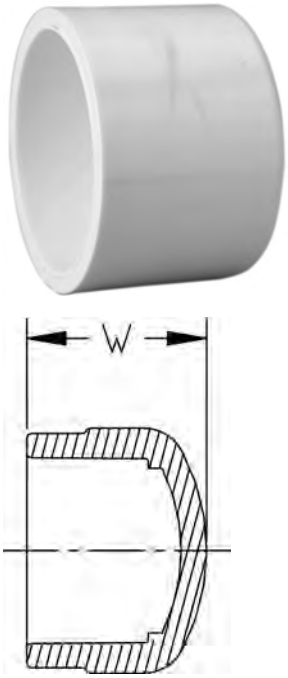
Reducer Bushing (SPGxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)
½ x ¼	601	**438-072**	100	1.19	0.69
½ x ⅜	601	**438-073**	100	1.25	0.63
¾ x ¼	601	**438-098**	50	1.13	0.63
¾ x ½	601	**438-101**	100	1.06	0.81
1 x ½	601	**438-130**	100	1.25	0.75
1 x ¾	601	**438-131**	100	1.25	0.69
1 ¼ x ½	601	**438-166**	25	1.56	1.06
1 ¼ x ¾	601	**438-167**	25	1.56	0.75
1 ¼ x 1	601	**438-168**	25	1.56	1.00
1 ½ x ½	601	**438-209**	25	1.56	0.69
1 ½ x ¾	601	**438-210**	25	1.56	0.69
1 ½ x 1	601	**438-211**	25	1.56	0.88
1 ½ x 1 ¼	601	**438-212**	25	1.63	1.38
2 x ½	601	**438-247**	10	1.69	0.75
2 x ¾	601	**438-248**	10	1.69	0.69
2 x 1	601	**438-249**	10	1.75	1.13
2 x 1 ¼	601	**438-250**	10	1.69	1.38
2 x 1 ½	601	**438-251**	10	1.69	0.94
2 ½ x 1 ½	601	**438-291**	10	2.31	1.31
2 ½ x 2	601	**438-292**	10	2.31	1.50
3 x 1 ½	601	**438-337**	10	2.38	0.88
3 x 2	601	**438-338**	10	2.38	1.00
3 x 2 ½	601	**438-339**	10	2.38	1.50
4 x 2	601	**438-420**	5	2.44	1.00
4 x 2 ½	601	**438-421**	5	2.44	1.31
4 x 3	601	**438-422**	5	2.38	1.38
6 x 4	601	**438-532**	5	3.88	1.69



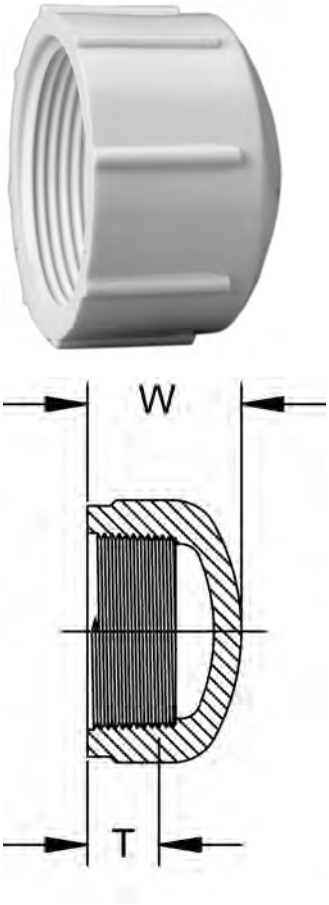
Reducer Bushing (MPTxFPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)
½ x ¼	601	**439-072**	50	1.13	0.63
½ x ⅜	601	**439-073**	50	1.13	0.69
¾ x ¼	601	**439-098**	50	1.13	0.69
¾ x ½	601	**439-101**	50	1.00	0.75
1 x ½	601	**439-130**	50	1.06	0.75
1 x ¾	601	**439-131**	50	1.13	0.75
1 ¼ x ½	601	**439-166**	25	1.31	0.75
1 ¼ x ¾	601	**439-167**	25	1.31	0.50
1 ¼ x 1	601	**439-168**	25	1.31	1.00
1 ½ x ½	601	**439-209**	25	1.38	0.75
1 ½ x ¾	601	**439-210**	25	1.44	0.81
1 ½ x 1	601	**439-211**	25	1.44	1.13
1 ½ x 1 ¼	601	**439-212**	25	1.44	1.00
2 x 1	601	**439-249**	10	1.44	1.00
2 x 1 ¼	601	**439-250**	10	1.44	1.00
2 x 1 ½	601	**439-251**	10	1.50	1.00
2 ½ x 2	601	**439-292**	10	1.81	1.06
3 x 2	601	**439-338**	5	2.06	1.06



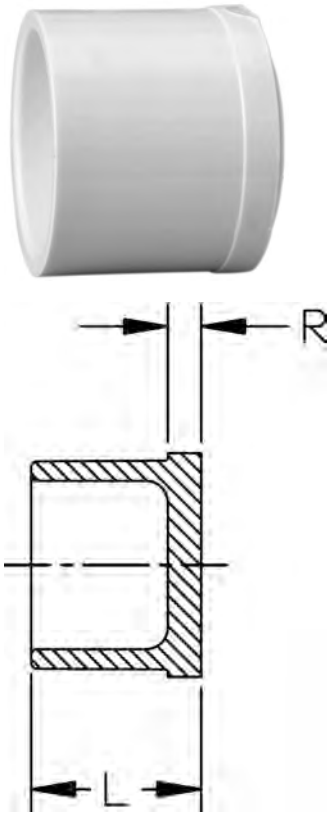
Cap (S) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	W (inch)	Design
½	601	**447-005**	100	1.19	
¾	601	**447-007**	100	1.31	
1	601	**447-010**	50	1.75	
1 ¼	601	**447-012**	25	1.75	
1 ½	601	**447-015**	25	2.00	
2	601	**447-020**	25	2.19	
2 ½	601	**447-025**	10	3.06	
3	601	**447-030**	10	3.19	
4	601	**447-040**	5	3.50	
6	601	**447-060**	5	5.38	
8	601	**447-080**	4	6.69	
10	B09	**447-100**	1	8.50	
12	B09	**447-120**	1	9.63	
14	A32	**447-140N**	1	5.00	FAB
16	A32	**447-160N**	1	5.25	FAB
18	A32	**447-180N**	1	6.25	FAB
20	A32	**447-200N**	1	6.75	FAB
24	A32	**447-240N**	1	8.00	FAB



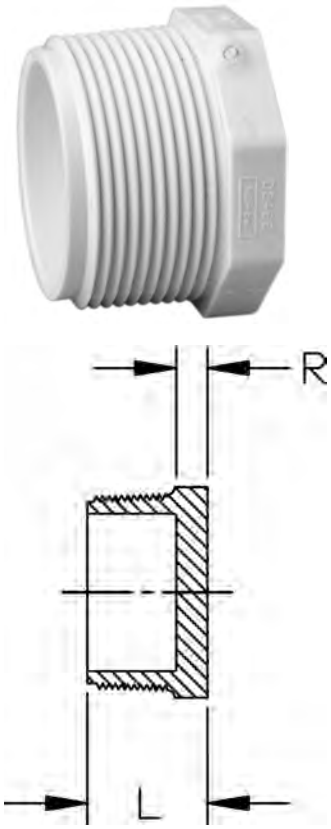
Cap (FPT) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	W (inch)	T (inch)
½	601	**448-005**	100	1.06	0.75
¾	601	**448-007**	100	1.13	0.81
1	601	**448-010**	50	1.25	1.00
1 ¼	601	**448-012**	25	1.50	1.31
1 ½	601	**448-015**	25	1.56	1.06
2	601	**448-020**	10	1.75	1.44
2 ½	601	**448-025**	10	2.56	2.13
3	601	**448-030**	10	3.13	2.00
4	601	**448-040**	5	3.25	2.19



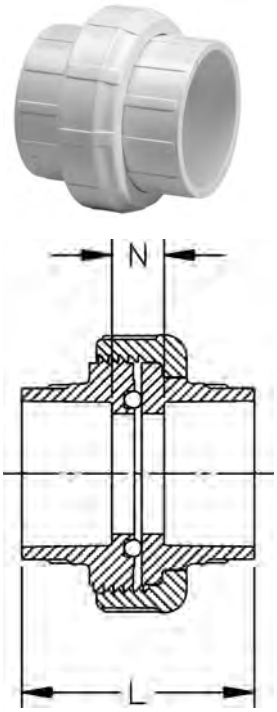
Plug (SPG) Schedule 40 PVC

Size (inch)	P/L	Code	Pack Qty	L (inch)	R (inch)
½	601	**449-005**	50	1.00	0.25
¾	601	**449-007**	50	1.06	0.25
1	601	**449-010**	50	1.25	0.25
1 ¼	601	**449-012**	25	1.56	0.31
1 ½	601	**449-015**	25	1.63	0.31
2	601	**449-020**	10	1.69	0.31
2 ½	601	**449-025**	10	2.38	0.38
3	601	**449-030**	10	2.38	0.38
4	601	**449-040**	5	2.38	0.38



Plug (MPT) Schedule 40 PVC

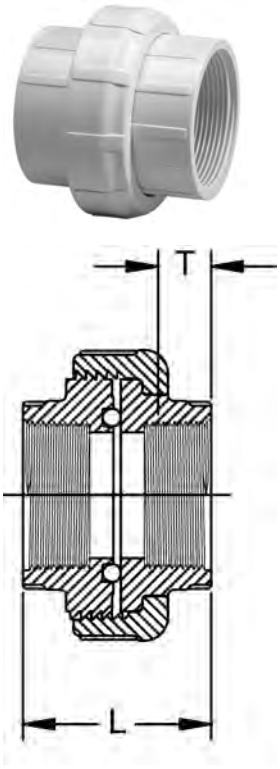
Size (inch)	P/L	Code	Pack Qty	L (inch)	R (inch)
½	601	**450-005**	50	1.00	0.25
¾	601	**450-007**	50	1.06	0.31
1	601	**450-010**	50	1.13	0.31
1 ¼	601	**450-012**	25	1.25	0.44
1 ½	601	**450-015**	25	1.38	0.31
2	601	**450-020**	10	1.38	0.31
2 ½	601	**450-025**	10	1.94	0.38
3	601	**450-030**	10	2.00	0.31
4	601	**450-040**	5	2.13	0.38
6	A32	**450-060N**	1	2.00	1.00
8	A32	**450-080N**	1	2.00	1.00
10	A32	**450-100N**	1	2.00	1.00
12	A32	**450-120N**	1	2.00	1.00



Union (SxS) Schedule 40 PVC

- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- O-ring material Buna-N

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)
½	601	**457-005**	10	1.75	0.25
¾	601	**457-007**	10	1.88	0.25
1	601	**457-010**	10	2.38	0.25
1 ¼	601	**457-012**	5	2.81	0.38
1 ½	601	**457-015**	5	3.00	0.38
2	601	**457-020**	5	3.13	0.38



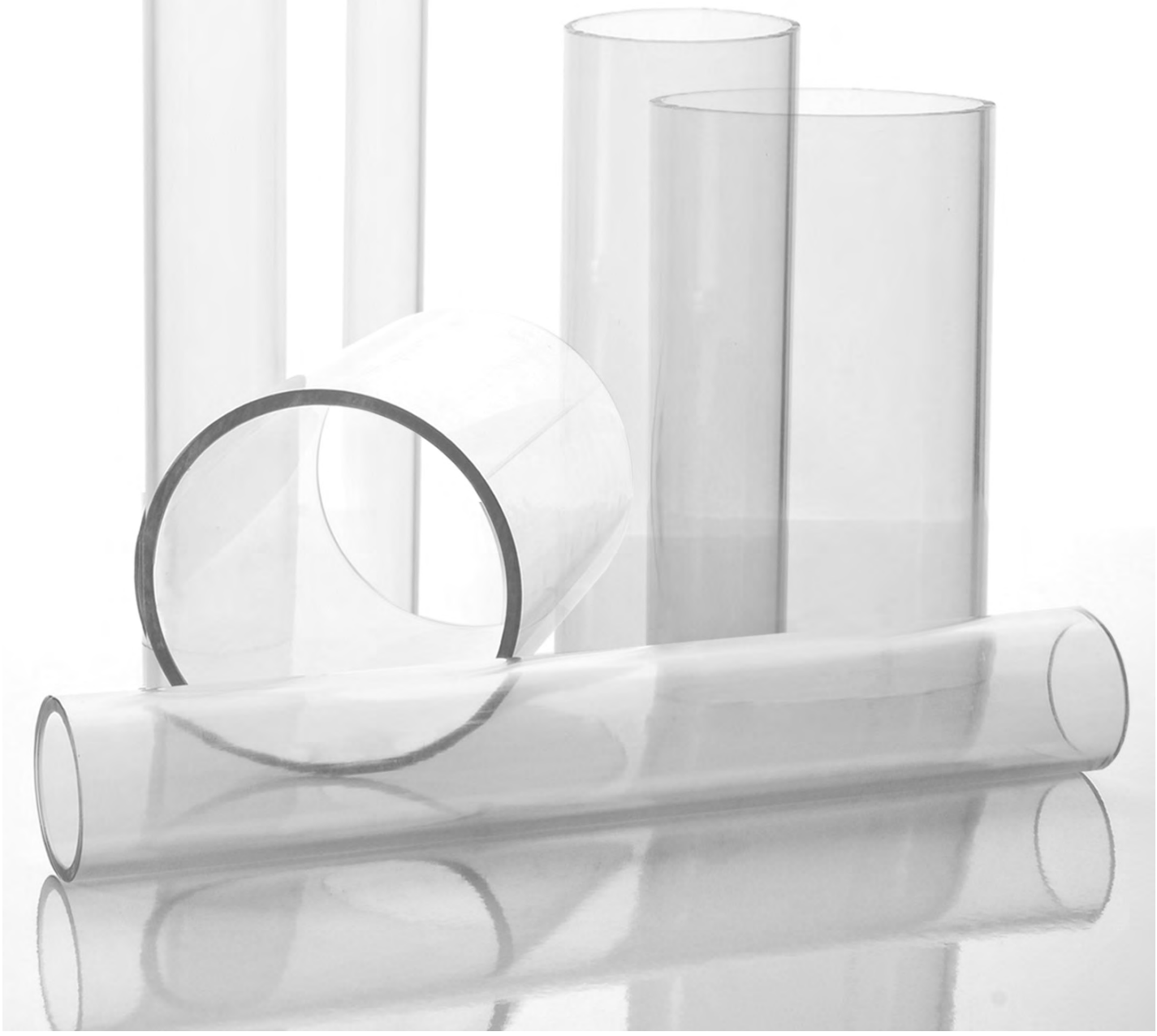
Union (FPTxFPT) Schedule 40 PVC

- 150 psi @ 73°F (10.3 bar @ 22.7°C)
- O-ring material Buna-N

Size (inch)	P/L	Code	Pack Qty	L (inch)	T (inch)
½	601	**458-005**	10	1.75	0.75
¾	601	**458-007**	10	1.88	0.81
1	601	**458-010**	10	2.44	1.06
1 ¼	601	**458-012**	5	2.81	1.13
1 ½	601	**458-015**	5	3.00	1.06
2	601	**458-020**	5	3.13	1.19

Section 4

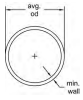
Clear PVC Piping Systems



The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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Specifications and Standards

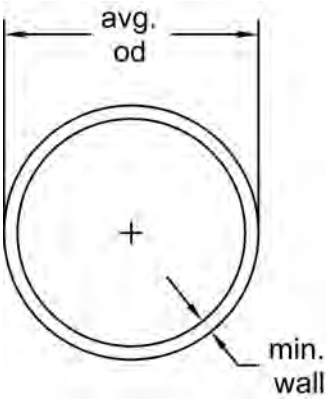
Specifications and Standards

NSF/ANSI Standard 61

FDA Title 21

ASTM D 1784	:	PVC Material, Clear Fittings, Cell Classification 12454
	:	PVC Material, Clear Pipe, Cell Classification 16443
ASTM D 1785	:	PVC Schedule 40 & Schedule 80 Pipe Dimensions
ASTM D 2672	:	PVC Schedule 40 Tapered Sockets for Bell End Pipe
ASTM D 2466	:	PVC Schedule 40 Socket & Threaded Fittings
ASTM D 2467	:	PVC Schedule 80 Socket & Threaded Fittings
ANSI B1.20.1	:	PVC Schedule 40 NPT Threads

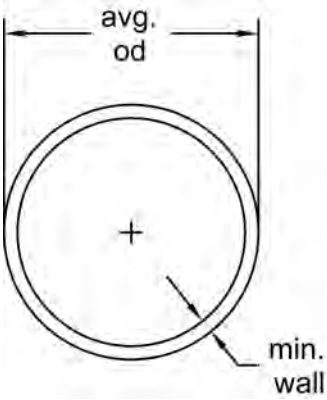
Harvel® Clear PVC Pressure Pipe



Schedule 40 Clear PVC

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request
- Must be purchased in full box qty
- 20ft Plain end length available upon request

Size (inch)	P/L	Code	Box Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
¼	H05	**H0400025PL1000**	100	0.540	0.088	0.081	390
⅜	H05	**H0400038PL1000**	100	0.675	0.091	0.109	310
½	H05	**H0400050PL1000**	350	0.840	0.109	0.161	300
¾	H05	**H0400075PL1000**	250	1.050	0.113	0.214	240
1	H05	**H0400100PL1000**	250	1.315	0.133	0.315	220
1 ¼	H05	**H0400125PL1000**	200	1.660	0.140	0.426	180
1 ½	H05	**H0400150PL1000**	160	1.900	0.145	0.509	170
2	H05	**H0400200PL1000**	120	2.375	0.154	0.682	140
2 ½	H05	**H0400250PL1000**	80	2.875	0.203	1.076	150
3	H05	**H0400300PL1000**	60	3.500	0.216	1.409	130
3 ½	H05	**H0400350PL1000**	40	4.000	0.226	1.697	120
4	H05	**H0400400PL1000**	40	4.500	0.237	2.006	110
5	H05	**H0400500PL1000**	10	5.563	0.258	2.726	95
6	H05	**H0400600PL1000**	10	6.625	0.280	3.535	90
6 ⅛	H05	**H0400613PL1000**	10	6.625	0.130	1.770	45
8	H05	**H0400800PL1000**	10	8.625	0.322	5.305	80
10	H05	**H0401000PL1000**	10	10.750	0.365	7.532	70
12	H05	**H0401200PL1000**	10	12.750	0.406	9.949	70

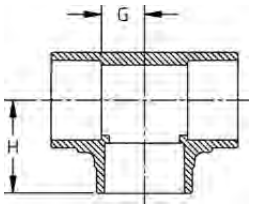


Schedule 80 Clear PVC

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request
- Must be purchased in full box qty
- 20ft Plain end length available upon request

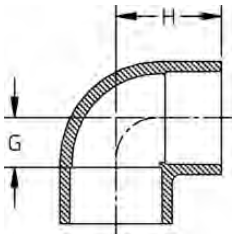
Size (inch)	P/L	Code	Box Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
¼	H56	**H0800025PL1000**	100	0.540	0.119	0.100	570
⅜	H56	**H0800038PL1000**	100	0.675	0.126	0.138	460
½	H56	**H0800050PL1000**	50	0.840	0.147	0.202	420
¾	H56	**H0800075PL1000**	50	1.050	0.154	0.273	340
1	H56	**H0800100PL1000**	20	1.315	0.179	0.402	320
1 ¼	H56	**H0800125PL1000**	10	1.660	0.191	0.554	260
1 ½	H56	**H0800150PL1000**	10	1.900	0.200	0.673	240
2	H56	**H0800200PL1000**	10	2.375	0.218	0.932	200
2 ½	H56	**H0800250PL1000**	10	2.875	0.276	1.419	210
3	H56	**H0800300PL1000**	10	3.500	0.300	1.903	190
4	H56	**H0800400PL1000**	10	4.500	0.337	2.782	160
6	H56	**H0800600PL1000**	10	6.625	0.432	5.313	140

Clear PVC Fittings



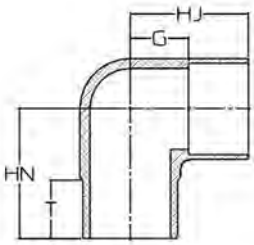
Tee (S x S x S)

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)
¼	H01	**H401002LS**	10	0.97	0.34
⅜	H01	**H401003LS**	10	1.13	0.38
½	H01	**H401005LS**	25	1.25	0.50
¾	H01	**H401007LS**	25	1.56	0.56
1	H01	**H401010LS**	25	1.75	0.69
1 ¼	H01	**H401012LS**	10	2.25	0.88
1 ½	H01	**H401015LS**	10	2.34	1.09
2	H01	**H401020LS**	10	2.75	1.38
2 ½	H01	**H401025LS**	5	3.41	1.66
3	H01	**H401030LS**	5	3.84	1.94
4	H01	**H401040LS**	5	4.44	2.41
6	H01	**H401060LS**	2	6.66	3.63
8	H01	**H401080LS**	1	8.53	4.50



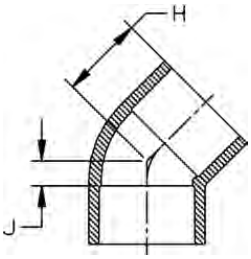
Harvel Clear 90° Elbow PVC Elbow (S x S) 90°

Size (inch)	P/L	Code	Pack Qty	H (inch)	G (inch)
¼	H01	**H406002LS**	10	1.09	0.41
⅜	H01	**H406003LS**	10	1.13	0.38
½	H01	**H406005LS**	25	1.25	0.50
¾	H01	**H406007LS**	25	1.50	0.56
1	H01	**H406010LS**	25	1.81	0.69
1 ¼	H01	**H406012LS**	10	2.16	0.97
1 ½	H01	**H406015LS**	10	2.34	1.06
2	H01	**H406020LS**	10	2.69	1.31
2 ½	H01	**H406025LS**	5	3.25	1.50
3	H01	**H406030LS**	5	3.72	1.84
4	H01	**H406040LS**	5	4.44	2.41
6	H01	**H406060LS**	2	6.56	3.53
8	H01	**H406080LS**	1	8.47	4.44



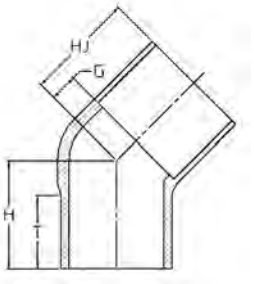
Harvel Clear 90° Elbow PVC Street (SPG x S) 90°

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	HN (inch)	G (inch)	T (inch)
½	H01	**H409005LS**	25	1.16	1.44	0.41	0.75
¾	H01	**H409007LS**	25	1.53	1.84	0.53	1.00
1	H01	**H409010LS**	25	1.81	2.09	0.69	1.13
1 ¼	H01	**H409012LS**	10	2.06	2.47	0.81	1.28
1 ½	H01	**H409015LS**	10	2.38	2.63	1.06	1.28
2	H01	**H409020LS**	10	2.63	3.00	1.25	1.41
2 ½	H01	**H409025LS**	5	3.38	3.72	1.53	2.25



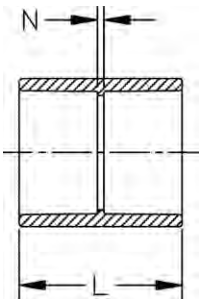
Harvel Clear 45° Elbow PVC
Elbow (S x S) 45°

Size (inch)	P/L	Code	Pack Qty	H (inch)	J (inch)
¼	H01	**H417002LS**	10	1.09	0.41
⅜	H01	**H417003LS**	10	1.13	0.38
½	H01	**H417005LS**	25	1.00	0.25
¾	H01	**H417007LS**	25	1.38	0.44
1	H01	**H417010LS**	25	1.50	0.47
1 ¼	H01	**H417012LS**	10	1.78	0.53
1 ½	H01	**H417015LS**	10	1.91	0.59
2	H01	**H417020LS**	10	2.06	0.69
2 ½	H01	**H417025LS**	5	2.44	0.69
3	H01	**H417030LS**	5	2.84	0.84
4	H01	**H417040LS**	5	3.09	1.09
6	H01	**H417060LS**	2	4.75	1.72
8	H01	**H417080LS**	1	6.00	2.00



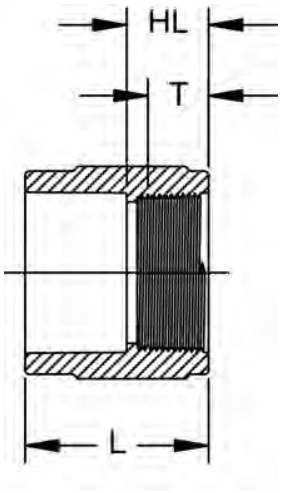
Harvel Clear 45° Elbow PVC
Street Elbow (SPG x S) 45°

Size (inch)	P/L	Code	Pack Qty	HJ (inch)	H (inch)	G (inch)	T (inch)
½	H01	**H427005LS**	25	1.28	1.28	0.41	0.94
¾	H01	**H427007LS**	25	1.53	1.50	0.53	1.06
1	H01	**H427010LS**	25	1.66	1.59	0.53	1.19
1 ¼	H01	**H427012LS**	10	1.91	1.78	0.66	1.28
1 ½	H01	**H427015LS**	10	2.09	2.03	0.72	1.44
2	H01	**H427020LS**	10	2.00	2.00	0.47	1.38
2 ½	H01	**H427025LS**	5	2.63	2.63	0.88	1.88
3	H01	**H427030LS**	5	3.03	2.97	1.22	1.97
4	H01	**H427040LS**	5	3.81	3.66	1.56	2.38



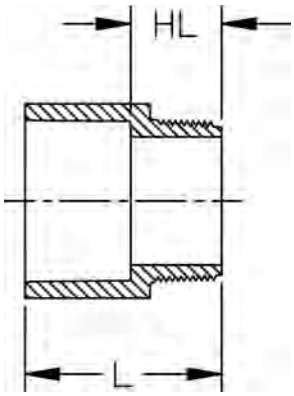
Harvel Clear Coupling PVC
Coupling (SxS)

Size (inch)	P/L	Code	Pack Qty	L (inch)	N (inch)
¼	H01	**H429002LS**	10	1.37	0.06
⅜	H01	**H429003LS**	10	2.63	0.13
½	H01	**H429005LS**	25	1.59	0.13
¾	H01	**H429007LS**	25	2.09	0.13
1	H01	**H429010LS**	25	2.13	0.13
1 ¼	H01	**H429012LS**	10	2.34	0.13
2	H01	**H429020LS**	10	2.88	0.19
2 ½	H01	**H429025LS**	5	3.75	0.19
3	H01	**H429030LS**	5	3.97	0.19
4	H01	**H429040LS**	5	4.25	0.25
6	H01	**H429060LS**	2	6.31	0.25
8	H01	**H429080LS**	2	8.34	0.25



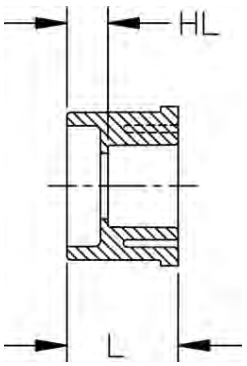
Harvel Clear Adapter PVC
Female Adapter (S x FPT)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)	T (inch)
¼	H01	**H435002SRLS**	10	0.75	1.31	0.40
⅜	H01	**H435003SRLS**	10	0.75	1.44	0.41
½	H01	**H435005SRLS**	25	0.91	1.75	0.53
¾	H01	**H435007SRLS**	25	0.95	1.88	0.55
1	H01	**H435010SRLS**	25	1.11	2.13	0.68
1 ¼	H01	**H435012SRLS**	10	1.16	2.31	0.71
1 ½	H01	**H435015SRLS**	10	1.19	2.44	0.72
2	H01	**H435020SRLS**	10	1.23	2.69	0.76
2 ½	H01	**H435025SRLS**	5	1.75	3.25	1.14
3	H01	**H435030SRLS**	5	1.91	3.50	1.20
4	H01	**H435040SRLS**	5	2.02	3.94	1.30



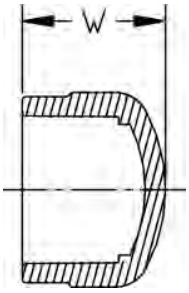
Harvel Clear Adapter PVC
Male Adapter (S x MPT)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)
½	H01	**H436005LS**	25	0.16	1.53
¾	H01	**H436007LS**	25	0.16	1.72
1	H01	**H436010LS**	25	0.22	2.06
1 ¼	H01	**H436012LS**	10	0.19	2.44
1 ½	H01	**H436015LS**	10	0.19	2.53
2	H01	**H436020LS**	10	0.22	2.66
2 ½	H01	**H436025LS**	5	0.28	3.81
3	H01	**H436030LS**	5	0.28	3.91
4	H01	**H436040LS**	5	0.28	4.03



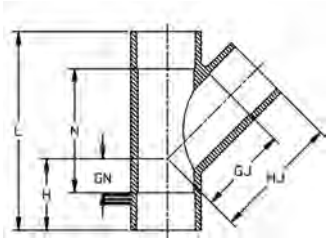
Flush Style Reducer Bushing (SPG x S)

Size (inch)	P/L	Code	Pack Qty	HL (inch)	L (inch)
¾ x ½	H01	**H437101LS**	25	0.28	1.06
1 x ¾	H01	**H437131LS**	25	0.31	1.25
1 ¼ x 1	H01	**H437168LS**	25	0.44	1.50
1 ½ x 1	H01	**H437211LS**	25	0.50	1.53
1 ½ x 1 ¼	H01	**H437212LS**	25	0.28	1.53
2 x 1 ½	H01	**H437251LS**	10	0.25	1.56
2 ½ x 2	H01	**H437292LS**	5	0.69	2.06
3 x 2	H01	**H437338LS**	5	0.56	2.22
3 x 2 ½	H01	**H437339LS**	5	0.44	2.22
4 x 3	H01	**H437422LS**	5	0.47	2.34
6 x 4	H01	**H437532LS**	2	1.50	3.56
8 x 6	H01	**H437585LS**	2	1.38	4.41



Harvel Clear Cap PVC Cap (S)

Size (inch)	P/L	Code	Pack Qty	W (inch)
¼	H01	**H447002LS**	10	3.63
⅜	H01	**H447003LS**	10	1.00
½	H01	**H447005LS**	25	1.03
¾	H01	**H447007LS**	25	1.31
1	H01	**H447010LS**	25	1.56
1 ¼	H01	**H447012LS**	10	1.75
1 ½	H01	**H447015LS**	10	1.91
2	H01	**H447020LS**	10	2.03
2 ½	H01	**H447025LS**	5	2.56
3	H01	**H447030LS**	5	2.91
4	H01	**H447040LS**	5	3.13
6	H01	**H447060LS**	2	5.00
8	H01	**H447080LS**	2	6.38



45° Wye (S x S x S)

Size (inch)	P/L	Code	Pack Qty	GJ (inch)	GN (inch)	H (inch)	HJ (inch)	L (inch)	N (inch)
1 ½	H01	**H475015LS**	20	2.59	0.50	1.88	3.97	5.81	3.06
2	H01	**H475020LS**	10	3.22	0.59	2.13	4.75	6.88	3.81
3	H01	**H475030LS**	4	4.56	0.88	2.78	6.47	8.75	4.94
4	H01	**H475040LS**	4	5.72	1.22	3.50	7.97	10.75	6.25
6	H01	**H475060LS**	2	8.50	1.31	4.31	11.66	15.38	9.38
6 x 4	H01	**H475532LS**	2	6.56	0.97	3.94	12.66	12.66	8.09

Section 5

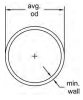
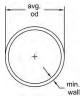
Specialty Pipe



The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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	Corrosion Resistant Duct	111
	EnviroKing® UV Resistant Pipe	112

Specifications and Standards

Specifications and Standards

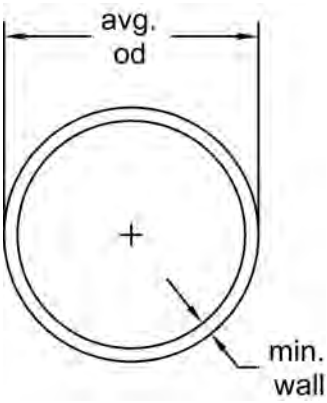
NSF/ANSI Standard 14

NSF/ANSI Standard 61

ASTM D 1784	:	Material PVC Type I, Grade I, White or Gray, Cell Classification 12454 (SDR Series Pipe & PVC Duct)
		Material CPVC Type IV, Grade I, Tan, Cell Classification 24448 (CTS CPVC Plumbing Pipe)
		Material CPVC Type IV, Grade I, Gray, Cell Classification 23447 (CPVC Duct)
ASTM D 1785	:	PVC Schedule 120 Pipe
ASTM D 2241	:	PVC SDR Series Pipe
ULC S102.2	:	CPVC Corrosion Resistant Duct (6"–24")

P1300127

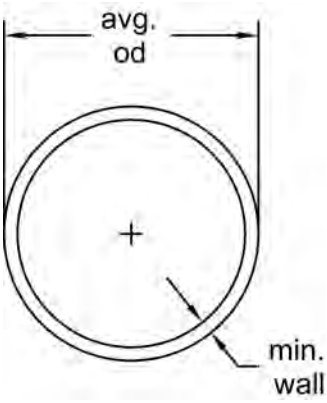
Harvel Specialized PVC Pipe Sizes



Schedule 120 PVC Pressure Pipe - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

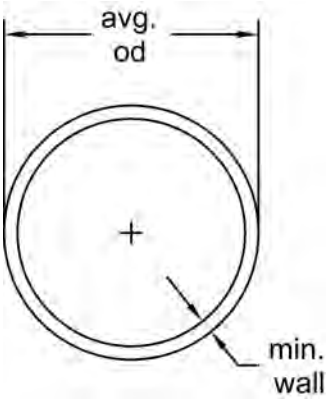
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
½	H15	**H1200050PG2000**	5700	0.840	0.170	0.223	1010
¾	H15	**H1200075PG2000**	5260	1.050	0.170	0.295	770
1	H15	**H1200100PG2000**	4280	1.315	0.200	0.440	720
1 ¼	H15	**H1200125PG2000**	2360	1.660	0.215	0.614	600
1 ½	H15	**H1200150PG2000**	2060	1.900	0.225	0.744	540
2	H15	**H1200200PG2000**	1660	2.375	0.250	1.052	470
2 ½	H15	**H1200250PG2000**	1080	2.875	0.300	1.529	470
3	H15	**H1200300PG2000**	840	3.500	0.350	2.184	440
4	H15	**H1200400PG2000**	520	4.500	0.437	3.516	430
6	H15	**H1200600PG2000**	340	6.625	0.562	6.759	370
8	H15	**H1200800PG2000**	220	8.625	0.718	11.251	380



SDR 13.5 PVC Pressure Pipe - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

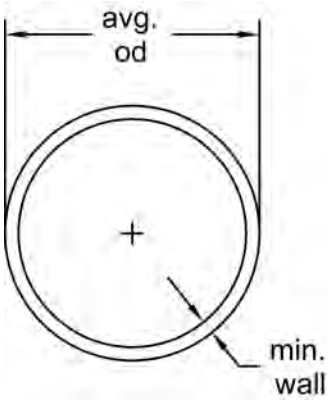
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
½	H21	**H1350050PG2000**	5700	0.840	0.062	0.104	315



SDR 13.5 PVC Pressure Pipe - White

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

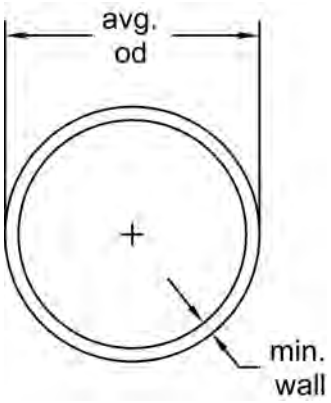
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
½	H21	**H1350050PW2000**	5700	0.840	0.062	0.104	315



SDR 21 PVC Pressure Pipe - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

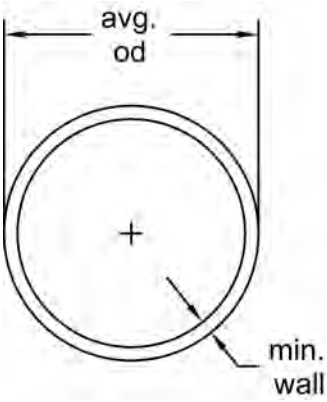
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
3/4	H21	**H0210075PG2000**	5260	1.050	0.060	0.129	200
1	H21	**H0210100PG2000**	4280	1.315	0.063	0.170	200
1 1/4	H21	**H0210125PG2000**	2360	1.660	0.079	0.263	200
1 1/2	H21	**H0210150PG2000**	2060	1.900	0.090	0.339	200
2	H21	**H0210200PG2000**	1660	2.375	0.113	0.521	200
2 1/2	H21	**H0210250PG2000**	1080	2.875	0.137	0.754	200
3	H21	**H0210300PG2000**	840	3.500	0.167	1.106	200
3 1/2	H21	**H0210350PG2000**	580	4.000	0.190	1.443	200
4	H21	**H0210400PG2000**	520	4.500	0.214	1.825	200
5	H21	**H0210500PG2000**	400	5.563	0.265	2.792	200
6	H21	**H0210600PG2000**	340	6.625	0.316	3.964	200
8	H21	**H0210800PG2000**	220	8.625	0.410	6.679	200



SDR 21 PVC Pressure Pipe - White

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

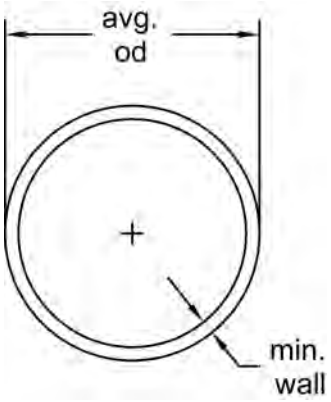
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
3/4	H21	**H0210075PW2000**	5260	1.050	0.060	0.129	200
1	H21	**H0210100PW2000**	4280	1.315	0.063	0.170	200
1 1/4	H21	**H0210125PW2000**	2360	1.660	0.079	0.263	200
1 1/2	H21	**H0210150PW2000**	2060	1.900	0.090	0.339	200
2	H21	**H0210200PW2000**	1660	2.375	0.113	0.521	200
2 1/2	H21	**H0210250PW2000**	1080	2.875	0.137	0.754	200
3	H21	**H0210300PW2000**	840	3.500	0.167	1.106	200
3 1/2	H21	**H0210350PW2000**	580	4.000	0.190	1.443	200
4	H21	**H0210400PW2000**	520	4.500	0.214	1.825	200
5	H21	**H0210500PW2000**	400	5.563	0.265	2.792	200
6	H21	**H0210600PW2000**	340	6.625	0.316	3.964	200
8	H21	**H0210800PW2000**	220	8.625	0.410	6.679	200



SDR 26 PVC Pressure Pipe - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

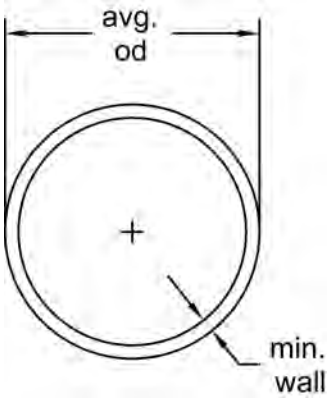
Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
1	H21	**H0260100PG2000**	4280	1.315	0.060	0.164	160
1 1/4	H21	**H0260125PG2000**	2360	1.660	0.064	0.221	160
1 1/2	H21	**H0260150PG2000**	2060	1.900	0.073	0.284	160
2	H21	**H0260200PG2000**	1660	2.375	0.091	0.432	160
2 1/2	H21	**H0260250PG2000**	1080	2.875	0.110	0.622	160
3	H21	**H0260300PG2000**	840	3.500	0.135	0.915	160
3 1/2	H21	**H0260350PG2000**	700	4.000	0.154	1.183	160
4	H21	**H0260400PG2000**	520	4.500	0.173	1.494	160
5	H21	**H0260500PG2000**	400	5.563	0.214	2.288	160
6	H21	**H0260600PG2000**	340	6.625	0.255	3.228	160
8	H21	**H0260800PG2000**	220	8.625	0.332	5.468	160
10	H21	**H0261000PG2000**	80	10.750	0.413	8.492	160
12	H21	**H0261200PG2000**	60	12.750	0.490	11.956	160
14	H21	**H0261400PG2000**	60	14.000	0.538	14.430	160
16	H21	**H0261600PG2000**	60	16.000	0.615	18.810	160
18	H21	**H0261800PG2000**	40	18.000	0.692	23.860	160
20	H21	**H0262000PG2000**	40	20.000	0.769	29.470	160
24	H21	**H0262400PG2000**	40	24.000	0.923	42.520	160



SDR 26 PVC Pressure Pipe - White

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
1	H21	**H0260100PW2000**	4280	1.315	0.060	0.164	160
1 1/4	H21	**H0260125PW2000**	2360	1.660	0.064	0.221	160
1 1/2	H21	**H0260150PW2000**	2060	1.900	0.073	0.284	160
2	H21	**H0260200PW2000**	1660	2.375	0.091	0.432	160
2 1/2	H21	**H0260250PW2000**	1080	2.875	0.110	0.622	160
3	H21	**H0260300PW2000**	840	3.500	0.135	0.915	160
3 1/2	H21	**H0260350PW2000**	700	4.000	0.154	1.183	160
4	H21	**H0260400PW2000**	520	4.500	0.173	1.494	160
5	H21	**H0260500PW2000**	400	5.563	0.214	2.288	160
6	H21	**H0260600PW2000**	340	6.625	0.255	3.228	160
8	H21	**H0260800PW2000**	220	8.625	0.332	5.468	160
10	H21	**H0261200PW2000**	80	10.750	0.413	8.492	160
12	H21	**H0261000PW2000**	60	12.750	0.490	11.956	160
14	H21	**H0261400PW2000**	60	14.000	0.538	14.430	160
16	H21	**H0261600PW2000**	60	16.000	0.615	18.810	160
18	H21	**H0261800PW2000**	40	18.000	0.692	23.860	160
20	H21	**H0262000PW2000**	40	20.000	0.769	29.470	160
24	H21	**H0262400PW2000**	40	24.000	0.923	42.520	160

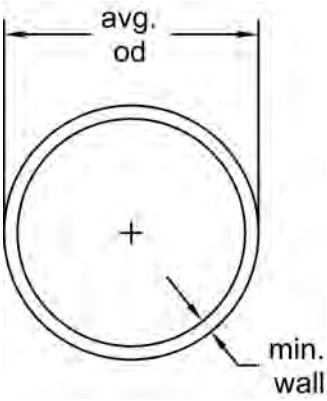


SDR 41 PVC Pressure Pipe - Gray

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Belled-end pipe available upon request

Pipe Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
18	H15	**H0411800PG2000**	60	18.000	0.439	15.370	100
20	H15	**H0412000PG2000**	40	20.000	0.488	18.920	100
24	H15	**H0412400PG2000**	40	24.000	0.585	27.320	100

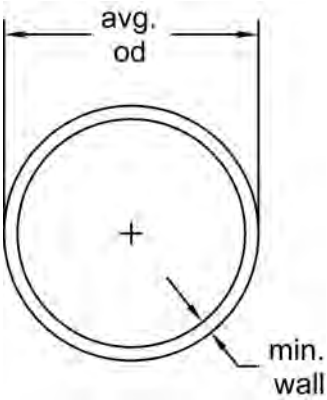
Corrosion Resistant Duct



Harvel® PVC Duct

- Belled-end pipe available upon request

Size (inch) (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)
2	H30	**HDUC0200PG2000**	1660	2.375	0.091	0.432
3	H30	**HDUC0300PG2000**	840	3.500	0.135	0.915
4	H30	**HDUC0400PG2000**	520	4.500	0.173	1.494
6 x ⅛	H30	**HDUC0600PG2000**	340	6.625	0.105	1.530
6	H30	**HDUC0601PG2000**	340	6.625	0.172	2.275
7	H30	**HDUC0700PG2000**	340	7.375	0.172	2.534
8	H30	**HDUC0800PG2000**	220	8.625	0.172	2.982
9	H30	**HDUC0900PG2000**	80	9.375	0.172	3.239
10	H30	**HDUC1000PG2000**	80	10.750	0.172	3.733
11	H30	**HDUC1100PG2000**	60	11.375	0.172	3.944
12	H30	**HDUC1200PG2000**	60	12.750	0.172	4.440
14	H30	**HDUC1400PG2000**	60	14.000	0.172	4.884
16	H30	**HDUC1600PG2000**	60	16.000	0.172	5.586
18	H30	**HDUC1800PG2000**	40	18.000	0.172	6.750
20	H30	**HDUC2000PG2000**	40	20.000	0.199	8.144
24	H30	**HDUC2400PG2000**	40	24.000	0.230	11.163

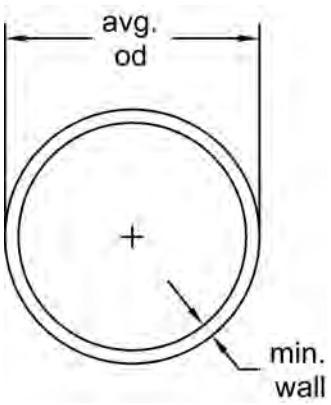


Harvel® CORZAN® CPVC Duct

- Belled-end pipe available upon request

Size (inch)	P/L	Code	Lift Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)
6	H41	**HDUC0600CG2000**	340	6.625	0.172	2.555
8	H41	**HDUC0800CG2000**	220	8.625	0.172	3.349
10	H41	**HDUC1000CG2000**	80	10.750	0.172	4.192
12	H41	**HDUC1200CG2000**	80	12.750	0.172	4.986
14	H41	**HDUC1400CG2000**	60	14.000	0.172	5.485
16	H41	**HDUC1600CG2000**	60	16.000	0.172	6.273
18	H41	**HDUC1800CG2000**	40	18.000	0.172	7.580
20	H41	**HDUC2000CG2000**	40	20.000	0.199	9.146
24	H41	**HDUC2400CG2000**	40	24.000	0.230	12.536

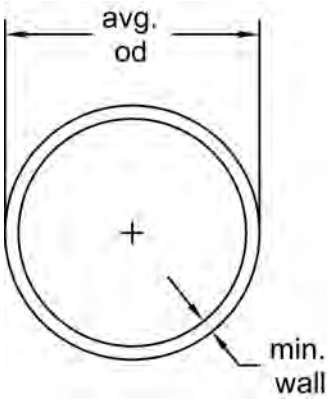
EnviroKing® UV Resistant Pipe



EnviroKing® UV Resistant Clear PVC Pipe
Thinwall - 10 ft lengths

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Must be purchased in full box qty
- 20ft Plain end length available upon request

Size (inch)	P/L	Code	Box Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
2	H20	**HTW00200EK1000**	120	2.375	0.091	0.456	80
3	H20	**HTW00300EK1000**	60	3.500	0.135	0.966	80
4	H20	**HTW00400EK1000**	40	4.500	0.173	1.569	80
6	H20	**HTW00600EK1000**	10	6.625	0.172	2.391	70
8	H20	**HTW00800EK1000**	10	8.625	0.172	3.134	53
10	H20	**HTW01000EK1000**	10	10.750	0.172	3.923	43
12	H20	**HTW01200EK1000**	10	12.750	0.172	4.666	36



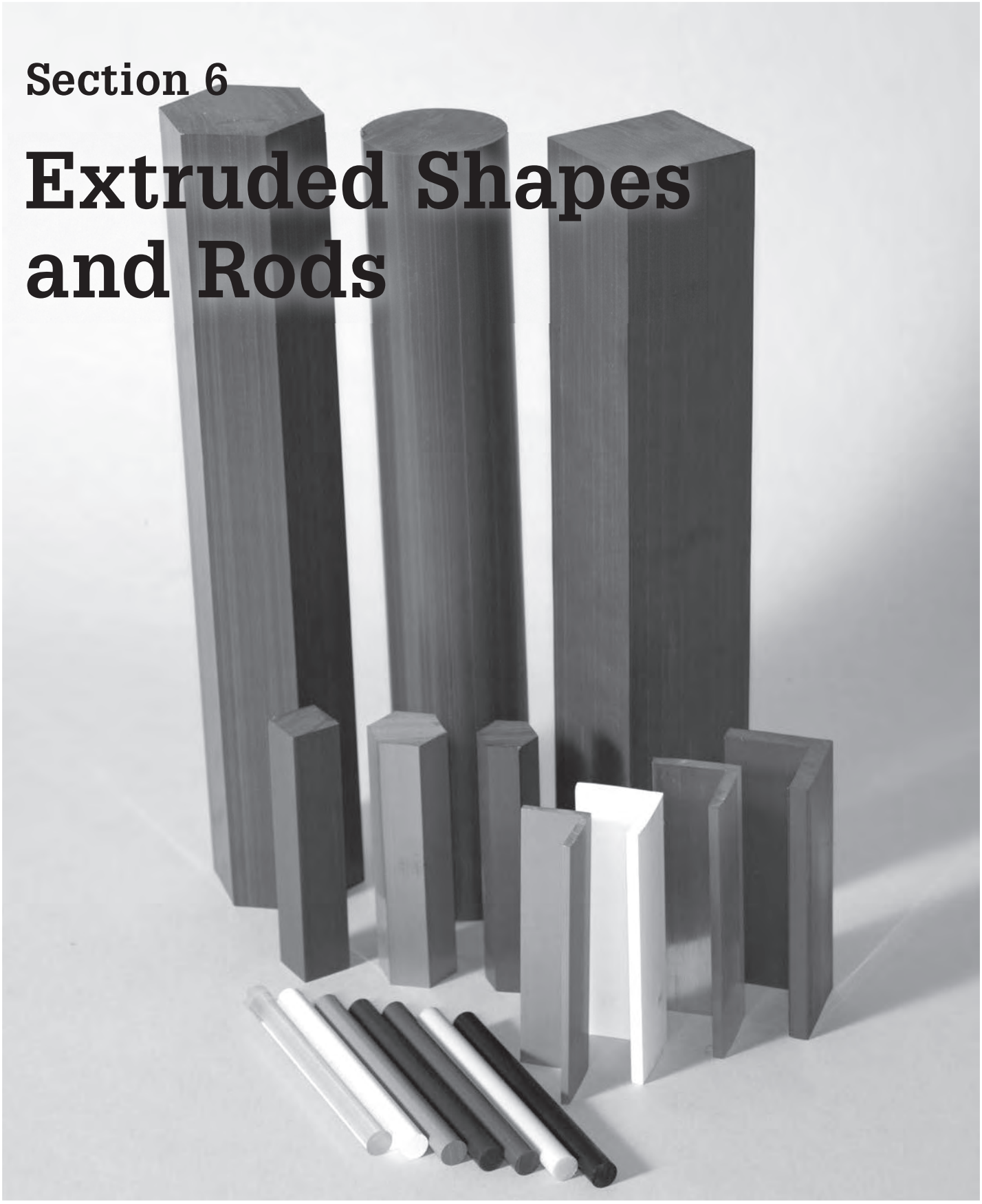
EnviroKing® UV Resistant Clear PVC Pipe
Schedule 40 - 10 ft lengths

- Max Water Pressure at 73°F (22.7°C) with solvent-cemented joints
- Must be purchased in full box qty
- 20ft Plain end length available upon request

Pipe Size (inch)	Code	Box Qty (ft)	Average O.D. (inch)	min. wall (inch)	Wt/Ft (lbs/ft)	Max Water Pressure (psi)
1/2	**H0400050EK1000**	350	0.840	0.109	0.170	300
3/4	**H0400075EK1000**	250	1.050	0.113	0.226	240
1	**H0400100EK1000**	250	1.315	0.133	0.333	220
1 1/4	**H0400125EK1000**	200	1.660	0.140	0.450	180
1 1/2	**H0400150EK1000**	160	1.900	0.145	0.537	170
2	**H0400200EK1000**	120	2.375	0.154	0.720	140
2 1/2	**H0400250EK1000**	80	2.875	0.203	1.136	150
3	**H0400300EK1000**	60	3.500	0.216	1.488	130
3 1/2	**H0400350EK1000**	40	4.000	0.226	1.789	120
4	**H0400400EK1000**	40	4.500	0.237	2.118	110
5	**H0400500EK1000**	10	5.563	0.258	2.726	95
6	**H0400600EK1000**	10	6.625	0.280	3.733	90

Section 6

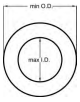
Extruded Shapes and Rods



The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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

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Specifications and Standards

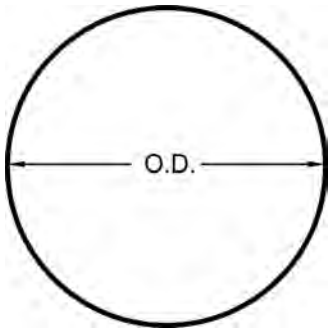
Specifications and Standards

NSF/ANSI Standard 61

FDA Title 21	:	Applies to PVC Type 2, Grade 1 (Clear) Cell Classification 16443
ASTM D 1784	:	Material PVC Type I, Grade I (White, Gray, or Black) Cell Classification 12454
		Material PVC Type 2, Grade I (Clear) Cell Classification 16443
		Material CPVC Type IV, Grade I, Cell Classification 23447
ASTM D 6263	:	Standard Specification for Extruded Rods and Bars made from Rigid PVC & CPVC

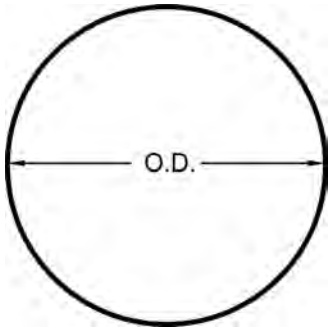
Refer to GF Harvel Engineering and Installation Guide for additional information

PVC Extruded Shapes and Rods



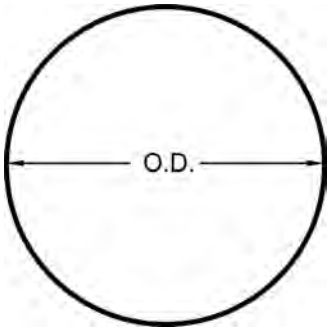
Harvel® PVC Solid Round Bar - Gray

Pipe Size (inch)	P/L	Code	Minimum O.D. (inch)	Maximum O.D. (inch)	Wt/Ft (lbs/ft)
¼	H32	**HROD0025PS1000**	0.250	0.273	0.029
⅜	H32	**HROD0038PS1000**	0.375	0.410	0.066
½	H32	**HROD0050PS1000**	0.500	0.535	0.117
⅝	H32	**HROD0063PS1000**	0.625	0.650	0.183
¾	H32	**HROD0075PS1000**	0.750	0.802	0.265
⅞	H32	**HROD0088PS1000**	0.875	0.930	0.358
1	H32	**HROD0100PS1000**	1.000	1.060	0.471
1 ⅛	H32	**HROD0113PS1000**	1.125	1.190	0.594
1 ¼	H32	**HROD0125PS1000**	1.250	1.325	0.736
1 ⅜	H32	**HROD0138PS1000**	1.375	1.455	0.891
1 ½	H32	**HROD0150PS1000**	1.500	1.580	1.600
1 ⅝	H32	**HROD0163PS1000**	1.625	1.710	1.244
1 ¾	H32	**HROD0175PS1000**	1.750	1.840	1.440
1 ⅞	H32	**HROD0188PS1000**	1.875	1.970	1.657
2	H32	**HROD0200PS1000**	2.000	2.120	1.890
2 ⅛	H32	**HROD0213PS1000**	2.125	2.245	2.128
2 ¼	H32	**HROD0225PS1000**	2.250	2.374	2.384
2 ⅜	H32	**HROD0238PS1000**	2.375	2.506	2.658
2 ½	H32	**HROD0250PS1000**	2.500	2.650	2.950
2 ¾	H32	**HROD0275PS1000**	2.750	2.905	3.560
3	H32	**HROD0300PS1000**	3.000	3.220	4.224
3 ¼	H32	**HROD0325PS1000**	3.250	3.450	4.975
3 ½	H32	**HROD0350PS1000**	3.500	3.705	5.770
4	H32	**HROD0400PS0500**	4.000	4.200	7.550
4 ½	H32	**HROD0450PS0500**	4.500	4.725	9.555
5	H32	**HROD0500PS0500**	5.000	5.300	11.700
5 ½	H32	**HROD0550PS0500**	5.500	5.815	14.300
6	H32	**HROD0600PS0500**	6.000	6.330	17.100
7	H32	**HROD0700PS0500**	7.000	7.410	24.010
8	H32	**HROD0800PS0500**	8.000	8.440	31.360
9	H32	**HROD0900PS0500**	9.000	9.470	39.690
10	H32	**HROD1000PS0500**	10.000	10.500	49.000



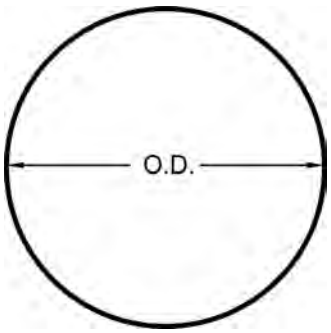
Harvel® PVC Solid Round Bar - White

Pipe Size (inch)	P/L	Code	Minimum O.D. (inch)	Maximum O.D. (inch)	Wt/Ft (lbs/ft)
¼	H34	**HROD0025PW1000**	0.250	0.273	0.029
⅜	H34	**HROD0038PW1000**	0.375	0.410	0.066
½	H34	**HROD0050PW1000**	0.500	0.535	0.117
⅝	H34	**HROD0063PW1000**	0.625	0.665	0.183
¾	H34	**HROD0075PW1000**	0.750	0.802	0.265
⅞	H34	**HROD0088PW1000**	0.875	0.930	0.358
1	H34	**HROD0100PW1000**	1.000	1.060	0.471
1 ⅛	H34	**HROD0113PW1000**	1.125	1.190	0.594
1 ¼	H34	**HROD0125PW1000**	1.250	1.325	0.736
1 ⅜	H34	**HROD0138PW1000**	1.375	1.455	0.891
1 ½	H34	**HROD0150PW1000**	1.500	1.580	1.060
1 ⅝	H34	**HROD0163PW1000**	1.625	1.710	1.244
1 ¾	H34	**HROD0175PW1000**	1.750	1.840	1.440
1 ⅞	H34	**HROD0188PW1000**	1.875	1.970	1.657
2	H34	**HROD0200PW1000**	2.000	2.120	1.890



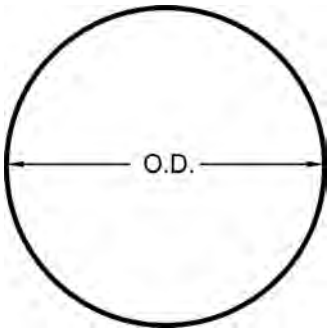
Harvel® PVC Solid Round Bar - Black

Pipe Size (inch)	P/L	Code	Minimum O.D. (inch)	Maximum O.D. (inch)	Wt/Ft (lbs/ft)
¼	H34	**HROD0025PK1000**	0.250	0.273	0.029
⅜	H34	**HROD0038PK1000**	0.375	0.410	0.066
½	H34	**HROD0050PK1000**	0.500	0.535	0.117
⅝	H34	**HROD0063PK1000**	0.625	0.665	0.183
¾	H34	**HROD0075PK1000**	0.750	0.802	0.265
⅞	H34	**HROD0088PK1000**	0.875	0.930	0.358
1	H34	**HROD0100PK1000**	1.000	1.060	0.471
1 ⅛	H34	**HROD0113PK1000**	1.125	1.190	0.594
1 ¼	H34	**HROD0125PK1000**	1.250	1.325	0.736
1 ⅜	H34	**HROD0138PK1000**	1.375	1.455	0.891
1 ½	H34	**HROD0150PK1000**	1.500	1.580	1.060
1 ⅝	H34	**HROD0163PK1000**	1.625	1.710	1.244
1 ¾	H34	**HROD0175PK1000**	1.750	1.840	1.440
1 ⅞	H34	**HROD0188PK1000**	1.875	1.970	1.657
2	H34	**HROD0200PK1000**	2.000	2.120	1.890



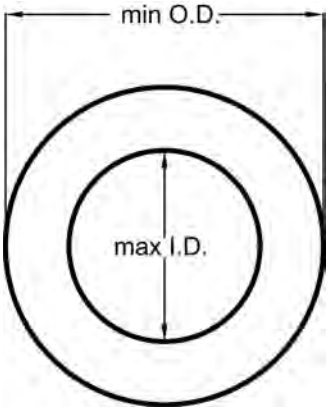
Harvel® PVC Solid Round Bar - Clear

Pipe Size (inch)	P/L	Code	Minimum O.D. (inch)	Maximum O.D. (inch)	Wt/Ft (lbs/ft)
¼	H39	**HROD0025PL1000**	0.250	0.273	0.029
⅜	H39	**HROD0038PL1000**	0.375	0.410	0.066
½	H39	**HROD0050PL1000**	0.500	0.535	0.117
⅝	H39	**HROD0063PL1000**	0.625	0.665	0.183
¾	H39	**HROD0075PL1000**	0.750	0.802	0.265
⅞	H39	**HROD0088PL1000**	0.875	0.930	0.358
1	H39	**HROD0100PL1000**	1.000	1.060	0.471



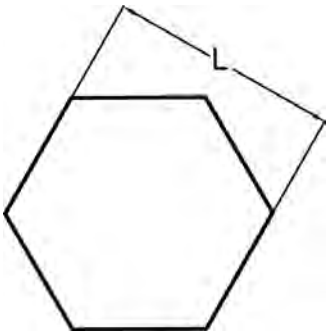
Harvel® PVC Centerless Ground Bar - Gray

Pipe Size (inch)	P/L	Code	O.D. (inch)	Wt/Ft (lbs/ft)
¼	H33	**HROD0025PC1000**	0.250	0.029
⅜	H33	**HROD0038PC1000**	0.375	0.066
½	H33	**HROD0050PC1000**	0.500	0.117
⅝	H33	**HROD0063PC1000**	0.625	0.183
¾	H33	**HROD0075PC1000**	0.750	0.265
⅞	H33	**HROD0088PC1000**	0.875	0.358
1	H33	**HROD0100PC1000**	1.000	0.471
1 ⅛	H33	**HROD0113PC1000**	1.125	0.594
1 ¼	H33	**HROD0125PC1000**	1.250	0.736
1 ⅜	H33	**HROD0138PC1000**	1.375	0.891
1 ½	H33	**HROD0150PC1000**	1.500	1.060
1 ⅝	H33	**HROD0163PC1000**	1.625	1.244
1 ¾	H33	**HROD0175PC1000**	1.750	1.440
1 ⅞	H33	**HROD0188PC1000**	1.875	1.657
2	H33	**HROD0200PC1000**	2.000	1.890
2 ⅛	H33	**HROD0213PC0500**	2.125	2.128
2 ¼	H33	**HROD0225PC0500**	2.250	2.384
2 ⅜	H33	**HROD0238PC0500**	2.375	2.658
2 ½	H33	**HROD0250PC0500**	2.500	2.950



Harvel® PVC Hollow Bar - Gray

Minimum O.D. (inch)	Maximum O.D. (inch)	Maximum I.D. (inch)	P/L	Code	Wt/Ft (lbs/ft)
1.625	1.710	0.562	H35	**HHOL1625PG1000**	1.154
1.900	2.000	0.562	H35	**HHOL1901PG1000**	1.647
2.000	2.120	1.250	H35	**HHOL2000PG1000**	1.285
2.125	2.245	0.750	H35	**HHOL2125PG1000**	2.010
2.250	2.374	1.125	H35	**HHOL2250PG1000**	2.025
2.250	2.374	1.500	H35	**HHOL2251PG1000**	1.625
2.375	2.506	1.000	H35	**HHOL2375PG1000**	2.393
2.500	2.650	1.000	H35	**HHOL2500PG1000**	2.680
2.500	2.650	1.500	H35	**HHOL2501PG1000**	2.209
2.625	2.753	1.500	H35	**HHOL2625PG1000**	2.511
2.750	2.905	1.000	H35	**HHOL2750PG1000**	3.299
3.000	3.120	1.000	H35	**HHOL3000PG1000**	3.976
3.000	3.120	1.250	H35	**HHOL3001PG1000**	3.770
3.000	3.120	1.500	H35	**HHOL3002PG1000**	3.375
3.000	3.120	2.000	H35	**HHOL3003PG1000**	2.798
3.250	3.450	1.250	H35	**HHOL3250PG1000**	4.506
3.500	3.705	1.500	H35	**HHOL3500PG1000**	5.037
3.563	3.842	1.500	H35	**HHOL3563PG1000**	5.245
4.000	4.200	2.500	H35	**HHOL4000PG1000**	5.153
4.000	4.200	3.000	H35	**HHOL4001PG1000**	3.845
4.250	4.513	1.750	H35	**HHOL4250PG1000**	7.452
4.500	4.725	2.000	H35	**HHOL4500PG1000**	8.099
4.750	5.038	3.000	H35	**HHOL4750PG1000**	7.069
5.000	5.300	3.000	H35	**HHOL5000PG1000**	8.217
5.563	6.143	4.000	H35	**HHOL5563PG0500**	7.954
6.000	6.330	2.437	H35	**HHOL6000PG0500**	15.200
6.000	6.330	4.000	H35	**HHOL6002PG0500**	11.190
6.625	7.188	2.875	H35	**HHOL6625PG0500**	18.030
6.625	7.188	4.000	H35	**HHOL6626PG0500**	14.910
8.625	9.269	5.750	H35	**HHOL8625PG0500**	21.400



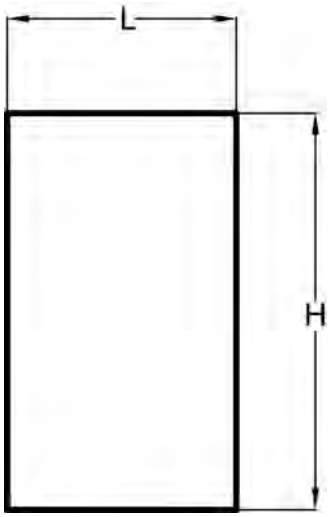
Harvel® PVC Hexagonal Bar - Gray

Pipe Size (inch)	P/L	Code	L (inch)	Wt/Ft (lbs/ft)
7/16	H36	**HHEX0044PG1000**	0.438	0.108
½	H36	**HHEX0050PG1000**	0.500	0.142
9/16	H36	**HHEX0056PG1000**	0.563	0.180
⅝	H36	**HHEX0063PG1000**	0.625	0.222
¾	H36	**HHEX0075PG1000**	0.750	0.320
13/16	H36	**HHEX0081PG1000**	0.813	0.375
⅞	H36	**HHEX0088PG1000**	0.875	0.435
1	H36	**HHEX0100PG1000**	1.000	0.569
1 ⅛	H36	**HHEX0113PG1000**	1.125	0.721
1 ¼	H36	**HHEX0125PG1000**	1.250	0.890
1 ⅜	H36	**HHEX0138PG1000**	1.375	1.080
1 ½	H36	**HHEX0150PG1000**	1.500	1.283
1 ¾	H36	**HHEX0175PG1000**	1.750	1.746
2	H36	**HHEX0200PG1000**	0.125	2.280



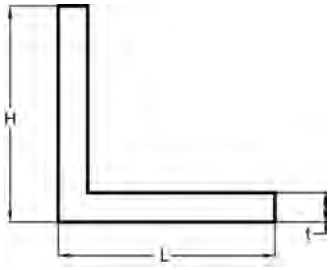
Harvel® PVC Square Bar - Gray

Pipe Size (inch)	P/L	Code	L (inch)	Wt/Ft (lbs/ft)
½	H37	**HSQU0050PG1000**	0.500	0.157
⅝	H37	**HSQU0063PG1000**	0.625	0.238
¾	H37	**HSQU0075PG1000**	0.750	0.360
1	H37	**HSQU0100PG1000**	1.000	0.629
1 ¼	H37	**HSQU0125PG0800**	1.250	1.033
1 ½	H37	**HSQU0150PG0800**	1.500	1.464
2	H37	**HSQU0200PG0800**	2.000	2.452



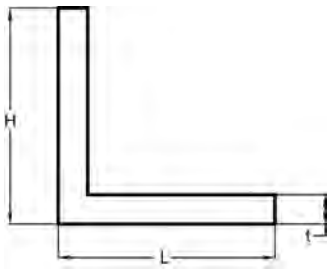
Harvel® PVC Rectangular Bar - Gray

Pipe Size (inch)	P/L	Code	L (inch)	H (inch)	Wt/Ft (lbs/ft)
½ x ¾	H38	**HREC0050PG1000**	0.500	0.750	0.225



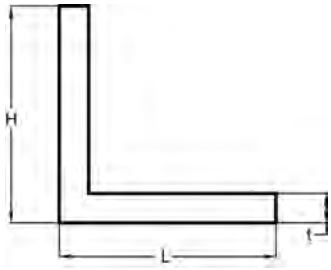
Harvel® PVC Angle Bar - Gray

Size (inch)	P/L	Code	H (inch)	L (inch)	T (inch)	Wt/Ft (lbs/ft)
1 x 1 x ⅛	H31	**HANG0100PG1000**	1.00	1.00	0.125	0.141
1 ¼ x 1 ¼ x 3⁄16	H31	**HANG0125PG1000**	1.25	1.25	0.188	0.262
1 ½ x 1 ½ x 3⁄16	H31	**HANG0151PG1000**	1.50	1.50	0.188	0.316
1 ½ x 1 ½ x ¼	H31	**HANG0150PG1000**	1.50	1.50	0.250	0.415
2 x 2 x ¼	H31	**HANG0200PG1000**	2.00	2.00	0.250	0.563



Harvel® PVC Angle Bar - White

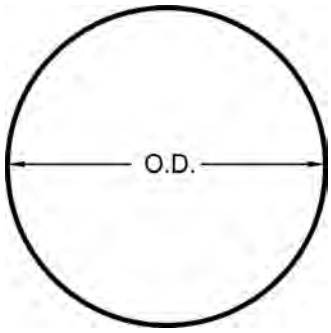
Size (inch)	P/L	Code	H (inch)	L (inch)	T (inch)	lbs per 100ft. (lb)	Wt/Ft (lbs/ft)
1 x 1 x ⅛	H31	**HANG0100PW1000**	1.00	1.00	0.125	14.10	0.141
1 ¼ x 1 ¼ x 3⁄16	H31	**HANG0125PW1000**	1.25	1.25	0.188	26.20	0.262
1 ½ x 1 ½ x 3⁄16	H31	**HANG0151PW1000**	1.50	1.50	0.188	31.60	0.316
2 x 2 x ¼	H31	**HANG0200PW1000**	2.00	2.00	0.250	56.30	0.563



Harvel® PVC Angle Bar - Clear

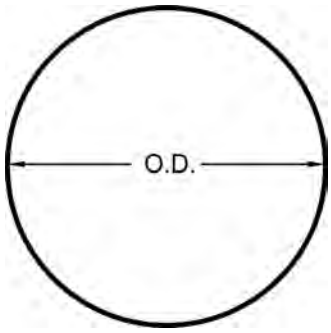
Size (inch)	P/L	Code	H (inch)	L (inch)	T (inch)	Wt/Ft (lbs/ft)
1 x 1 x 1 ⅛	H40	**HANG0100PL1000**	1.00	1.00	0.125	0.141
1 ¼ x 1 ¼ x 3⁄16	H40	**HANG0125PL1000**	1.25	1.25	0.188	0.262
1 ½ x 1 ½ x 3⁄16	H40	**HANG0150PL1000**	1.50	1.50	0.188	0.316
1 ½ x 1 ½ x ¼	H40	**HANG0151PL1000**	1.50	1.50	0.250	0.415
2 x 2 x ¼	H40	**HANG0200PL1000**	2.00	2.00	0.250	0.563

CPVC Extruded Shapes and Rods



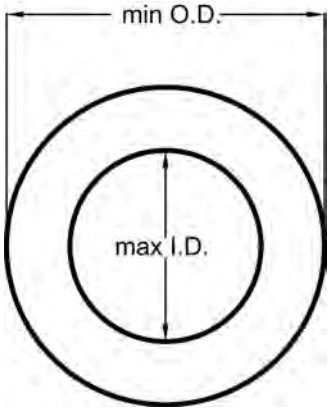
Harvel® CORZAN® CPVC Solid Round Bar - Gray

Pipe Size (inch)	P/L	Code	O.D. (inch)	Wt/Ft (lbs/ft)
¼	H43	**HROD0025CS1000**	0.250	0.032
⅜	H43	**HROD0038CS1000**	0.375	0.074
½	H43	**HROD0050CS1000**	0.500	0.131
¾	H43	**HROD0075CS1000**	0.750	0.296
1	H43	**HROD0100CS1000**	1.000	0.526
1 ¼	H43	**HROD0125CS1000**	1.250	0.821
1 ⅜	H43	**HROD0138CS1000**	1.375	0.994
1 ½	H43	**HROD0150CS1000**	1.500	1.183
1 ¾	H43	**HROD0175CS1000**	1.750	1.618
2	H43	**HROD0200CS0500**	2.000	2.109
2 ½	H43	**HROD0250CS0500**	2.500	3.375
3	H43	**HROD0300CS0500**	3.000	4.595
3 ½	H43	**HROD0350CS0500**	3.500	6.439
4	H43	**HROD0400CS0500**	4.000	8.460
5	H43	**HROD0500CS0500**	5.000	13.950
6	H43	**HROD0600CS0500**	6.000	20.395



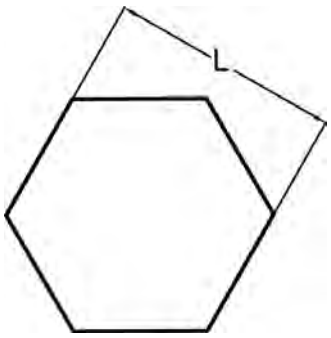
Harvel® CORZAN® CPVC Centerless Ground Bar - Gray

Pipe Size (inch)	P/L	Code	O.D. (inch)	Wt/Ft (lbs/ft)
¼	H44	**HROD0025CC1000**	0.250	0.032
⅜	H44	**HROD0038CC1000**	0.375	0.074
½	H44	**HROD0050CC1000**	0.500	0.131
¾	H44	**HROD0075CC1000**	0.750	0.296
1	H44	**HROD0100CC1000**	1.000	0.526
1 ¼	H44	**HROD0125CC1000**	1.250	0.821
1 ⅜	H44	**HROD0138CC1000**	1.375	0.994
1 ½	H44	**HROD0150CC1000**	1.500	1.183
1 ¾	H44	**HROD0175CC1000**	1.750	1.618
2	H44	**HROD0200CC0500**	2.000	2.109
2 ½	H44	**HROD0250CC0500**	2.500	3.375



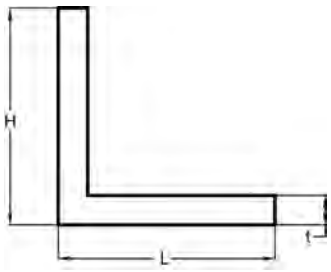
Harvel® CORZAN® CPVC Hollow Bar - Gray

Minimum O.D. (inch)	Maximum I.D. (inch)	P/L	Code	Wt/Ft (lbs/ft)
1.625	0.562	H45	**HHOL1625CG1000**	1.288
2.125	0.750	H45	**HHOL2125CG1000**	2.243
2.250	1.125	H45	**HHOL2250CG1000**	2.260
2.375	1.000	H45	**HHOL2375CG1000**	2.671
2.625	1.500	H45	**HHOL2625CG1000**	2.802
2.750	1.000	H45	**HHOL2750CG1000**	3.682
2.875	1.500	H45	**HHOL2875CG1000**	3.525
3.000	1.250	H45	**HHOL3001CG1000**	4.207
3.563	1.500	H45	**HHOL3563CG1000**	5.853
4.000	2.500	H45	**HHOL4000CG1000**	5.751
4.250	1.750	H45	**HHOL4250CG1000**	8.316
4.750	3.000	H45	**HHOL4750CG1000**	7.889
5.000	3.000	H45	**HHOL5000CG1000**	9.170
6.625	2.875	H45	**HHOL6625CG0500**	20.121
6.625	4.000	H45	**HHOL6626CG0500**	16.640



Harvel® CORZAN® CPVC Hexagonal Bar - Gray

Pipe Size (inch)	P/L	Code	L (inch)	Wt/Ft (lbs/ft)
7/16	H46	**HHEX0044CG1000**	0.438	0.121
½	H46	**HHEX0050CG1000**	0.500	0.159
9/16	H46	**HHEX0056CG1000**	0.563	0.202
⅝	H46	**HHEX0063CG1000**	0.625	0.249
¾	H46	**HHEX0075CG1000**	0.750	0.359
13/16	H46	**HHEX0081CG1000**	0.813	0.421
⅞	H46	**HHEX0088CG1000**	0.875	0.489
1	H46	**HHEX0100CG1000**	1.000	0.639
1 ⅛	H46	**HHEX0113CG1000**	1.125	0.810
1 ¼	H46	**HHEX0125CG1000**	1.250	0.999
1 ⅜	H46	**HHEX0138CG1000**	1.375	1.213
1 ½	H46	**HHEX0150CG1000**	1.500	1.441
2	H46	**HHEX0200CG1000**	2.000	2.560



Harvel® CORZAN® CPVC Angle Bar - Gray

Size (inch)	P/L	Code	H (inch)	L (inch)	T (inch)	Wt/Ft (lbs/ft)
1 x 1 x 1 ⅛	H42	**HANG0100CG1000**	1.00	1.00	0.125	0.180
1 ¼ x 1 ¼ x 3/16	H42	**HANG0125CG1000**	1.25	1.25	0.188	0.325
1 ½ x 1 ½ x 1 ¼	H42	**HANG0151CG1000**	1.50	1.50	0.250	0.395
2 x 2 x ¼	H42	**HANG0200CG1000**	2.00	2.00	0.250	0.645

Section 7

Joining Accessories



The technical information given in this publication implies no warranty of any kind and is subject to change without notice. Please consult our Terms and Conditions of Sale.

For complete technical information, please consult the GF Harvel Engineering and Installation Guide available online at www.gfpiping.com/resource.html [see “Technical Docs”] or by calling (800) 854-4090.

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



304SS Flange Backing Rings - 150# ANSI Bolt Pattern

Size	P/L	Code	Pack Qty
1/2	607	**37X003308**	1
3/4	607	**37X003309**	1
1	607	**37X003310**	1
1 1/4	607	**37X003337**	1
1 1/2	607	**37X003311**	1
2	607	**37X003312**	1
2 1/2	607	**37X003338**	1
3	607	**37X003313**	1
4	607	**37X003334**	1
6	607	**37X003335**	1
8	607	**37X003336**	1
10	607	**37X003339**	1
12	607	**37X003340**	1



EPDM Full Face Flange Gasket - 150# ANSI Bolt Pattern

Size	P/L	Code	Pack Qty
1/2	607	**37X002001**	5
3/4	607	**37X002002**	5
1	607	**37X002003**	5
1 1/4	607	**37X002004**	5
1 1/2	607	**37X002005**	5
2	607	**37X002006**	5
2 1/2	607	**37X002007**	5
3	607	**37X002008**	5
4	607	**37X002009**	5
5	607	**37X002019**	1
6	607	**37X002010**	2
8	607	**37X002011**	2
10	607	**37X002012**	2
12	607	**37X002013**	2
14	607	**37X002014**	1
16	607	**37X002015**	1
18	607	**37X002016**	1
20	607	**37X002017**	1
24	607	**37X002018**	1



FKM Stress Saver XP Flange Gasket - 150# ANSI Bolt Pattern

Size	P/L	Code	Pack Qty
1/2	607	**37X002200**	1
3/4	607	**37X002201**	1
1	607	**37X002202**	1
1 1/4	607	**37X002203**	1
1 1/2	607	**37X002204**	1
2	607	**37X002205**	1
2 1/2	607	**37X002206**	1
3	607	**37X002207**	1
4	607	**37X002208**	1
6	607	**37X002209**	1
8	607	**37X002210**	1
10	607	**37X002211**	1
12	607	**37X002212**	1



FKM Full Face Flange Gasket - 150# ANSI Bolt Pattern

Size	P/L	Code	Pack Qty
1/2	607	**37X002110**	5
3/4	607	**37X002111**	5
1	607	**37X002112**	5
1 1/4	607	**37X002113**	5
1 1/2	607	**37X002114**	5
2	607	**37X002115**	5
2 1/2	607	**37X002116**	5
3	607	**37X002117**	5
4	607	**37X002118**	5
5	607	**37X002128**	1
6	607	**37X002119**	2
8	607	**37X002120**	2
10	607	**37X002121**	2
12	607	**37X002122**	2
14	607	**37X002123**	1
16	607	**37X002124**	1
18	607	**37X002125**	1
20	607	**37X002126**	1
24	607	**37X002127**	1



EPDM Full Face Flange Gasket - 300# ANSI Bolt Pattern

Size (inch)	P/L	Code	Pack Qty
½	607	**37X002021**	5
¾	607	**37X002022**	5
1	607	**37X002023**	5
1 ¼	607	**37X002024**	5
1 ½	607	**37X002025**	5
2	607	**37X002026**	5
2 ½	607	**37X002027**	5
3	607	**37X002028**	5
4	607	**37X002029**	5
6	607	**37X002031**	2
8	607	**37X002032**	2
10	607	**37X002033**	2
12	607	**37X002034**	2



316SS Flange Bolt Kits - 150# ANSI Bolt Pattern

- The kits will include the appropriate number of UNC bolts, SAE washers, and nuts prelubricated prior to packaging.

P/L	Code	Flange Size (inch)	Bolts Per Kit	Bolt Length (inch)	Bolt Size (inch)
607	**37Z000061**	½	4	2.50	½
607	**37Z000062**	¾	4	2.50	½
607	**37Z000063**	1	4	2.75	½
607	**37Z000064**	1 ¼	4	2.75	½
607	**37Z000065**	1 ½	4	3.25	½
607	**37Z000066**	2	4	3.50	⅝
607	**37Z000067**	2 ½	4	4.00	⅝
607	**37Z000068**	3	4	4.00	⅝
607	**37Z000069**	4	8	4.25	⅝
607	**37Z000070**	6	8	4.50	¾
607	**37Z000071**	8	8	6.00	¾
607	**37Z000072**	10	12	6.00	⅞
607	**37Z000073**	12	12	6.00	⅞
607	**37Z000074**	14	12	5.00	1
607	**37Z000075**	16	16	5.50	1
607	**37Z000076**	18	16	5.50	1 ⅛
607	**37Z000077**	20	20	6.00	1 ⅛
607	**37Z000078**	24	20	6.50	1 ¼



KS 355 Plastic Pipe Cutter

- For 6" - 14" diameter pipe with wall thickness 5/16" - 1-1/2"
- Unique clamping mechanism. No additonal belts, chains or reduction inserts needed.
- Supplied with transport box: Dimensions 27.50" x 13.75" x 19.70"; Weight 34.5 lbs.

Size (inch)	P/L	Code	Power
6 - 14	607	**790 202 001**	1750 W; 230 V; 50/60 Hz



150 109 104

Chamfering Tools Sizes 1-1/4" - 14"

- Chamfering tool with 15° bevel

Size (inch)	P/L	Code
1 ¼ - 4	607	**150 109 104**
2 - 14	607	**790 309 004**



Section 8

Metric PVC Piping System

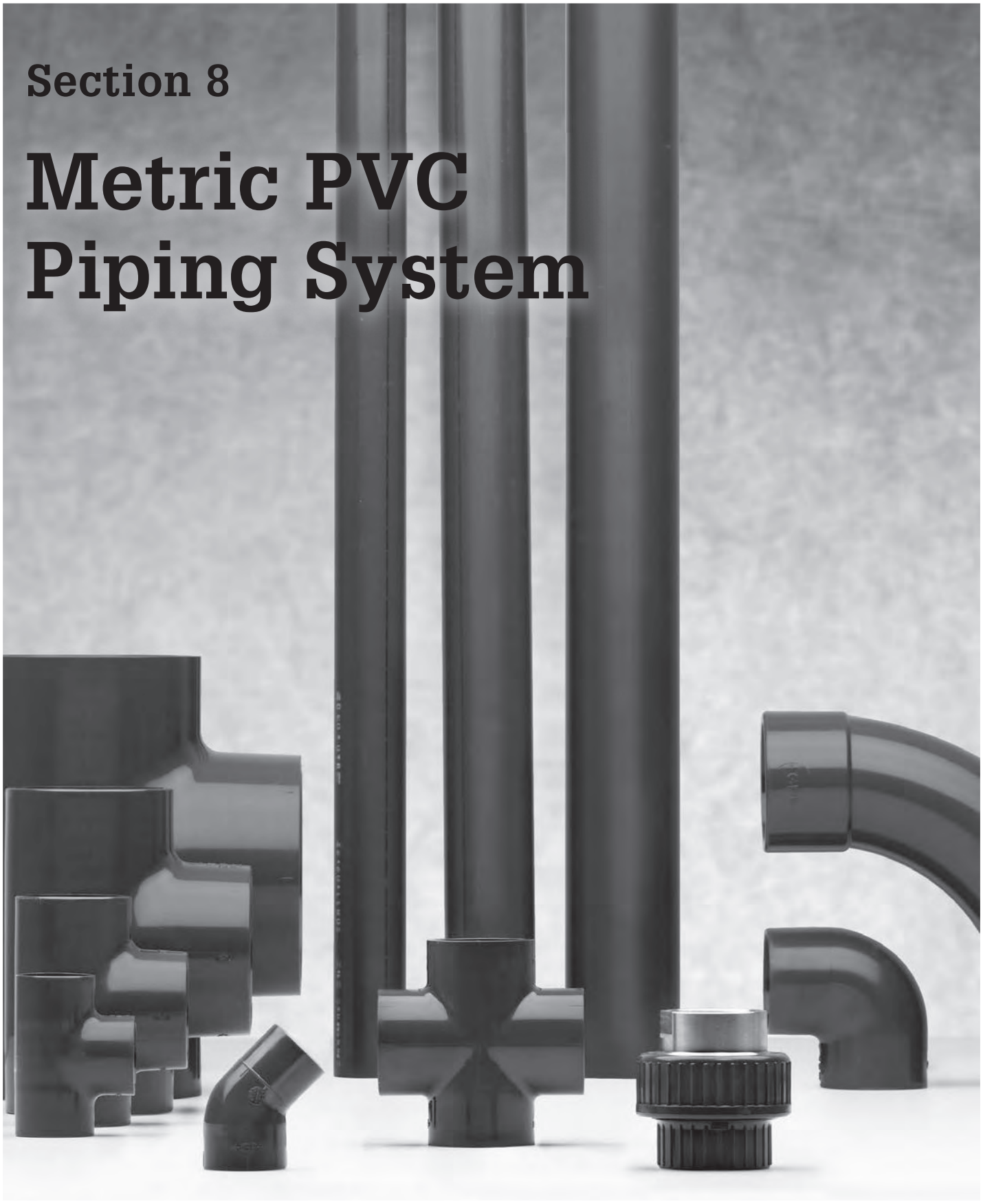
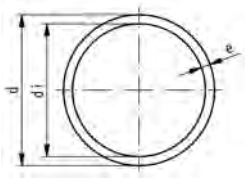


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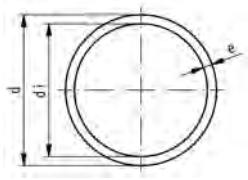
Pipes PVC, grey
Series S 6.3, SDR 13.6, nominal pressure PN 16

Model:

- Material: PVC
- Dimension: DIN 8061/62
- Color: dark grey RAL 7011
- Supplied in 5m (16.4 foot) length
- **Note 1**: DIBT Z-40.23-1 approval
- Attention: Pressure rates refer to operating temperatures at 20°C. Higher temperatures and aggressive flow media reduce pressure load (see above DIN and our technical documentation). Pressure load capacity has to be determined in consideration with safety demands of the respective applications and calculated in accordance.

d (mm)	PN (bar)	Code	weight (kg/m)	e (mm)	di (mm)
12	16	**161 017 104**	0.062	1.1	9.8
16	16	**161 017 105**	0.091	1.2	13.6
20	16	**161 017 106**	0.139	1.5	17.0
25	16	**161 017 107**	0.215	1.9	21.2
32	16	**161 017 108**	0.347	2.4	27.2
40	16	**161 017 109**	0.533	3.0	34.0
50	16	**161 017 110**	0.821	3.7	42.6
63	16	**161 017 111**	1.310	4.7	53.6
75	16	**161 017 112**	1.850	5.6	58.2
90	16	**161 017 113**	2.640	6.7	76.6
110	16	**161 017 114**	3.910	8.1	93.8
125	16	**161 017 115**	5.040	9.2	106.6
140	16	**161 017 116**	6.030	10.3	119.4
160	16	**161 017 117**	8.230	11.8	136.4





Pipe PVC grey
SDR21/PN10/S10

Model:

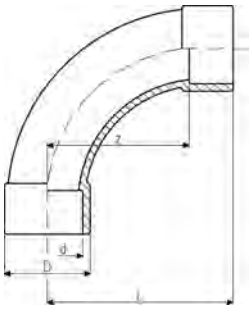
- Material: PVC
- Dimension: DIN 8061/62
- Color: dark grey RAL 7011
- Supplied in 5m (16.4 foot) length
- **Note 1**: DIBT Z-40.23-1 approval
- Attention: Pressure rates refer to operating temperatures at 20°C. Higher temperatures and aggressive flow media reduce pressure load (see above DIN and our technical documentation). Pressure load capacity has to be determined in consideration with safety demands of the respective applications and calculated in accordance.

d (mm)	SDR	PN (bar)	Code	weight (kg/m)	e (mm)	di (mm)
25	17	10	**161 017 082**	0.177	1.5	22.0
32	17	10	**161 017 083**	0.280	1.9	28.4
40	21	10	**161 017 084**	0.355	1.9	36.2
50	21	10	**161 017 085**	0.560	2.4	45.2
63	21	10	**161 017 086**	0.866	3.0	57.0
75	21	10	**161 017 087**	1.240	3.6	67.8
90	21	10	**161 017 088**	1.770	4.3	81.4
110	21	10	**161 017 089**	2.650	5.3	99.4
125	21	10	**161 017 090**	3.390	6.0	113.0
140	21	10	**161 017 091**	4.240	6.7	126.6
160	21	10	**161 017 092**	5.550	7.7	144.7
180	21	10	**161 017 093**	6.970	8.6	162.8
200	21	10	**161 017 094**	8.640	9.6	180.8
225	21	10	**161 017 095**	10.900	10.8	203.4
250	21	10	**161 017 096**	13.300	11.9	226.2
280	21	10	**161 017 097**	16.800	13.4	253.2
315	21	10	**161 017 098**	21.200	15.0	285.0

Fittings

Pipe Fittings for solvent cement jointing

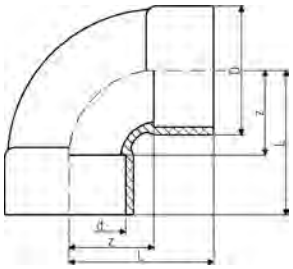




Bends 90°, PVC metric

d (mm)	Size (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
20		16	**721 000 106**	10	0.029	40	27	56
25		16	**721 000 107**	10	0.049	50	33	69
32		16	**721 000 108**	10	0.074	64	38	86
40		16	**721 000 109**	30	0.121	80	47	106
50		16	**721 000 110**	5	0.298	100	61	131
63		16	**721 000 111**	6	0.516	126	76	164
75	2 ½	16	**721 000 112**	5	0.798	150	90	194
90		16	**721 000 113**	5	1.373	180	108	231
110		16	**721 000 114**	5	2.699	220	137	281
140	5	16	**721 000 116**	2	5.204	280	168	356
160		16	**721 000 117**	1	8.298	320	192	406



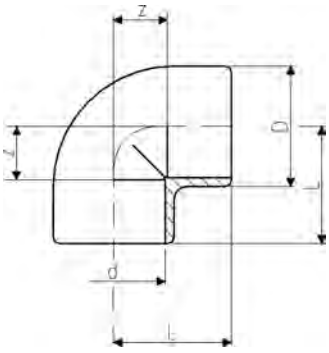


Bend 90° short pattern PVC metric

d (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
225	10	**721 010 120**	1	7.554	168	256	287
280	10	**721 010 122**	1	16.987	210	318	357
315	6	**721 010 123**	1	21.567	237	356	402
400	6	**721 010 125**	1	30.000	300	442	521

Elbow 90° PVC metric

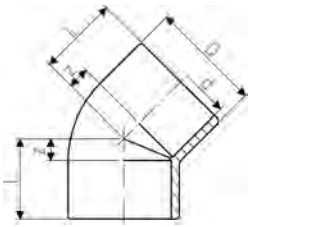




d (mm)	Size (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
6		16	**721 100 101**	10	0.004	4	11	16
8		16	**721 100 102**	10	0.004	5	13	17
10		16	**721 100 103**	10	0.004	6	14	18
12		16	**721 100 104**	10	0.006	7	17	19
16		16	**721 100 105**	10	0.007	9	21	23
20		16	**721 100 106**	10	0.012	11	25	27
25		16	**721 100 107**	10	0.024	14	32	33
32		16	**721 100 108**	10	0.043	17	40	39
40		16	**721 100 109**	10	0.062	23	47	49
50		16	**721 100 110**	10	0.107	26	59	57
63		16	**721 100 111**	10	0.202	33	73	71
75	2 ½	16	**721 100 112**	5	0.332	40	87	83
90		16	**721 100 113**	5	0.576	46	105	97
110		16	**721 100 114**	4	1.009	55	128	116
125		16	**721 100 115**	1	1.522	63	146	131
140	5	16	**721 100 116**	6	1.945	70	162	146
160		16	**721 100 117**	1	2.873	80	185	166
200		10	**721 100 119**	1	4.446	101	225	207
225		10	**721 100 120**	1	5.989	114	252	233
250		10	**721 100 121**	1	10.014	131	282	263

Elbow 45° PVC metric





d (mm)	Size (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
16		16	**721 150 105**	10	0.008	5	21	19
20		16	**721 150 106**	10	0.011	5	25	21
25		16	**721 150 107**	10	0.017	6	31	25
32		16	**721 150 108**	10	0.021	8	38	30
40		16	**721 150 109**	10	0.048	10	47	36
50		16	**721 150 110**	5	0.086	12	59	43
63		16	**721 150 111**	5	0.160	14	73	52
75	2 ½	16	**721 150 112**	5	0.253	17	87	61
90		16	**721 150 113**	4	0.430	20	105	71
110		16	**721 150 114**	4	0.750	25	127	86
125		16	**721 150 115**	1	1.193	28	146	97
140	5	16	**721 150 116**	1	1.570	32	162	108
160		16	**721 150 117**	4	2.280	36	185	122
200		10	**721 150 119**	2	3.288	43	225	149
225		10	**721 150 120**	1	4.191	49	250	168
250		10	**721 150 121**	1	7.115	60	282	192
280		10	**721 150 122**	1	10.340	66	318	213
315		6	**721 150 123**	1	14.292	74	356	239
400		6	**721 150 125**	1	25.268	94	442	302

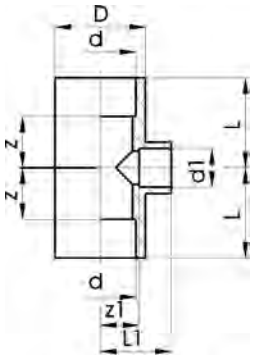




Tee 90° equal PVC metric

d (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	D (mm)	L (mm)	z (mm)
6	16		**721 200 101**	10	0.004	11	16	4
8	16		**721 200 102**	10	0.008	13	17	5
10	16		**721 200 103**	10	0.008	16	18	6
12	16		**721 200 104**	10	0.011	19	19	7
16	16		**721 200 105**	10	0.011	21	23	9
20	16		**721 200 106**	10	0.019	25	27	11
25	16		**721 200 107**	10	0.029	31	33	14
32	16		**721 200 108**	10	0.055	38	39	17
40	16		**721 200 109**	10	0.100	48	49	23
50	16		**721 200 110**	10	0.156	58	57	26
63	16		**721 200 111**	10	0.291	73	71	33
75	16	2 ½	**721 200 112**	5	0.476	87	83	39
90	16		**721 200 113**	4	0.824	105	97	46
110	16		**721 200 114**	6	1.411	127	116	55
125	16		**721 200 115**	2	2.521	151	135	66
140	16	5	**721 200 116**	4	3.410	169	147	71
160	16		**721 200 117**	4	4.982	193	167	81
200	10		**721 200 119**	1	5.868	225	207	101
225	10		**721 200 120**	1	9.268	256	233	114
250	10		**721 200 121**	1	14.350	282	263	132
280	10		**721 200 122**	1	19.541	318	298	152
315	6		**721 200 123**	1	27.254	356	332	168
400	6		**721 200 125**	1	35.000	442	420	214

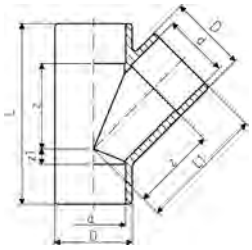




Tee 90° reducing PVC metric

d (mm)	d1 (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	z (mm)	z1 (mm)	D (mm)	L (mm)	L1 (mm)
25	20	16		**721 200 134**	10	0.038	14	14	33	33	30
32	20	16		**721 200 141**	10	0.061	17	17	41	39	33
32	25	16		**721 200 138**	10	0.063	17	17	41	39	36
40	20	16		**721 200 155**	10	0.103	23	23	50	49	39
40	25	16		**721 200 151**	10	0.107	23	23	50	49	42
40	32	16		**721 200 147**	10	0.109	23	23	50	49	45
50	20	16		**721 200 009**	5	0.179	28	28	62	59	44
50	25	16		**721 200 010**	5	0.183	28	28	62	59	47
50	32	16		**721 200 164**	5	0.189	28	28	62	59	50
50	40	16		**721 200 161**	5	0.208	28	28	62	59	54
63	25	16		**721 200 011**	10	0.332	34	34	77	72	53
63	32	16		**721 200 178**	5	0.336	34	34	77	72	56
63	40	16		**721 200 174**	5	0.347	34	34	77	72	60
63	50	16		**721 200 170**	5	0.354	34	34	77	72	65
75	32	16	2 ½	**721 200 181**	9	0.535	40	41	92	84	63
75	40	16	2 ½	**721 200 182**	9	0.555	40	41	92	84	67
75	50	16	2 ½	**721 200 183**	8	0.541	40	41	92	84	72
75	63	16	2 ½	**721 200 184**	8	0.570	40	41	92	84	79
90	32	16		**721 200 142**	6	0.855	46	55	110	97	77
90	50	16		**721 200 144**	6	0.907	46	55	110	97	86
90	63	16		**721 200 145**	5	0.931	46	55	110	97	93
90	75	16		**721 200 146**	5	0.959	46	55	110	97	99
110	32	16		**721 200 135**	3	1.441	56	67	133	117	89
110	50	16		**721 200 136**	3	1.471	56	67	133	117	98
110	63	16		**721 200 132**	3	1.522	56	65	133	117	103
110	75	16		**721 200 133**	3	1.543	56	65	133	117	109
110	90	16		**721 200 137**	3	1.634	56	65	133	117	116
125	50	16		**721 200 139**	4	1.970	64	75	151	133	106
125	90	16		**721 200 140**	4	2.200	64	75	151	133	126
140	50	16	5	**721 200 148**	1	3.235	72	82	172	148	113
140	75	16	5	**721 200 149**	1	3.319	72	78	172	148	122
140	110	16	5	**721 200 150**	1	3.422	72	74	172	148	135
160	110	16		**721 200 152**	1	4.305	81	81	192	167	142
200	110	10		**721 200 153**	1	8.782	107	131	232	213	192
200	160	10		**721 200 154**	1	8.036	107	106	232	213	192
225	110	10		**721 200 156**	1	10.619	120	143	257	239	204
225	160	10		**721 200 157**	1	9.760	120	119	257	239	205
250	160	10		**721 200 159**	1	14.520	132	151	282	263	237
250	200	10		**721 200 162**	1	12.213	132	131	282	263	237
280	160	10		**721 200 165**	1	18.402	120	180	318	266	266
280	225	10		**721 200 167**	1	16.145	120	148	318	266	268
315	160	6		**721 200 169**	1	22.189	120	197	356	284	283
315	225	6		**721 200 172**	1	20.154	120	165	356	284	284
400	225	6		**721 200 176**	1	40.000	163	258	442	369	377
400	315	6		**721 200 180**	1	35.000	163	213	442	369	377

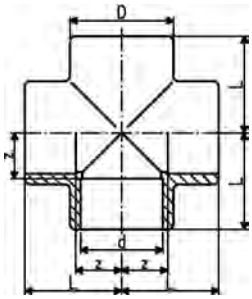




Tee 45° PVC metric

d (mm)	d (inch)	PN (bar)	Size (inch)	Code	SP	weight (kg)	z (mm)	z1 (mm)	D (mm)	L (mm)	L1 (mm)
10		10		**721 250 103**	100	0.013	18	4	16	46	30
12		10		**721 250 104**	100	0.014	21	4	18	49	33
16		10		**721 250 105**	100	0.022	25	5	23	58	39
20		10		**721 250 106**	10	0.035	30	6	28	68	46
25		10		**721 250 107**	10	0.056	36	9	33	83	55
32		10		**721 250 108**	10	0.096	45	10	41	99	67
40		10		**721 250 109**	10	0.159	56	10	50	118	82
50		10		**721 250 110**	8	0.265	66	12	60	140	97
63		10		**721 250 111**	5	0.439	85	14	74	175	123
75	2 ½	6	2 ½	**721 250 112**	5	0.816	101	18	91	207	145
90		6		**721 250 113**	1	1.275	122	20	107	245	173
110		6		**721 250 114**	3	2.579	149	27	134	298	210
125		6		**721 250 115**	2	3.616	167	30	147	335	236
140	5	6	5	**721 250 116**	1	5.628	190	34	168	376	266
160		6		**721 250 117**	1	7.187	213	41	190	428	300
200		6		**721 250 119**	1	12.314	265	48	232	527	372
225		6		**721 250 120**	1	15.735	296	54	260	590	416
250		6		**721 250 121**	1	20.350	330	60	286	654	462

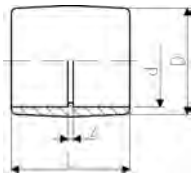




Cross PVC metric

d (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	D (mm)	L (mm)	z (mm)
12	16		**721 300 104**	100	0.010	18	20	8
16	16		**721 300 105**	100	0.020	23	24	10
20	16		**721 300 106**	10	0.036	29	27	11
25	16		**721 300 107**	10	0.054	35	33	14
32	16		**721 300 108**	10	0.092	43	39	17
40	16		**721 300 109**	5	0.155	52	49	23
50	16		**721 300 110**	5	0.259	63	59	28
63	16		**721 300 111**	5	0.482	79	72	34
75	10	2 ½	**721 300 112**	3	0.725	92	83	40
90	10		**721 300 113**	4	1.221	106	97	48
110	10		**721 300 114**	4	2.111	128	117	59

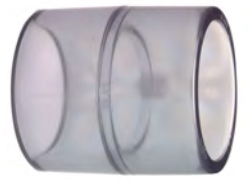


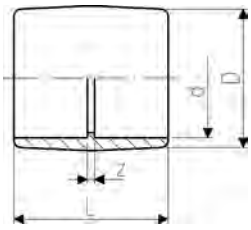


Socket equal PVC metric

[1] Socket d355 and d400 fabricated from pipe

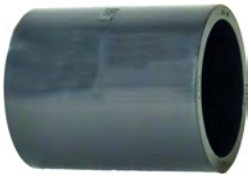
d (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
6	16	**721 910 101**	10	0.004	3	12	27
8	16	**721 910 102**	10	0.005	3	14	27
10	16	**721 910 103**	1	0.004	3	16	27
12	16	**721 910 104**	1	0.004	3	19	27
16	16	**721 910 105**	10	0.006	3	22	31
20	16	**721 910 106**	10	0.011	3	26	35
25	16	**721 910 107**	10	0.015	3	32	41
32	16	**721 910 108**	10	0.026	3	39	47
40	16	**721 910 109**	10	0.045	3	48	55
50	16	**721 910 110**	10	0.064	3	58	65
63	16	**721 910 111**	10	0.187	3	73	79
75	16	**721 910 112**	20	0.188	4	87	92
90	16	**721 910 113**	10	0.328	5	105	107
110	16	**721 910 114**	6	0.554	6	128	128
125	16	**721 910 115**	3	0.825	7	142	145
140	16	**721 910 116**	2	1.118	7	162	159
160	16	**721 910 117**	2	1.540	8	183	180
200	10	**721 910 119**	1	2.559	9	221	221
225	10	**721 910 120**	2	3.519	10	253	248
250	10	**721 910 121**	1	5.394	16	284	284
280	10	**721 910 122**	1	8.312	16	321	314
315	6	**721 910 123**	1	10.388	16	356	348
355	6	**721 910 124**		10.706	68	377	454
400	6	**721 910 125**		11.326	73	425	505

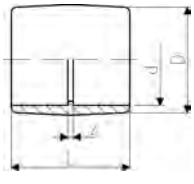




Socket equal PVC transparent metric

d (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
16	16	**752 910 105**	10	0.009	3	23	31
20	16	**752 910 106**	1	0.012	3	27	35
25	16	**752 910 107**	1	0.016	3	32	41
32	16	**752 910 108**	1	0.027	3	40	47
40	16	**752 910 109**	1	0.061	3	52	55
50	16	**752 910 110**	1	0.068	3	60	65
63	16	**752 910 111**	5	0.115	3	75	79





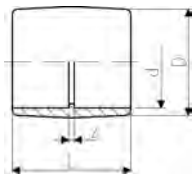
Outlet socket coupling PVC

Model:

- With solvent cement sockets metric and BS inch

d (mm)	d (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
16	⅜	16	**721 913 105**	10	0.010	5	23	35
20	½	16	**721 913 106**	10	0.012	5	27	38
25	¾	16	**721 913 107**	10	0.020	5	33	45
32	1	16	**721 913 108**	10	0.031	5	41	51
40	1 ¼	16	**721 913 109**	10	0.054	5	51	60

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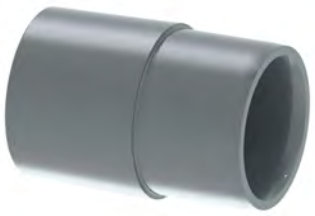
d (mm)	d (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
50	1 ½	16	**721 913 110**	10	0.074	4	59	65
63	2	16	**721 913 111**	5	0.155	5	75	79
90	3	16	**721 913 113**	10	0.340	6	104	108
110	4	16	**721 913 115**	5	0.488	4	128	128

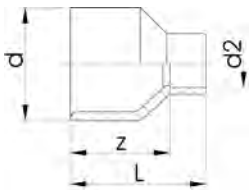


Barrel Nipples, PVC metric

Model:

d (mm)	PN (bar)	Code	weight (kg)	L (mm)
16	16	**721 900 905**	0.002	28
20	16	**721 900 906**	0.005	32
25	16	**721 900 907**	0.009	38
32	16	**721 900 908**	0.015	44
40	16	**721 900 909**	0.027	52
50	16	**721 900 910**	0.048	62
63	16	**721 900 911**	0.092	76
75	16	**721 900 912**	0.156	88
90	16	**721 900 913**	0.260	102
110	16	**721 900 914**	0.455	122
125	16	**721 900 915**	0.673	138
140	16	**721 900 916**	0.932	152
160	16	**721 900 917**	1.565	192
200	10	**721 900 919**	1.779	212
225	10	**721 900 920**	2.566	238



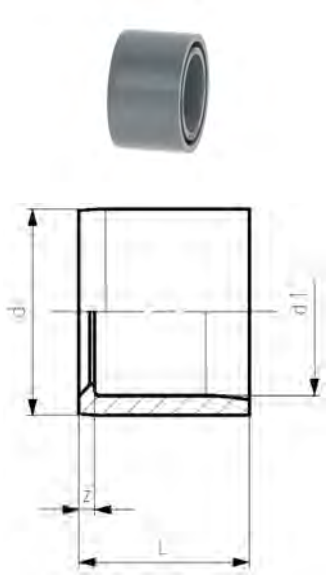


Reducing bush long PVC metric

Model:

- With solvent cement spigot and socket metric

d (mm)	d2 (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	z (mm)	L (mm)
8	6	16		**721 910 323**	10	0.003	15	27
10	6	16		**721 910 326**	10	0.003	15	27
10	8	16		**721 910 325**	10	0.003	15	27
20	16	16		**721 910 334**	10	0.009	21	35
25	20	16		**721 910 337**	10	0.014	25	41
32	25	16		**721 910 341**	10	0.024	30	49
40	32	16		**721 910 346**	10	0.044	36	58
50	40	16		**721 910 352**	10	0.074	44	70
63	50	16		**721 910 358**	5	0.148	54	85
75	63	16	2 ½	**721 910 364**	5	0.211	62	100
90	75	16		**721 910 370**	8	0.335	74	118
140	110	16	5	**721 910 385**	2	0.808	111	172



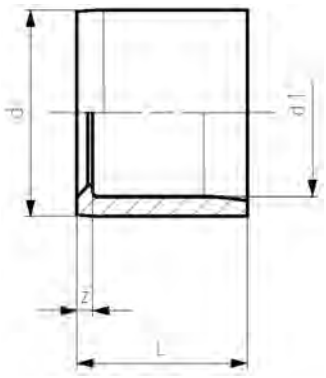
Reducing bush short PVC metric

Model:

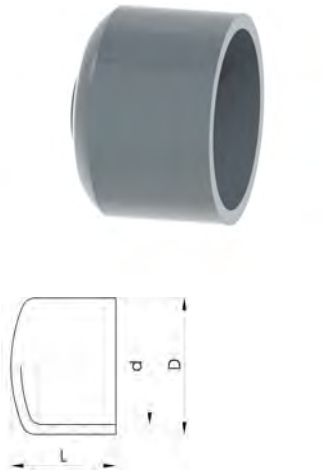
- With solvent cement spigot and socket metric

d (mm)	d1 (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	z (mm)	L (mm)
12	8	16		**721 900 329**	1	0.002	2	14
16	12	16		**721 900 331**	50	0.002	2	14
20	16	16		**721 900 334**	10	0.002	2	16
25	20	16		**721 900 337**	10	0.004	3	19
32	20	16		**721 900 342**	10	0.014	6	22
32	25	16		**721 900 341**	10	0.009	3	22
40	20	16		**721 900 348**	10	0.021	10	26
40	25	16		**721 900 347**	10	0.021	7	26
40	32	16		**721 900 346**	10	0.016	4	26
50	20	16		**721 900 355**	10	0.037	15	31
50	25	16		**721 900 354**	10	0.034	12	31
50	32	16		**721 900 353**	10	0.036	9	31
50	40	16		**721 900 352**	10	0.030	5	31
63	32	16		**721 900 360**	10	0.064	16	38
63	40	16		**721 900 359**	10	0.067	12	38
63	50	16		**721 900 358**	10	0.058	7	38
75	50	16	2 ½	**721 900 365**	10	0.109	13	44
75	63	16	2 ½	**721 900 364**	10	0.078	6	44
90	50	16		**721 900 372**	10	0.181	20	51
90	63	16		**721 900 371**	12	0.183	13	51
90	75	16		**721 900 370**	10	0.135	7	51
110	50	16		**721 900 379**	5	0.316	30	61
110	63	16		**721 900 378**	5	0.308	23	61
110	75	16		**721 900 377**	20	0.295	17	61
110	90	16		**721 900 376**	5	0.259	10	61
125	90	16		**721 900 381**	5	0.465	18	69
125	110	16		**721 900 380**	5	0.267	8	69
140	90	16	5	**721 900 386**	5	0.562	25	76
140	110	16	5	**721 900 385**	5	0.605	15	76
140	125	16	5	**721 900 384**	5	0.331	7	76
160	90	16		**721 900 391**	6	0.751	35	86
160	110	16		**721 900 390**	6	0.883	25	86
160	140	16		**721 900 388**	5	0.551	10	86
200	110	10		**721 900 393**	3	1.985	45	108
200	125	10		**721 900 325**	3	2.024	37	108
200	140	10		**721 900 394**	3	1.928	29	108
200	160	10		**721 900 392**	2	1.085	20	108
225	110	10		**721 900 397**	4	2.544	57	120
225	125	10		**721 900 399**	4	2.563	49	120
225	140	10		**721 900 398**	4	2.609	41	120
225	160	10		**721 900 396**	2	2.199	31	119
225	200	10		**721 900 181**	9	1.360	13	119
250	125	10		**721 900 326**	4	3.150	11	131
250	140	10		**721 900 300**	4	3.200	54	133
250	160	10		**721 900 301**	4	3.390	44	133
250	200	10		**721 900 302**	4	3.198	24	133
250	225	10		**721 900 303**	4	1.686	11	133
280	140	10		**721 900 307**	1	4.157	69	148
280	160	10		**721 900 308**	1	4.170	60	148
280	200	10		**721 900 304**	1	4.577	39	148
280	225	10		**721 900 305**	1	4.409	27	146
280	250	10		**721 900 306**	1	2.515	14	148
315	160	6		**721 900 313**	1	5.188	77	166
315	200	6		**721 900 309**	1	5.480	57	166
315	225	6		**721 900 310**	1	6.035	44	166
315	250	6		**721 900 311**	1	6.481	32	166
315	280	6		**721 900 312**	1	4.055	28	167
355	315	6		**721 900 315**	1	5.792	23	206

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d (mm)	d1 (mm)	PN (bar)	Size (inch)	Code	SP	weight (kg)	z (mm)	L (mm)
400	250	6		**721 900 319**	1	11.528	60	206
400	280	6		**721 900 320**	1	11.366	60	206
400	315	6		**721 900 321**	1	13.006	42	206
400	355	6		**721 900 322**	1	7.524	22	206



Cap PVC metric

d (mm)	PN (bar)	Code	SP	weight (kg)	D (mm)	L (mm)
12	16	**721 960 104**	10	0.004	19	15
16	16	**721 960 105**	10	0.005	23	21
20	16	**721 960 106**	10	0.008	27	24
25	16	**721 960 107**	10	0.013	33	28
32	16	**721 960 108**	10	0.020	40	32
40	16	**721 960 109**	10	0.029	47	37
50	16	**721 960 110**	10	0.051	58	45
63	16	**721 960 111**	5	0.095	73	56
75	16	**721 960 112**	5	0.152	87	65
90	16	**721 960 113**	5	0.269	105	77
110	16	**721 960 114**	12	0.457	128	94
140	10	**721 960 116**	10	1.036	164	114
160	10	**721 960 117**	2	1.534	188	130
200	10	**721 960 119**	3	2.614	230	170
225	10	**721 960 120**	2	3.320	257	185
280	10	**721 960 122**	1	6.200	318	230
315	6	**721 960 123**	1	8.500	356	255

Adapter Fittings



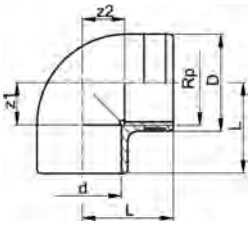
Adaptor fitting PVC metric - Victaulic

Model:

- With solvent cement spigot and socket metric
- For metal couplings (type Victaulic)

d (mm)	d1 (mm)	d2 (inch)	d2- victaulic (inch)	PN (bar)	Code	SP	weight (kg)	L (mm)	z (mm)
50	40	1 ½	1 1/2	10	**721 910 090**	50	0.150	71	45
63	50	2	2	10	**721 910 091**	50	0.200	78	47
75	63	2 ½	2 1/2	10	**721 910 092**	50	0.250	84	46





Elbow 90° PVC-U metric Rp

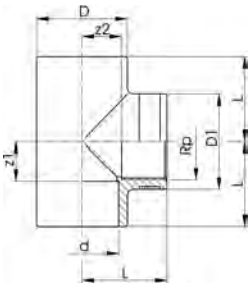
Model:

- With solvent cement socket metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

as long as stocks last

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	D (mm)	L (mm)
12	¼	16	**721 100 204**	10	0.010	7	7	20	19
16	⅜	16	**721 100 205**	10	0.015	9	9	25	23
20	½	16	**721 100 206**	10	0.023	13	11	30	27
25	¾	16	**721 100 207**	10	0.035	16	15	35	33
32	1	16	**721 100 208**	10	0.060	19	19	45	39
40	1 ¼	16	**721 100 209**	10	0.122	23	27	55	50
50	1 ½	16	**721 100 210**	5	0.187	27	36	62	58
63	2	16	**721 100 211**	10	0.324	33	46	75	73





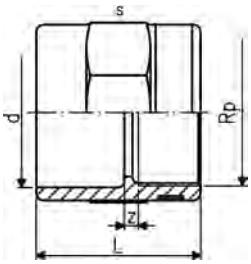
Tee 90° PVC-U metric Rp

Model:

- With solvent cement socket metric, branch with parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	D (mm)	D1 (mm)	L (mm)
12	¼	16	**721 200 204**	10	0.015	7	7	17	20	19
16	⅜	16	**721 200 205**	10	0.027	9	9	21	25	23
20	½	16	**721 200 206**	10	0.029	11	13	26	30	29
25	¾	16	**721 200 207**	10	0.043	14	15	32	35	33
32	1	16	**721 200 208**	10	0.080	17	19	40	45	39
40	1 ¼	16	**721 200 209**	10	0.134	23	26	47	55	49
50	1 ½	16	**721 200 210**	5	0.212	27	36	59	59	59
63	2	16	**721 200 211**	5	0.379	33	46	74	75	71





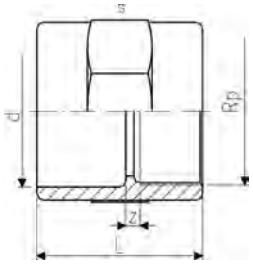
Adaptor socket PVC-U metric Rp

Model:

- With solvent cement socket metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
12	¼	16	**721 910 204**	10	0.010	4	27	22
16	⅜	16	**721 910 205**	10	0.016	5	31	27
20	½	16	**721 910 206**	10	0.025	5	36	32
25	¾	16	**721 910 207**	10	0.032	5	40	36
32	1	16	**721 910 208**	10	0.057	5	45	46
40	1 ¼	16	**721 910 209**	10	0.087	5	51	55
50	1 ½	16	**721 910 210**	10	0.126	7	59	65
63	2	16	**721 910 211**	5	0.206	7	69	80





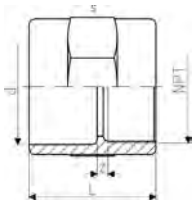
Adaptor socket PVC-U metric Rp

Model:

- With solvent cement socket metric and parallel female thread Rp
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
75	2 ½	10	**721 916 012**	10	0.220	7	82	90
90	3	10	**721 916 013**	5	0.365	9	94	110
110	4	10	**721 916 014**	5	0.536	9	110	130





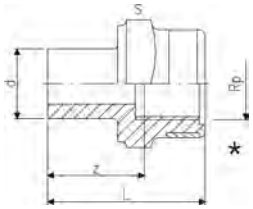
Female Adaptor, PVC metric - NPT

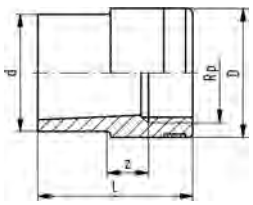
Model:

- With solvent cement socket metric and NPT (ASTM) taper female thread
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Thread Type	Size (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
20	Rp	½	10	**721 914 206**	10	0.021	5	35	32
25	Rp	¾	10	**721 914 207**	10	0.028	6	40	36
32	Rp	1	10	**721 914 208**	10	0.049	6	45	46
40	Rp	1 ¼	10	**721 914 209**	10	0.076	6	51	55
50	Rp	1 ½	10	**721 914 210**	10	0.110	10	59	65
63	Rp	2	10	**721 914 211**	5	0.175	10	69	80







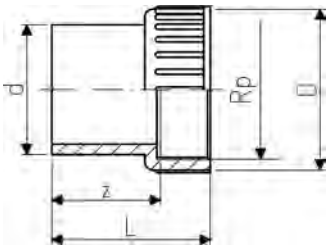
Reducing bush PVC-U metric Rp

Model:

- With solvent cement spigot metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

	d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)	s (mm)
*	12	¼	16	**721 910 404**	10	0.008	0	20	27	22
	20	⅜	16	**721 910 434**	10	0.014	7	25	35	
	25	½	16	**721 910 437**	10	0.021	7	30	41	
	32	¾	16	**721 910 441**	10	0.032	15	35	48	
	40	1	16	**721 910 446**	10	0.058	20	45	56	
	50	1 ¼	16	**721 910 452**	10	0.097	20	55	66	
	63	1 ½	16	**721 910 458**	5	0.151	10	62	77	





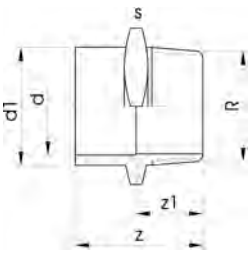
Adapter PVC metric Rp

Model:

- With solvent cement spigot metric and parallel female thread Rp
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
20	½	10	**721 900 406**	10	0.012	22	28	37
25	¾	10	**721 900 407**	10	0.018	25	34	41
32	1	10	**721 900 408**	10	0.035	29	42	48
40	1 ¼	10	**721 900 409**	10	0.063	34	52	56
50	1 ½	10	**721 900 410**	10	0.097	40	62	61
63	2	10	**721 900 411**	5	0.170	49	77	74





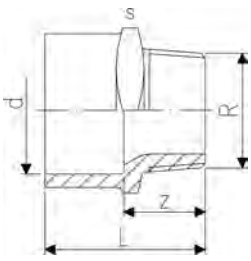
Adaptor socket nipple PVC-U metric R

Model:

- With solvent cement spigot/socket reducing metric and taper male thread R
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	d1 (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	z1 (mm)	s (mm)
12	16	⅜	16	**721 910 555**	10	0.010	35	23	27
16	20	½	16	**721 910 556**	10	0.016	42	28	32
20	25	¾	16	**721 910 557**	10	0.023	47	31	36
25	32	1	16	**721 910 558**	10	0.040	54	35	46
32	40	1 ¼	16	**721 910 559**	10	0.061	60	38	55
40	50	1 ½	16	**721 910 560**	10	0.094	66	40	65
50	63	2	16	**721 910 561**	5	0.164	78	47	80





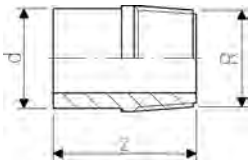
Adapter bush equal PVC metric R

Model:

- With solvent cement socket metric and taper male thread R
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (inch)	R (inch)	d (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
⅜	⅜	16	16	**721 910 705**	10	0.011	20	34	27
½	½	20	16	**721 910 706**	10	0.018	24	40	32
¾	¾	25	16	**721 910 707**	10	0.025	25	44	36
1	1	32	16	**721 910 708**	10	0.039	28	50	46
1 ¼	1 ¼	40	16	**721 910 709**	10	0.061	31	57	55
1 ½	1 ½	50	16	**721 910 710**	10	0.092	32	63	65
2	2	63	16	**721 910 711**	5	0.161	38	76	80
2 ½	2 ½	75	10	**721 910 712**	6	0.227	42	86	90
3	3	90	10	**721 910 713**	5	0.389	46	97	110
4	4	110	10	**721 910 714**	5	0.572	53	114	130





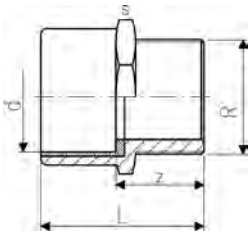
Adaptor nipple PVC-U metric R

Model:

- With solvent cement spigot metric and taper male thread R
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)
16	⅜	10	**721 913 505**	10	0.006	31
20	½	10	**721 913 506**	10	0.010	35
25	¾	10	**721 913 507**	10	0.017	40
32	1	10	**721 913 508**	10	0.026	46





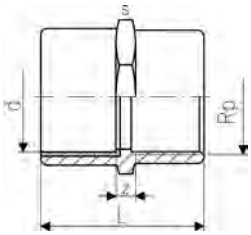
Adaptor socket brass/PVC-U metric R

Model:

- Brass with taper male thread R and PVC solvent cement socket insert, metric
- Install with low mechanical stress and avoid large cyclic temperature changes

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
40	1 ¼	16	**720 910 709**	1	0.437	36	64	58
50	1 ½	16	**720 910 710**	1	0.671	38	72	70
63	2	16	**720 910 711**	1	1.035	43	84	85



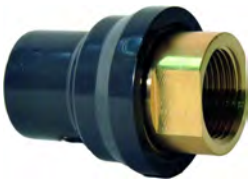


Adaptor socket brass/PVC-U metric Rp

Model:

- Brass with parallel female thread Rp and PVC solvent cement socket insert, metric
- Install with low mechanical stress and avoid large cyclic temperature changes

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
40	1 ¼	16	**720 910 209**	1	0.482	17	66	58
50	1 ½	16	**720 910 210**	1	0.737	19	74	70
63	2	16	**720 910 211**	1	1.130	19	86	83





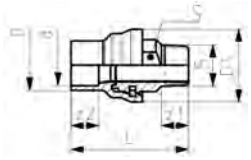
Adaptor Fitting PVC-U/brass Rp

Model:

- Adapter fitting equally suitable as socket and spigot
- Brass with parallel female thread Rp
- Gasket: O-ring EPDM

d (mm)	D (mm)	PN (bar)	Rp (inch)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	D1 (mm)	L (mm)	S (mm)
20	25	16	½	**721 950 106**	10	0.098	17.0	16.5	40	54.5	25
25	32	16	¾	**721 950 107**	5	0.181	18.5	19.0	50	65.2	30
32	40	16	1	**721 950 108**	5	0.270	21.5	22.5	59	76.5	36





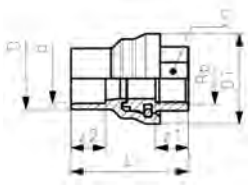
Adaptor Fitting PVC-U/brass R

Model:

- Adapter fitting equally suitable as socket and spigot
- Brass with taper male thread R
- Gasket: O-ring EPDM

d (mm)	D (mm)	PN (bar)	R (inch)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	D1 (mm)	L (mm)	S (mm)
20	25	16	½	**721 950 606**	10	0.129	17	17	40	70	25
25	32	16	¾	**721 950 607**	5	0.232	19	19	50	83	30
32	40	16	1	**721 950 608**	5	0.390	22	23	59	96	36





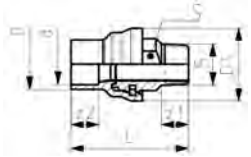
Adaptor Fitting PVC-U/stainless steel Rp

Model:

- Adapter fitting equally suitable as socket and spigot
- Adaptor fitting ABS/stainless steel Rp
- Gasket: O-ring EPDM

d (mm)	D (mm)	PN (bar)	Rp (inch)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	D1 (mm)	L (mm)	S (mm)
20	25	16	½	**721 940 106**	10	0.095	17	17	40	70	25
25	32	16	¾	**721 940 107**	5	0.171	19	19	50	83	30
32	40	16	1	**721 940 108**	5	0.262	22	23	59	96	36





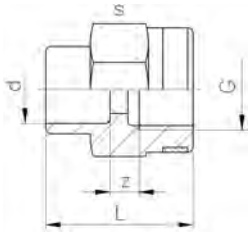
Adaptor Fitting PVC-U/stainless steel R

Model:

- Adapter fitting equally suitable as socket and spigot
- Stainless steel with taper male thread R
- Gasket: O-ring EPDM

PN (bar)	D (mm)	R (inch)	d (mm)	Code	SP	weight (kg)	D1 (mm)	S (mm)	z2 (mm)	z1 (mm)	L (mm)
16	25	½	20	**721 940 606**	10	0.120	40	25	17	17	70
16	32	¾	25	**721 940 607**	5	0.213	50	30	19	19	83
16	40	1	32	**721 940 608**	5	0.320	59	36	23	22	96





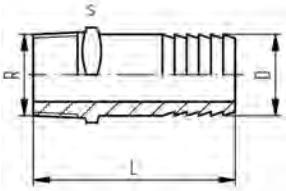
Manometer adaptor sockets PVC-U metric G

Model:

- With solvent cement socket metric and female thread G
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Do not apply solvent-based or other sealing compounds which could damage PVC
- Install with low mechanical stress and avoid large cyclic temperature changes

d (mm)	G (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
12	¼	16	**721 916 204**	10	0.010	4	27	22
16	½	16	**721 916 206**	10	0.026	7	36	32





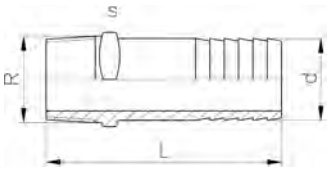
Hose connector PVC-U R

Model:

- With taper male thread R
- With parallel hose connector
- Do not apply solvent-based or other sealing compounds which could damage PVC

R (inch)	PN (bar)	Code	SP	weight (kg)	D (mm)	L (mm)	s (mm)
¼	10	**721 960 704**	10	0.003	12	59	14
⅜	10	**721 960 705**	10	0.006	16	67	19
½	10	**721 960 706**	10	0.019	20	86	22
¾	10	**721 960 707**	10	0.026	25	92	27
1	10	**721 960 708**	5	0.048	30	103	36
1 ¼	10	**721 960 709**	5	0.079	40	115	46





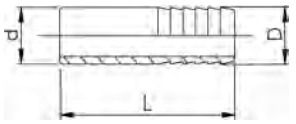
Hose connector PVC R reduced

Model:

- With taper male thread R
- With parallel hose connector
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC

R (inch)	Code	SP	weight (kg)	s (mm)	d (mm)	L (mm)
½	**721 961 706**	10	0.012	22	14	70
¾	**721 961 707**	10	0.021	27	20	80
1	**721 961 708**	5	0.042	36	27	90





Hose connector PVC metric

Model:

- With solvent cement spigot metric and parallel hose connection

d (mm)	PN (bar)	Code	SP	weight (kg)	D (mm)	L (mm)
10	16	**721 960 403**	10	0.002	8	47
12	16	**721 960 404**	10	0.003	12	51
16	16	**721 960 405**	10	0.008	16	57
20	16	**721 960 406**	10	0.016	20	73
25	16	**721 960 407**	10	0.021	25	79
32	16	**721 960 408**	10	0.035	30	89
32	16	**721 960 508**	10	0.035	32	89
40	16	**721 960 409**	5	0.060	40	100
50	16	**721 960 410**	5	0.112	50	105
63	16	**721 960 411**	5	0.180	60	120





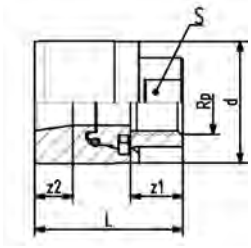
Hose connector PVC-U metric

Model:

- With solvent cement spigot metric and tapered hose connection

d (mm)	PN (bar)	Code	SP	weight (kg)	d1 (mm)	D (mm)	L (mm)
10	16	**721 960 303**	10	0.004	6	12	51
12	16	**721 960 304**	10	0.004	6	12	51
16	16	**721 960 305**	10	0.007	8	16	57
20	16	**721 960 306**	10	0.016	11	22	73





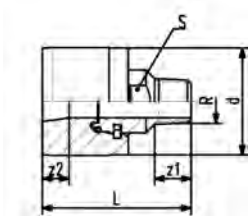
Adaptor fitting PVC-U/brass

Model:

- Brass with parallel female thread Rp
- Gasket: O-ring EPDM

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	L (mm)	S (mm)
40	½	10	**721 950 131**	10	0.279	17.0	12.4	48.2	25
50	½	10	**721 950 132**	5	0.355	17.0	12.5	54.2	25
50	¾	10	**721 950 133**	10	0.362	18.5	13.0	54.9	30
63	½	10	**721 950 134**	10	0.526	17.0	7.1	66.2	25
63	¾	10	**721 950 135**	5	0.531	18.5	13.0	66.9	30
63	1	10	**721 950 136**	5	0.542	21.5	18.9	70.7	36





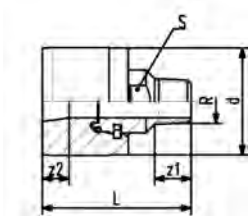
Adaptor fitting PVC-U/brass

Model:

- Brass with taper male thread R
- Gasket: O-ring EPDM

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	L (mm)	S (mm)
40	½	10	**721 950 631**	10	0.352	17.0	12.4	63.2	25
50	½	10	**721 950 632**	10	0.438	17.0	12.5	69.2	25
50	¾	10	**721 950 633**	10	0.442	18.5	13.0	72.9	30
63	½	10	**721 950 634**	10	0.498	17.0	7.1	81.2	25
63	¾	10	**721 950 635**	10	0.512	18.5	13.0	84.9	30
63	1	10	**721 950 636**	10	0.521	21.5	18.9	89.7	36





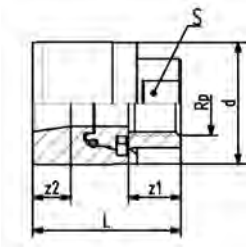
Adaptor fitting PVC-U/stainless steel

Model:

- Stainless steel WN 1.4404 (316L) with taper male thread R
- Gasket: O-ring EPDM

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	L (mm)	S (mm)
40	½	10	**721 940 631**	10	0.335	17.0	12.4	63.2	25
50	½	10	**721 940 632**	10	0.402	17.0	12.5	69.2	25
50	¾	10	**721 940 633**	10	0.414	18.5	13.0	72.9	30
63	½	10	**721 940 634**	10	0.521	17.0	7.1	81.2	25
63	¾	10	**721 940 635**	10	0.533	18.5	13.0	84.9	30
63	1	10	**721 940 636**	10	0.542	21.5	18.9	89.7	36





Adaptor fitting PVC-U/stainless steel

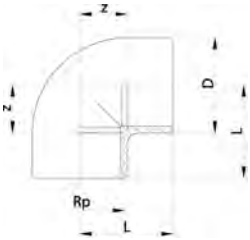
Model:

- Adaptor fitting ABS/stainless steel Rp
- Gasket: O-ring EPDM

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z1 (mm)	z2 (mm)	L (mm)	S (mm)
40	½	10	**721 940 131**	10	0.267	17.0	12.4	63.2	25
50	½	10	**721 940 132**	10	0.345	17.0	12.5	69.2	25
50	¾	10	**721 940 133**	10	0.352	18.5	13.0	72.9	30
63	½	10	**721 940 134**	10	0.432	17.0	7.1	81.2	25
63	¾	10	**721 940 135**	10	0.441	18.5	13.0	84.9	30
63	1	10	**721 940 136**	10	0.453	21.5	18.9	89.7	36

Threaded Fittings





Elbow 90° PVC Rp

Model:

- With parallel female thread Rp
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
⅜	10	**721 101 605**	10	0.013	9	23	23
½	10	**721 101 606**	10	0.017	12	27	27
¾	10	**721 101 607**	10	0.029	15	33	33
1	10	**721 101 608**	10	0.042	19	39	39
1 ¼	10	**721 101 609**	10	0.070	27	48	49
1 ½	10	**721 101 610**	5	0.178	35	61	59
2	10	**721 101 611**	5	0.322	44	75	72





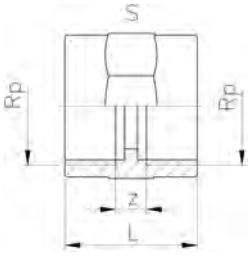
Tee 90° equal PVC Rp

Model:

- With parallel female thread Rp
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)
⅜	10	**721 201 605**	10	0.016	9	23	23
½	10	**721 201 606**	10	0.027	12	28	27
¾	10	**721 201 607**	10	0.039	15	33	33
1	10	**721 201 608**	5	0.072	19	41	39
1 ¼	10	**721 201 609**	100	0.146	27	50	49
1 ½	10	**721 201 610**	10	0.267	36	62	60
2	10	**721 201 611**	10	0.485	44	77	72





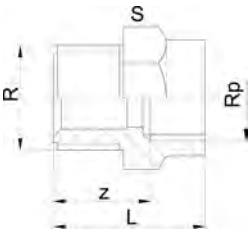
Socket PVC Rp

Model:

- With parallel female thread Rp
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC
- Install with low mechanical stress and avoid large cyclic temperature changes

Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
¼	10	**721 910 604**	10	0.010	7	27	22
⅜	10	**721 910 605**	10	0.015	7	29	27
½	10	**721 910 606**	10	0.024	9	35	32
¾	10	**721 910 607**	10	0.029	9	39	36
1	10	**721 910 608**	10	0.053	11	45	46
1 ¼	10	**721 910 609**	10	0.076	11	49	55
1 ½	10	**721 910 610**	10	0.106	11	49	65
2	10	**721 910 611**	5	0.180	11	57	80





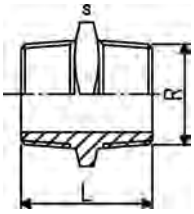
Reducing bush PVC R Rp

Model:

- With taper male thread R and parallel female thread Rp
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

R (inch)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
½	⅜	10	**721 910 834**	10	0.014	25	36	27
¾	½	10	**721 910 837**	10	0.021	25	39	32
1	½	10	**721 910 842**	10	0.029	31	45	32
1	¾	10	**721 910 841**	10	0.031	29	45	36
1 ¼	1	10	**721 910 846**	10	0.050	32	50	46
1 ½	1 ¼	10	**721 910 852**	10	0.065	35	55	55
2	1 ½	10	**721 910 858**	5	0.127	45	65	65





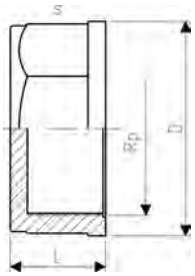
Threaded nipple R PVC-U

Model:

- With taper male thread R
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

R (inch)	PN (bar)	Type	Code	SP	weight (kg)	L (mm)	s (mm)
⅜	10	A	**721 911 905**	10	0.007	37	19
½	10	A	**721 911 906**	10	0.012	45	22
¾	10	A	**721 911 907**	10	0.019	49	27
1	10	A	**721 911 908**	10	0.034	57	36
1 ¼	10	A	**721 911 909**	10	0.052	62	46
1 ½	10	A	**721 911 910**	10	0.070	67	50
2	10	A	**721 911 911**	10	0.126	76	65





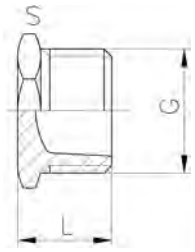
Cap PVC Rp

Model:

- With parallel female thread Rp
- Connection to plastic thread only
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

Rp (inch)	PN (bar)	Code	SP	weight (kg)	D (mm)	L (mm)	s (mm)
⅜	10	**721 960 605**	10	0.012	31	19	27
½	10	**721 960 606**	10	0.018	37	21	32
¾	10	**721 960 607**	10	0.024	42	24	36
1	10	**721 960 608**	10	0.040	50	26	46
1 ¼	10	**721 960 609**	10	0.060	60	29	55
1 ½	10	**721 960 610**	10	0.072	65	31	60
2	10	**721 960 611**	5	0.127	81	36	75





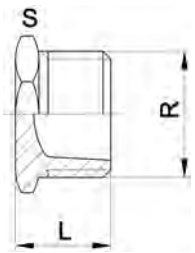
Plug PVC G

Model:

- With parallel male thread G
- Flat gasket necessary for sealing
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

G (inch)	PN (bar)	Code	SP	weight (kg)	L (mm)	s (mm)
⅜	10	**721 960 905**	10	0.005	21	22
½	10	**721 960 906**	10	0.010	25	27
¾	10	**721 960 907**	10	0.018	29	36
1	10	**721 960 908**	10	0.029	32	41
1 ¼	10	**721 960 909**	10	0.048	36	50
1 ½	10	**721 960 910**	10	0.070	37	60
2	10	**721 960 911**	5	0.120	42	75





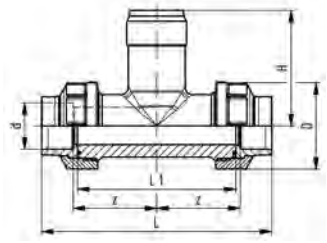
Plug PVC R

Model:

- With taper male thread R
- Install with low mechanical stress and avoid large cyclic temperature changes
- Do not apply solvent-based or other sealing compounds which could damage PVC

R (inch)	PN (bar)	Code	SP	weight (kg)	L (mm)	s (mm)
⅜	10	**721 961 905**	10	0.006	21	22
½	10	**721 961 906**	10	0.011	25	27
¾	10	**721 961 907**	10	0.020	29	36
1	10	**721 961 908**	10	0.030	32	41
1 ¼	10	**721 961 909**	10	0.048	36	50
1 ½	10	**721 961 910**	10	0.071	37	60
2	10	**721 961 911**	5	0.119	42	75





Installation fitting type 310 PVC-U
For socket systems metric

Range of use:

- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512
- Compatible Signet pH/ORP sensors: type 2724, 2725, 2726, 2734, 2736, 2735

Attention:

- Sensor length depends on installation fitting

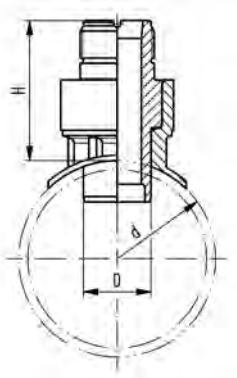
Model:

- Threaded outlet 1 ¼" NPSM
- Union end with solvent cement socket PVC

Type	d (mm)	DN (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
PVMT005	20	15	16	**721 310 006**	1	0.181	**721 310 036**	1	0.181
PVMT007	25	20	16	**721 310 007**	1	0.226	**721 310 037**	1	0.226
PVMT010	32	25	16	**721 310 008**	1	0.303	**721 310 038**	1	0.304
PVMT012	40	32	16	**721 310 009**	1	0.419	**721 310 039**	1	0.479
PVMT015	50	40	16	**721 310 010**	1	0.568	**721 310 040**	1	0.571
PVMT020	63	50	16	**721 310 011**	1	0.879	**721 310 041**	1	0.881

L1 (mm)	D (mm)	H (mm)	L (mm)	Sensor Type	z (mm)
90	43	76	128	flow X0, pH XX	48
100	51	78	144	flow X0, pH XX	53
110	58	81	160	flow X0, pH XX	58
110	72	85	168	flow X0, pH XX	58
120	83	89	188	flow X0, pH XX	63
130	100	95	212	flow X0, pH XX	68





Installation fitting type 312
PVC-U metric glue on saddle

Model:

- Top saddle for solvent cement bonding
- Saddle with threaded outlet 1 ¼" NPSM

Range of use:

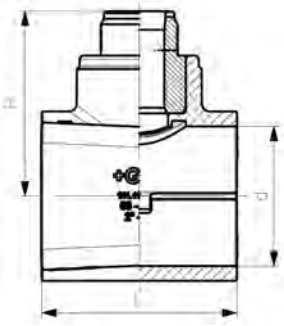
- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512

Attention:

- Sensor length depends on installation fitting

PN (bar)	DN (mm)	d (mm)	Code	SP	weight (kg)	D (mm)	Sensor Type	H (mm)
10	65	75	**721 312 012**	1	0.220	38	flow X1	89
10	80	90	**721 312 013**	1	0.228	38	flow X1	89
10	100	110	**721 312 014**	1	0.225	38	flow X1	89
10	100	125	**721 312 015**	1	0.218	38	flow X1	81
10	125	140	**721 312 016**	1	0.213	38	flow X1	79
10	150	160	**721 312 017**	1	0.217	38	flow X1	76
10	200	200	**721 312 019**	1	0.192	38	flow X1	69
10	200	225	**721 312 020**	1	0.297	38	flow X2	141
10	250	250	**721 312 021**	1	0.295	38	flow X2	137
10	300	315	**721 312 023**	1	0.290	38	flow X2	127





Installation fitting type 312
PVC-U metric clamp on saddle

Model:

- Saddle with threaded outlet 1 ¼" NPSM
- Top saddle for solvent cement bonding
- Seal: Lip seal EPDM

Range of use:

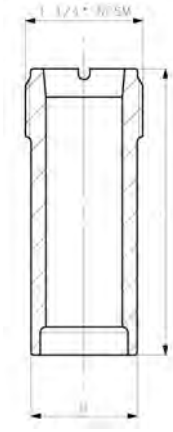
- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512
- Compatible Signet pH/ORP sensors: type 2724, 2725, 2726, 2734, 2736, 2735

Attention:

- Sensor length depends on installation fitting

DN (mm)	PN	d (mm)	Code	SP	weight (kg)	Sensor Type	H (mm)	L (mm)
65	16	75	**198 150 538**	1	0.780	flow X0, pH XX	99	105
80	16	90	**198 150 539**	1	0.835	flow X0, pH XX	105	105
100	16	110	**198 150 540**	1	0.885	flow X0, pH XX	114	105
150	16	160	**198 150 543**	1	1.375	flow X1	157	120
200	16	225	**198 150 545**	1	1.700	flow X1	184	120





Installation fitting type 314
PVC-U metric

Model:

- Threaded outlet 1 ¼" NPSM
- For conventional hot gas back welding according to DVS 2207 part 3

Attention:

- pH sensors can also be used for dimensions above d180/DN150 and below d75/DN65 with 721 314 000 The length might have to be adjusted (sensor has to touch the medium)
- only for pressure less or low-pressure application
- pressure rate depends on quality of hot gas back welding
- please consult the instruction manual
- Installation by trained and certified welders only
- Sensor length depends on installation fitting

Range of use:

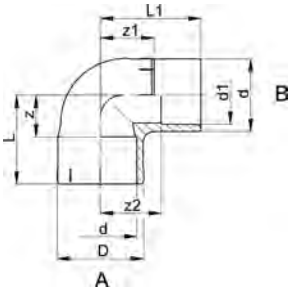
- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512
- Compatible Signet pH/ORP sensors: type 2724, 2725, 2726, 2734, 2736, 2735

DN	d (mm)	PN (bar)	Code	SP	weight (kg)	Sensor Type	D (mm)	L (mm)
65 - 150	75 - 180	-	**721 314 000**	1	0.053	flow X0, pH XX	38	68
200 - 350	200 - 355	-	**721 314 001**	1	0.078	flow X1	38	102
350 - 600	400 - 630	-	**721 314 002**	1	0.153	flow X2	38	178

PRO-FIT

Pipe fittings for solvent cement jointing





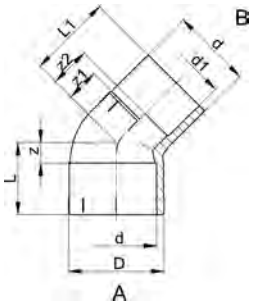
PRO-FIT elbow 90° PVC-U metric

Model:

- Outlet: A = Solvent cemented socket metric
- Outlet: B = Solvent cemented spigot in combination with reducing socket metric
- Direct connection from fitting to fitting allowing shortest possible overall length

d (mm)	d1 (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	z1 (mm)	z2 (mm)	D (mm)	L (mm)	L1 (mm)
20	16	16	**721 100 306**	10	0.011	11	16	18	25	27	32
25	20	16	**721 100 307**	10	0.020	14	18	21	31	33	37
32	25	16	**721 100 308**	10	0.038	17	22	25	38	39	44
40	32	16	**721 100 309**	10	0.069	23	30	34	47	49	56
50	40	16	**721 100 310**	10	0.122	26	36	41	58	57	67
63	50	16	**721 100 311**	10	0.237	33	45	52	73	71	83





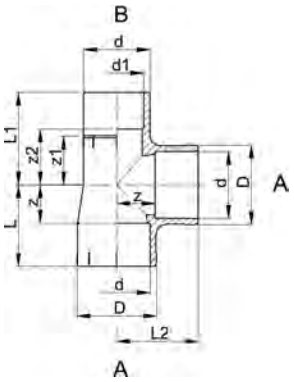
PRO-FIT elbow 45° PVC-U metric

Model:

- Outlet: A = Solvent cemented socket metric
- Outlet: B = Solvent cemented spigot in combination with reducing socket metric
- Direct connection from fitting to fitting allowing shortest possible overall length

d (mm)	d1 (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	z1 (mm)	z2 (mm)	D (mm)	L (mm)	L1 (mm)
20	16	16	**721 150 306**	10	0.010	5	9	11	25	21	25
25	20	16	**721 150 307**	10	0.015	6	11	14	31	25	30
32	25	16	**721 150 308**	10	0.027	8	13	16	38	30	35
40	32	16	**721 150 309**	5	0.053	10	17	21	47	36	43
50	40	16	**721 150 310**	5	0.090	12	18	23	58	43	49
63	50	16	**721 150 311**	5	0.175	14	23	30	73	52	61





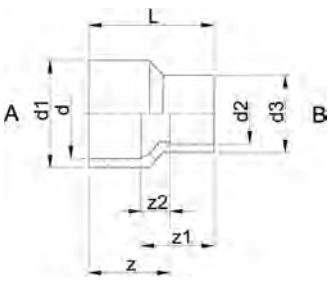
PRO-FIT tee 90° equal PVC-U metric

Model:

- Outlet: A = Solvent cemented socket metric
- Outlet: B = Solvent cemented spigot in combination with reducing socket metric
- Direct connection from fitting to fitting allowing shortest possible overall length

d (mm)	d1 (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	z1 (mm)	z2 (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)
20	16	16	**721 200 306**	10	0.017	11	17	19	25	27	33	27
25	20	16	**721 200 307**	10	0.022	14	19	22	31	33	38	33
32	25	16	**721 200 308**	10	0.051	17	24	27	38	39	46	39
40	32	16	**721 200 309**	10	0.098	23	30	34	47	47	56	49
50	40	16	**721 200 310**	10	0.164	26	36	41	58	57	67	57
63	50	16	**721 200 311**	10	0.329	33	45	52	73	71	83	71





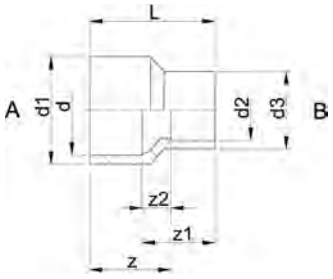
PRO-FIT reducing bush PVC-U metric

Model:

- Outlet: A and B = Solvent cemented spigot in combination with reducing socket metric

d (mm)	d1 (mm)	d3 (mm)	PN (bar)	d2 (mm)	Code	SP	weight (kg)	z (mm)	z1 (mm)	z2 (mm)	L (mm)
10	14	12	16	8	**721 910 903**	10	0.003	15	15	3	27
12	16	12	16	8	**721 910 905**	10	0.004	18	18	6	30
12	16	16	16	10	**721 910 906**	10	0.004	18	18	6	30
16	20	16	16	10	**721 910 908**	10	0.003	21	19	7	33
16	20	16	16	12	**721 910 909**	10	0.004	21	19	7	33
20	25	16	16	12	**721 910 910**	10	0.008	25	21	9	37
20	25	20	16	16	**721 910 911**	10	0.008	25	23	9	39
25	32	16	16	12	**721 910 912**	10	0.014	30	23	11	42
25	32	20	16	16	**721 910 913**	10	0.015	30	26	12	44
25	32	25	16	20	**721 910 914**	10	0.017	30	27	11	46
32	40	20	16	16	**721 910 915**	10	0.025	36	28	14	50
32	40	25	16	20	**721 910 916**	10	0.026	36	30	14	52
32	40	32	16	25	**721 910 917**	10	0.031	36	33	14	55

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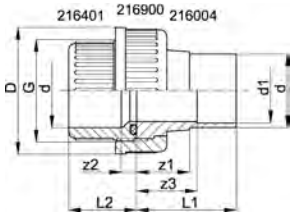


d (mm)	d1 (mm)	d3 (mm)	PN (bar)	d2 (mm)	Code	SP	weight (kg)	z (mm)	z1 (mm)	z2 (mm)	L (mm)
40	50	25	16	20	**721 910 918**	10	0.045	44	34	18	60
40	50	32	16	25	**721 910 919**	10	0.052	44	37	18	63
40	50	40	16	32	**721 910 920**	10	0.058	44	40	18	66
50	63	32	16	25	**721 910 921**	5	0.092	54	42	23	73
50	63	40	16	32	**721 910 922**	5	0.098	54	45	23	76
50	63	50	16	40	**721 910 923**	5	0.111	54	49	23	80
63	75	40	16	32	**721 910 924**	5	0.127	62	46	24	84
63	75	50	16	40	**721 910 925**	5	0.139	62	50	24	88
63	75	63	16	50	**721 910 926**	5	0.167	62	55	24	93
75	90	50	16	40	**721 910 927**	10	0.224	74	56	30	100
75	90	63	16	50	**721 910 928**	10	0.253	74	61	30	105
75	90	75	16	63	**721 910 929**	10	0.265	74	68	30	112

Unions for solvent cement jointing







PRO-FIT union PVC-U metric

Model:

- Union End: Solvent cemented spigot in combination with reducing socket metric
- Union Bush: Solvent socket metric
- Gasket: O-ring EPDM code no. 748 410 005-011

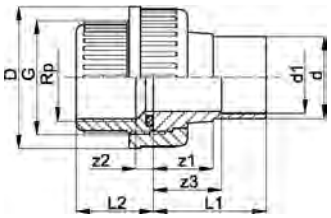
	d (mm)	d1 (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
*	16	12	16	**721 510 305**	10	0.029	**721 510 330**	10	0.029
*	20	16	16	**721 510 306**	10	0.046	**721 510 331**	10	0.044
*	25	20	16	**721 510 307**	10	0.073	**721 510 332**	10	0.073
*	32	25	16	**721 510 308**	10	0.097	**721 510 333**	10	0.095
	40	32	16	**721 510 309**	10	0.169	**721 510 334**	10	0.171
	50	40	16	**721 510 310**	10	0.250	**721 510 335**	10	0.250
	63	50	16	**721 510 311**	5	0.437	**721 510 336**	10	0.449

	d (mm)	G (inch)	z1 (mm)	z2 (mm)	z3 (mm)	D (mm)	L1 (mm)	L2 (mm)
*	16	¾	22	10	24	35	36	24
*	20	1	24	10	26	43	40	26
*	25	1 ¼	25	10	28	51	44	29
*	32	1 ½	27	10	30	58	49	33
	40	2	31	12	35	74	57	39
	50	2 ¼	35	14	40	83	66	46
	63	2 ¾	39	18	46	100	77	58

Adaptor unions







PRO-FIT adaptor union PVC-U metric Rp

Model:

- Union End: Solvent cemented spigot in combination with reducing socket metric
- Union Bush: Threaded socket with parallel female thread Rp
- Gasket: O-ring EPDM code no. 748 410 005-011
- Gasket: O-ring FKM code no. 749 410 005-011 (to be ordered separately)
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC

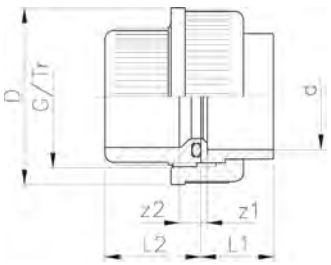
	d (mm)	d1 (mm)	Rp (inch)	PN (bar)	EPDM Code	SP	weight (kg)
*	16	12	⅜	10	**721 510 405**	10	0.032
*	20	16	½	10	**721 510 406**	10	0.046
*	25	20	¾	10	**721 510 407**	10	0.079
*	32	25	1	10	**721 510 408**	10	0.116
	40	32	1 ¼	10	**721 510 409**	10	0.192
	50	40	1 ½	10	**721 510 410**	10	0.263
	63	50	2	10	**721 510 411**	10	0.496

	d (mm)	G (inch)	z1 (mm)	z2 (mm)	z3 (mm)	D (mm)	L1 (mm)	L2 (mm)
*	16	¾	22	13	24	35	36	24
*	20	1	24	13	26	43	40	26
*	25	1 ¼	25	14	28	51	44	29
*	32	1 ½	27	15	30	58	49	32
	40	2	31	19	35	74	57	38
	50	2 ¼	35	26	40	83	66	45
	63	2 ¾	39	33	46	100	77	56

Unions

Unions for solvent cement jointing





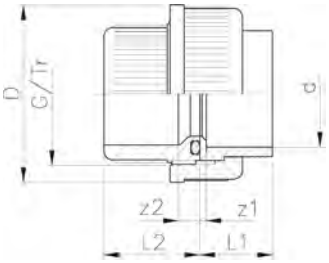
Union for solvent cement joining, PVC metric

Model:

- Union End: solvent socket metric
- Union Bush: Solvent socket metric
- Joining face: with O-ring groove
- Gasket: O-Ring EPDM code no. 748 410 004-016; d90 748 410 248; FKM: 749 410 004-016; d90 749 410 248

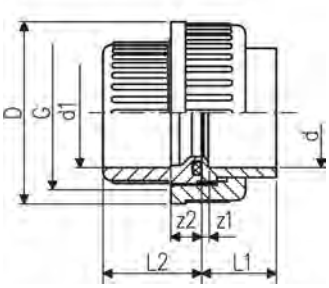
d (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
10	16	**721 510 103**	10	0.021	**721 510 128**	10	0.020
12	16	**721 510 104**	10	0.020	**721 510 129**	10	0.019
16	16	**721 510 105**	10	0.025	**721 510 130**	10	0.025
20	16	**721 510 106**	10	0.041	**721 510 131**	10	0.042
25	16	**721 510 107**	10	0.058	**721 510 132**	10	0.058
32	16	**721 510 108**	10	0.083	**721 510 133**	10	0.084
40	16	**721 510 109**	10	0.147	**721 510 134**	10	0.152
50	16	**721 510 110**	5	0.203	**721 510 135**	2	0.207
63	16	**721 510 111**	5	0.356	**721 510 136**	5	0.361
75	10	**721 510 112**	2	0.614	**721 510 137**	2	0.621
90	10	**721 510 313**	2	0.920	**721 510 338**	2	0.929
110	10	**721 510 114**	1	1.434	**721 510 139**	1	1.492

table continued on the next page



d (mm)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)	G/Tr (inch)
10	3	10	31	15	22	5/8
12	3	10	31	15	22	5/8
16	3	10	35	17	24	3/4
20	3	10	43	19	26	1
25	3	10	51	22	29	1 1/4
32	3	10	58	25	33	1 1/2
40	3	12	72	29	39	2
50	3	14	83	34	46	2 1/4
63	3	18	100	41	58	2 3/4
75	3	18	135	47	62	Tr108x5
90	5	18	158	56	69	Tr128x5
110	5	11	188	66	72	Tr154x6





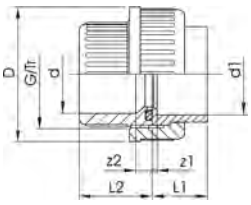
Adaptor union PVC-U metric Inch BS

Model:

- Union End: Solvent cement socket metric
- Union Bush: Solvent cement socket BS inch
- Gasket: O-ring EPDM code no. 748 410 005-011
- Gasket: O-ring FKM code no. 749 410 005-011 (to be ordered separately)

PN (bar)	d (mm)	d1 (inch)	Code	SP	weight (kg)	G (inch)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)
15	16	⅜	**721 513 105**	10	0.025	¾	3	8	35	17	24
15	20	½	**721 513 106**	10	0.040	1	3	9	43	19	26
15	25	¾	**721 513 107**	10	0.065	1 ¼	3	9	51	22	29
15	32	1	**721 513 108**	10	0.090	1 ½	3	9	58	25	33
15	40	1 ¼	**721 513 109**	10	0.155	2	3	10	72	29	39
15	50	1 ½	**721 513 110**	5	0.200	2 ¼	3	10	83	34	46
15	63	2	**721 513 111**	5	0.341	2 ¾	3	10	100	41	58





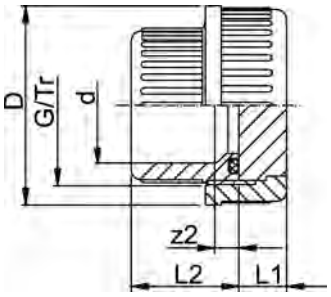
Union for solvent cement jointing, PVC metric - ASTM Socket

Model:

- Union End: Solvent cement socket ASTM
- Union Bush: Solvent socket metric
- Gasket: O-ring EPDM code no. 748 410 005-011
- Gasket: O-ring FKM code no. 749 410 005-011 (to be ordered separately)

d (mm)	Size (inch)	PN (bar)	Code	SP	weight (kg)	G (inch)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)
16	⅜	16	**721 514 105**	10	0.022	¾	3	10	35	22	24
20	½	16	**721 514 106**	10	0.042	1	3	10	43	25	26
25	¾	16	**721 514 107**	10	0.065	1 ¼	3	10	51	28	29
32	1	16	**721 514 108**	10	0.103	1 ½	3	10	58	32	33
40	1 ¼	16	**721 514 109**	10	0.174	2	3	12	72	35	39
50	1 ½	16	**721 514 110**	5	0.239	2 ¼	3	14	83	38	46
63	2	16	**721 514 111**	5	0.356	2 ¾	3	18	100	41	58





Union with union end blank PVC-U metric

Model:

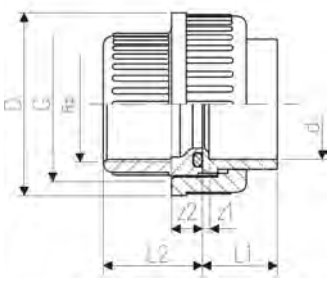
- Union Bush: Solvent socket metric
- Joining face: with O-ring groove

d (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
10	16	**721 510 003**	10	0.020	**721 510 028**	10	0.020
12	16	**721 510 004**	10	0.020	**721 510 029**	10	0.020
16	16	**721 510 005**	10	0.026	**721 510 030**	10	0.026
20	16	**721 510 006**	10	0.041	**721 510 031**	10	0.041
25	16	**721 510 007**	10	0.068	**721 510 032**	10	0.068
32	16	**721 510 008**	10	0.095	**721 510 033**	10	0.095
40	16	**721 510 009**	10	0.159	**721 510 034**	10	0.159
50	16	**721 510 010**	5	0.227	**721 510 035**	5	0.227
63	16	**721 510 011**	16	0.392	**721 510 036**	10	0.405
75	10	**721 510 012**	2	0.679	**721 510 037**	2	0.693
90	10	**721 510 213**	2	1.022	**721 510 238**	2	1.022
110	10	**721 510 014**	1	1.556	**721 510 039**	1	1.573

d (mm)	z2 (mm)	L2 (mm)	D (mm)	L1 (mm)	G/Tr (inch)
10	9	22	31	10	5/8
12	9	22	31	15	5/8
16	10	24	35	10	3/4
20	10	26	43	11	1
25	10	29	51	11	1 1/4
32	10	33	58	12	1 1/2
40	12	39	72	13	2
50	14	46	83	16	2 1/4
63	18	58	100	18	2 3/4
75	18	62	135	22	Tr108x5
90	18	69	158	24	Tr128x5
110	11	72	188	26	Tr154x6

Adaptor Unions





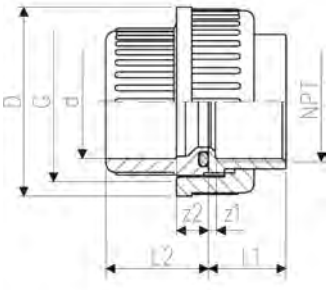
Adaptor union PVC-U metric Rp

Model:

- Union End: Solvent cement socket metric
- Union Bush: Parallel female thread Rp
- Gasket: O-ring EPDM code no. 748 410 004-011
- Gasket: O-ring FKM code no. 749 410 004-011 (to be ordered separately)
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	Rp (inch)	PN (bar)	EPDM Code	SP	weight (kg)	G (inch)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)
12	¼	10	**721 510 204**	10	0.019	⅝	3	12	31	15	22
16	⅜	10	**721 510 205**	10	0.020	¾	3	13	35	17	24
20	½	10	**721 510 206**	10	0.040	1	3	13	43	19	26
25	¾	10	**721 510 207**	10	0.057	1 ¼	3	14	51	22	29
32	1	10	**721 510 208**	10	0.084	1 ½	3	15	58	25	33
40	1 ¼	10	**721 510 209**	10	0.147	2	3	19	72	29	39
50	1 ½	10	**721 510 210**	2	0.218	2 ¼	3	26	83	34	46
63	2	10	**721 510 211**	2	0.383	2 ¾	3	33	100	41	58





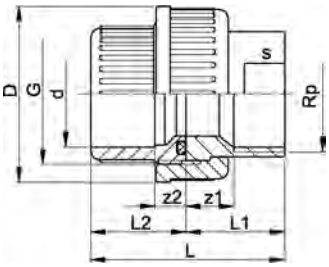
Adaptor Union, PVC metric - ASTM NPT

Model:

- Union End: Taper female thread NPT (ASTM)
- Union Bush: Solvent socket metric
- Gasket: O-ring EPDM code no. 748 410 005-011
- Gasket: O-ring FKM code no. 749 410 005-011 (to be ordered separately)
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC

d (mm)	PN (bar)	EPDM Code	SP	weight (kg)	G (inch)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)
16	10	**721 514 205**	10	0.026	¾	4	10	35	17	24
20	10	**721 514 206**	10	0.042	1	2	10	43	19	26
25	10	**721 514 207**	10	0.068	1 ¼	4	10	51	22	29
32	10	**721 514 208**	10	0.093	1 ½	4	10	58	25	33
40	10	**721 514 209**	2	0.150	2	6	12	72	29	39
50	10	**721 514 210**	2	0.228	2 ¼	11	14	83	34	46
63	10	**721 514 211**	2	0.387	2 ¾	17	18	100	41	58





Adaptor union PVC-U/stainless steel metric Rp

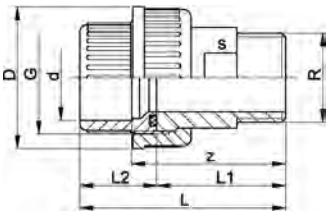
Model:

- Union nut: PVC-U
- Union Bush: Solvent cement socket PVC-U metric
- Union End: Stainless Steel 1.4404 (316L), parallel female thread Rp
- Gasket: O-ring EPDM code no. 748 410 005-011

Rp (inch)	d (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
⅜	16	16	**721 540 205**	10	0.053	**721 540 230**	10	0.053
½	20	16	**721 540 206**	10	0.096	**721 540 231**	10	0.096
¾	25	16	**721 540 207**	5	0.154	**721 540 232**	10	0.134
1	32	16	**721 540 208**	5	0.212	**721 540 233**	10	0.212
1 ¼	40	16	**721 540 209**	2	0.356	**721 540 234**	1	0.343
1 ½	50	16	**721 540 210**	2	0.455	**721 540 235**	1	0.455
2	63	16	**721 540 211**	2	0.730	**721 540 236**	1	0.721

G (inch)	z1 (mm)	z2 (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	s (mm)
¾	9	10	35	43	19	24	19
1	11	10	43	50	24	26	24
1 ¼	11	10	51	55	26	29	29
1 ½	12	10	58	61	29	33	36
2	14	12	72	71	33	39	45
2 ¼	15	14	83	79	34	46	54
2 ¾	15	18	100	95	39	58	63





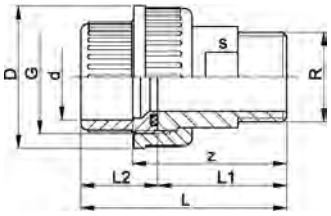
Adaptor union PVC-U/stainless steel metric R

Model:

- Union nut: PVC-U
- Union Bush: Solvent cement socket PVC-U metric
- Union End: Stainless Steel 1.4404 (316L), taper male thread R
- Gasket: O-ring EPDM code no. 748 410 005-011

d (mm)	R (inch)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
16	⅜	16	**721 540 705**	10	0.073	**721 540 730**	1	0.073
20	½	16	**721 540 706**	10	0.126	**721 540 731**	10	0.126
25	¾	16	**721 540 707**	10	0.174	**721 540 732**	5	0.170

table continued on the next page



d (mm)	R (inch)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
32	1	16	**721 540 708**	5	0.262	**721 540 733**	10	0.262
40	1 ¼	16	**721 540 709**	2	0.476	**721 540 734**	1	0.472
50	1 ½	16	**721 540 710**	2	0.535	**721 540 735**	1	0.535
63	2	16	**721 540 711**	2	0.934	**721 540 736**	1	0.931

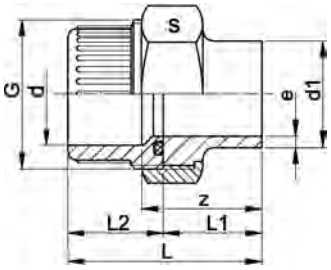
d (mm)	G (inch)	z (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	s (mm)
16	¾	40	35	54	30	24	19
20	1	44	43	60	34	26	24
25	1 ¼	46	51	65	36	29	32
32	1 ½	50	58	72	40	33	37
40	2	58	72	84	46	39	48
50	2 ¼	62	83	93	48	46	54
63	2 ¾	73	100	111	55	58	69



Adaptor union PVC-U/stainless steel metric Welding end

Model:

- Union Bush: Solvent cement socket PVC-U metric
- Union End: Stainless Steel 1.4404 (316L) with welding end
- Union Nut: Stainless Steel WN 1.4404 (316L)
- Gasket: O-ring EPDM code no. 748 410 005-011



d (mm)	d1 (mm)	PN (bar)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
16	17	16	**721 545 505**	10	0.101	**721 545 530**	10	0.101
20	21	16	**721 545 506**	10	0.176	**721 545 531**	10	0.168
25	27	16	**721 545 507**	5	0.204	**721 545 532**	10	0.198
32	34	16	**721 545 508**	5	0.313	**721 545 533**	10	0.313
40	42	16	**721 545 509**	2	0.493	**721 545 534**	1	0.493
50	48	16	**721 545 510**	2	0.566	**721 545 535**	1	0.605
63	60	16	**721 545 511**	2	0.902	**721 545 536**	1	0.902

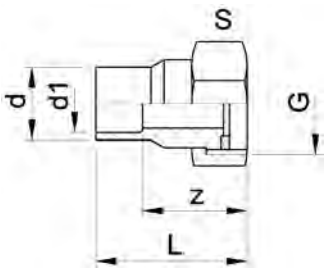
d (mm)	G (inch)	z (mm)	L (mm)	L1 (mm)	L2 (mm)	e (mm)	s (mm)
16	¾	28	42	18	24	1.6	32
20	1	32	48	22	26	2.0	41
25	1 ¼	33	52	23	29	2.0	46
32	1 ½	36	58	26	33	2.0	55
40	2	38	64	26	39	2.0	68
50	2 ¼	42	73	28	46	2.0	74
63	2 ¾	50	88	32	58	2.6	88



Tap connectors PVC-U/brass metric G

Model:

- Union End: PVC-U, solvent cement socket / spigot metric
- Union Nut: brass with female thread G
- Gasket: flat gasket EPDM code no. 748 400 030; 748 400 005-006



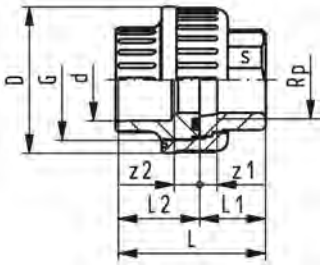
d (mm)	d1 (mm)	G (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	L (mm)	s (mm)
16	12	½	16	**721 550 305**	10	0.031	22	34	24
20	16	¾	16	**721 550 306**	10	0.049	24	38	30
25	20	1	16	**721 550 307**	10	0.079	27	43	38



Adaptor union PVC-U/malleable iron galvanised metric Rp

Model:

- Union nut: PVC-U
- Union Bush: Solvent cement socket PVC-U metric
- Union End: malleable iron with parallel female thread Rp
- Gasket: O-ring EPDM code no. 748 410 006-014; d90 748 410 248



d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)
20	½	16	**721 530 306**	10	0.073
25	¾	16	**721 530 307**	5	0.107
32	1	16	**721 530 308**	5	0.154
40	1 ¼	16	**721 530 309**	2	0.282
50	1 ½	16	**721 530 310**	2	0.377
63	2	16	**721 530 311**	2	0.594
75	2 ½	10	**721 530 312**	2	1.008
90	3	10	**721 530 313**	2	1.350

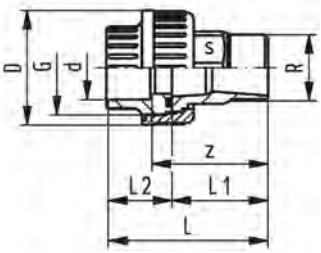
d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	z1 (mm)	z2 (mm)	G (R/Rp BS Thread) (inch)	s (mm)
20	43	48	22	26	9	10	1	25
25	51	51	22	29	7	10	1 1/4	31
32	58	58	26	33	9	10	1 1/2	38
40	72	69	31	39	12	12	2	48
50	83	78	33	46	14	14	2 1/4	54
63	100	91	35	58	11	18	2 3/4	67
75	127	101	39	62	12	18	Tr 108x5	85
90	150	114	45	69	15	19	Tr 128x5	96



Adaptor union PVC-U/malleable iron galvanised metric R

Model:

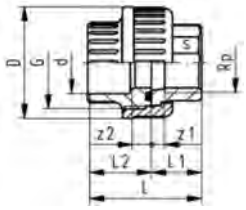
- Union nut: PVC-U
- Union Bush: Solvent cement socket PVC-U metric
- Union End: Malleable iron with taper male thread R
- Gasket: O-ring EPDM code no. 748 410 006-014; d90 748 410 248



d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)
20	½	16	**721 530 806**	10	0.107
25	¾	16	**721 530 807**	5	0.159
32	1	16	**721 530 808**	5	0.213
40	1 ¼	16	**721 530 809**	2	0.426
50	1 ½	16	**721 530 810**	2	0.528
63	2	16	**721 530 811**	5	0.863
75	2 ½	10	**721 530 812**	2	1.441
90	3	10	**721 530 813**	1	1.873

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	z (mm)	G (R/Rp BS Thread) (inch)	s (mm)
20	43	66	40	26	50	1	25
25	51	72	43	29	53	1 1/4	31
32	58	80	48	33	58	1 1/2	38
40	72	95	57	39	69	2	48
50	83	104	59	46	73	2 1/4	54
63	100	118	62	58	80	2 3/4	67
75	127	137	75	62	93	Tr 108x5	85
90	150	149	80	69	99	Tr 128x5	96





Adaptor union PVC-U/brass metric Rp

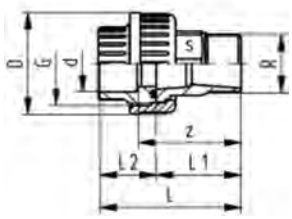
Model:

- Union nut: PVC-U
- Union bush: Solvent cement socket metric
- Union End: Brass with parallel female thread Rp
- Gasket: O-ring EPDM code no. 748 410 006-014; d90 748 410 248

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)
20	½	16	**721 550 506**	10	0.088
25	¾	16	**721 550 507**	10	0.145
32	1	16	**721 550 508**	5	0.175
40	1 ¼	16	**721 550 509**	2	0.322
50	1 ½	16	**721 550 510**	2	0.467
63	2	16	**721 550 511**	8	0.776
75	2 ½	10	**721 550 512**	2	1.360
90	3	10	**721 550 513**	2	2.003

d (mm)	Rp (inch)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	s (mm)	z1 (mm)	z2 (mm)	G (R/Rp BS Thread) (inch)
20	½	43	48	22	26	25	7	10	1
25	¾	51	54	25	29	30	9	10	1 1/4
32	1	58	60	27	33	36	8	11	1 1/2
40	1 ¼	72	70	31	39	46	10	13	2
50	1 ½	83	81	35	46	55	13	15	2 1/4
63	2	100	98	40	58	65	14	20	2 3/4
75	2 ½	127	109	47	62	85	16	18	Tr 108x5
90	3	150	121	52	69	95	18	18	Tr 128x5





Adaptor union PVC-U/brass metric R

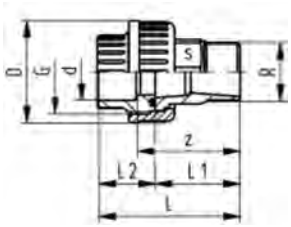
Model:

- Union nut: PVC-U
- Union Bush: Solvent cement socket PVC-U metric
- Union End: Brass with taper male thread R
- Gasket: O-ring EPDM code no. 748 410 006-014; d90 748 410 248

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)
20	½	16	**721 550 906**	10	0.125
25	½	16	**721 550 957**	5	0.196
25	¾	16	**721 550 907**	5	0.196
25	1	16	**721 550 967**	5	0.307
32	½	16	**721 550 958**	5	0.297
32	¾	16	**721 550 968**	5	0.297
32	1	16	**721 550 908**	5	0.283
40	1 ¼	16	**721 550 909**	2	0.502
50	1 ½	16	**721 550 910**	2	0.681
63	2	16	**721 550 911**	2	1.101
75	2 ½	10	**721 550 912**	2	1.706
90	3	10	**721 550 913**	1	2.662

d (mm)	R (inch)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	z (mm)	G (R/Rp BS Thread) (inch)	s (mm)
20	½	43	63	37	26	47	1	25
25	½	51	66	37	29	47	1 1/4	30
25	¾	51	71	42	29	52	1 1/4	30
25	1	51	75	46	29	56	1 1/4	30
32	½	58	70	37	33	48	1 1/2	36
32	¾	58	75	42	33	53	1 1/2	36
32	1	58	79	46	33	57	1 1/2	36
40	1 ¼	72	91	52	39	65	2	46

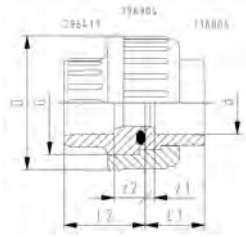
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d (mm)	R (inch)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	z (mm)	G (R/Rp BS Thread) (inch)	s (mm)
50	1 ½	83	102	56	46	71	2 1/4	55
63	2	100	125	67	58	87	2 3/4	65
75	2 ½	127	139	77	62	95	Tr 108x5	85
90	3	150	155	86	69	104	Tr 125x8	95

Thread unions





Thread union PVC-U Rp Rp

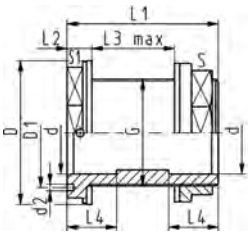
Model:

- Union nut: PVC-U
- Union Bush: Parallel female thread Rp
- Union End: Parallel female thread Rp
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC
- Gasket: O-ring EPDM code no. 748 410 004-011
- Gasket: O-ring FKM code no. 749 410 004-011 (to be ordered separately)

Rp (inch)	PN (bar)	Code	SP	weight (kg)	G (inch)	z1 (mm)	z2 (mm)	D (mm)	L1 (mm)	L2 (mm)
¼	10	**721 510 604**	10	0.019	⅝	3	12	31	22	15
⅜	10	**721 510 605**	10	0.027	¾	3	13	35	24	17
½	10	**721 510 606**	10	0.042	1	3	13	43	26	19
¾	10	**721 510 607**	10	0.065	1 ¼	3	14	51	29	22
1	10	**721 510 608**	10	0.093	1 ½	3	15	58	32	25
1 ¼	10	**721 510 609**	10	0.160	2	3	19	72	38	29
1 ½	10	**721 510 610**	2	0.220	2 ¼	3	26	83	45	34
2	10	**721 510 611**	5	0.415	2 ¾	3	33	100	56	41

Tank adaptors





Tank adaptor for fix position stop
Compact PVC-U metric

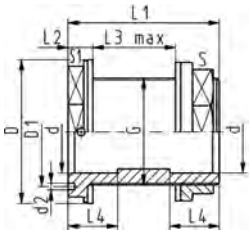
Model:

- End connection: solvent cement socket, metric
- Gasket: flat gasket EPDM
- Washer: PP
- Run-out holes: Two holes in octagonal head
- FKM flat gasket available for tank adaptor type 050

d (mm)	PN (bar)	EPDM Code	SP	weight (kg)
16	16	**161 050 445**	75	0.048
20	16	**161 050 446**	50	0.066
25	16	**161 050 447**	70	0.170
32	16	**161 050 448**	50	0.144
40	16	**161 050 449**	30	0.238
50	16	**161 050 450**	20	0.260
63	16	**161 050 451**	15	0.398

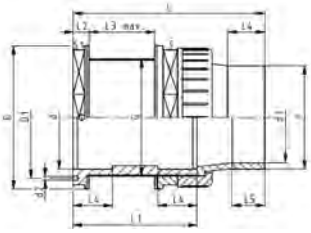
d (mm)	L3 max (mm)	Diameter of bore in tank side (mm)	D1 (mm)	S (mm)	D (mm)	L2 (mm)	S1 (mm)	L4 (mm)	L1 (mm)	d2 (mm)	G (inch)
16	28	28	29	32	44	11	40	14	58	5	¾
20	28	35	35	40	54	12	50	16	61	5	1
25	28	43	42	50	60	13	55	19	65	5	1 ¼

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d (mm)	L3 max (mm)	Diameter of bore in tank side (mm)	D1 (mm)	S (mm)	D (mm)	L2 (mm)	S1 (mm)	L4 (mm)	L1 (mm)	d2 (mm)	G (inch)
32	28	49	49	56	69	13	65	22	67	5	1 ½
40	29	61	59	69	84	13	80	26	72	5	2
50	30	67	70	76	92	15	85	31	76	5	2 ¼
63	35	83	82	95	108	15	100	38	84	5	2 ¾





Tank adaptor for fix position stop
PVC-U, Union end with spigot / reducing socket metric

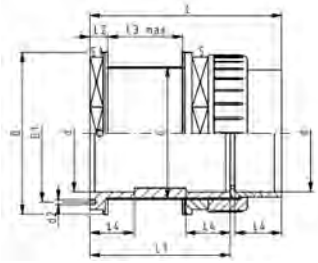
Model:

- Gaskets: flat gaskets EPDM
- Washer: PP
- Run-out holes: Two holes in octagonal head
- FKM flat gaskets available for tank adaptor type 050

d (mm)	d1 (mm)	PN (bar)	EPDM Code	SP	weight (kg)
16	12	16	**161 050 345**	1	0.068
20	16	16	**161 050 346**	1	0.102
25	20	16	**161 050 347**	1	0.157
32	25	16	**161 050 348**	1	0.220
40	32	16	**161 050 349**	1	0.353
50	40	16	**161 050 350**	1	0.438
63	50	16	**161 050 351**	1	0.680

d (mm)	L (mm)	D (mm)	L1 (mm)	L5 (mm)	L4 (mm)	S1 (mm)	L2 (mm)	S (mm)	D1 (mm)	Diameter of bore in tank side (mm)	L3 max (mm)	G (inch)	d2 (mm)
16	96	44	58	12	14	40	11	32	29	28	19	¾	5
20	104	54	61	14	16	50	12	40	35	35	17	1	5
25	112	60	65	16	19	55	13	50	42	43	18	1 ¼	5
32	119	69	67	19	22	65	13	56	49	49	19	1 ½	5
40	132	84	72	22	26	80	13	69	59	61	16	2	5
50	145	92	76	26	31	85	15	76	70	67	16	2 ¼	5
63	163	108	84	31	38	100	15	95	82	83	19	2 ¾	5





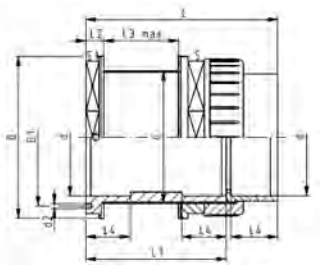
Tank adaptor for fix position stop
PVC-U, Union end with socket metric

Model:

- Gaskets: flat gaskets EPDM
- Washer: PP
- Run-out holes: Two holes in octagonal head
- FKM flat gaskets available for tank adaptor type 050

d (mm)	PN (bar)	Code	SP	weight (kg)
16	16	**161 050 245**	1	0.064
20	16	**161 050 246**	1	0.070
25	16	**161 050 247**	1	0.100
32	16	**161 050 248**	1	0.196
40	16	**161 050 249**	1	0.328
50	16	**161 050 250**	1	0.395
63	16	**161 050 251**	1	0.530

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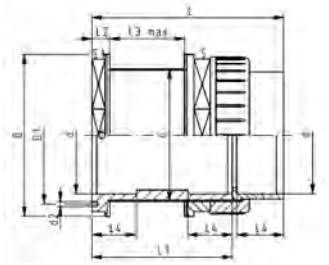
d (mm)	L (mm)	L2 (mm)	L1 (mm)	D (mm)	L3 max (mm)	Diameter of bore in tank side (mm)	S1 (mm)	L4 (mm)	d2 (mm)	D1 (mm)	S (mm)	G (inch)
16	77	11	58	44	19	28	40	14	5	29	32	¾
20	83	12	61	54	17	35	50	16	5	35	40	1
25	90	13	65	60	18	43	55	19	5	42	50	1 ¼
32	95	13	67	69	19	49	65	22	5	49	56	1 ½
40	104	13	72	84	16	61	80	26	5	59	69	2
50	113	15	76	92	16	67	85	31	5	70	76	2 ¼
63	128	15	84	108	19	83	100	38	5	82	95	2 ¾



Tank adaptor for fix position stop PVC-U with O-Ring gasket

Model:

- Gaskets: O-Ring EPDM, flat gasket EPDM
- Washer: PP
- Run-out holes: Two holes in octagonal head
- For round tanks



d (mm)	PN (bar)	Code	SP	weight (kg)
16	16	**161 050 385**	1	0.040
20	16	**161 050 386**	1	0.070
25	16	**161 050 387**	1	0.160
32	16	**161 050 388**	1	0.200
40	16	**161 050 389**	1	0.240
50	16	**161 050 390**	1	0.400
63	16	**161 050 391**	1	0.530

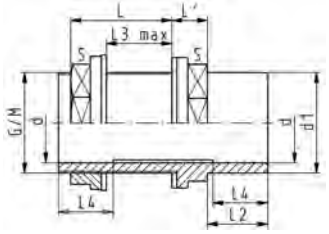
d (mm)	G (inch)	d2 (mm)	D1 (mm)	S (mm)	L3 max (mm)	Diameter of bore in tank side (mm)	S1 (mm)	L4 (mm)	L (mm)	L2 (mm)	L1 (mm)	D (mm)
16	¾	5	29	32	19	28	40	14	77	11	58	44
20	1	5	35	40	17	35	50	16	83	12	61	54
25	1 ¼	5	42	50	18	43	55	19	90	13	65	60
32	1 ½	5	49	56	19	49	65	22	95	13	67	69
40	2	5	59	69	16	61	80	26	104	13	72	84
50	2 ¼	5	70	76	16	67	85	31	113	15	76	92
63	2 ¾	5	82	95	19	83	100	38	128	15	84	108



Tank adaptor for adjustable stop PVC-U metric

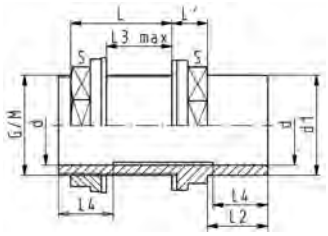
Model:

- Gasket: flat gasket EPDM
- Washer: PP
- Spare parts on request



d (mm)	d1 (mm)	Code	SP	weight (kg)
20	25	**161 050 206**	75	0.046
25	32	**161 050 207**	50	0.066
32	40	**161 050 208**	50	0.106
40	50	**161 050 209**	35	0.190
50	63	**161 050 210**	25	0.248
63	75	**161 050 211**	15	0.352
75	90	**161 050 212**	20	0.539
90	110	**161 050 213**	10	1.083
110	125	**161 050 214**	6	1.350

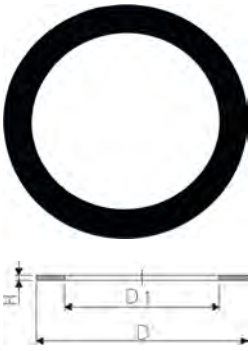
table continued on the next page



d (mm)	L3 max (mm)	Diameter of bore in tank side (mm)	G (inch)	L1 (mm)	L2 (mm)	L (mm)	L4 (mm)	s (mm)	M
20	23	28	¾	13	19	42	16	32	
25	23	35	1	15	22	45	19	40	
32	24	43	1 ¼	17	26	49	22	50	
40	21	55	1 ¾	19	31	48	26	60	
50	21	61	2	21	38	52	31	69	
63	23	77	2 ½	23	44	53	38	85	
75	20	89	3	26	51	56	44	100	
90	20	115		32	61	62	51	125	M113
110	22	135		36	69	66	61	147	M133

Spare Parts Unions

Tank adaptor



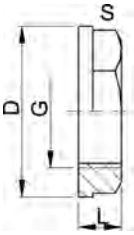
Flat Gasket union
For tank adaptor type 050

Model:

- Hardness approx. 65° Shore
- Dimension size "inch" correspond with the thread dimension "G" of the tank adaptor

Size (inch)	EPDM Code	weight (kg)	FKM Code	weight (kg)	D (mm)	D1 (mm)	H (mm)
¾	**748 400 005**	0.002	**749 400 005**	0.020	24	17	2
1	**748 400 006**	0.002	**749 400 006**	0.003	30	21	3
1 ¼	**748 400 007**	0.003	**749 400 007**	0.004	38	27	3
1 ½	**748 400 008**	0.010	**749 400 008**	0.002	44	32	3
2	**748 400 009**	0.007	**749 400 009**	0.003	55	42	3
2 ¼	**748 400 010**	0.004	**749 400 010**	0.007	62	46	3
2 ¾	**748 400 011**	0.005	**749 400 011**	0.006	78	60	3





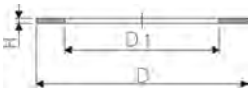
Backing nut PVC-U tank adaptor

Model:

- With G thread ISO 228/1
- Spare part for tank adaptor type 050

M	G (inch)	Code	SP	weight (kg)	D (mm)	L (mm)	s (mm)
	¾	**161 490 630**	400	0.007	39	13	32
	1	**161 490 632**	200	0.012	48	15	40
	1 ¼	**161 490 634**	100	0.019	58	17	50
	1 ½	**161 490 635**	100	0.027	65	18	56
	1 ¾	**161 490 636**	75	0.036	72	19	64
	2	**161 490 637**	50	0.043	79	21	69
	2 ¼	**161 490 638**	50	0.053	86	21	76
	2 ½	**161 490 639**	25	0.063	94	23	85
	2 ¾	**161 490 640**	25	0.092	106	25	95
	3	**161 490 641**	20	0.101	112	26	100
	4	**161 490 644**	10	0.164	139	32	126





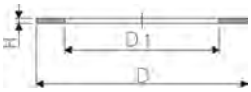
Washer PP for tank adaptor

Model:

- Spare part for tank adaptor type 050

d (mm)	d (inch)	Code	SP	weight (kg)	H (mm)	D1 (mm)	D (mm)
3/4	3/4	**727 490 005**		0.002	3	27	39
1	1	**727 490 006**		0.002	3	34	47
1 1/4	1 1/4	**727 490 007**	0	0.010	3	43	58
1 1/2	1 1/2	**727 490 108**	0	0.004	4	49	65
1 3/4	1 3/4	**727 490 008**		0.024	4	55	72
2	2	**727 490 009**		0.028	4	61	79
2 1/4	2 1/4	**727 490 010**		0.007	4	67	86
2 1/2	2 1/2	**727 490 011**	10	0.008	4	77	95
2 3/4	2 3/4	**727 490 111**	1	0.013	4	83	106
3	3	**727 490 012**		0.013	5	90	112
M113	M113	**727 490 013**		0.021	5	115	139
M133	M133	**727 490 014**		0.025	5	135	160





Flat Gasket inside the tank
For tank adaptor type 050

Model:

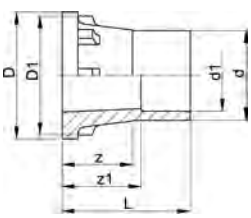
- Hardness approx. 65° Shore
- Dimension size "inch" correspond with the thread dimension "G" of the tank adaptor

Size (inch)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)	D (mm)	D1 (mm)	H (mm)
¾	**748 400 007**	1	0.003	**749 400 007**	1	0.004	38	27	3
1	**748 400 042**	1	0.003	**749 400 042**	1	0.003	46	34	3
1 ¼	**748 400 009**	1	0.007	**749 400 009**	1	0.003	55	42	3
1 ½	**748 400 043**	1	0.005	**749 400 043**	1	0.009	69	49	3
2	**748 400 011**	1	0.005	**749 400 011**	1	0.006	78	60	3
2 ¼	**748 400 044**	1	0.008	**749 400 044**	1	0.009	90	64	3
2 ¾	**748 400 045**	1	0.011	**749 400 045**	1	0.011	106	82	3

Union Ends







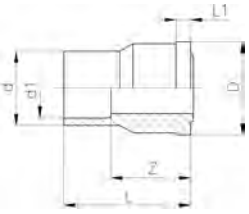
Union end with spigot PVC-U metric

Model:

- Solvent cement spigot in combination with reducing socket metric
- For unions and diaphragm valve Type 514

	d (mm)	d1 (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	z1 (mm)	D (mm)	D1 (mm)	L (mm)
*	16	12	16	**721 500 405**	10	0.010	22	24	24	22	36
*	20	16	16	**721 500 406**	10	0.009	24	26	30	28	40
*	25	20	16	**721 500 407**	10	0.026	25	28	39	36	44
*	32	25	16	**721 500 408**	10	0.035	27	30	45	42	49
	40	32	16	**721 500 409**	10	0.055	31	35	57	53	57
	50	40	16	**721 500 410**	10	0.085	35	40	63	59	66
	63	50	16	**721 500 411**	10	0.108	39	46	79	74	77





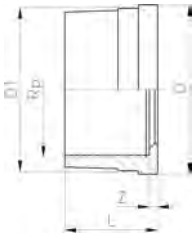
Union end PVC-U metric

Model:

- For tap connector code no. 721 550 305-307

d (mm)	d1 (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)	L1 (mm)
16	12	16	**721 600 305**	2000	0.005	22	19	34	3
20	16	16	**721 600 306**	800	0.009	24	24	38	5
25	20	16	**721 600 307**	1200	0.016	27	30	43	5





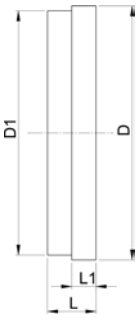
Union end PVC-U Rp

Model:

- Parallel female thread Rp

Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	D1 (mm)	L (mm)
¼	10	**721 600 654**	970	0.004	5	20	18	15
⅜	10	**721 600 655**	2000	0.005	6	24	22	17
½	10	**721 600 656**	1430	0.010	6	30	28	19
¾	10	**721 600 657**	1200	0.015	7	39	36	22
1	10	**721 600 658**	800	0.019	8	45	42	25
1 ¼	10	**721 600 659**	500	0.038	10	57	53	29
1 ½	10	**721 600 660**	300	0.057	11	63	59	34
2	10	**721 600 661**	170	0.102	18	78	74	41



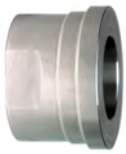


Union end blank PVC-U

Model:

- For unions, tank adaptor and daphragm valve type 514
- Flat sealing faces

d (mm)	DN (mm)	Size (inch)	PN (bar)	Code	SP	weight (kg)	D (mm)	D1 (mm)	L (mm)	L1 (mm)
10/12		1/8	16	**721 600 004**	900	0.006	20	18	9	4
16	10	3/8	16	**721 600 005**	800	0.004	24	22	10	5
20	15	1/2	16	**721 600 006**	500	0.009	30	28	11	5
25	20	3/4	16	**721 600 007**	400	0.017	39	36	11	6
32	25	1	16	**721 600 008**	300	0.025	45	42	12	6
40	32	1 1/4	16	**721 600 009**		0.042	57	53	13	7
50	40	1 1/2	16	**721 600 010**		0.061	63	59	16	7
63	50	2	16	**721 600 011**		0.108	78	74	18	8
75	65	2 1/2	10	**721 600 012**		0.216	101	90	22	10
90	80	3	10	**721 600 013**		0.333	121	108	24	11
110	100	4	10	**721 600 014**		0.530	146	131	26	12





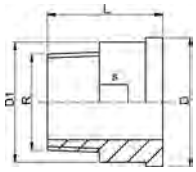
Union end stainless steel Rp

Model:

- Material: Stainless Steel 1.4404 (316L)
- Parallel female thread Rp

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	D1 (mm)	L (mm)	s (mm)
16	⅜	16	**724 600 655**	10	0.030	9	24	22	19	19
20	½	16	**724 600 656**	10	0.060	11	30	28	24	24
25	¾	16	**724 600 657**	10	0.092	11	39	36	26	29
32	1	16	**724 600 658**	10	0.137	12	45	42	29	36
40	1 ¼	16	**724 600 659**	10	0.226	14	57	53	33	45
50	1 ½	16	**724 600 660**	10	0.314	15	63	59	34	54
63	2	16	**724 600 661**	45	0.438	15	78	74	39	63





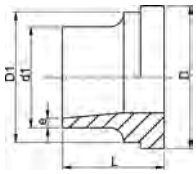
Union end stainless steel R

Model:

- Material: Stainless Steel 1.4404 (316L)
- Taper male thread R

d (mm)	R (inch)	PN (bar)	Code	SP	weight (kg)	D (mm)	D1 (mm)	L (mm)	s (mm)
16	⅜	16	**724 600 705**	10	0.052	24	22	30	19
20	½	16	**724 600 706**	10	0.083	30	28	34	24
25	¾	16	**724 600 707**	10	0.125	39	36	36	32
32	1	16	**724 600 708**	10	0.189	45	42	40	37
40	1 ¼	16	**724 600 709**	10	0.356	57	53	46	48
50	1 ½	16	**724 600 710**	10	0.407	63	59	48	54
63	2	16	**724 600 711**	10	0.668	78	74	55	69





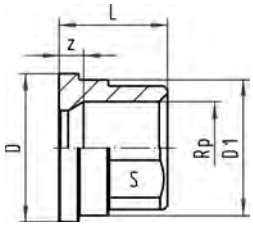
Union end stainless steel Welding end

Model:

- Material: Stainless Steel 1.4404 (316L)

d1 (mm)	d (mm)	PN (bar)	Code	SP	weight (kg)	D (mm)	D1 (mm)	L (mm)	e (mm)
17	16	16	**724 605 505**	10	0.029	24	22	18	1.6
21	20	16	**724 605 506**	10	0.046	30	28	22	2.0
27	25	16	**724 605 507**	10	0.080	39	36	23	2.0
34	32	16	**724 605 508**	10	0.112	45	42	26	2.0
42	40	16	**724 605 509**	10	0.188	57	53	26	2.0
48	50	16	**724 605 510**	10	0.222	63	59	28	2.0
60	63	16	**724 605 511**	10	0.361	78	74	32	2.6





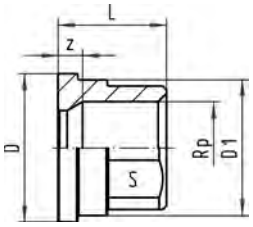
Union end brass Rp

Model:

- Union End: Brass with parallel female thread Rp

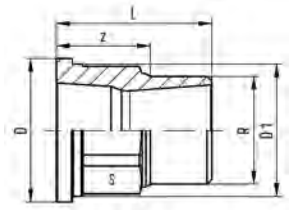
Rp (inch)	d (mm)	Code	SP	weight (kg)	L (mm)	s (mm)	D (mm)	D1 (mm)	z (mm)
½	20	**720 600 236**	1	0.059	22	25	30	28	5
¾	25	**720 600 237**	1	0.100	25	30	39	36	6
1	32	**720 600 238**	1	0.128	27	36	45	42	6
1 ¼	40	**720 600 239**	1	0.211	31	46	56	53	7

table continued on the next page



Rp (inch)	d (mm)	Code	SP	weight (kg)	L (mm)	s (mm)	D (mm)	D1 (mm)	z (mm)
1 ½	50	**720 600 240**	1	0.324	35	55	62	59	7
2	63	**720 600 241**	1	0.510	40	65	78	74	8
2 ½	75	**720 600 242**	1	0.893	47	85	100	92	10
3	90	**720 600 243**	1	1.395	52	95	121	110	11





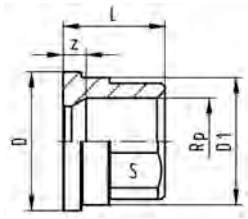
Union end brass R

Model:

- Union End: Brass with taper male thread R

d (mm)	R (inch)	Code	SP	weight (kg)	z (mm)	D1 (mm)	D (mm)	s (mm)	L (mm)
20	½	**720 600 246**	1	0.092	22	28	30	25	37
25	¾	**720 600 247**	1	0.151	25	36	39	30	42
25	½	**720 600 257**	1	0.142	27	36	39	30	42
32	1	**720 600 248**	1	0.216	28	42	45	36	46
32	½	**720 600 258**	1	0.113	31	42	45	36	46
32	¾	**720 600 268**	1	0.206	30	42	45	36	46
40	1 ¼	**720 600 249**	1	0.408	32	53	56	46	52
50	1 ½	**720 600 250**	1	0.538	36	59	62	55	56
63	2	**720 600 251**	1	0.859	42	74	78	65	67
75	2 ½	**720 600 252**	1	1.446	49	92	100	85	77
90	3	**720 600 253**	1	2.063	54	110	121	95	86





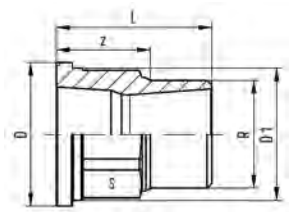
Union end malleable iron galvanized Rp

Model:

- Union End: malleable iron with parallel female thread Rp

d (mm)	Rp (inch)	PN (bar)	Code	SP	weight (kg)	D (mm)	L (mm)	s (mm)	z (mm)	D1 (mm)
20	½	16	**724 600 206**	1	0.037	30	22	25	9	27
25	¾	16	**724 600 207**	0	0.072	39	22	31	7	36
32	1	16	**724 600 208**	120	0.088	44	26	38	9	41
40	1 ¼	16	**724 600 209**	0	0.172	56	31	48	12	52
50	1 ½	16	**724 600 210**	10	0.210	62	33	54	14	58
63	2	16	**724 600 211**	0	0.324	78	35	67	11	73
75	2 ½	16	**724 600 212**	35	0.557	100	39	85	12	92
90	3	16	**724 600 213**	0	0.650	121	45	96	15	110





Union end malleable iron galvanized R

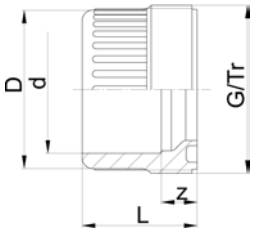
Model:

- Union End: Malleable iron with taper male thread R

R (inch)	d (mm)	Code	SP	weight (kg)	D (mm)	L (mm)	D1 (mm)	z (mm)	s (mm)
½	20	**724 600 806**	1	0.069	30	40	27	25	23
¾	25	**724 600 807**	1	0.115	39	43	36	27	30
1	32	**724 600 808**	0	0.161	44	48	41	29	36
1 ¼	40	**724 600 809**	0	0.294	56	57	52	36	48
1 ½	50	**724 600 810**	0	0.353	62	59	58	37	54
2	63	**724 600 811**	1	0.570	78	62	73	36	66
2 ½	75	**724 600 812**	0	0.980	97	75	92	45	85
3	90	**724 600 813**	0	1.217	110	80	104	47	95

Union bushes





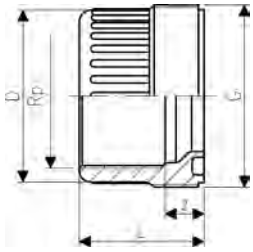
Union bush PVC-U metric

Model:

- Solvent cement socket metric
- Jointing face: With O-Ring groove
- Gasket: O-ring EPDM code no. 748 410 004-016; d90 748 410 248

d (mm)	PN (bar)	Code	SP	weight (kg)	z (mm)	D (mm)	L (mm)	G/Tr (inch)
10	16	**721 840 103**	10	0.002	10	20	22	5/8
12	16	**721 840 104**	10	0.007	10	20	22	5/8
16	16	**721 840 105**	10	0.009	10	24	24	3/4
20	16	**721 840 106**	10	0.014	10	29	26	1
25	16	**721 840 107**	10	0.020	10	34	29	1 1/4
32	16	**721 840 108**	10	0.032	10	42	33	1 1/2
40	16	**721 840 109**	10	0.057	12	52	39	2
50	16	**721 840 110**	10	0.073	14	62	46	2 1/4
63	16	**721 840 111**	10	0.137	18	78	58	2 3/4
75	10	**721 840 112**	20	0.210	18	93	62	Tr108x5
90	10	**721 840 123**	12	0.355	18	110	69	Tr128x5
110	10	**721 840 114**	10	0.445	11	133	72	Tr154x6





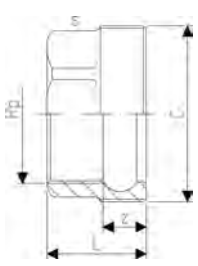
Union bush PVC-U Rp

Model:

- With parallel female thread Rp
- Jointing face: With O-Ring groove
- Gasket: O-ring EPDM code no. 748 410 004-011
- Connection to plastic thread only
- Do not apply solvent-based or other sealing compounds which could damage PVC

Rp (inch)	PN (bar)	Code	SP	weight (kg)	G (inch)	z (mm)	D (mm)	L (mm)
¼	10	**721 840 604**	10	0.007	⅝	12	20	22
⅜	10	**721 840 605**	10	0.009	¾	13	24	24
½	10	**721 840 606**	10	0.013	1	13	29	26
¾	10	**721 840 607**	10	0.026	1 ¼	14	34	29
1	10	**721 840 608**	10	0.036	1 ½	15	42	32
1 ¼	10	**721 840 609**	10	0.063	2	19	53	38
1 ½	10	**721 840 610**	10	0.098	2 ¼	26	63	45
2	10	**721 840 611**	10	0.187	2 ¾	33	78	56



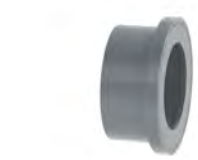


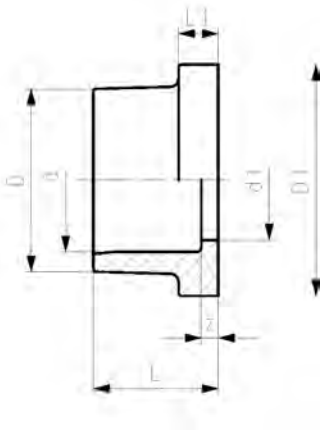
Union bush malleable iron galvanized Rp

Model:

- Parallel female thread Rp

PN (bar)	Rp (inch)	d (mm)	Code	SP	weight (kg)	G (inch)	z (mm)	s (mm)	L (mm)
16	½	20	**724 630 606**	1	0.058	1	12	25	25
16	¾	25	**724 630 607**	1	0.100	1 ¼	13	31	28
16	1	32	**724 630 608**	1	0.127	1 ½	14	28	31
16	1 ¼	40	**724 630 609**	1	0.204	2	14	47	33
16	1 ½	50	**724 630 610**	24	0.268	2 ¼	17	53	36
16	2	63	**724 630 611**	1	0.443	2 ¾	18	66	42
16	2 ½	75	**724 630 612**	1	0.679	3 ½	19	82	46
16	3	90	**724 630 613**	1	0.913	4	22	96	52





Flange Adapter, PVC
Joining face flat, Combined Joining face flat and serrated, metric

Model:

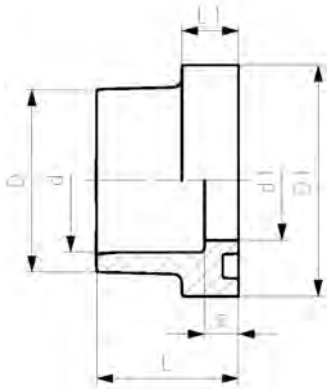
- Solvent cement socket metric
- d16 - d50: Sealing surface flat
- d63 - d400: combined jointing face flat and serrated

Note:

Gasket: Profile flange gasket EPDM code no. 748 440 705-725, FPM code no. 749 440 705-725 or flat gasket EPDM code no. 748 440 705-725, only use O-ring EPDM code no. 748 410 000-174, FPM code no. 749 410 000-174 in combination with counterpart flange adapter code no. 721 810 105-123

DN (mm)	d (mm)	PN (bar)	Code	SP	weight (kg)	D1 (mm)	z (mm)	d1 (mm)	L (mm)	D (mm)	L1 (mm)
10	16	16	**721 800 105**	10	0.006	29	3	13	17	22	6
15	20	16	**721 800 106**	10	0.009	34	3	16	19	27	6
20	25	16	**721 800 107**	10	0.015	41	3	21	22	33	7
25	32	16	**721 800 108**	10	0.024	50	3	28	25	41	7
32	40	16	**721 800 109**	10	0.039	61	3	36	29	50	8
40	50	16	**721 800 110**	10	0.056	73	3	45	34	61	8
50	63	16	**721 790 111**	10	0.103	90	3	57	41	77	9
65	75	16	**721 790 112**	10	0.159	106	3	69	47	91	10
80	90	16	**721 790 113**	10	0.253	125	5	82	56	108	11
100	110	16	**721 790 114**	10	0.417	150	5	102	66	131	12
125	125	16	**721 790 115**	5	0.533	170	5	117	74	148	13
125	140	16	**721 790 116**	6	0.725	188	5	132	81	165	14
150	160	16	**721 790 117**	2	1.093	213	5	152	91	188	16
200	200	10	**721 790 119**	2	1.460	250	6	192	112	224	24
200	225	10	**721 790 120**	2	1.743	274	6	217	125	248	25
250	250	10	**721 790 121**	1	2.203	303	9	240	140	274	23
250	280	10	**721 790 122**	1	2.930	329	5	270	151	308	23
300	315	6	**721 790 123**	1	4.455	379	8	302	172	346	27
350	355	6	**721 790 124**	1	5.963	430	10	341	194	384	32
400	400	6	**721 790 125**	1	9.041	482	10	384	216	438	34





Flange adaptor PVC-U
Jointing face with O-ring groove metric

Model:

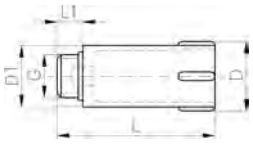
- Solvent cement socket metric
- Counterpart: flange adaptor flat code no. 721 800 105-721 790 111-125, combined flange adaptor (d160, d200, d225, d280, d315)
- Gasket: O-ring EPDM code no. 748 410 000-176, FKM code no. 749 410 000-176
- Flange: PVC-U code no. 721 700 005-138, PP/steel code no. 727 700 206-223, PP-V for socket systems metric code no. 727 700 406-423

d (inch)	d (mm)	DN (mm)	PN (bar)	Code	SP	weight (kg)	D1 (mm)	z (mm)	d1 (mm)	D (mm)	L (mm)	L1 (mm)
	16	10	16	**721 810 105**	10	0.008	29	6	13	22	20	9
	20	15	16	**721 810 106**	10	0.011	34	6	16	27	22	9
	25	20	16	**721 810 107**	10	0.018	41	6	21	33	25	10
	32	25	16	**721 810 108**	10	0.027	50	6	28	41	28	10
	40	32	16	**721 810 109**	10	0.046	61	8	36	50	34	13
	50	40	16	**721 810 110**	10	0.068	73	8	45	61	39	13
	63	50	16	**721 810 111**	10	0.120	90	8	57	77	46	14
2 ½	75	65	16	**721 810 112**	10	0.183	106	8	69	91	52	15
	90	80	16	**721 810 113**	10	0.286	125	10	82	108	61	16
	110	100	16	**721 810 114**	10	0.478	150	11	102	131	72	18
	125	100	16	**721 810 115**	5	0.607	170	11	117	148	80	19
5	140	125	16	**721 810 116**	6	0.804	188	11	132	165	87	20
	160	150	16	**721 810 117**	2	1.226	213	11	152	188	97	22
	200	200	10	**721 810 119**	2	1.593	250	12	192	224	118	30
	225	200	10	**721 810 120**	2	1.878	274	12	217	248	131	31
	250	250	10	**721 810 121**	1	2.175	303	9	240	274	140	23
	280	250	10	**721 810 122**	1	3.170	329	13	270	308	158	30
	315	300	6	**721 810 123**	1	4.891	379	17	302	346	180	35

Accessories and special parts

Miscellaneous





Wall inlet plug PVC-U

Model:

- Gasket: flat gasket Code No. 748 400 001, EPDM
- Use: for all fittings with parallel female thread in accordance with ISO 7
- The wall inlet plug has a parallel male thread G

G (inch)	Code	SP	weight (kg)	D (mm)	D1 (mm)	L (mm)	L1 (mm)
½	**799 150 003**	10	0.044	39	32	87	11

Section 9

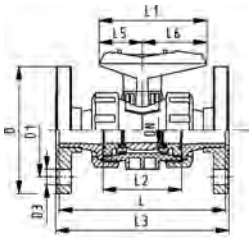
PVC and CPVC Valves

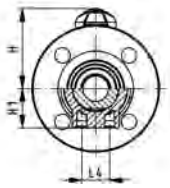


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Ball Valves



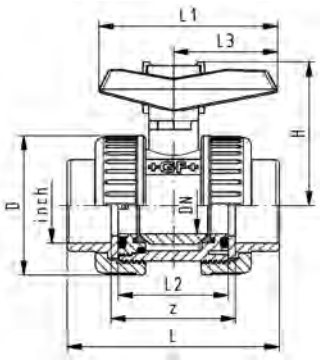




Type 546 True Union Ball Valve-CPVC ANSI Flanged

Size (inch)	EPDM Code	FKM Code
½	163 546 582	163 546 592
¾	163 546 583	163 546 593
1	163 546 584	163 546 594
1 ¼	163 546 585	163 546 595
1 ½	163 546 586	163 546 596
2	163 546 587	163 546 597
2 ½	163 546 588	163 546 598
3	163 546 589	163 546 599
4	163 546 590	163 546 600





Type 375 True Union Ball Valve PVC Solvent cement socket/Threaded NPT

Model:

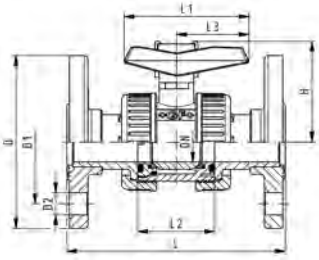
- For easy installation and removal
- Ball seats PTFE
- Actuation not available
- Threaded valve ends are only enclosed for DN10/15-50
- z-dimension, valve end andunion nut are not compatible with type 546

Range of use:

- Basic applications of the water treatment sector as well as other applications involving water.

Size (inch)	EPDM Code	FKM Code
⅜	161 375 001	161 375 016
½	161 375 002	161 375 017
¾	161 375 003	161 375 018
1	161 375 004	161 375 019
1 ¼	161 375 005	161 375 020
1 ½	161 375 006	161 375 021
2	161 375 007	161 375 022
2 ½	161 375 008	161 375 023
3	161 375 009	161 375 024
4	161 375 010	161 375 025





Type 375 True Union Ball Valve PVC ANSI Flanged

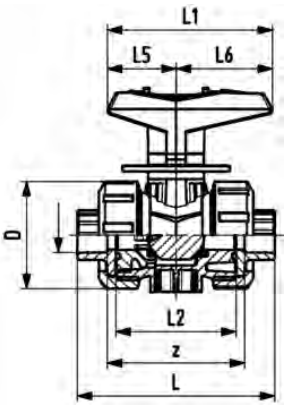
Size (inch)	EPDM Code	FKM Code
½	161 375 062	161 375 077
¾	161 375 063	161 375 078
1	161 375 064	161 375 079
1 ¼	161 375 065	161 375 080
1 ½	161 375 066	161 375 081
2	161 375 067	161 375 082
2 ½	161 375 068	161 375 083
3	161 375 069	161 375 084
4	161 375 070	161 375 085



Type 375 True Union Ball Valve CPVC ANSI Flanged

Size (inch)	EPDM Code	FKM Code
½	163 375 062	163 375 077
¾	163 375 063	163 375 078
1	163 375 064	163 375 079
1 ¼	163 375 065	163 375 080
1 ½	163 375 066	163 375 081
2	163 375 067	163 375 082
2 ½	163 375 068	163 375 083
3	163 375 069	163 375 084
4	163 375 070	163 375 085





Type 523 Metering Ball Valve PVC With mounting inserts With solvent cement sockets inch ASTM Including 2 threaded valve ends NPT

Model:

- Micro-doser
- Excellent control characteristics
- Designed for easy installation and removal
- Ball seats PTFE
- Angle of operation 180° with scale
- Integrated stainless steel mounting inserts
- Z-length, end connectors and union nuts **not compatible** to Type 323

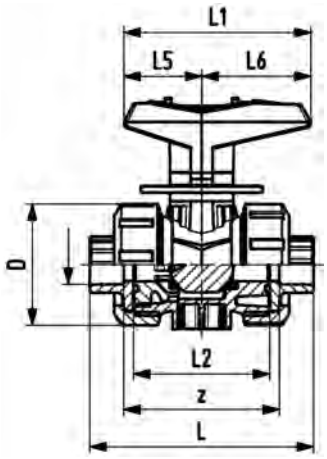
Option:

- Other materials on demand

Size (inch)	PN (psi)	EPDM Code	FKM Code
⅜	145	161 523 521	161 523 531
½	145	161 523 522	161 523 532

Size (inch)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M	z (mm)
⅜	50	68	27	12	105	77	56	25	32	45	6	67
½	50	68	27	12	105	77	56	25	32	45	6	61





Type 523 Metering Ball Valve CPVC
With mounting inserts
With solvent cement sockets inch ASTM
Including 2 threaded valve ends NPT

Model:

- Micro-doser
- Excellent control characteristics
- Designed for easy installation and removal
- Ball seats PTFE
- Angle of operation 180° with scale
- Integrated stainless steel mounting inserts
- Z-length, end connectors and union nuts **not compatible** to Type 323

Option:

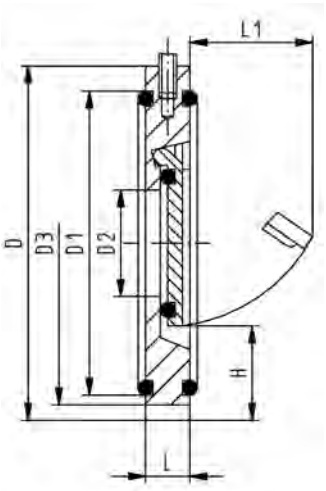
- Other materials on demand

d (mm)	Size (inch)	PN (psi)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
16	3/8	145	**163 523 521**	1	0.170	**163 523 531**	1	0.170
20	1/2	145	**163 523 522**	1	0.174	**163 523 532**	1	0.170

D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M	z (mm)
50	68	27	12	105	77	56	25	32	45	6	67
50	68	27	12	105	77	56	25	32	45	6	61

Check Valves & Line Strainer





Type 369 Wafer Check Valve PVC
Without spring

Model:

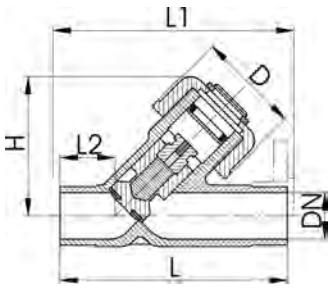
- Supporting eyelets for simple fitting
- Suitable for vertical and horizontal mounting

Installation instruction:

- Installation between ISO/DIN (all dimensions) and ANSI flange adaptors (all except DN32 and DN125)
- Installation with ANSI flange adaptor: for wafer check valves 1 1/2" to 3", use ANSI flange adaptors with the next bigger dimension (example: 1 1/2" wafer check valve between 2" ANSI flange adaptor)
- Centering by body diameter (ISO/DIN by D3, ANSI by D)
- Sealing with O-rings
- A stabilizing zone of at least 5 times nominal diameter should be provided before and after the wafer check valve
- Do not install on pump flange
- For use with Sch40 or Sch80 pipe
- Wafer check valves without reset spring are not recommended for pulsating flows (production of noise)

d (mm)	Size (inch)	EPDM Code	FKM Code
40	1 ¼	**161 369 002**	**161 369 022**
50	1 ½	**161 369 003**	**161 369 023**
63	2	**161 369 004**	**161 369 024**
75	2 ½	**161 369 005**	**161 369 025**
90	3	**161 369 006**	**161 369 026**
110	4	**161 369 007**	**161 369 027**
140	5	**161 369 009**	**161 369 029**
160	6	**161 369 010**	**161 369 030**
225	8	**161 369 011**	**161 369 031**
280	10	**161 369 012**	**161 369 032**
315	12	**161 369 013**	**161 369 033**

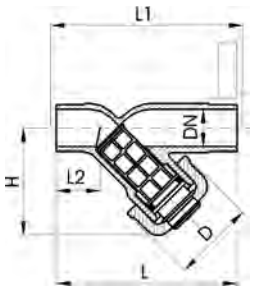




Type 304 Translucent Y-Check Valve PVC
Transparent body with solvent cement spigots ASTM

Size (inch)	EPDM Code	FKM Code
½	192 304 006	192 304 031
¾	192 304 007	192 304 032
1	192 304 008	192 304 033
1 ¼	192 304 009	192 304 034
1 ½	192 304 010	192 304 035
2	192 304 011	192 304 036
3	192 304 013	192 304 038





Type 306 Translucent Line Strainer PVC
Transparent body with solvent cement spigots ASTM/ANSI

Model:

- Protects valves, pumps, etc. from becoming damaged
- Easy dismantling to clean or replace the screen
- With screen PVC, perforation ø 0.8 mm, 20 mesh, 1/32 inch

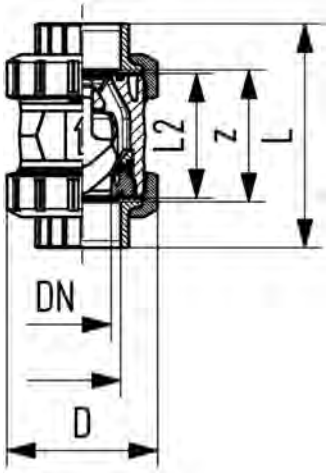
Size (inch)	EPDM Code	FKM Code
½	192 306 300	192 306 349
¾	192 306 350	192 306 399
1	192 306 400	192 306 449
1 ¼	192 306 450	192 306 499
1 ½	192 306 500	192 306 549
2	192 306 550	192 306 599
3	192 306 650	192 306 699



Check valve type 561 PVC
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



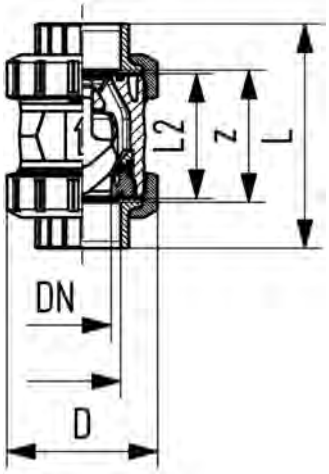
d (mm)	Thread Type	Size (inch)	EPDM Code	FKM Code
16	NPT	⅜	**161 561 101**	**161 561 111**
20	NPT	½	**161 561 102**	**161 561 112**
25	NPT	¾	**161 561 103**	**161 561 113**
32	NPT	1	**161 561 104**	**161 561 114**
40	NPT	1 ¼	**161 561 105**	**161 561 115**
50	NPT	1 ½	**161 561 106**	**161 561 116**
63	NPT	2	**161 561 107**	**161 561 117**
75	NPT	2 ½	**161 561 108**	**161 561 118**
90	NPT	3	**161 561 109**	**161 561 119**
110	NPT	4	**161 561 110**	**161 561 120**



Check valve type 562 PVC
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- For horizontal or vertical installation
- Sealing at a minimum water column of1m
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



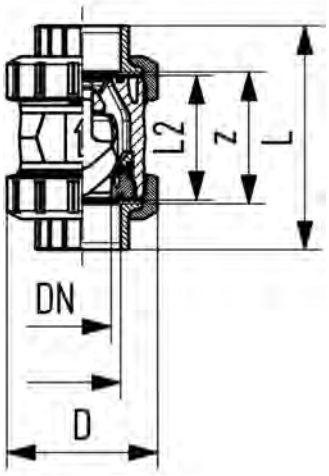
NPT (inch)	EPDM Code	FKM Code
⅜	**161 562 101**	**161 562 111**
½	**161 562 102**	**161 562 112**
¾	**161 562 103**	**161 562 113**
1	**161 562 104**	**161 562 114**
1 ¼	**161 562 105**	**161 562 115**
1 ½	**161 562 106**	**161 562 116**
2	**161 562 107**	**161 562 117**
2 ½	**161 562 108**	**161 562 118**
3	**161 562 109**	**161 562 119**
4	**161 562 110**	**161 562 120**



Check valve type 561 CPVC
With solvent cement sockets inch ASTM
Including 2 threaded valve ends NPT

Model:

- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



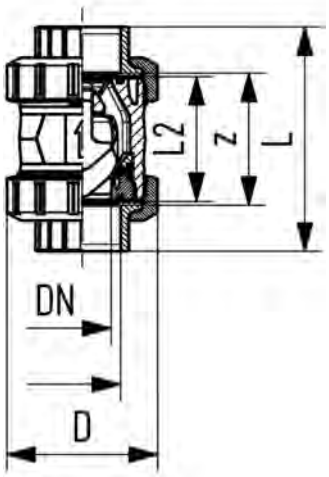
d (mm)	Thread Type	Size (inch)	EPDM Code	FKM Code
16	NPT	⅜	**163 561 101**	**163 561 111**
20	NPT	½	**163 561 102**	**163 561 112**
25	NPT	¾	**163 561 103**	**163 561 113**
32	NPT	1	**163 561 104**	**163 561 114**
40	NPT	1 ¼	**163 561 105**	**163 561 115**
50	NPT	1 ½	**163 561 106**	**163 561 116**
63	NPT	2	**163 561 107**	**163 561 117**
75	NPT	2 ½	**163 561 108**	**163 561 118**
90	NPT	3	**163 561 109**	**163 561 119**
110	NPT	4	**163 561 110**	**163 561 120**



Check valve type 562 CPVC
With solvent cement sockets inch ASTM
Threaded valve ends NPT

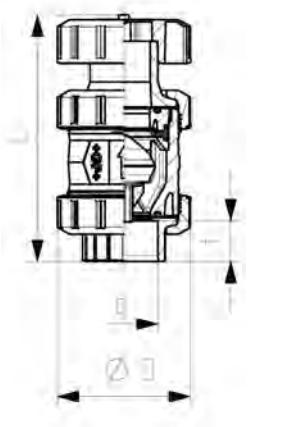
Model:

- For horizontal or vertical installation
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



NPT (inch)	PN (psi)	EPDM Code	FKM Code	D (mm)	L (mm)	L2 (mm)	z (mm)
⅜	232	**163 562 101**	**163 562 111**	50	105	56	67
½	232	**163 562 102**	**163 562 112**	50	105	56	61
¾	232	**163 562 103**	**163 562 113**	58	121	65	70
1	232	**163 562 104**	**163 562 114**	68	133	71	76
1 ¼	232	**163 562 105**	**163 562 115**	84	154	85	90
1 ½	232	**163 562 106**	**163 562 116**	97	164	89	94
2	232	**163 562 107**	**163 562 117**	124	183	101	107
2 ½	232	**163 562 108**	**163 562 118**	166	233	136	144
3	232	**163 562 109**	**163 562 119**	200	254	141	151
4	232	**163 562 110**	**163 562 120**	238	301	164	174





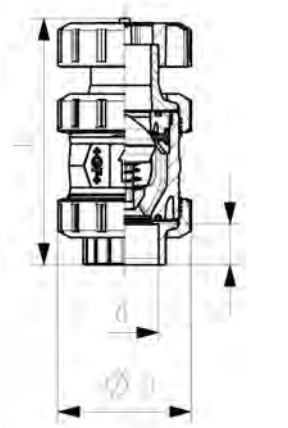
Type 591 PVC Ventilating and bleed valve
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- With protection cap up to DN50 made from PP-GF, DN65-100 made from POM
- Floater made of PP-H
- Designed for easy installation and removal
- Compact installation length

NPT (inch)	EPDM Code	FKM Code
⅜	161 591 101	161 591 111
½	161 591 102	161 591 112
¾	161 591 103	161 591 113
1	161 591 104	161 591 114
1 ¼	161 591 105	161 591 115
1 ½	161 591 106	161 591 116
2	161 591 107	161 591 117
2 ½	161 591 108	161 591 118
3	161 591 109	161 591 119
4	161 591 110	161 591 120





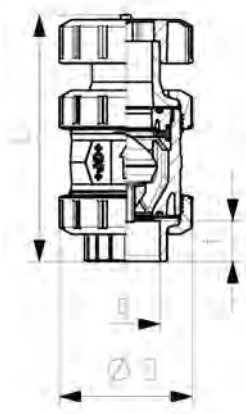
Type 595 PVC ventilating valve
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- With protection cap up to DN50 made from PP-GF, DN65-100 made from POM
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Compact installation length

Thread Type	Size (inch)	EPDM Code	FKM Code
NPT	⅜	161 595 101	161 595 111
NPT	½	161 595 102	161 595 112
NPT	¾	161 595 103	161 595 113
NPT	1	161 595 104	161 595 114
NPT	1 ¼	161 595 105	161 595 115
NPT	1 ½	161 595 106	161 595 116
NPT	2	161 595 107	161 595 117
NPT	2 ½	161 595 108	161 595 118
NPT	3	161 595 109	161 595 119
NPT	4	161 595 110	161 595 120





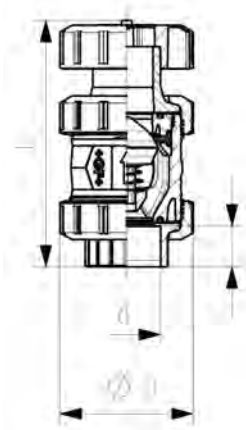
Type 591 CPVC Ventilating and bleed valve
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- With protection cap up to DN50 made from PP-GF, DN65-100 made from POM
- Floater made of PP-H
- Designed for easy installation and removal
- Compact installation length

NPT (inch)	EPDM Code	FKM Code
⅜	163 591 101	163 591 111
½	163 591 102	163 591 112
¾	163 591 103	163 591 113
1	163 591 104	163 591 114
1 ¼	163 591 105	163 591 115
1 ½	163 591 106	163 591 116
2	163 591 107	163 591 117
2 ½	163 591 108	163 591 118
3	163 591 109	163 591 119
4	163 591 110	163 591 120





Type 595 CPVC ventilating valve
With solvent cement sockets inch ASTM
Threaded valve ends NPT

Model:

- With protection cap up to DN50 made from PP-GF, DN65-100 made from POM
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Compact installation length

Thread Type	Size (inch)	EPDM Code	FKM Code
NPT	⅜	163 595 101	163 595 111
NPT	½	163 595 102	163 595 112
NPT	¾	163 595 103	163 595 113
NPT	1	163 595 104	163 595 114
NPT	1 ¼	163 595 105	163 595 115
NPT	1 ½	163 595 106	163 595 116
NPT	2	163 595 107	163 595 117
NPT	2 ½	163 595 108	163 595 118
NPT	3	163 595 109	163 595 119
NPT	4	163 595 110	163 595 120

Diaphragm Valves



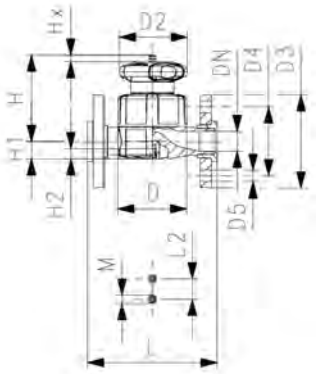
Diaphragm valve type 517 PVC
With backing flanges PVC Inch ANSI

Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Handwheel with built-in locking mechanism
- Flat sealing faces
- Overall length EN 558
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

Option:

- Individual configuration of the valve
- Self adjusting multifunctional module with integrated limit switches



Size (inch)	PN (psi)	EPDM Code	FKM Code	PTFE/EPDM Code
½	145	**161 517 612**	**161 517 662**	**161 517 632**
¾	145	**161 517 613**	**161 517 663**	**161 517 633**
1	145	**161 517 614**	**161 517 664**	**161 517 634**
1 ¼	145	**161 517 615**	**161 517 665**	**161 517 635**
1 ½	145	**161 517 616**	**161 517 666**	**161 517 636**
2	145	**161 517 617**	**161 517 667**	**161 517 637**

Size (inch)	D (mm)	D2 (mm)	D3 (mm)	D4 (mm)	D5 (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L2 (mm)	M	Lift = Hx (mm)
½	65	65	95	60	16	73	14	12	130	25	M6	7
¾	80	65	105	70	16	81	18	12	150	25	M6	10
1	88	87	115	79	16	107	22	12	160	25	M6	13
1 ¼	101	87	140	89	16	115	26	15	180	45	M8	15
1 ½	117	135	150	98	16	148	32	15	200	45	M8	19
2	144	135	165	121	19	166	39	15	230	45	M8	25



Diaphragm valve type 317 CPVC
Flanged ANSI

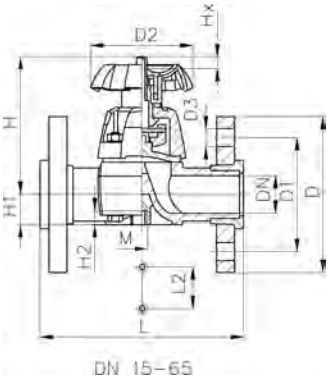
Model:

- Flat sealing faces
- DN65 with backing flange
- Overall length according to EN 558
- Connecting dimension ANSI/ASME B 16.5 / ASTM D 4024
- DN 80-150 with fixed flange

Option:

- Handwheel with built-in locking mechanism (standard version is nonlockable)
- Handwheel lockable DN15-65 (basic version not lockable)

*** 3# and 6# fixed flanges metric and inch ANSI B16.5**
*** DN80, DN100 and DN150 fixed flanges metric and inch ANSI B16.5**



Size (inch)	PN (psi)	EPDM Code	FKM Code	PTFE with EPDM supp. diaphragm Code
2 ½	145	**163 317 623**	**163 317 668**	**163 317 638**
3	145	**163 317 024**	**163 317 069**	
4	87	**163 317 025**	**163 317 370**	**163 317 040**

Size (inch)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	M	Lift = Hx (mm)	AL
2 ½	185		152		201	46		290		70	M8		4
3	200	160	270	18	265	57	23	310	35	120	M12	40	8
4	225	180	270	18	304	69	23	350	35	120	M12	50	8

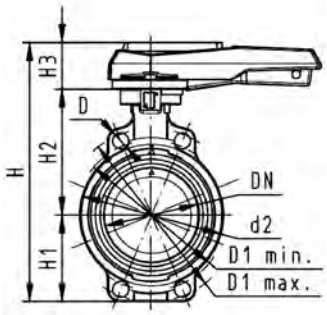
Butterfly Valves



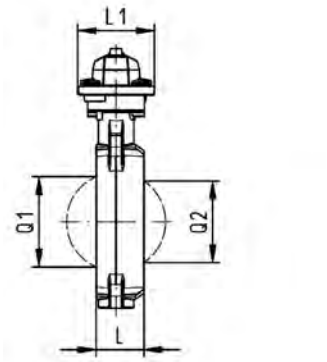
Butterfly valve type 567 PVC
Hand lever with ratchet settings

Model:

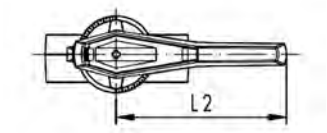
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- We recommend for the dimensions DN250 and DN300 only 6 bar maximum system pressure for the hand lever version



d (mm)	Size (inch)	PN (psi)	EPDM Code	FKM Code
63	2	145	**161 567 002**	**161 567 022**
75	2 ½	145	**161 567 003**	**161 567 023**
90	3	145	**161 567 004**	**161 567 024**
110	4	145	**161 567 005**	**161 567 025**
140	5	145	**161 567 006**	**161 567 026**
160	6	145	**161 567 007**	**161 567 027**
225	8	145	**161 567 008**	**161 567 028**
280	10	145	**161 567 009**	**161 567 029**
315	12	145	**161 567 010**	**161 567 030**

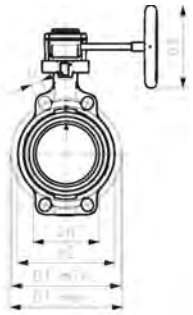


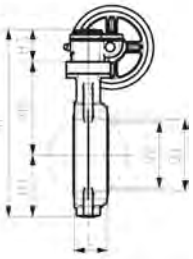
d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D3 (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
63	104	19	120.0	160	125.0	265	77	134	54	45	106	205	179	40
75	115	19	139.7	160	145.0	268	83	140	45	46	106	205	179	54
90	131	19	150.0	160	160.0	289	89	146	54	49	106	205	179	67
110	161	19	175.0	160	190.5	326	104	167	55	56	106	255	179	88
140	187	23	210.0	160	215.9	353	117	181	55	64	106	255	179	113
160	215	24	241.3	160	241.3	374	130	189	55	72	106	255	179	139
225	267	23	290.0	160	295.0	435	158	210	67	73	140	408	179	178
280	329	25	353.0	200	362.0	554	205	264	85	113	149	408	198	210
315	379	25	400.0	200	432.0	598	228	285	85	113	149	408	198	256

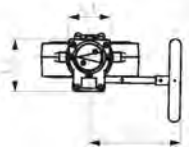


d (mm)	Q2 (mm)
63	35
75	
90	50
110	74
140	97
160	123
225	169
280	207
315	253









Butterfly valve type 567 PVC
Reduction gear with handwheel

Model:

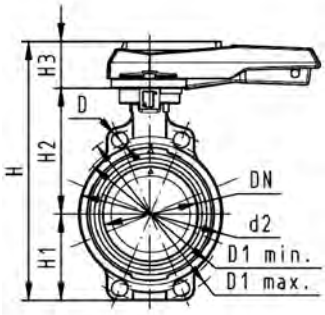
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220

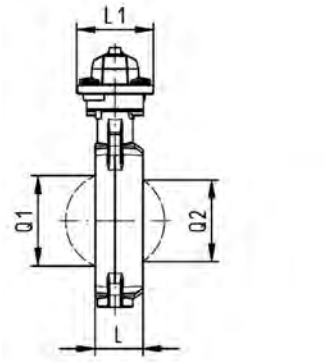
d (mm)	Size (inch)	PN (bar)	EPDM Code	FKM Code
63	2	10	**161 567 042**	**161 567 062**
75	2 ½	10	**161 567 043**	**161 567 063**
90	3	10	**161 567 044**	**161 567 064**
110	4	10	**161 567 045**	**161 567 065**
140	5	10	**161 567 046**	**161 567 066**
160	6	10	**161 567 047**	**161 567 067**
225	8	10	**161 567 048**	**161 567 068**
280	10	10	**161 567 049**	**161 567 069**
315	12	10	**161 567 050**	**161 567 070**

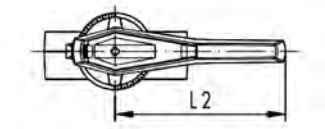
d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
63	104	19	120	125	160	273	77	134	62	45	78	112	179	40
75	115	19	140	145	160	285	83	140	62	46	78	112	179	54
90	131	19	150	160	160	297	89	146	62	49	78	112	179	67
110	160	19	175	191	160	333	104	167	62	56	78	112	179	88
140	187	23	210	216	160	360	117	181	62	64	78	112	179	113
160	215	24	241	241	160	381	130	189	62	72	78	112	179	139
225	267	23	290	295	160	430	158	210	62	73	78	112	179	178
280	329	25	353	362	200	538	205	264	69	113	97	130	198	210
315	379	25	400	432	200	582	228	285	69	113	97	130	198	256

d (mm)	Q2 (mm)
63	
75	35
90	50
110	74
140	97
160	123
225	169
280	207
315	253









Butterfly valve type 567 CPVCHand lever with ratchet settings

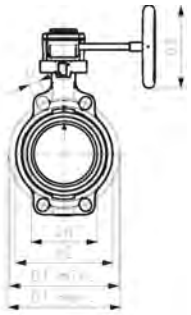
Model:

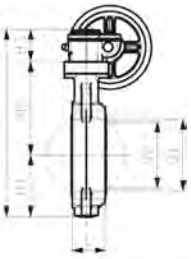
- Overall length according to EN 558, ISO 5752
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220

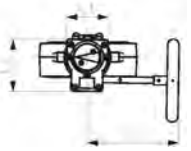
d (mm)	Size (inch)	PN (psi)	EPDM Code	FKM Code
63	2	145	**163 567 002**	**163 567 022**
75	2 ½	145	**163 567 003**	**163 567 023**
90	3	145	**163 567 004**	**163 567 024**
110	4	145	**163 567 005**	**163 567 025**
140	5	145	**163 567 006**	**163 567 026**
160	6	145	**163 567 007**	**163 567 027**
225	8	145	**163 567 008**	**163 567 028**
280	10	145	**163 567 009**	**163 567 029**
315	12	145	**163 567 010**	**163 567 030**

d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)
63	104	19	120	125	264	77	134	54	45	106	205	40	
75	115	19	140	145	277	83	140	54	46	106	205	54	35
90	131	19	150	160	289	89	146	54	49	106	205	67	50
110	161	19	175	191	325	104	167	55	56	106	255	88	74
140	187	23	210	216	352	117	181	55	64	106	255	113	97
160	215	24	241	241	373	130	189	55	72	106	255	139	123
225	267	23	290	295	435	158	210	67	73	140	408	178	169
280	329	25	353	362	555	205	264	85	113	149	408	210	207
315	379	25	400	432	599	228	285	85	113	149	408	256	253









Butterfly valve type 567 CPVC
Reduction gear with handwheel

Model:

- Overall length according to EN 558, ISO 5752
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220

d (mm)	Size (inch)	PN (psi)	EPDM Code	FKM Code
63	2	145	**163 567 042**	**163 567 062**
75	2 ½	145	**163 567 043**	**163 567 063**
90	3	145	**163 567 044**	**163 567 064**
110	4	145	**163 567 045**	**163 567 065**
140	5	145	**163 567 046**	**163 567 066**
160	6	145	**163 567 047**	**163 567 067**
225	8	145	**163 567 048**	**163 567 068**
280	10	145	**163 567 049**	**163 567 069**
315	12	145	**163 567 050**	**163 567 070**

d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
63	104	19	120	125	160	273	77	134	62	45	78	112	179	40
75	115	19	140	145	160	285	83	140	62	46	78	112	179	54
90	131	19	150	160	160	297	89	146	62	49	78	112	179	67
110	160	19	175	191	160	333	104	167	62	56	78	112	179	88
140	187	23	210	216	160	360	117	181	62	64	78	112	179	113
160	215	24	241	241	160	381	130	189	62	72	78	112	179	139
225	267	23	290	295	160	430	158	210	62	73	78	112	179	178
280	329	25	353	362	200	538	205	264	69	113	97	130	198	210
315	379	25	400	432	200	582	228	285	69	113	97	130	198	256

d (mm)	Q2 (mm)
63	
75	35
90	50
110	74
140	97
160	123
225	169
280	207
315	253



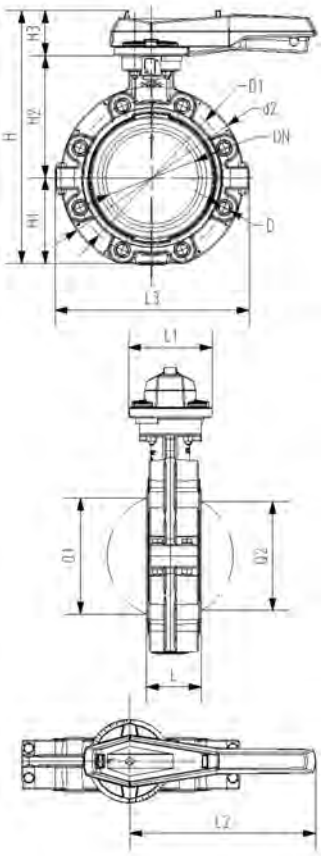
Type 578 Lugstyle Butterfly Valve PVC
Hand lever with ratchet settings

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Overall length according to EN 558, ISO 5752 (DN50 - 200 line 25, DN250 - 300 line 10)
- Connecting dimension: ANSI/ASME B 16.5 Class 150
- We recommend for the dimensions DN250 and DN300 only 6 bar maximum system pressure for the hand lever version

Option:

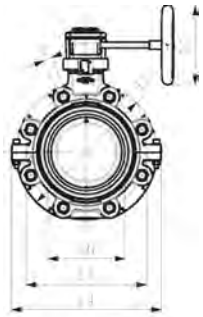
- Optional accessory: Integrated position feedback with limit switches (sold separately)

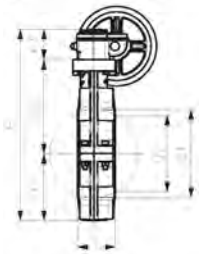


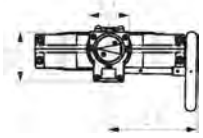
d (mm)	Size (inch)	DN (mm)	PN (psi)	EPDM Code	FKM Code
63	2	50	145	**161 578 102**	**161 578 122**
75	2 ½	65	145	**161 578 103**	**161 578 123**
90	3	80	145	**161 578 104**	**161 578 124**
110	4	100	145	**161 578 105**	**161 578 125**
140	5	125	145	**161 578 106**	**161 578 126**
160	6	150	145	**161 578 107**	**161 578 127**
200	8	200	145	**161 578 108**	**161 578 128**
250	10	250	145	**161 578 109**	**161 578 129**
315	12	300	145	**161 578 110**	**161 578 130**

d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
160	UNC 5/8	120.6	265	77	134	54	45	106	205	165	40	
180	UNC 5/8	139.7	277	83	140	54	46	106	205	182	54	35
195	UNC 5/8	152.4	289	89	146	54	49	106	205	210	67	50
226	UNC 5/8	190.5	328	106	167	55	56	106	255	240	88	74
258	UNC 3/4	215.9	357	121	181	55	64	106	255	272	113	97
284	UNC 3/4	241.3	377	133	189	55	72	106	255	300	139	123
341	UNC 3/4	298.4	436	159	210	67	73	140	408	360	178	169
412	UNC 7/8	362.0	536	205	264	67	113	140	408	440	210	207
482	UNC 7/8	431.8	586	234	285	67	113	140	408	510	256	253









Type 578 Lugstyle Butterfly Valve PVC
Reduction gear with handwheel

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Overall length according to EN 558, ISO 5752 (DN50 - 200 line 25, DN250 - 300 line 10)
- Connecting dimension: ANSI/ASME B 16.5 Class 150

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

d (mm)	Size (inch)	DN (mm)	PN (psi)	EPDM Code	FKM Code
63	2	50	145	**161 578 142**	**161 578 162**
75	2 ½	65	145	**161 578 143**	**161 578 163**
90	3	80	145	**161 578 144**	**161 578 164**
110	4	100	145	**161 578 145**	**161 578 165**
140	5	125	145	**161 578 146**	**161 578 166**
160	6	150	145	**161 578 147**	**161 578 167**
200	8	200	145	**161 578 148**	**161 578 168**
250	10	250	145	**161 578 149**	**161 578 169**
315	12	300	145	**161 578 150**	**161 578 170**

d2 (mm)	D	D1 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	Q1 (mm)
160	UNC 5/8	120.6	160	273	77	134	62	23	45	78	112	179	165	40
180	UNC 5/8	139.7	160	285	83	140	62	23	46	78	112	179	182	54
195	UNC 5/8	152.4	160	297	89	146	62	23	49	78	112	179	210	67
226	UNC 5/8	190.5	160	335	106	167	62	23	56	78	112	179	240	88
258	UNC 3/4	215.9	160	364	121	181	62	23	64	78	112	179	272	113
284	UNC 3/4	241.3	160	384	133	189	62	23	72	78	112	179	300	139
341	UNC 3/4	298.4	160	431	159	210	62	23	73	78	112	179	360	178
412	UNC 7/8	362.0	200	538	205	264	69	23	113	97	130	198	440	210
482	UNC 7/8	431.8	200	588	234	285	69	23	113	97	130	198	510	256

Q2 (mm)
35
50
74
97
123
169
207
253



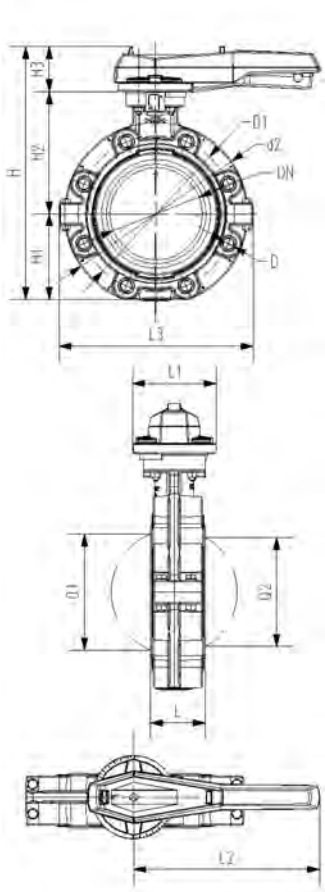
Type 578 Lugstyle Butterfly Valve CPVC
Hand lever with ratchet settings

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Overall length according to EN 558, ISO 5752 (DN50 - 200 line 25, DN250 - 300 line 10)
- Connecting dimension: ANSI/ASME B 16.5 Class 150
- We recommend for the dimensions DN250 and DN300 only 6 bar maximum system pressure for the hand lever version

Option:

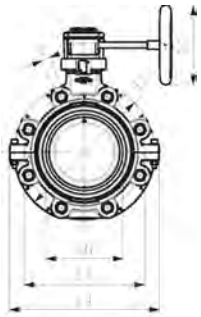
- Optional accessory: Integrated position feedback with limit switches (sold separately)

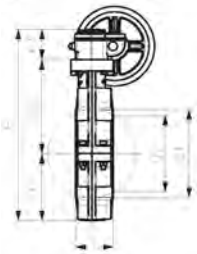


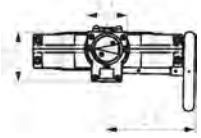
d (mm)	Size (inch)	DN (mm)	PN (psi)	EPDM Code	FKM Code
63	2	50	145	**163 578 102**	**163 578 122**
75	2 ½	65	145	**163 578 103**	**163 578 123**
90	3	80	145	**163 578 104**	**163 578 124**
110	4	100	145	**163 578 105**	**163 578 125**
140	5	125	145	**163 578 106**	**163 578 126**
160	6	150	145	**163 578 107**	**163 578 127**
225	8	200	145	**163 578 108**	**163 578 128**
280	10	250	145	**163 578 109**	**163 578 129**
315	12	300	145	**163 578 110**	**163 578 130**

d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
160	UNC 5/8	120.6	265	77	134	54	45	106	205	165	40	
180	UNC 5/8	139.7	277	83	140	54	46	106	205	182	54	35
195	UNC 5/8	152.4	289	89	146	54	49	106	205	210	67	50
226	UNC 5/8	190.5	328	106	167	55	56	106	255	240	88	74
258	UNC 3/4	215.9	357	121	181	55	64	106	255	272	113	97
284	UNC 3/4	241.3	377	133	189	55	72	106	255	300	139	123
341	UNC 3/4	298.4	436	159	210	67	73	140	408	360	178	169
412	UNC 7/8	362.0	536	205	264	67	113	140	408	440	210	207
482	UNC 7/8	431.8	586	234	285	67	113	140	408	510	256	253









Type 578 Lugstyle Butterfly Valve CPVC
Reduction gear with handwheel

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Overall length according to EN 558, ISO 5752 (DN50 - 200 line 25, DN250 - 300 line 10)
- Connecting dimension: ANSI/ASME B 16.5 Class 150

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

d (mm)	Size (inch)	DN (mm)	PN (psi)	EPDM Code	FKM Code
63	2	50	145	**163 578 142**	**163 578 162**
75	2 ½	65	145	**163 578 143**	**163 578 163**
90	3	80	145	**163 578 144**	**163 578 164**
110	4	100	145	**163 578 145**	**163 578 165**
140	5	125	145	**163 578 146**	**163 578 166**
160	6	150	145	**163 578 147**	**163 578 167**
225	8	200	145	**163 578 148**	**163 578 168**
280	10	250	145	**163 578 149**	**163 578 169**
315	12	300	145	**163 578 150**	**163 578 170**

d2 (mm)	D	D1 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	Q1 (mm)	Q2 (mm)
160	UNC 5/8	120.6	160	273	77	134	62	45	78	112	179	165	40	
180	UNC 5/8	139.7	160	285	83	140	62	46	78	112	179	182	54	35
195	UNC 5/8	152.4	160	297	89	146	62	49	78	112	179	210	67	50
226	UNC 5/8	190.5	160	335	106	167	62	56	78	112	179	240	88	74
258	UNC 3/4	215.9	160	364	121	181	62	64	78	112	179	272	113	97
284	UNC 3/4	241.3	160	384	133	189	62	72	78	112	179	300	139	123
341	UNC 3/4	298.4	160	431	159	210	62	73	78	112	179	360	178	169
412	UNC 7/8	362.0	200	555	205	264	69	113	97	130	198	440	210	207
482	UNC 7/8	431.8	200	605	234	285	69	113	97	130	198	510	256	253



Wafer-style, intermediate installation butterfly valve type 565 PVDF/PA-GF
With hand lever
Flange standard metric/ANSI/BS/JIS
Suitable for ABS, PVC-U, PVC-C, ecoFIT, COOL-FIT and PROGEF Systems

Model:

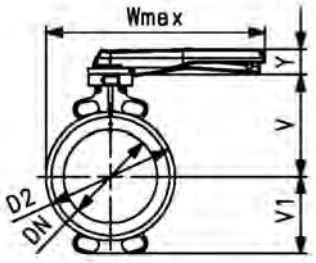
- Installation length: EN558 row 20, ISO 5752 row 20, API 609 table 2
- Flange standards: ISO 7005 PN10/16, EN 1092 PN10/16, DIN 2501 PN10/16, ANSI/ASME B 16.5 Class 150, BS 1560: 1989 Class 125/150; BS 4504 PN10/16, JIS B 2220 10K, JIS B 2239 10K
- For easy installation and removal
- Lockable ergonmic lever
- Suitable for water and water treatment applications (e.g. sea water, drinking water and industrial water)

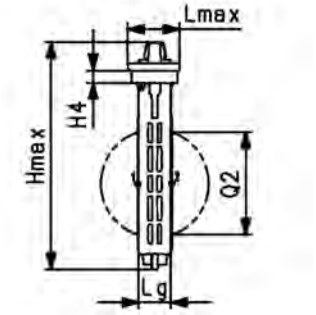
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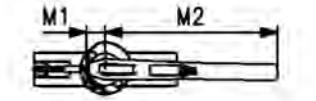
- Individual configuration of the valve possible
- Pneumatic or electric actuators from GF
- Double sensor for electrical position feedback incl. LED feedback

Note:

For some material combination (e.g. DN300 valves with PE/PP pipes) special flange adapters are needed. Please check the "Perfect flange connection tool" on www.gfps.com







d (mm)	Size (inch)	DN (mm)	PN (bar)	Cv-value (l/min)	EPDM Code	SP	weight (kg)	FKM Code	SP	weight (kg)
63	2	50	16	1445	**199 565 000**	1	1.3	**199 565 020**	1	1.4
75	2 ½	65	16	2530	**199 565 001**	1	1.5	**199 565 021**	1	1.6
90	3	80	16	4020	**199 565 002**	1	1.7	**199 565 022**	1	1.8
110	4	100	16	5850	**199 565 003**	1	2.5	**199 565 023**	1	2.7
140	5	125	16	11900	**199 565 004**	1	3.1	**199 565 024**	1	3.3
160	6	150	16	18050	**199 565 005**	1	4.0	**199 565 025**	1	4.3
225	8	200	10	43667	**199 565 006**	1	5.3	**199 565 026**	1	5.7

d (mm)	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)	M1 (mm)	M2 (mm)	Y (mm)	Q2 (mm)
63	100.0	264.0	249.5	96.0	23.0	133.5	63.0	43.0	35.5	204.5	53.0	28.5
75	121.0	271.0	275.5	96.0	23.0	140.0	82.0	46.0	35.5	204.5	53.0	44.0
90	138.0	273.5	288.0	96.0	23.0	146.0	89.0	46.0	35.5	204.5	53.0	63.5
110	158.5	334.0	324.0	96.0	23.0	166.5	104.0	52.0	35.5	254.5	53.0	84.0
140	187.0	348.0	351.0	96.0	23.0	180.0	118.0	56.0	35.5	254.5	53.0	110.5
160	213.0	426.0	372.5	96.0	23.0	189.0	130.5	56.0	35.5	319.5	53.0	137.5
225	267.0	453.0	422.0	96.0	23.0	209.5	159.0	60.0	35.5	319.5	53.0	190.5

Double-See®

Vinyl Double Containment Piping System

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Patented

Double-See® Benefits

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- Flexible choice of PVC, Corzan® CPVC, and Clear PVC
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- Allows true, practical compliance with ASME B31.3 during installation
- Performance - patented fitting centralizer design compensates for some thermal expansion and contraction
- Fully pressure rated valve-in-valve completes the system

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www.gfps.com/our-locations

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