HERSHEY VALVE 鑲琪塑膠

We know how systems flow - Hershey

UPVC

Industrial Piping System

Product Information

www.hershey.com.tw

Company History

1980	Hershey Valve Co. Ltd. was found in Chingshui, Taichung, Taiwan.
1982	Moved to Kwanlien industrial District, Wuchi, Taichung, Taiwan.
1982	Overseas marketing department was set up to promote export business.
1984	Export business expanded to the USA, Canada, Australia, Europe and other advanced countries.
1988	USA and Canada became the major export markets.
1990	Japan became the most important export country in Asia.
1993	Korean market was developed.
1995	Responding to the market demands, Taiwan domestic sales department was set up to develop Taiwanese markets.
1996	Taiwan factory was awarded SGS ISO 9002 certification.
1996	Valve products were approved by NSF International.
1997	Shanghai factory was awarded SGS ISO 9002 certification.
1997	Began manufacturing SCH40/80 UPVC, SCH40/80 CORZAN® CPVC and SDR 13.5 BlazeMaster® CPVC piping systems in Taiwan Wuchi No. 2 factory.
1998	USA Lubrizol (BF Goodrich) authorized Hershey Valves as the exclusive licensee of FlowGuard® CPVC piping system.
1998	SCH40 FlowGuard® CPVC hot and cold water distribution system and SCH40 clear PVC piping system came on line.
1999	BlazeMaster® CPVC fire sprinkler system was certificated by LPCB (UK).
1999	Hershey Valve Taiwan was awarded LPCB ISO 9002.
1999	BlazeMaster® CPVC fire sprinkler system was approved by National Fire Administration Ministry of Interior in Taiwan.
2001	Hershey Taichang factory was established in China.
2003	BlazeMaster® CPVC material obtained WRAS approval.
2004	CORZAN® 4910 CPVC sheet obtained FM approval.
2005	Hershey BlazeMaster® fire sprinkler fittings were listed by UL (Underwriters Laboratories Inc.).
2006	Hershey Taiwan factories were consolidated and moved to Taichung Chungkang Export Processing Zone and it serves as Hershey Group Global Headquarters.
2010	Hershey Taiwan factory was awarded LPCB ISO9001: 2008

Design , Installation and Product Specification
UPVC Industrial Piping System

Table of Contents

System Description

Engineering Information

Installation Guides

Product Dimension and Drawing

UPVC Industrial Piping System

System Description

UPVC has been utilized for a long time, it becomes the most general specified thermoplastic material. Overall UPVC has superior basic properties; it has good mechanical strength, chemical resistance and weatherability. As the UPVC has the largest volume of vinyl plastic family, it is exceptionally economical in cost.

Basic Physical Properties

Physical Property	Metric units	Imperial units	Test Condition	Standard
Cell Classification	12454			ASTM D1784
Specific Gravity	1.35 ~ 1.40		23˚C	ASTM D792
Tensile Strength	50 N/mm²	7200 psi	23˚C	ASTM D638
Flexural Strength	63 N/mm²	9,200 psi	23˚C	ASTM D790
Modulus of Elasticity in Tension	2,758 N/mm²	400,000 psi	23˚C	ASTM D638
Heat Deflection Temp	70 ˚C	158 ˚F	264psi, 23˚C	ASTM D648
Softening Temp.(Vicat)	76 ˚C	169 ˚F	Loading 50 NN	ASTM D1525
Izod Impact (Notch)	40 J/m	0.75 ft-lb/in	23˚C	ASTM D256
Coefficient of Thermal Expansion	6×10^{-5} cm/cm · ˚C	3×10^{-5} in/in · ˚F		ASTM D696
Flammability	V0			UL-94 (Tested, not listed)
Maximum Operation Temperature	55˚C	131˚F		

Note : Data presented are typical values.

General Applications

- Acid /alkaline chemicals transportation systems
- Pure water transportation systems
- Salt water transportation systems
- Drinking water transportation systems
- Irrigation Water transportation systems
- Chemical waste transportation systems
- Environmental engineering general piping systems
- Air conditioning chilling water supply/return piping systems

Applied Industries

- Electroplating factory
- Electronic industry plant
- Steel industry plant
- Power plant
- Food factory
- Pharmaceutical Plant
- Hospital
- Chemical industry plant
- Semiconductor industry plant
- Nuclear power plant
- Paper mill
- Beverage factory
- Waste water treatment plant

Product Advantages

Chemical Resistance

- UPVC piping systems have good chemical resistance, especial in acids, bases and salts.

Electrical Resistance

- UPVC piping systems have very excellent insulating property.

High Strength

- UPVC products are highly resilient, tough and durable with high tensile and high impact strength.

Low Friction Loss

- The smooth interior surfaces of UPVC assure low friction loss and high flow rate. Additionally, since UPVC pipe will not rust, pit, scale, or corrode, the high flow rate will be maintained for the life of the piping system.

Easy Installation

- There are many joint methods, such as solvent cement, threaded, flanged, & hot air welding.

Low Thermal Conductivity

- UPVC pipe has a much lower thermal conductivity factor than metal pipe. Therefore, fluids being piped maintain a more constant temperature. In most cases, pipe insulation is not required.

Cost Effective

- UPVC piping system is light weight, convenient to handle, relatively flexible, and easy to install. These features lead to lower installation cost than other piping systems.

Light Weight

- UPVC pipe is light in weight (approximately one-half the weight of aluminum and one-sixth the weight of steel) reducing transportation, handling, and installation cost.

Maintenance Free

- Once an UPVC system is properly selected, designed, and installed, it is virtually maintenance free. It will not rust, pit, scale, corrode, or promote build-up on the interior. Therefore, years of trouble-free service can be expected when using UPVC piping system.

Long Life

- There is over 30 years of actual usage life of Hershey UPVC piping system in these fields.

Weatherability

Weatherability is defined as a material's ability to maintain its basic physical properties after prolonged exposure to sunlight, wind and rain/humidity.

Hershey UPVC has been blended with a titanium dioxide (TiO2) and carbon black. TiO2 coupled with carbon black is widely recognized as an excellent ultraviolet blocking agent and helps to protect the polymer backbone from the effects of ultraviolet radiation. Therefore, Hershey UPVC piping system will be able to meet the requirements of most outdoor installations.

If the specific installation requires additional protection from UV exposure, Hershey UPVC piping system can be pained with common acrylic latex paint. Priming of the piping is not necessary prior to painting.

Abrasion Resistance

A piping system's resistance to abrasion is a function of many factors:

- Particle size and shape
- Particle concentration
- Velocities
- Design of the piping system
- Hardness of particles
- Densities of fluid and particle
- Properties of piping materials

Hershey UPVC piping systems will usually outperform metal when transporting abrasive media and have been used successfully in many abrasive industrial applications.

One widely referenced test method is the Taber Abrasion Test, in which the weight loss of a material is measured after being exposed to an abrasive wheel for 1000 cycles. While the Taber test cannot predict actual performance of a material to a given application, it does provide a relative measure to compare materials.

TABER ABRASION TESTER (Abrasion Ring CS-10, Load 1 kg)

Material	Weight loss (mg/1000 cycles)	Material	Weight loss (mg/1000 cycles)
Nylon 6-10	5	CTFE	13
UHMW PE	5	PS	40-50
PVDF	5-10	Steel (304 SS)	50
PVC (rigid)	12-20	ABS	60-80
PP	15-20	PTFE	500-1000
CPVC	20		

Properties Comparison of Commonly Used Piping Materials

	UPVC	PP	HDPE	ABS	GIP*	SS*
Joint	Solvent welding	Heat melted welding	Heat melted welding	Solvent welding	Threading or welding	Threading or welding
Life	Long	Middle	Middle	Middle	Short	Very long
Friction loss	Low	Medium	Medium	Low	High	Low
Chemical resistance	Excellent	Good	Good	Fair	Bad	Good
Thermal conductivity	Low	Low	Low	Low	High	High
Maximum operation temperature(˚C)	55	80	70	70	400	400
Earthquake resistance	Good	Good	Good	Good	Bad	Bad
Impact resistance	Good	Excellent	Excellent	Excellent	Good	Vary
Operating pressure	High	Medium	Medium	Medium	High	Vary
Weatherability	Good	Bad	Bad	bad	Good	Excellent
Maintenance	Easy	Difficult	Difficult	Easy	Difficult	Easy
Installation	Easy	Difficult	Difficult	Easy	Difficult	Difficult
Cost	Low	Medium	Medium	Medium	Low	High
Specific gravity	1.4	0.91	0.95	1.0	7.9	7.9

Note : 1. *GIP : Galvanized Iron Pipe, SS : Stainless Steel
2. Information provided in the Table is for reference only.

Product specification description

UPVC piping system products are manufactured by high quality PVC compound without plasticizer(DOP). All UPVC materials meet ASTM D1784 requirements.

Pipe :

UPVC pipe meets ASTM D1785 SCH 40 and SCH 80 requirements.

Fittings :

UPVC threaded fittings meet ASTM D2464, UPVC SCH 40 socket fittings meet ASTM D2466, and UPVC SCH 80 socket fittings meet D2467.

Cleaners (Primer) and Solvent Cements :

Socket fittings and pipes are suggested to be jointed by cleaner (primer) and solvent cements. The procedure of application should follow ASTM D2855 standard.

Marking :

All pipes and fittings are requested to bear manufacturing company name or logo , production date, material ASTM standard.

Referenced Standards

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, Schedule 40, 80 and 120

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 D2564 Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM F402 Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

ASTM F656 Specification for Primer for Use in Solvent Cement Joints of Poly (Vinyl Chloricle) (PVC) Plastic Pipe and Fittings

Engineering Information

UPVC Pipe Pressure Rating

Size	OD (inch)	SCH 80		SCH 40	
		Water Pressure Rating	Water Pressure Rating	Water Pressure Rating	Water Pressure Rating
		kg/cm^2	psi	kg/cm^2	psi
1/2"	0.840	59.76	850	42.18	600
3/4"	1.050	48.51	690	33.75	480
1"	1.315	44.29	630	31.64	450
1-1/4"	1.660	36.56	520	26.01	370
1-1/2"	1.900	33.04	470	23.2	330
2"	2.375	28.12	400	19.69	280
2-1/2"	2.875	29.53	420	21.09	300
3"	3.500	26.01	370	18.28	260
4"	4.500	22.5	320	15.47	220
5"	5.563	20.39	290	13.36	190
6"	6.625	19.69	280	12.66	180
8"	8.625	17.58	250	11.25	160
10"	10.750	16.17	230	9.84	140
12"	12.750	16.17	230	9.14	130
14"	14.000	15.47	220	9.14	130
16"	16.000	15.47	220	9.14	130
18"	18.000	15.47	220	9.14	130
20"	20.000	15.47	220	8.44	120
24"	24.000	14.76	210	8.44	120

Note :

1. Pressure rating applies for water at 73˚F. For temperature greater than 73˚F see derating factors. For fluids other than water the full pressure rating may not apply, see chemical resistance table.
2. Schedule 80 pipe operating above 130˚F should not be threaded. Use flanged joints, or Victaulic coupling where occasional disassembly is necessary.
3. All dimension of SCH40 should never be threaded, SCH80 pipe if diameter 6" and greater also should never be threaded.

Temperature Derating Factors – UPVC Pipe

Temperature Correction Factors - Pipe

Operation Temperature		Factor	
˚F	˚C	PVC	CPVC
70	21	1.00	1.00
80	27	0.90	0.96
90	32	0.75	0.92
100	38	0.62	0.85
110	43	0.50	0.77
115	16	0.40	0.74
120	19	0.45	0.70
125	52	0.32	0.66
130	54	0.30	0.62
140	60	0.22	0.55
150	66	*	0.47
160	71	*	0.40
170	77	*	0.32
180	82	*	0.25
200	93	NR	0.18
210	99	NR	*

Pressure Ratings for Flanged Systems

Flanged systems of any size should not exceed 150 psi working pressure.

Pressure Ratings for Threaded Systems

Threaded systems are derated to 50% of the pressure rating for the piping at the system operating temperature.

Friction Loss in Pipe

A great advantage that UPVC pipe enjoys over its metallic competitors is a smooth inner surface which is resistant to scaling and fouling. This means that friction pressure losses in the fluid flow are minimized from the beginning and do not significantly increase as the system ages, as can be the case with metal pipes subject to scaling.

The Hazen-Williams formula is the generally accepted method of calculating friction head losses in piping systems. The values in the following fluid flow tables are based on this formula ano a surface roughness constant of C=150 for 1 UPVC pipe. Surface roughness constants for other piping materials are given below:

$$f = 0.2083 \times \left(\frac{100}{d}\right)^{1.852} \frac{g^{1.852}}{d^{4.86555}}$$

Where f = friction head in feet of water per 100 feet of pipe
d = inside diameter of pipe in inches
g = flow rate in gallons per minute
c = pipe surface roughness constant

Constant (C)	Type of Pipe
150	PVC/CPVC pipe, new-40 years old
130-140	Steel/cast iron pipe, copper new
125	Steel pipe, old
120	Cast iron, copper 4-12 years old
110	Galvanized steel; Cast iron, 13-20 years old
60-80	Cast iron, worn/pitted

Friction Loss in Fittings

Friction losses through fittings are calculated from the equivalent length of straight pipe which would produce the same friction loss in the fluid. The equivalent lengths of pipe for common fittings are given below.

Equivalent Length of Pipe (Feet)*

Nominal Size (in)	90° Standard Elbow	45° Standard Elbow	Standard Tee Run Flow	Standard Tee Branch Flow
½	1.5	0.8	1.0	4.0
¾	2.0	1.1	1.4	5.0
1	2.6	1.4	1.7	6.0
1¼	3.8	1.8	2.3	7.0
1½	4.0	2.1	2.7	8.1
2	5.7	2.7	4.3	12.0
2½	6.9	3.3	5.1	14.
3	7.9	4.1	6.2	16.3
4	11.4	5.3	8.3	22.0
6	16.7	8.0	12.5	32.2
8	21.0	10.6	16.5	39.7
10	25.1	13.4	19.1	50.1
12	29.8	15.9	22.4	63.0

* The data provided in this table is for reference only.

Pressure Drop in Valves and Strainers

The equation for calculating pressure drop in this manner is:

$$\Delta P \cdot \rho = \frac{G^2}{Cv^2}$$

Where: ΔP = water pressure drop in psi
G = maximum flow rate in gallons per minute
Cv = the valve flow coefficient
ρ = specific gravity of fluids

Typical flow coefficients at fully opening for different valves and strainers are given below. Pressure drops for fluids other than water may be calculated by multiplying ΔP value with specific gravity of the fluid.

Valves	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"
MIP Ball	8	15	29	75	90	140	330	480	600	-	-	-
Double Union Ball	8	15	29	75	90	140	330	480	600	-	-	-
Single Union Ball	8	15	29	75	90	140	-	-	-	-	-	-
Swing Check	15	22	76	120	120	125	255	285	490	-	1050	1800
Butterfly	-	-	-	-	70	120	260	310	480	830	1000	2300
Diaphragm	6	6.5	11	14	32.5	54	110	150	250	-	-	-
Strainers (Clean)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"	8"
Y Type	3.8	6.6	8.4	20	25	35	60	60	95	-	-	-
T Type	6	9.5	29	-	40	55	-	125	155	-	-	-

Water Hammer Surge Pressure

Whenever the flow rate of liquid in a pipe is changed, there is a surge in pressure known as water hammer. The loner the line and the faster the fluid is moving, the greater the hydraulic shock will be. Water hammer may be caused by opening or closing a valve, starting or stopping a pump, or the movement of entrapped air through the pipe. The maximum water hammer surge pressure may be calculated from:

$$P_{wh} = \frac{\rho \Delta V}{g_c} \left[\frac{\rho}{g_c} \left(\frac{1}{K} + \frac{d}{bE} \right) \right]^{-½}$$

where Pwh = maximum surge pressure, PSI

ρ = fluid density (lb/ft^3)

ΔV = change in fluid velocity (ft/s)

g_c = gravitational constant (32.2 ft/s^2)

K = bulk modulus of elasticity of fluid (lb/ft^2) K water = 43.2 x 106 lb/ft^2

d = pipe inside diameter (inches)

b = pipe wall thickness (inches)

E = pipe material bulk modulus of elasticity (PSI)

The values in the following table are based on this formula at 73˚F and the assumption that water flowing at a given rate of gallons per minute is suddenly completely stopped. The value for fluids other than water may be approximated by multiplying by the square root of the fluid's specific gravity.

The water hammer surge pressure plus the system operating pressure should not exceed 1.5 times the recommended working rating of the system.

In order to minimize hydraulic shock due to water hammer, linear fluid flow velocity should generally be limited to 5 ft/s, particularly for pipe size of 6" or larger velocity at system start-up should be limited to 1 ft/s during filling until it is certain that all air has been flushed from the system and the pressure has been brought up to operating conditions.

Air should not be allowed to accumulate in the system while it is operating. Pumps should not be allowed to draw in air.

Where necessary, extra protective equipment may be used to prevent water hammer damage. Such equipment might include pressure relief valve, shock absorbers, surge arrestors and vacum air relief valves.

Carrying Capacity and Friction Loss for Schedule 80 Thermoplastic

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

½ in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
1	1.465	2.198	0.950	44.100
3	4.395	16.916	7.260	132.300
5	7.325	43.310	18.720	220.500
7	10.255	80.763	34.910	308.700

¾ in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
1	0.779	0.473	0.205	21.570
3	2.338	3.619	1.564	64.710
5	3.896	9.322	4.029	107.800
7	5.455	17.383	7.514	150.900
9	7.013	27.686	11.967	194.100
10	7.792	33.652	14.546	215.700

1 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
3	1.402	1.048	0.451	37.290
5	2.336	2.686	1.161	62.150
7	3.271	5.009	2.165	87.010
9	4.205	7.977	3.448	111.870
10	4.672	9.696	4.191	124.300
15	7.009	20.545	8.880	186.450
20	9.344	35.002	15.129	248.600

1¼ in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
3	0.777	0.248	0.107	19.041
5	1.295	0.639	0.276	31.735
7	1.812	1.191	0.515	44.429
9	2.330	1.898	0.820	57.123
10	2.589	2.306	0.997	63.470
15	3.884	4.887	2.112	95.205
20	5.178	8.326	3.599	126.940
25	6.473	12.587	5.441	158.675
30	7.768	17.643	7.626	190.410
35	9.062	23.472	10.146	222.145
40	10.357	30.057	12.992	253.880

1½ in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
3	0.562	0.113	0.049	13.161
5	0.937	0.291	0.126	21.935
7	1.312	0.543	0.235	30.709
9	1.687	0.865	0.374	39.483
10	1.875	1.052	0.455	43.870
15	2.812	2.228	0.963	65.805
20	3.750	3.797	1.641	87.740
25	4.687	5.739	2.481	109.675
30	5.625	8.045	3.477	131.610
35	6.562	10.703	4.626	153.545
40	7.499	13.705	5.924	175.480
45	8.437	17.046	7.368	197.415
50	9.374	20.719	8.956	219.350
60	11.249	29.041	12.553	263.220

2 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
7	0.781	0.154	0.066	17.059
9	1.005	0.245	0.106	21.933
10	1.116	0.298	0.129	24.370
15	1.674	0.631	0.273	36.555
20	2.232	1.075	0.465	48.740
25	2.790	1.625	0.702	60.925
30	3.348	2.278	0.985	73.110
35	3.906	3.030	1.310	85.295
40	4.465	3.881	1.677	97.480
45	5.023	4.827	2.086	109.665
50	5.581	5.866	2.536	121.850
60	6.697	8.223	3.554	146.220
70	7.813	10.940	4.729	170.590
80	8.929	14.009	6.055	194.960
90	10.045	17.424	7.531	219.330
100	11.161	21.178	9.154	243.700

2½ in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
7	0.548	0.064	0.028	12.173
9	0.702	0.102	0.044	15.651
10	0.780	0.124	0.054	17.390
15	1.169	0.264	0.114	26.085
20	1.559	0.449	0.194	34.780
25	1.949	0.679	0.293	43.475
30	2.339	0.951	0.411	52.170
35	2.728	1.266	0.547	60.865
40	3.118	1.621	0.701	69.560
45	3.508	2.016	0.871	78.255
50	3.898	2.450	1.059	86.950
60	4.677	3.434	1.484	104.340
70	5.457	4.569	1.975	121.730
80	6.237	5.851	2.529	139.120
90	7.016	7.277	3.146	156.510
100	7.796	8.845	3.823	173.900
125	9.745	13.372	5.780	217.375

3 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
10	0.499	0.042	0.019	10.500
15	0.747	0.089	0.038	15.750
20	0.996	0.151	0.065	21.000
25	1.245	0.228	0.099	26.250
30	1.494	0.320	0.138	31.500
35	1.743	0.425	0.184	36.750
40	1.992	0.545	0.235	42.000
45	2.241	0.678	0.293	47.250
50	2.490	0.823	0.356	52.500
60	2.988	1.154	0.499	63.000
70	3.486	1.536	0.664	73.500
80	3.984	1.966	0.850	84.000
90	4.482	2.446	1.057	94.500
100	4.980	2.973	1.285	105.000
125	6.225	4.494	1.943	131.250
150	7.469	6.299	2.723	157.500
175	8.714	8.381	3.622	183.750
200	9.959	10.732	4.639	210.000

4 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
20	0.570	0.039	0.017	11.220
25	0.712	0.059	0.025	14.025
30	0.855	0.082	0.036	16.830
35	0.997	0.109	0.047	19.635
40	1.140	0.140	0.061	22.440
45	1.282	0.174	0.075	25.245
50	1.425	0.212	0.092	28.050
60	1.710	0.297	0.128	33.660
70	1.995	0.395	0.171	39.270
80	2.280	0.506	0.219	44.880
90	2.565	0.629	0.272	50.490
100	2.850	0.765	0.330	56.100
125	3.562	1.156	0.500	70.125
150	4.274	1.620	0.700	84.150
175	4.987	2.155	0.932	98.175
200	5.699	2.759	1.193	112.200
250	7.124	4.170	1.804	140.250
300	8.549	5.849	2.528	168.300
350	9.974	7.781	3.363	196.350

6 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
50	0.627	0.029	0.012	11.500
60	0.752	0.040	0.017	13.800
70	0.877	0.054	0.023	16.100
80	1.003	0.069	0.030	18.400
90	1.128	0.085	0.037	20.700
100	1.253	0.104	0.045	23.000
125	1.567	0.157	0.068	28.750
150	1.880	0.220	0.095	34.500
175	2.193	0.292	0.126	40.250
200	2.506	0.374	0.162	46.000
250	3.133	0.566	0.244	57.500
300	3.760	0.793	0.343	69.000
350	4.386	1.055	0.456	80.500
400	5.013	1.351	0.584	92.000
450	5.639	1.680	0.726	103.500
500	6.266	2.042	0.883	115.000
750	9.399	4.327	1.870	172.500

8 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
125	0.892	0.040	0.017	15.375
150	1.071	0.056	0.024	18.450
175	1.249	0.074	0.032	21.525
200	1.427	0.095	0.041	24.600
250	1.784	0.144	0.062	30.750
300	2.141	0.202	0.087	36.900
350	2.498	0.268	0.116	43.050
400	2.855	0.343	0.148	49.200
450	3.212	0.427	0.185	55.350
500	3.569	0.519	0.224	61.500
750	5.353	1.100	0.475	92.250
1000	7.137	1.874	0.810	123.000
1250	8.921	2.833	1.224	153.750
1500	10.706	3.970	1.716	184.500

10 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
200	0.907	0.032	0.014	15.200
250	1.133	0.048	0.021	19.000
300	1.360	0.067	0.029	22.800
350	1.587	0.089	0.038	26.600
400	1.813	0.114	0.049	30.400
450	2.040	0.142	0.061	34.200
500	2.267	0.172	0.074	38.000
750	3.400	0.365	0.158	57.000
1000	4.533	0.621	0.269	76.000
1250	5.667	0.939	0.406	95.000
1500	6.800	1.316	0.569	114.000
1720	7.934	1.751	0.757	133.000
2000	9.067	2.243	0.969	152.000

12 in

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
350	1.121	0.038	0.016	18.550
400	1.281	0.049	0.021	21.200
450	1.441	0.061	0.026	23.850
500	1.601	0.074	0.032	26.500
750	2.402	0.157	0.068	39.750
1000	3.202	0.267	0.115	53.000
1250	4.003	0.403	0.174	66.250
1500	4.803	0.565	0.244	79.500
1720	5.604	0.752	0.325	92.750
2000	6.404	0.963	0.416	106.000

Caution: Flow velocity should not exeed 5 feet per second. PVC and CPVC pipe cannot be used for compressed air service.

Carrying Capacity and Friction Loss for Schedule 40 Thermoplastic

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

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	½ in			
1	1.105	1.107	0.478	28.040
3	3.315	8.465	3.659	85.920
5	5.525	21.801	9.423	140.200
7	7.735	40.634	17.573	200.480
	3 in			
10	0.441	0.031	0.013	7.870
15	0.662	0.066	0.029	11.805
20	0.883	0.113	0.049	15.740
25	1.103	0.170	0.074	19.675
30	1.324	0.238	0.103	23.610
35	1.545	0.317	0.137	27.545
40	1.766	0.406	0.176	31.480
45	1.986	0.505	0.218	35.415
50	2.207	0.614	0.265	39.350
60	2.648	0.861	0.372	47.220
70	3.090	1.145	0.495	55.090
80	3.531	1.466	0.634	62.960
90	3.973	1.824	0.788	70.830
100	4.414	2.217	0.958	78.700
125	5.517	3.351	1.449	98.375
150	6.621	4.698	2.031	118.050
175	7.724	6.250	2.701	137.725
200	8.828	8.003	3.459	157.400

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	¾ in			
1	0.623	0.274	0.118	14.710
3	1.868	2.096	0.906	44.130
5	3.113	5.399	2.334	73.550
7	4.358	10.069	4.352	102.970
9	5.603	16.036	6.931	132.390
10	6.226	19.491	8.425	147.100
	4 in			
20	0.511	0.030	0.013	8.420
25	0.639	0.045	0.019	10.525
30	0.767	0.063	0.027	12.630
35	0.894	0.084	0.036	14.735
40	1.022	0.107	0.046	16.840
45	1.150	0.134	0.058	18.945
50	1.278	0.162	0.070	21.050
60	1.533	0.228	0.098	25.260
70	1.789	0.303	0.131	29.470
80	2.044	0.388	0.168	33.680
90	2.300	0.483	0.209	37.890
100	2.555	0.587	0.254	42.100
125	3.194	0.887	0.383	52.625
150	3.833	1.243	0.537	63.150
175	4.472	1.654	0.715	73.675
200	5.111	2.117	0.915	84.200
250	6.389	3.201	1.384	105.250
300	7.666	4.487	1.939	126.300
350	8.944	5.969	2.580	147.350

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	1 in			
3	1.148	0.672	0.278	25.334
5	1.914	1.654	0.715	43.090
7	2.679	3.084	1.333	61.446
9	3.445	4.912	2.123	79.002
10	3.828	5.970	2.580	87.780
15	5.742	12.650	5.468	131.670
20	7.656	21.551	9.315	175.560
	6 in			
50	0.561	0.022	0.010	8.250
60	0.674	0.031	0.013	9.900
70	0.786	0.041	0.018	11.550
80	0.898	0.052	0.023	13.200
90	1.011	0.065	0.028	14.850
100	1.123	0.079	0.034	16.500
125	1.404	0.120	0.052	20.625
150	1.684	0.168	0.073	24.750
175	1.965	0.224	0.097	28.875
200	2.246	0.286	0.124	33.000
250	2.807	0.433	0.187	41.250
300	3.369	0.607	0.262	49.500
350	3.930	0.808	0.349	57.750
400	4.492	1.034	0.447	66.000
450	5.053	1.286	0.556	74.250
500	5.615	1.563	0.676	82.500
750	8.422	3.313	1.432	123.750

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	1¼ in			
3	0.659	0.166	0.072	13.791
5	1.098	0.426	0.185	22.985
7	1.537	0.796	0.345	32.179
9	1.976	1.270	0.549	41.373
10	2.195	1.544	0.667	45.970
15	3.293	3.272	1.414	68.955
20	4.391	5.574	2.409	91.940
25	5.489	8.426	3.642	114.925
30	6.586	11.810	5.105	137.910
35	7.684	15.712	6.792	160.895
40	8.782	20.121	8.697	183.880
	8 in			
125	0.809	0.031	0.014	11.125
150	0.971	0.044	0.019	13.350
175	1.133	0.059	0.025	15.575
200	1.295	0.075	0.032	17.800
250	1.619	0.113	0.049	22.250
300	1.942	0.159	0.069	26.700
350	2.266	0.211	0.091	31.150
400	2.590	0.271	0.117	35.600
450	2.913	0.337	0.146	40.050
500	3.237	0.409	0.177	44.500
750	4.856	0.868	0.375	66.750
1000	6.474	1.478	0.639	89.000
1250	8.093	2.234	0.966	111.250
1500	9.711	3.132	1.354	133.500
1750				
2000				

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	1½ in			
3	0.483	0.078	0.034	9.603
5	0.806	0.202	0.087	16.005
7	1.128	0.376	0.163	22.407
9	1.450	0.599	0.259	28.809
10	1.612	0.728	0.315	32.010
15	2.417	1.542	0.667	48.015
20	3.223	2.627	1.136	64.020
25	4.029	3.972	1.717	80.025
30	4.835	5.567	2.406	96.030
35	5.641	7.407	3.202	112.035
40	6.446	9.458	4.100	128.040
45	7.252	11.757	5.099	144.045
50	8.058	14.339	6.198	160.050
60	9.670	20.098	8.687	192.060
	10 in			
200	0.821	0.025	0.011	10.800
250	1.026	0.037	0.016	13.500
300	1.231	0.052	0.023	16.200
350	1.436	0.070	0.030	18.900
400	1.642	0.089	0.039	21.600
450	1.847	0.111	0.048	24.300
500	2.052	0.135	0.058	27.000
750	3.078	0.286	0.124	40.500
1000	4.104	0.488	0.211	54.000
1250	5.130	0.737	0.319	67.500
1500	6.156	1.033	0.447	81.000
1750	7.182	1.375	0.594	94.500
2000	8.208	1.761	0.761	108.000

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	2 in			
7	0.681	0.113	0.048	12.467
9	0.876	0.175	0.076	16.029
10	0.973	0.213	0.092	17.810
15	1.459	0.452	0.195	26.715
20	1.946	0.770	0.333	35.620
25	2.432	1.163	0.503	44.525
30	2.919	1.631	0.705	53.430
35	3.405	2.170	0.938	62.335
40	3.892	2.778	1.201	71.240
45	4.378	3.455	1.494	80.145
50	4.864	4.200	1.815	89.050
60	5.837	5.887	2.545	106.860
70	6.810	7.832	3.385	124.670
80	7.783	10.030	4.335	142.480
90	8.756	12.474	5.392	160.290
100	9.729	15.162	6.554	178.100
	12 in			
350	1.011	0.030	0.013	12.600
400	1.155	0.038	0.015	14.400
450	1.300	0.047	0.020	16.200
500	1.445	0.058	0.025	18.000
750	2.167	0.122	0.053	27.000
1000	2.889	0.208	0.090	36.000
1250	3.612	0.314	0.136	45.000
1500	4.334	0.440	0.190	54.000
1750	5.056	0.585	0.253	63.000
2000	5.778	0.750	0.324	72.000

Gallons per minutes	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100 Ft)	Friction Pressure Loss (PSI/100 Ft)	Maximum Surge Pressure (PSI)
	2½ in			
7	0.478	0.047	0.020	9.142
9	0.615	0.074	0.032	11.754
10	0.683	0.090	0.039	13.060
15	1.025	0.191	0.083	19.590
20	1.367	0.326	0.141	26.120
25	1.708	0.492	0.213	32.650
30	2.050	0.690	0.298	39.180
35	2.391	0.918	0.397	45.710
40	2.733	1.176	0.508	52.240
45	3.075	1.463	0.632	58.770
50	3.416	1.778	0.768	65.300
60	4.100	2.492	1.077	78.360
70	4.783	3.315	1.433	91.420
80	5.466	4.245	1.835	104.480
90	6.149	5.280	2.282	117.540
100	6.833	6.418	2.774	130.600
125	8.541	9.702	4.194	163.250

Caution: Flow velocity should not exeed 5 feet per second. PVC and CPVC pipe cannot be uses for compressed air service.

Thermal Expansion and Thermal Stresses

General

It is important to consider thermal expansion when designing a system with Hershey UPVC pipe. Most thermoplastics have a coefficient of thermal expansion which is significantly higher than those of metals. The thermal expansion of a piping system subject to a temperature change can therefore be significant, and may need compensation in the system design. The expansion or contraction of thermoplastic pipe may be calculated from the following formula:

Thermal Expansion Formula

$\Delta L = Lp\, C\, \Delta T$

Where: ΔL = Change in length due to change in temperature (in.)

Lp = Length of pipe (in.)

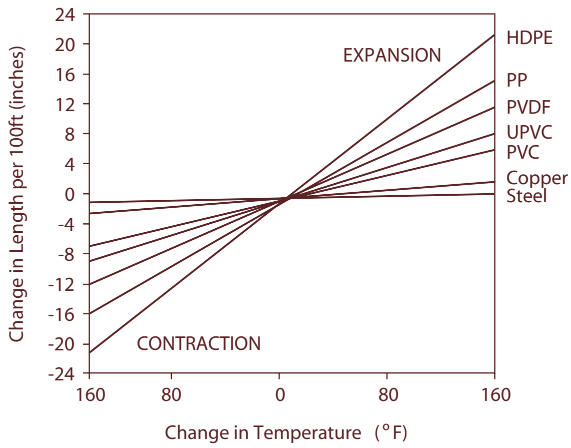
C = Coefficient of thermal expansion (in./in./°F) = 3.3×10^{-5} in./in./°F for PVC

ΔT = Change in temperature (°F)

The thermal expansion and contraction of PVC and other piping materials is displayed below.

Thermal Expansion of Piping Materials

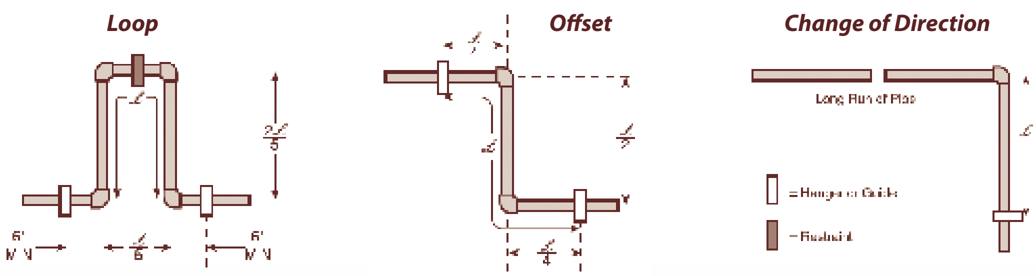
Per 100 feet



Expansion Loops and Offsets

As a rule of thumb, if the total temperature change is greater than 30°F (17°C), compensation for thermal expansion should be included in the system design. The recommended method of accommodating thermal expansion is to include expansion loops, offsets, or changes in direction where necessary in the system design.

An expansion loop schematic is presented here.



Expansion Loop Formula

$$L_L = \sqrt{\frac{3ED\Delta L}{2S}}$$

Where: L_L= Loop length (in.)

E = Modulus of elasticity at maximum temperature (psi)

S = Working Stress at maximum temperature (psi)

D = Outside diameter of pipe (in.)

ΔL = Change in length due to change in temperature (in.)

Expansion loops and offsets should be constructed with straight pipe and 90˚ elbows which are solvent cemented together. If threaded pipe is used in the rest of the system, it is still recommended that expansion loops and offsets be constructed with solvent cement in order to better handle the bending stresses incurred during expansion. The expansion loop or offset should be located approximately at the midpoint of the pipe run and should not have any supports or anchors installed in it. Valves or strainers should not be installed within an expansion loop or offset.

Thermal Stresses

If thermal expansion is not accommodated, it is absorbed in the pipe as an internal compression. This creates a compressive stress in the pipe. The stress induced in a pipe which is restrained from expanding is calculated with the following formula:

$$S = EC\Delta T$$

Where: S = stress induced in the pipe

E = Modulus of elasticity at maximum temperature

C = coefficient of thermal expansion

ΔT = total temperature change of the system

Modulus of Elasticity and Working Stress for UPVC

Temperature		Modulus, E		Stress,S	
˚F	˚C	psi	MPa	psi	MPa
73	23	400,000	2,758	2,000	14
90	32	372,000	2,565	1,500	10
100	38	352,000	2,427	1,300	9
110	43	336,000	2,316	1,000	7
120	49	316,000	2,179	800	5
130	54	300,000	2,068	600	4

Typical Recommended Maximum Support Spacing

Pipe Size (in.)	SCH80 -Temperature (˚F)				SCH40 - Temperature (˚F)			
	60	80	100	120	60	80	100	120
1/2"	5	4.5	4.5	3	4.5	4.5	4	2.5
3/4"	5.5	5	4.5	3	5	4.5	4	2.5
1"	6	5.5	5	3.5	5.5	5	4.5	3
1-1/4"	6	6	5.5	3.5	5.5	5.5	5	3
1-1/2"	6.5	6	5.5	3.5	6	5.5	5	3.5
2"	7	6.5	6	4	6	5.5	5	3.5
2-1/2"	7.5	7.5	6.5	4.5	7	6.5	6	4
3"	8	7.5	7	4.5	7	7	6	4
4"	9	8.5	7.5	5	7.5	7	6.5	4.5
6"	10	9.5	9	6	8.5	8	7.5	5
8"	11	10.5	9.5	6.5	9	8.5	8	5
10"	12	11	10	7	10	9	8.5	5.5
12"	13	12	10.5	7.5	11.5	10.5	9.5	6.5
14"	13.5	13	11	8	12	11	10	7
16"	14	13.5	11.5	8.5	12.5	11.5	10.5	7.5
18"	14.5	14	12	11	13	12	11	8
20"	15.5	14.5	12.5	11.5	14	12.5	11.5	10
24"	17	15	14	12.5	15	13	12.5	11

(Unit : Feet)

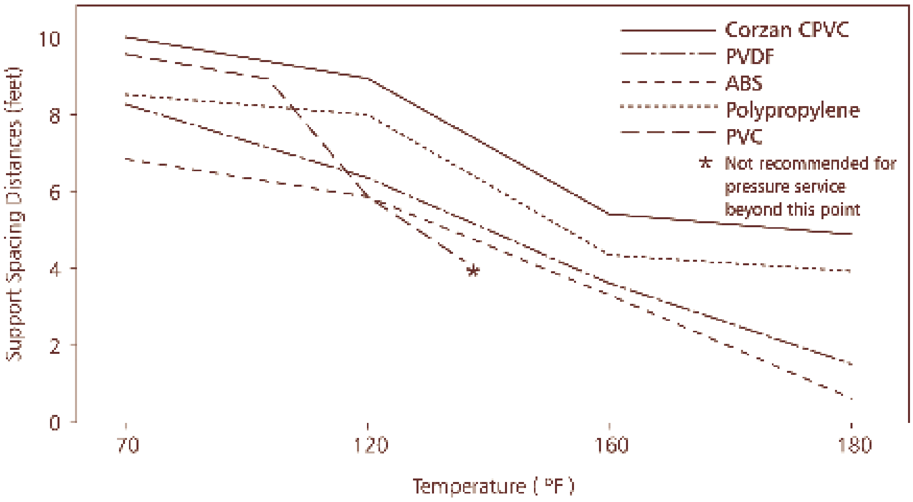
* Chart based on spacing for continuous spans and for unisulated line conveying fluids of specific gravity up to 1.00.

* The pipe should not be anchored tightly by the support, but secured in a manner to allow for movement caused by thermal expansion and contraction. It is recommended that you use clamps or straps that allow pipe to remain away from the framing, thus reducing the noise generated when pipe is allowed to rub against wood.

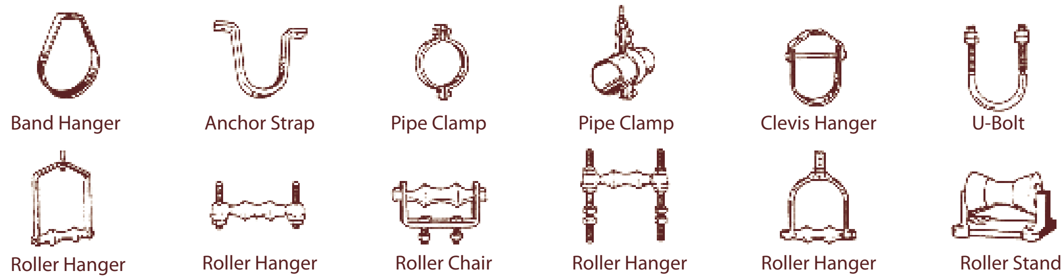
* If normally working temperature usually keep above 120˚F, it is recommended to use CPVC piping systems.

Specific Gravity	1.0	1.1	1.2	1.4	1.6	2.0	2.5
Correction Factor	1.00	0.98	0.96	0.93	0.90	0.85	0.80

Support Spacing for 6 Inch Diameter, Schedule 80 Thermoplastic Systems



Pipe Hangers, Clamps, & Supports



Installation Guides

General Installation Guides

Proper install of UPVC piping systems is critical to the performance of the system. A few sample guidelines should be followed to ensure long service life and safe operation.

Handling

Proper care should be exercised when transporting or installing Hershey UPVC piping to prevent damage. Hershey UPVC piping should be stored and shipped only with other non-metallic piping. It should not be dropped or dragged during handling, especially during extremely cold weather. The same treatment should apply to the handling of Hershey UPVC fittings.

Prior to actual installation, the pipe and fittings should be thoroughly inspected for cracks, gouges, or other signs of damage. Particular attention should be given to the inside surface of the part. While the outside surface may not exhibit damage, improper handling can result in damage that appears only on the inside surface of the part.

Cutting

Lengths of pipe can be easily and successfully cut by following a few simple guidelines. Best results are obtained by using fine-toothed saw blades (16 to 18 teeth per inch) with little or no offset (0.025” max.). Circular power saws (6,000 rpm) or band saws (3,600 ft./min.) are recommended using ordinary hand pressure. Miter boxes or other guide devices are strongly recommended for manual operation to ensure square cuts. Burrs, chips, and dust should be removed following cutting to prevent contamination of the piping system and facilitate joining.

Joining Methods

Hershey UPVC piping can be installed using a number of joining techniques. Solvent welding, flanging, and threading are the more common methods and are covered in greater detail in this section. Back welding of joints using hot gas welders is also covered in some detail. Less common joining methods are also possible with Hershey UPVC piping and fittings. Contact Hershey Sales rep. for assistance with less common joining methods.

Hanging/Laying of Pipe

Hershey UPVC piping can be installed above ground or buried underground. Methods to minimize stress on the piping as a result of installation are covered in detail below.

System Stress

Any metal or non-metal piping system is subject to stress-induced corrosion. As a result, special attention should be given to minimizing stress throughout the system. The total stress on a piping system includes not only the known pressure stress, but also stresses from sources such as expansion or installation. Expansion stresses can be minimized with expansion joints or loops. Installation stresses are minimized with careful installation techniques. Pipe and fittings should be properly prepared when joints are made up. Hangers and supports should be properly spaced to prevent sagging and should not cut into the pipe or clamp it tightly, preventing movement. System components should not be forced into place.

Thermal Expansion

UPVC piping has the lowest coefficient of thermal expansion of any thermoplastic piping. However, thermal expansion will be greater than that of metal piping. Typically, expansion loops or offsets in the piping are designed to account for any thermal expansion. These design methods are covered in detail in page 15 Expansion joints can also be installed. Information on expansion joints can be obtained by contacting Hershey Valve sale rep.

Testing the Piping System

After the piping system is installed and any solvent cement is fully cured, the system should be pressure tested and checked for leaks using water. Testing using compressed air or inert gas is not recommended. All entrapped air should be allowed to vent as the system is filled with water. Water filling should occur at a velocity not more than 1ft/sec. After filling, the system should be pressured to 125% of the maximum design pressure of the lowest rated part of the system. Pressure should be held for no more than one hour while the system is checked for leaks.

Joining UPVC Pipe and Fittings – Solvent Cementing

Cutting

Hershey UPVC pipe can be easily cut with a ratchet cutter, wheel-type plastic tubing cutter, power saw, or fine-toothed saw. To ensure the pipe is cut square, a mitre box must be used when cutting with a saw. Cutting the pipe as squarely as possible provides the maximum bonding surface area.

Chamfering and Deburring

Burrs and filings can prevent proper contact between the pipe and fitting and may put undue stress on the pipe and fitting assembly. Burrs and filings must be removed from the outside and inside of the pipe. A chamfering tool or file is suitable for this purpose. A slight bevel should be placed at the end of the pipe to ease entry of the pipe into the socket and minimize the chances of wiping solvent cement from the fitting. For pipe sizes 2 inches and larger a 10° -15° chamfer of 3/32" is recommended.

Fitting Preparation

Loose soil and moisture should be wiped from the fitting socket and pipe end with a clean, dry rag. Moisture can slow the curing, and at this stage of assembly excessive water can reduce the joint strength. The dry fit of the pipe and fitting should be checked. The pipe should enter the fitting socket easily 1/4 to 3/4 of the depth. If the pipe bottoms in the fitting with little interference, extra solvent cement should be used to prepare the joint.

Primer Application

Use primer conforming to ASTM F656. Primer is needed to prepare the bonding area for the addition of the cement and subsequent assembly. It is important that a proper applicator be used. A dauber, swab or paintbrush approximately half the size of the pipe diameter is appropriate. A rag should not be used. Primer is applied to both the outside of the pipe end and inside of the fitting socket, redipping the applicator as necessary to ensure that the entire surface of both is tacky.

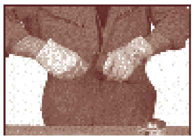
Solvent Cement Application

Use only solvent cement conforming to ASTM D2564. Solvent cement must be applied when the pipe surface is tacky, not wet, from primer. Joining surfaces must be penetrated and softened. Cement should be applied with a natural bristle brush or swab half the size of the pipe diameter. A dauber may be used to apply cement on pipe sizes below 2 inches. A heavy, even coat of cement should be applied to the outside of the pipe end, and a medium coat should be applied to the inside of the fitting socket. Pipe sizes greater than 2 inches should receive a second coat of cement on the pipe end.

Assembly

After cement application, for smaller pipe under 4" should immediately be inserted into the fitting socket and rotated 1/8 to 1/4 turn until the fitting-stop is reached. The fitting should be properly aligned for installation at this time. The pipe must meet the bottom of the fitting socket. The assembly should be held in place for 10 to 30 seconds to ensure initial bonding and to avoid pushout. A bead of cement should be evident around the pipe and fitting juncture. If this bead is not continuous around the socket shoulder, it may indicate that insufficient cement was applied. In this case, the fitting should be discarded and the joint reassembled. Cement in excess of the bead may be wiped off with a rag.


Chamfering the pipe

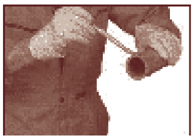

Removing the internal burr


Measuring the insertion depth


Marking the pipe end


Applying the primer to the pipe


Brush applying cement to the fitting


Brush applying cement to the pipe


Assembly


Wiping away excess cement

Joining of Large Diameter Pipe

For 6 inch or larger diameter pipe, a pipe puller (come-along) is recommended to assemble the joint and hold it in place for the initial set time without applying excess force that may damage the pipe or fitting. This equipment should be set up prior to the start of priming so the assembly can happen quickly while primer and cement are still fluid.

Set and Cure Times

Solvent cement set and cure times are a function of pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, high temperatures, and tighter fits. The assembly must be allowed to set, without any stress on the joint, per the time shown in the following tables. Following the initial set period, the assembly can be handled carefully avoiding significant stresses to the joint.

Extra care should be exercised when systems are assembled in extreme temperature conditions. Extra set and cure times should be allowed when the temperature is below 40˚F (4˚C). When the temperature is above 100˚F (38˚C), the assembler should ensure that both surfaces to be joined are still wet with cement before joining them.

Recommended Set Times

After a joint is assembled using solvent cement, it should not be disturbed for a period of time to allow for proper "setting" of the newly prepared joint. Recommended set times are as follows:

Average Initial Set Schedule

Ambient Temperature	1/2" to 1 ¼"	1 ½" to 2"	2 ½" to 8"	10" to 15"	15" +
60˚F to 100˚F	2 min	5 min	30 min	2 hrs	4 hrs
40˚F to 60˚F	5 min	10 min	2 hrs	8 hrs	16 hrs
0˚F to 40˚F	10 min	15 min	12 hrs	24 hrs	48 hrs

Note:

1. Initial set schedule is the necessary time to allow before the joint can be carefully handled. In damp or weather allow 50% more set time.

2. These figures are estimates based on laboratory tests using water; extended set times are required for economical applications. Due to the many variables in the field, these figures should be used as a general guide only.

Recommended Cure Times

After a joint is assembled using solvent cement, the cement must be allowed to properly "cure" before the piping system is pressurized. Recommended minimum cure times are shown below. These recommendations should only serve as a guide since atmospheric conditions during installation will affect the curing process. High humidity and/or colder weather will require longer cure times: typically add 50% to the recommended cure time if surroundings are humid or damp.

	1/2" - 1 ¼"		1 ½" - 2"		2 ½" - 8"		10" - 15"	15"+
Ambient Temperature	-160 psi	160- 370 psi	-160 psi	160 -315 psi	- 160 psi	160 -315 psi	-100 psi	-100 psi
60˚F to 100˚F	15 min	6 hrs	30 min	12 hrs	90 min	24 hrs	48 hrs	72 hrs
40˚F to 60˚F	20 min	12 hrs	45 min	24 hrs	4 hrs	48 hrs	96 hrs	6 days
0˚F to 40˚F	30 min	48 hrs	1 hr	96 hrs	72 hrs	8 days	8 days	14 days

Note: These figures are estimates based on laboratory tests using water; extended set times are required for economical applications. Due to the many variables in the field, these figures should be used as a general guide only.

Back-Welding of Pipe Joints

Back-welding may be used to repair minor leaks in solvent a welding rod to fuse in the joint fillet while both rod and fillet are softened with hot air.

Before hot-air welding begins, the section of piping where the repair will be made must be emptied. Joints should not be welded with fluid still in the pipe.

All dirt and moisture should be wiped away from the joint to be repaired. Excess dried solvent cement around the joint should be removed with an emery cloth. Residual solvent cement may tend to scorch and burn during welding. If the joint to be welded is a threaded joint, excess threads in the joint area should be removed with a file in order to provide a smooth surface for welding.

If a speed tip will be used for back-welding, please contact BFGoodrich or Hershey Valve for relative information.

If welding will be done by feeding the rod manually, the following conditions and procedures should be used :

The welding temperature should be approximately 550 ~ 600˚F.

The end of the welding rod should be inserted into the junction of the pipe and fittings, and the rod should be held at a 90˚ angle to the joint. The rod and base material should be preheated with the welding torch 1/4 to 3/4 inch away from both the rod and the base material and fanning back and forth in the immediate welding area. while preheating, the rod can be moved up and down until it is soft enough to stick to the base.

When the materials are softened enough to fuse, the rod should be advanced by the application of a slight pressure. The fanning motion of the torch should be continued throughout the welding process. when the weld is finished, another inch of rod material should be lapped over the bead.

When large diameter pipe is welded, three beads may be required to fill the joint adequately, the first bead should be laid directly into the joint fillet, and the subsequent beads on either side of the first bead.

Flanging of UPVC pipe

Flanging can be used to provide temporary disassembly of a piping system or when it is not possible to make up solvent cemented joints at the assembly site.

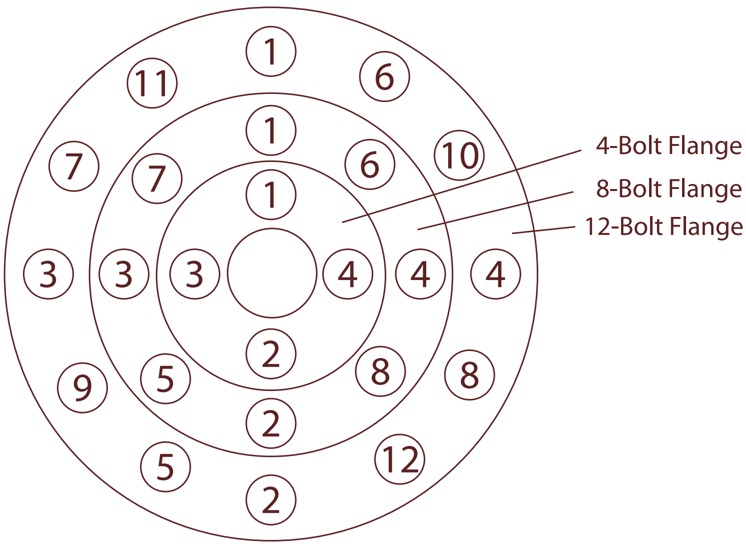
Flanges are joined to the pipe by solvent cement or threaded joints. Refer to the sections on solvent cementing or threading of UPVC pipe for the proper techniques.

Flanged joints incorporate an elastomeric gasket between the mating faces to provide for a seal. The gasket selected must be full-faced and have a hardness of 55-80 durometer A. Typically, gaskets are 1/8" thick. The gasket material must be resistant to the chemical environment. Many manufacturers of gasketing materials supply this kind of information. The flanges should be carefully aligned and the bolts inserted through matching holes. A flat washer should be used beneath each nut and bolt head. Each bolt should be partially tightened in the alternating sequence indicated in the patterns below. A torque wrench should be used for the final tightening of the bolts. The bolts should be tightened to the torque recommended in the table below in the same alternating sequence used previously.

Recommended Bolt Torque

Nominal Pipe Size	Number of Bolt Holes	Bolt Diameter (in)	Recommended Torque (ft-lbs)
1/2 – 1 1/2	4	1/2	10 ~ 15
2 ~ 3	4	5/8	20 ~ 30
4	8	5/8	20 ~ 30
6	8	3/4	33 ~ 50
8	8	3/4	33 ~ 50
10	12	7/8	53 ~75
12	12	1	80 ~ 110

Flage Bolt Tightening Patterns



Underground Installation Guidelines

References

These guidelines are based upon the following:

1. ASTM D2774
   Standard Recommended Practice for Underground Installation of Thermoplastic Piping.

2. Industry Experience
   For additional information and data, consult ASTM standards D2774, D2321, or F645.

Installation Procedures

This procedure will cover the typical steps encountered in underground installations: trench design, trench preparation, piping assembly, laying of pipe, and backfilling.

Trench Design

Width: The trench should be of adequate width to allow for convenient installation, but as narrow as possible depending on whether the piping will be assembled inside or outside of the trench.

Depth:The trench depth should be sufficient to place the pipe deep enough to meet frost, above-ground load, and any trench bedding requirements.

Frost: Piping at least 12 inches below the frost line.

Loads: Piping should be deep enough to keep external stress levels below acceptable design stress. Design stress will be determined by pipe size and operating temperature and may be governed by various codes.

Bedding: 4 to 6 inches underneath piping, if necessary.

Trench Preparation

The trench bottom should be continuous, relatively smooth and free of rocks. If ledge rock, hardpan, boulders, or rocks that are impractical to remove are encountered, it will be necessary to pad the trench bottom to protect the piping from damage. 4 to 6 inches of tamped earth or sand bedding will be sufficient in such situations.

Piping Assembly/Placement

Piping may be assembled using conventional solvent cementing techniques either inside or outside of the trench depending on the specific installation requirements. Solvent cement usually requires at least 12 to 24 hours for the cemented joint to cure properly. During this critical curing process, every effort should be made to minimize the stress on any joints. As a result, the piping should not be moved during the curing period, nor should the pipe be backfilled, or otherwise constrained during curing. See the recommendations on joint curing time to determine the exact curing requirements for a specific installation.

If the piping was assembled outside of the trench, the pipe may be placed into the trench after proper curing, but **MUST NOT** be rolled or dropped into place. Long lengths of joined piping should be properly supported as the piping is put into place to prevent excessive stress.

After proper curing and before backfilling, the piping should be brought to within 15˚F of the expected operating temperature. Backfilling can proceed while the piping is maintained at this temperature in order to minimize stress on the system due to thermal expansion/contraction. If this step is impractical, then stress calculations must be done to determine the loads that will be created due to constrained thermal expansion/contraction.* These loads must then be compared to the design stress of the particular piping system.

Backfilling

Backfilling should only proceed after all solvent cement joints have been properly cured and the piping brought close to normal operating temperature, if operation will be more than 15˚F different than the current ambient temperature. The piping should be uniformly supported over its entire length on firm, stable material.

Backfill material should be free of rocks and have a particle size no greater than 1/2." Piping should initially be surrounded with backfill to provide between 6" and 8" of cover. The backfill should be compacted using vibratory or water flooding methods. If water flooding is used, additional material should not be added until the water flooded backfill is firm enough to walk on. Backfill containing a significant amount of fine-grained material, such as silt or clay, should be hand or mechanically tamped.

The remainder of the backfill should be placed and spread in approximately uniform layers to completely fill the trench without voids. Particle size for this final fill should not exceed 3." Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

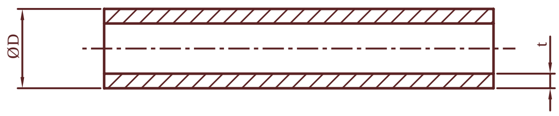
Product Dimension and Drawing

SCH 80 and SCH 40 UPVC Pipe

SCH 80 UPVC Pipe

Size	Standard			
	D	Tolerance	t(min)	Tolerance
1/2"	21.34	±0.10	3.73	+0.51
3/4"	26.67	±0.10	3.91	+0.51
1"	33.40	±0.13	4.55	+0.53
1-1/4"	42.16	±0.13	4.85	+0.58
1-1/2"	48.26	±0.15	5.08	+0.61
2"	60.32	±0.15	5.54	+0.66
2-1/2"	73.02	±0.18	7.01	+0.84
3"	88.90	±0.20	7.62	+0.91
4"	114.30	±0.23	8.56	+1.02
5"	141.30	±0.25	9.52	+1.14
6"	168.28	±0.28	10.97	+1.32
8"	219.08	±0.38	12.70	+1.52
10"	273.05	±0.38	15.06	+1.80
12"	323.85	±0.38	17.45	+2.08
14"	355.60	±0.38	19.05	+2.29
16"	406.40	±0.48	21.41	+2.57
18"	457.20	±0.48	23.80	+2.84
20"	508.00	±0.58	26.20	+3.15
24"	609.60	±0.79	30.94	+3.71

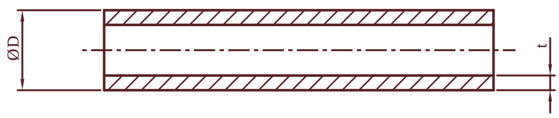
(unit:mm)



SCH 40 UPVC Pipe

Size	Standard			
	D	Tolerance	t(min)	Tolerance
1/2"	21.34	±0.10	2.77	+0.51
3/4"	26.67	±0.10	2.87	+0.51
1"	33.40	±0.13	3.38	+0.51
1-1/4"	42.16	±0.13	3.56	+0.51
1-1/2"	48.26	±0.15	3.68	+0.51
2"	60.32	±0.15	3.91	+0.51
2-1/2"	73.02	±0.18	5.16	+0.61
3"	88.90	±0.20	5.49	+0.66
4"	114.30	±0.23	6.02	+0.71
5"	141.30	±0.25	6.55	+0.79
6"	168.28	±0.28	7.11	+0.86
8"	219.08	±0.38	8.18	+0.99
10"	273.05	±0.38	9.27	+1.12
12"	323.85	±0.38	10.31	+1.24
14"	355.60	±0.38	11.10	+1.35
16"	406.40	±0.48	12.70	+1.52
18"	457.20	±0.48	14.27	+1.70
20"	508.00	±0.58	15.06	+1.80
24"	609.60	±0.79	17.45	+2.08

(unit:mm)

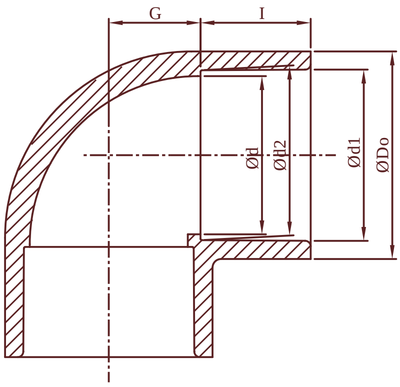


SCH 80 UPVC Fittings

SCH 80 UPVC 90° Elbow (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	I	d	G
1/2"	31.5	21.54	21.23	22.22	16.5	12.8
3/4"	38	26.87	26.57	25.4	22	15.3
1"	46	33.65	33.27	28.58	28	18
1-1/4"	55	42.42	42.04	31.75	35	23
1-1/2"	60	48.56	48.11	34.93	43	26
2"	75	60.63	60.17	38.1	54	32
2-1/2"	90	73.38	72.85	44.45	69	38
3"	107	89.31	88.70	47.63	84	48
4"	133	114.76	114.1	57.15	105	59
5"	163.5	141.81	141	66.68	136	80
6"	191	168.83	168.00	76.2	150	89
8"	246	219.84	218.69	101.6	200	115
10"	306.5	273.81	272.67	127	265	150
12"	364	324.61	323.47	152.4	315	180
14"	396.5	356.49	355.22	*180	346	248

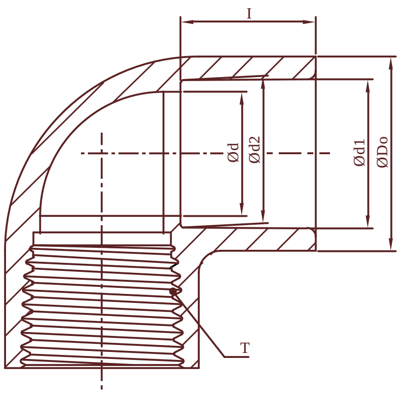
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 80 UPVC 90° Elbow (Slip×NPT)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	I	d	NPT (thd./in)
1/2"	30.5	21.54	21.23	22.22	16	14
3/4"	38	26.87	26.57	25.4	22	14
1"	46	33.65	33.27	28.58	28	11.5
1-1/4"	55	42.42	42.04	31.75	35	11.5
1-1/2"	60	48.56	48.11	34.93	43	11.5
2"	75	60.63	60.17	38.1	54	11.5

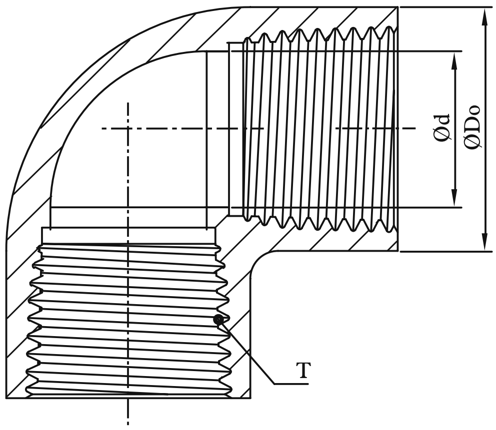
(unit : mm)



SCH 80 UPVC 90° Elbow (NPT×NPT)

Size	Outside Dia	Structure Diameter	
	D0	d	NPT(thd./in)
1/2"	30.5	16	14
3/4"	38	22	14
1"	46	28	11.5
1-1/4"	55	35	11.5
1-1/2"	60	43	11.5
2"	75	54	11.5

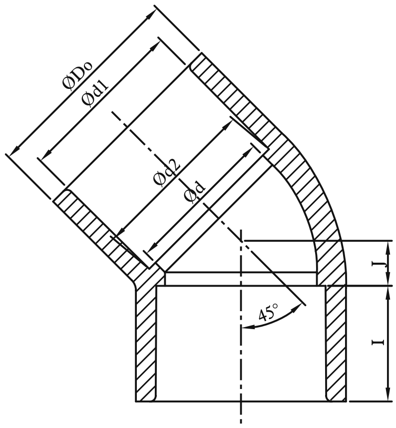
(unit : mm)



SCH 80 UPVC 45° Elbow (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	I	d	J
1/2"	30.5	21.54	21.23	22.22	16.5	6.5
3/4"	40	26.87	26.57	25.4	22	8
1"	46	33.65	33.27	28.58	28	8
1-1/4"	56	42.42	42.04	31.75	35	10
1-1/2"	62.5	48.56	48.11	34.93	43	12
2"	75.5	60.63	60.17	38.1	54	16
2-1/2"	90	73.38	72.85	44.45	69	18
3"	107	89.31	88.70	47.63	84	20
4"	133	114.76	114.1	57.15	108	26
5"	163.5	141.81	141	66.68	136	38.5
6"	191	168.83	168.00	76.2	150	45
8"	246	219.84	218.69	101.6	200	51
10"	307	273.81	272.67	127	265	60
12"	364	324.61	323.47	152.4	315	73
14"	396.5	356.49	355.22	*180	350	90

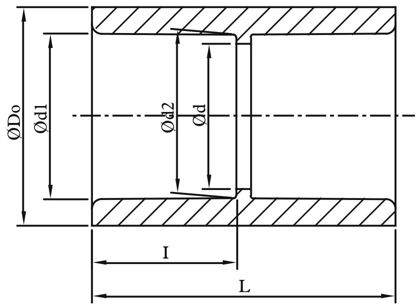
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 80 UPVC Coupling (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	l	d	L
1/2"	30.5	21.54	21.23	22.22	16.5	50
3/4"	38	26.87	26.57	25.4	22	63.5
1"	46	33.65	33.27	28.58	28	70
1-1/4"	55.5	42.42	42.04	31.75	35	75
1-1/2"	61	48.56	48.11	34.93	42.5	77
2"	73.5	60.63	60.17	38.1	54	84
2-1/2"	89	73.38	72.85	44.45	65	100
3"	106	89.31	88.70	47.63	80	108
4"	133	114.76	114.1	57.15	100	126
5"	163	141.81	141	66.68	134.5	160
6"	191	168.83	168.00	76.2	158	169
8"	246	219.84	218.69	101.6	200	220
10"	307	273.81	272.67	127	259	283
12"	364	324.61	323.47	152.4	308	336.5
14"	396.5	356.49	355.22	205	346	436.5
16"	454	407.54	405.89	230	396	486.5

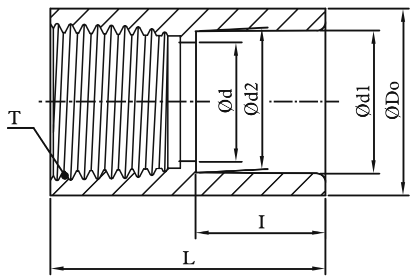
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 80 UPVC Coupling (Slip×NPT)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	l	d	L	NPT(thd./in)
1/2"	30.5	21.54	21.23	22.22	16.5	50	14
3/4"	38	26.87	26.57	25.4	22	63.5	14
1"	46	33.65	33.27	28.58	28	70	11.5
1-1/4"	55.5	42.42	42.04	31.75	35	75	11.5
1-1/2"	61	48.56	48.11	34.93	42.5	77	11.5
2"	73.5	60.63	60.17	38.1	54	84	11.5

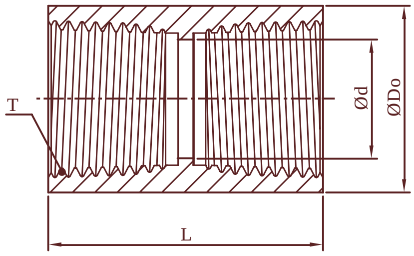
(unit : mm)



SCH 80 UPVC Coupling (NPT×NPT)

Size	Outside Dia	Structure Diameter		
	D0	d	L	NPT(thd./in)
1/2"	30.5	16.5	50	14
3/4"	38	22	63.5	14
1"	46	28	70	11.5
1-1/4"	55.5	35	75	11.5
1-1/2"	61	42.5	77	11.5
2"	73.5	54	84	11.5

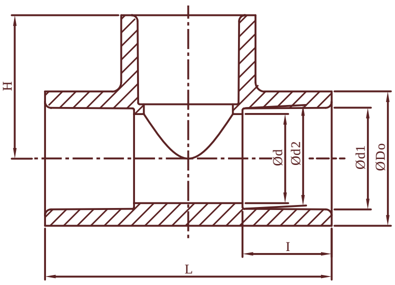
(unit : mm)



SCH 80 UPVC Tee (Slip×Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	I	d	L	H
1/2"	30	21.54	21.23	22.22	16.5	73	37.25
3/4"	37	26.87	26.57	25.4	24	89.5	42.5
1"	46	33.65	33.27	28.58	28	103	51.5
1-1/4"	55.5	42.42	42.04	31.75	35	119.5	57.75
1-1/2"	63.5	48.56	48.11	34.93	41	128	64
2"	75	60.63	60.17	38.1	52	152	73
2-1/2"	92	73.38	72.85	44.45	69	173	86.5
3"	109	89.31	88.70	47.63	84	197	98.5
4"	135	114.76	114.1	57.15	109	239	119.5
5"	163.5	141.81	141	66.68	136	298	149
6"	191	168.83	168.00	76.2	150	336.5	168.25
8"	246	219.84	218.69	101.6	200	439	219.5
10"	317	273.81	272.67	127	265	560	280
12"	364	324.61	323.47	152.4	315	660	330
14"	396.5	356.49	355.22	*180	346	856.5	428.25

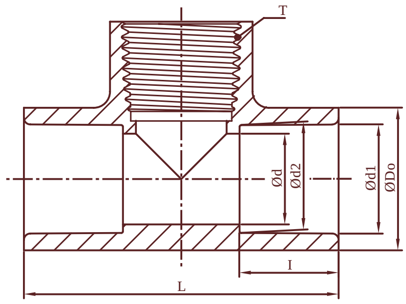
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 80 UPVC Tee (Slip×Slip×NPT)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	l	d	L	NPT(thd./in)
1/2"	30	21.54	21.23	22.22	16.5	73	14
3/4"	37	26.87	26.57	25.4	24	89.5	14
1"	46	33.65	33.27	28.58	28	103	11.5
1-1/4"	55.5	42.42	42.04	31.75	35	119.5	11.5
1-1/2"	63.5	48.56	48.11	34.93	41	128	11.5
2"	75	60.63	60.17	38.1	52	152	11.5

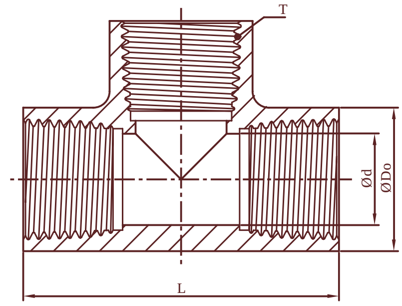
(unit : mm)



SCH 80 UPVC Tee (NPT×NPT×NPT)

Size	Outside Dia	Structure Diameter		
	D0	d	L	NPT(thd./in)
1/2"	30	16.5	73	14
3/4"	37	24	89.5	14
1"	46	28	103	11.5
1-1/4"	55.5	35	119.5	11.5
1-1/2"	63.5	41	128	11.5
2"	75	52	152	11.5

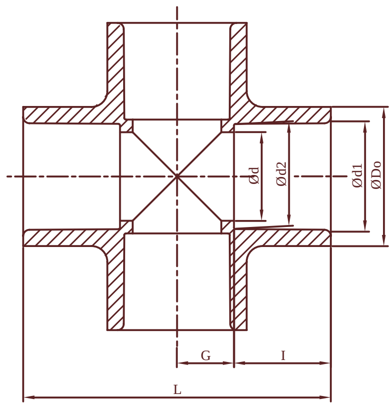
(unit : mm)



SCH 80 UPVC Cross(Slip×Slip×Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	l	d	G	L
1/2"	32	21.54	21.23	22.22	16.5	13	74.5
3/4"	44	26.87	26.57	25.4	22	15.4	86
1"	47	33.65	33.27	28.58	28	17.8	97
1-1/4"	56	42.42	42.04	31.75	35	23	116
1-1/2"	65	48.56	48.11	34.93	43	26.1	128.5
2"	78	60.63	60.17	38.1	54	31.8	146
2-1/2"	89	73.38	72.85	44.45	65	37.8	171
3"	105	89.31	88.70	47.63	80	47.6	196
4"	132	114.76	114.1	57.15	100	58	236.5

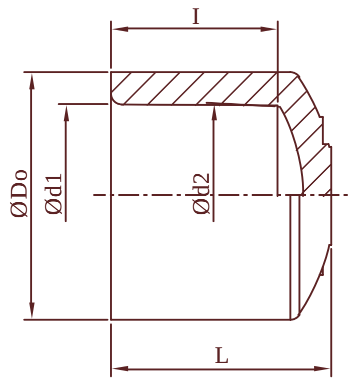
(unit : mm)



SCH 80 UPVC Cap (Slip)

Size	Outside Dia	Socket Type			Structure Diameter
	D0	d1	d2	I	L
1/2"	30.5	21.54	21.23	22.22	31
3/4"	37	26.87	26.57	25.4	36
1"	45.5	33.65	33.27	28.58	41
1-1/4"	55	42.42	42.04	31.75	46
1-1/2"	61.5	48.56	48.11	34.93	50
2"	75	60.63	60.17	38.1	55.5
2-1/2"	91	73.38	72.85	44.45	65.5
3"	106	89.31	88.70	47.63	69.5
4"	134	114.76	114.1	57.15	78
5"	163.5	141.81	141	66.68	108
6"	192	168.83	168.00	76.2	118.5
8"	246	219.84	218.69	101.6	143
10"	307	273.81	272.67	127	194
12"	366	324.61	323.47	152.4	235.5
14"	395	356.49	355.22	180	226
16"	452	407.54	405.89	205	258.5

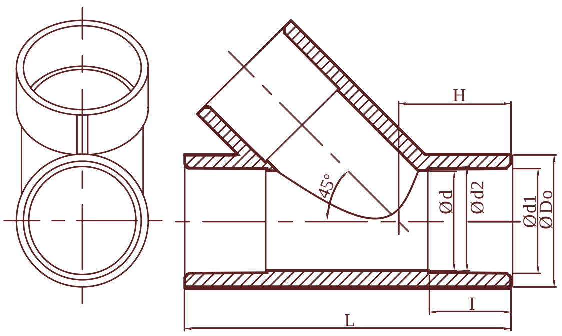
(unit : mm)



SCH 80 UPVC Y-Tee (45°, Slip×Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	I	d	L	H
1/2"	30.5	21.54	21.23	22.22	19	90	34
3/4"	36	26.87	26.57	25.4	24.5	105	40
1"	44	33.65	33.27	28.58	31	117	42
1-1/4"	61	42.42	42.04	31.75	40	150	52
1-1/2"	61	48.56	48.11	34.93	46	150	52
2"	76.5	60.63	60.17	38.1	58.5	181	60
3"	106	89.31	88.70	47.63	74	222	68
4"	132	114.76	114.1	57.15	100	277	83
6"	191	168.83	168	76.2	150	393	114
8"	246	219.84	218.69	101.6	200	570	177

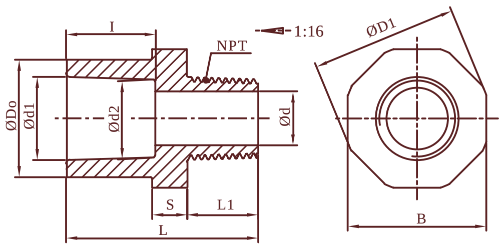
(unit : mm)



SCH 80 UPVC Male Adapter (Slip×NPT)

Size	Outside Dia	Socket Type			Structure Diameter						
	D0	d1	d2	I	d	S	L	L1	B	D1	NPT
1/2"	30.5	21.54	21.23	22.22	13	9	50	19	36	38	14
3/4"	35	26.87	26.57	25.4	17	9	50	15	41	43	14
1"	44	33.65	33.27	28.58	23	9	59	21	50	53	11.5
1-1/4"	54	42.42	42.04	31.75	29	9	61	19	60	63	11.5
1-1/2"	60	48.56	48.11	34.93	37	9	72	27	65	68	11.5
2"	73	60.63	60.17	38.1	48	10	77	27	80	83	8
2-1/2"	88	73.38	72.85	44.45	57	11.5	97	40	95	100	8
3"	105	89.31	88.70	47.63	72	14	103	42	115	122	8
4"	132	114.76	114.1	57.15	96	14	116	45	145	154	8

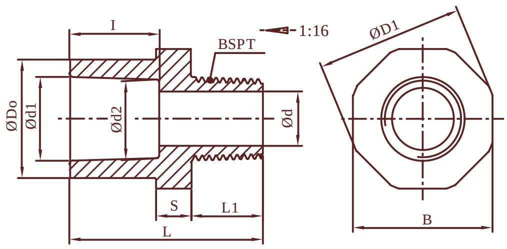
(unit : mm)



SCH 80 UPVC Male Adapter (Slip×BSPT)

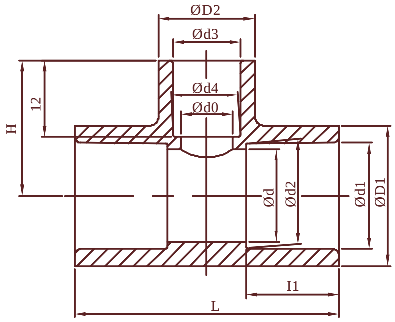
Size	Outside Dia	Socket Type			Structure Diameter						
	D0	d1	d2	I	d	S	L	L1	B	D1	BSPT
1/2"	30.5	21.54	21.23	22.22	13	9	50	19	36	38	14
3/4"	35	26.87	26.57	25.4	17	9	50	15	41	43	14
1"	44	33.65	33.27	28.58	23	9	55	16.5	50	53	11
1-1/4"	54	42.42	42.04	31.75	29.5	9	61	19	60	63	11
1-1/2"	60	48.56	48.11	34.93	37	9	64	19	65	68	11
2"	73	60.63	60.17	38.1	48	10	70.5	20.5	80	83	11
2-1/2"	88	73.38	72.85	44.45	57	11.5	90	32	95	100	11
3"	105	89.31	88.70	47.63	72	14	94.5	32	115	122	11
4"	132	114.76	114.1	57.15	96	14	109.5	38	145	154	11

(unit : mm)



SCH 80 UPVC Reducer Tee (Slip×Slip×Slip)

Size	Outside Dia		Socket Type						Structure Diameter			
	D1	D2	d1	d2	l1	d3	d4	l2	L	H	d	d0
3/4"X3/4"X1/2"	37	32	26.87	26.57	25.4	21.54	21.23	22.22	88	38.5	22	16.5
1"X1"X1/2"	44	30	33.65	33.27	28.58	21.54	21.23	22.22	97	41	28	16.5
1"X1"X3/4"	46	32	33.65	33.27	28.58	26.87	26.57	25.4	97	44	28	22
1"X1"X2"	44	73	33.65	33.27	28.58	60.63	60.17	38.1	97	65	28	28
1-1/4"X1-1/4"X1/2"	57	32	42.42	42.04	31.75	21.54	21.23	22.2	116	44.5	35	16.5
1-1/4"X1-1/4"X3/4"	57	37	42.42	42.04	31.75	26.87	26.57	25.4	116	48	35	22
1-1/4"X1-1/4"X1"	57	46	42.42	42.04	31.75	33.65	33.27	28.58	116	52	35	28
1-1/2"X1-1/2"X1/2"	62	32	48.56	48.11	34.93	21.54	21.23	22.22	128.5	48.5	43	16.5
1-1/2"X1-1/2"X3/4"	62	37	48.56	48.11	34.93	26.87	26.57	25.4	128.5	52	43	22
1-1/2"X1-1/2"X1"	62	48	48.56	48.11	34.93	33.65	33.27	28.58	128.5	55.5	43	28
1-1/2"X1-1/2"X1-1/4"	62	56	48.56	48.11	34.93	42.42	42.04	31.75	128.5	60	43	35
2"X2"X1/2"	76	32.5	60.63	60.17	38.1	21.54	21.23	22.22	146	54	54	16.5
2"X2"X3/4"	76	37	60.63	60.17	38.1	26.87	26.57	25.4	146	57.5	54	22
2"X2"X1"	76	46	60.63	60.17	38.1	33.65	33.27	28.58	146	60.5	54	28
2"X2"X1-1/4"	76	56	60.63	60.17	38.1	42.42	42.04	31.75	146	65	54	35
2"X2"X1-1/2"	76	62	60.63	60.17	38.1	48.56	48.11	34.93	146	69	54	43
2-1/2"X2-1/2"X1"	91	46	73.38	72.85	44.45	33.65	33.27	28.58	171	67.5	65	28
2-1/2"X2-1/2"X1-1/4"	91	54	73.38	72.85	44.45	42.42	42.04	31.75	171	72	65	35
2-1/2"X2-1/2"X1-1/2"	91	62	73.38	72.85	44.45	48.56	48.11	34.93	171	75.5	65	43
2-1/2"X2-1/2"X2"	91	75	73.38	72.85	44.45	60.63	60.17	38.1	171	79	65	54
3"X3"X1"	107	46	89.31	88.7	47.63	33.65	33.27	28.58	196	77.5	80	28
3"X3"X1-1/4"	107	56	89.31	88.7	47.63	42.42	42.04	31.75	196	77.5	80	35
3"X3"X1-1/2"	107	62	89.31	88.7	47.63	48.56	48.11	34.93	196	82	80	43
3"X3"X2"	107	75	89.31	88.7	47.63	60.63	60.17	38.1	196	86.5	80	54
3"X3"X2-1/2"	107	91	89.31	88.7	47.63	73.38	72.85	44.45	196	95	80	65
4"X4"X1"	133	46	114.76	114.1	57.15	33.65	33.27	28.58	237.5	89.5	100	28
4"X4"X1-1/4"	133	57	114.76	114.1	60.15	42.42	42.04	31.75	237.5	90.5	100	38
4"X4"X1-1/2"	133	64	114.76	114.1	57.15	48.56	48.11	34.93	237.5	97	100	43
4"X4"X2"	133	75	114.76	114.1	57.15	60.63	60.17	38.10	237.5	96	100	54
4"X4"X2-1/2"	133	91	114.76	114.1	57.15	73.38	72.85	44.45	237.5	104	100	65
4"X4"X3"	133	107	114.76	114.1	57.15	89.31	88.7	47.63	237.5	110	100	80
5"X5"X2"	163	75	141.81	141	66.68	60.63	60.17	38.10	298	114.5	132	54
6"X6"X1"	191	45	168.83	168	76.2	33.65	33.27	28.58	336.5	115	150	29
6"X6"X1-1/4"	191	54	168.83	168	76.2	42.42	42.04	31.75	336.5	120	150	38
6"X6"X1-1/2"	191	60.5	168.83	168	76.2	48.56	48.11	34.93	336.5	123	150	44
6"X6"X2"	191	73	168.83	168	76.2	60.63	60.17	38.10	336.5	125	150	54
6"X6"X2-1/2"	191	89	168.83	168	76.2	73.88	72.85	44.45	336.5	130	150	65
6"X6"X3"	191	105	168.83	168	76.2	89.31	88.7	47.63	336.5	135	150	80
6"X6"X4"	191	132	168.83	168	76.2	114.76	114.1	57.15	336.5	145	150	100
8"X8"X2"	246	75	219.84	218.69	101.6	60.63	60.17	38.1	439	151	200	54
8"X8"X2-1/2"	246	89	219.84	218.69	101.6	73.38	72.85	44.45	439	157.25	200	65
8"X8"X3"	246	105	219.84	218.69	101.6	89.31	88.7	47.63	439	160	200	80
8"X8"X4"	246	132	219.84	218.69	101.6	114.76	114.1	57.15	439	170	200	100
8"X8"X6"	246	191	219.84	218.69	101.6	168.83	168	76.20	439	194	200	150
10"X10"X2"	307	74	273.81	272.67	127	60.63	60.17	38.1	560	185	265	54
10"X10"X3"	307	107	273.81	272.67	127	89.31	88.7	47.63	560	194	265	80
10"X10"X4"	307	134	273.81	272.67	127	114.76	114.1	57.15	560	205	265	100
10"X10"X6"	307	193	273.81	272.67	127	168.83	168	76.2	560	225	265	160
10"X10"X8"	307	248	273.81	272.67	127	219.84	218.69	101.6	560	250	265	210
12"X12"X2"	364	74	324.61	323.47	152.4	60.63	60.17	38.1	660	215	315	54
12"X12"X3"	364	108	324.61	323.47	152.4	89.31	88.7	47.63	660	225	315	80
12"X12"X4"	364	136	324.61	323.47	152.4	114.76	114.1	57.15	660	235	315	100
12"X12"X6"	364	195	324.61	323.47	152.4	168.83	168	76.2	660	255	315	160
12"X12"X8"	364	248	324.61	323.47	152.4	219.84	218.69	101.6	660	280	315	210
12"X12"X10"	364	308	324.61	323.47	152.4	273.81	272.67	127	660	298	315	265
14"X14"X4"	396.5	133	356.49	355.22	*205	114.76	114.1	57.15	856.5	290	346	100
14"X14"X6"	396.5	192	356.49	355.22	*205	168.83	168	76.2	856.5	310	346	144
14"X14"X8"	396.5	246	356.49	355.22	*205	219.84	218.69	101.6	856.5	339	346	200
14"X14"X10"	396.5	307	356.49	355.22	*205	273.81	272.67	127	856.5	365	346	259
14"X14"X12"	396.5	364	356.49	355.22	*205	324.61	323.47	152.4	856.5	390	346	308

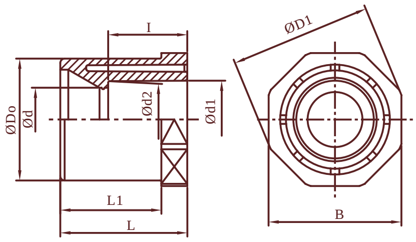


Note : Do not comply with ASTM standards, if mark with *. (unit : mm)

SCH 80 UPVC Reducer Bushing (Spig×Slip)

Size	Outside Dia	Socket Type			Structure Diameter				
	D0	d1	d2	l	d	L	L1	D1	B
1/2"X1/4"	21.34	14.02	13.61	19	11	29	23	31	30
1/2"X3/8"	21.34	17.45	17.04	22	12	29	23	31	30
3/4"X1/2"	26.67	21.54	21.23	24	13	33	27	31	30
1"X3/8"	33.4	17.45	17.04	24	12	38	30	39.4	38
1"X1/2"	33.4	21.54	21.23	24	12	38	30	39.4	38
1"X3/4"	33.4	26.87	26.57	26	18	38	30	39.4	38
1-1/4"X1/2"	42.16	21.54	21.23	24.2	16.5	44	35	52	50
1-1/4"X3/4"	42.16	26.87	26.57	26	21	44	35	52	50
1-1/4"X1"	42.16	33.65	33.27	29.5	28	44	35	52	50
1-1/2"X1/2"	48.26	21.54	21.23	24.2	16.5	47	38	58	55
1-1/2"X3/4"	48.26	26.87	26.57	26	21	47	38	58	55
1-1/2"X1"	48.26	33.65	33.27	29.5	28	47	38	58	55
1-1/2"X1-1/4"	48.26	42.42	42.04	32.5	35	47	38	58	55
2"X1/2"	60.33	21.54	21.23	24.2	16.5	52	42	68	65
2"X3/4"	60.33	26.87	26.57	26	21	52	42	68	65
2"X1"	60.33	33.65	33.27	29.5	28	52	42	68	65
2"X1-1/4"	60.33	42.42	42.04	32.5	35	52	42	68	65
2"X1-1/2"	60.33	48.56	48.11	35.5	43	52	42	68	65
2-1/2"X1-1/4"	73.03	42.42	42.04	32.5	36	60	48.5	85	80
2-1/2"X1-1/2"	73.03	48.56	48.11	35.5	43	60	48.5	85	80
2-1/2"X2"	73.03	60.63	60.17	39.1	52	60	48.5	85	80
3"X1"	88.9	33.65	33.27	30.5	28	65	51	105	99
3"X1-1/2"	88.9	48.56	48.11	35.5	43	65	51	105	99
3"X2"	88.9	60.63	60.17	39.1	54	65	51	105	99
3"X2-1/2"	88.9	73.38	72.85	47.5	65	65	51	105	99
4"X1"	114.3	33.65	33.27	30.5	28	75	60.5	132	125
4"X2"	114.3	60.63	60.17	41.1	54	75	60.5	132	125
4"X2-1/2"	114.3	73.38	72.85	47.5	65	75	60.5	132	125
4"X3"	114.3	89.31	88.7	50.6	80	75	60.5	132	125
5"X4"	141.3	114.76	114.1	60.2	100	84	69.6	150	145
6"X2"	168.28	60.63	60.17	41.1	51	90	76.5	191	180
6"X3"	168.28	89.31	88.7	50.6	80	90	76.5	191	180
6"X4"	168.28	114.76	114.1	60.2	105	90	76.5	191	180
6"X5"	168.28	141.81	141	69.6	125	90	76.5	191	180
8"X4"	219.1	114.76	114.1	60.5	105	120	104.6	246	235
8"X6"	219.1	168.83	168	79	150	120	104.6	246	235
10"X3"	273.05	89.31	88.7	50.6	80	148	130	290	280
10"X4"	273.05	114.76	114.1	60.2	105	148	130	290	280
10"X6"	273.05	168.83	168	79.2	150	148	130	290	280
10"X8"	273.05	219.84	218.69	105	200	148	130	290	280
12"X4"	323.85	114.76	114.1	60.2	100	175	155	345	330
12"X6"	323.85	168.83	168	79.2	150	175	155	345	330
12"X8"	323.85	219.84	218.69	105	200	175	155	345	330
12"X10"	323.85	273.81	272.67	130	245	175	155	345	330
14"X10"	355.6	273.81	272.67	130	245	200	180	380	360
14"X12"	355.6	324.61	323.47	135	300	200	180	380	360

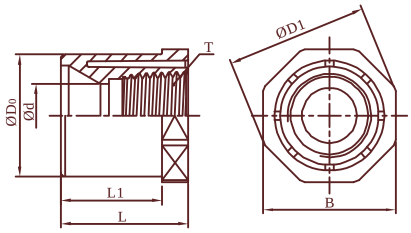
(unit : mm)



SCH 80 UPVC Reducer Bushing (Spig×NPT)

Size	Outside Dia	Structure Diameter					
	D0	d	L	L1	B	D1	NPT(thd./in)
1/2"X1/4"	21.34	11	29	23	30	31	18
1/2"X3/8"	21.34	12	29	23	30	31	18
3/4"X1/2"	26.67	13	33	27	30	31	14
1"X3/8"	33.4	12	38	30	38	39.4	18
1"X1/2"	33.4	12	38	30	38	39.4	14
1"X3/4"	33.4	18	38	30	38	39.4	14

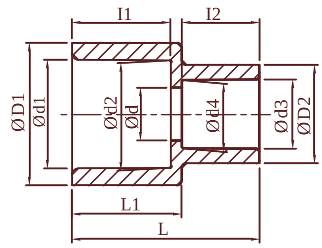
(unit : mm)



SCH 80 UPVC Reducer Coupling (Slip×Slip)

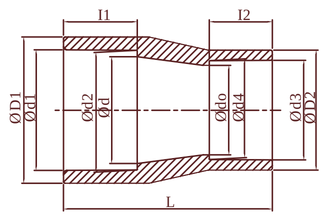
Size	Outside Dia		Socket Type						Structure Diameter		
	D1	D2	d1	d2	l1	d3	d4	l2	d	L	L1
3/4" X 1/2"	37	30.5	26.87	26.57	25.4	21.54	21.23	22.22	16.5	57.5	30
1" X 1/2"	47	30.5	33.65	33.27	28.58	21.54	21.23	22.22	16.5	58	36
1" X 3/4"	47	35	33.65	33.27	28.58	26.87	26.57	25.4	21	61	36
1-1/4" X 1/2"	55.5	30.5	42.42	42.04	31.75	21.54	21.23	22.22	16.5	62.5	42
1-1/4" X 3/4"	55.5	35	42.42	42.04	31.75	26.87	26.57	25.4	21	65	42
1-1/4" X 1"	55.5	44	42.42	42.04	31.75	33.65	33.27	28.58	28	68.5	42
1-1/2" X 1/2"	63	30.5	48.56	48.11	34.93	21.54	21.23	22.22	16.5	65	44
1-1/2" X 3/4"	63	35	48.56	48.11	34.93	26.87	26.57	25.4	21	68	44
1-1/2" X 1"	63	44	48.56	48.11	34.93	33.65	33.27	28.58	28	71	44
1-1/2" X 1-1/4"	63	54	48.56	48.11	34.93	42.42	42.04	31.75	35	75	44
2" X 1/2"	75	30.5	60.63	60.17	38.1	21.54	21.23	22.22	16.5	68	49.5
2" X 3/4"	75	35	60.63	60.17	38.1	26.87	26.57	25.4	21	71	49.5
2" X 1"	75	44	60.63	60.17	38.1	33.65	33.27	28.58	28	74.5	49.5
2" X 1-1/4"	75	54	60.63	60.17	38.1	42.42	42.04	31.75	35	78.5	49.5
2" X 1-1/2"	75	60	60.63	60.17	38.1	48.56	48.11	34.93	42.5	82.5	49.5

(unit : mm)



Size	Outside Dia		Socket Type						Structure Diameter		
	D1	D2	d1	d2	l1	d3	d4	l2	d	d0	L
2-1/2" X1"	89	44	73.38	72.85	44.45	33.65	33.27	28.58	65	27.5	117.5
2-1/2" X 1-1/2"	89	61	73.38	72.85	44.45	48.56	48.11	34.93	65	42.5	124
2-1/2" X2"	89	73	73.38	72.85	44.45	60.63	60.17	38.10	65	54.5	127
3" X 1-1/2"	106	61	89.31	88.70	47.63	48.56	48.11	34.93	81	42.5	136
3" X 2"	106	73	89.31	88.70	47.63	60.63	60.17	38.10	81	54.5	140
3" X 2-1/2"	106	89	89.31	88.70	47.63	73.38	72.85	44.45	81	65	147
4" X 2"	133.5	73	114.76	114.10	57.15	60.63	60.17	38.10	-	54.5	158.5
4" X 2-1/2"	133.5	89	114.76	114.10	57.15	73.38	72.85	44.45	-	65	158.5
4" X 3"	133.5	106	114.76	114.10	57.15	89.31	88.70	47.63	-	81	158.5

(unit : mm)

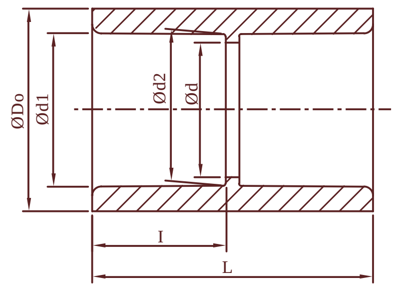


SCH 40 UPVC Fittings

SCH 40 UPVC Coupling (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	l	d	L
1/2"	27.5	21.54	21.23	17.8	18	38.6
3/4"	33.5	26.87	26.57	18.7	22.5	40.5
1"	41.7	33.65	33.27	22.7	29	48.5
1-1/4"	50.5	42.42	42.04	24.3	38	57.5
1-1/2"	56.8	48.56	48.11	28.3	43.5	60
2"	69	60.63	60.17	29.9	55.5	63.5
2-1/2"	84.2	73.38	72.85	45	67.5	95
3"	100.8	89.31	88.70	48.1	83.5	101.2
4"	127.3	114.76	114.07	51.3	108.5	107.6

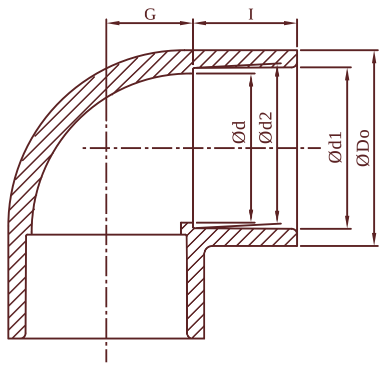
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 40 UPVC 90° Elbow (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	l	d	G
1/2"	27.5	21.54	21.23	17.8	18	12.7
3/4"	33.6	26.87	26.57	18.7	22.5	14.8
1"	41.7	33.65	33.27	22.7	29	18.3
1-1/4"	50.5	42.42	42.04	24.3	38	22.7
1-1/2"	56.8	48.56	48.11	28.3	43.5	25.7
2"	69	60.63	60.17	29.9	55	32
2-1/2"	84.2	73.38	72.85	45	67.5	39
3"	100.8	89.31	88.70	48.1	83.5	46.5
4"	127.3	114.76	114.07	51.3	108.5	59.7
16"	434.5	407.58	405.87	*205	376	240

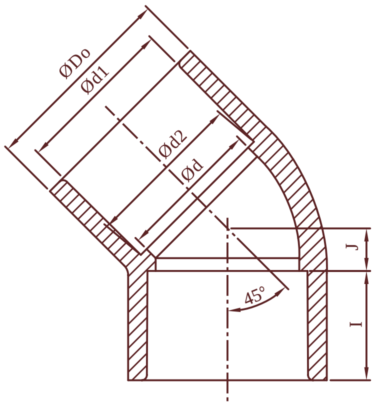
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 40 UPVC 45° Elbow (Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter	
	D0	d1	d2	I	d	J
1/2"	27.5	21.54	21.23	17.8	18	6.4
3/4"	33.1	26.87	26.57	18.7	22.5	8
1"	40.9	33.65	33.27	22.7	29	8
1-1/4"	50.1	42.42	42.04	24.3	38	9.6
1-1/2"	56.5	48.56	48.11	28.3	43.5	11.2
2"	69	60.63	60.17	29.9	55	16
2-1/2"	84.2	73.38	72.85	45	67.5	18
3"	100.8	89.31	88.70	48.1	83.5	20
4"	127.3	114.76	114.07	51.3	108.5	25.4
16"	434.5	407.58	405.87	*205	376	120

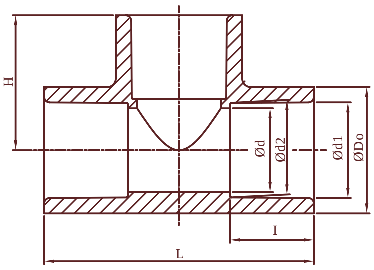
Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



SCH 40 UPVC Tee (Slip×Slip×Slip)

Size	Outside Dia	Socket Type			Structure Diameter		
	D0	d1	d2	I	d	L	H
1/2"	27.5	21.54	21.23	17.8	18	61	30.5
3/4"	33.6	26.87	26.57	18.7	22.5	67	33.5
1"	41.7	33.65	33.27	22.7	29	82	41
1-1/4"	50.5	42.42	42.04	24.3	38	94	47
1-1/2"	56.8	48.56	48.11	28.3	43.5	108	54
2"	69	60.63	60.17	29.9	55	124	62
2-1/2"	84.2	73.38	72.85	45	67.5	168	84
3"	100.8	89.31	88.70	48.1	83.5	189.2	94.6
4"	127.3	114.76	114.07	51.3	108.5	222	111
16"	434.5	407.58	405.87	*205	376	890	445

Note : Do not comply with ASTM standards, if mark with *. (unit : mm)



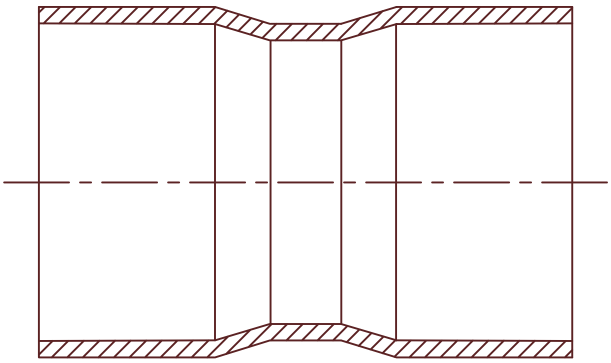
Note :

1.All of Hershey Valves molded fittings meet ASTM standards in dimension and performance. While their dimensions complying with ASTM standards, Hershey Valve reserves the right to change or modify their designs without further notice.

2.Data shown in the tables are typical values which meet ASTM standards. For detail information of ASTM values, please see ASTM 2464, 2466 and 2467.

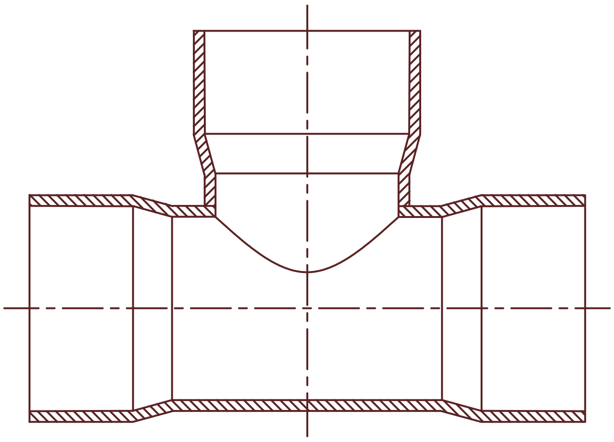
Fabricated UPVC Fittings

Coupling



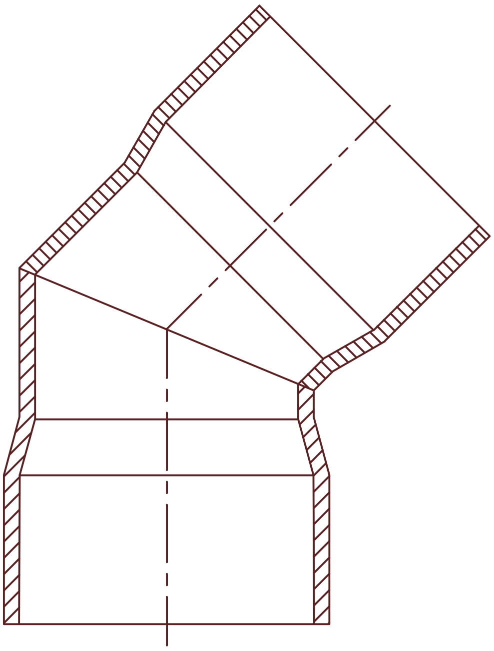
Size : 14"~24"

Tee



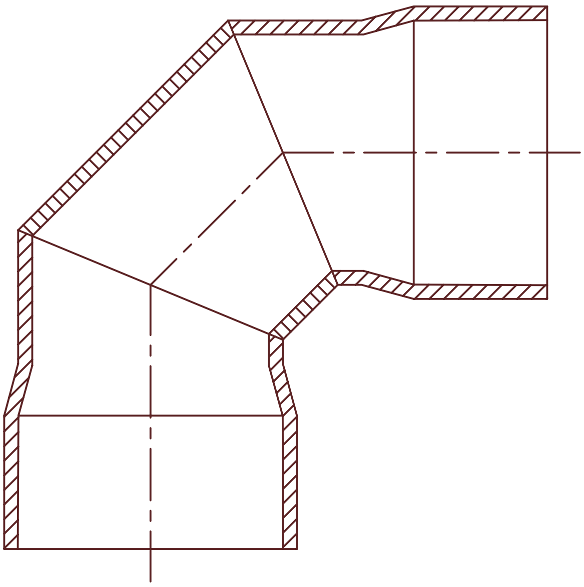
Size : 14"~24"

45°Elbow



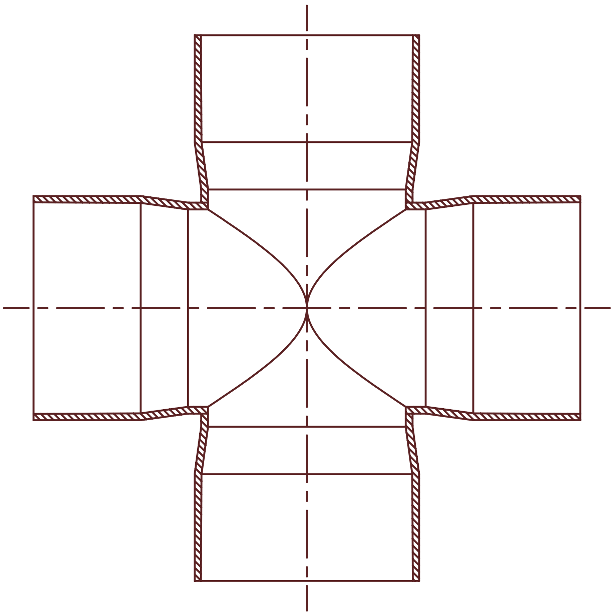
Size : 14"~24"

90°Elbow



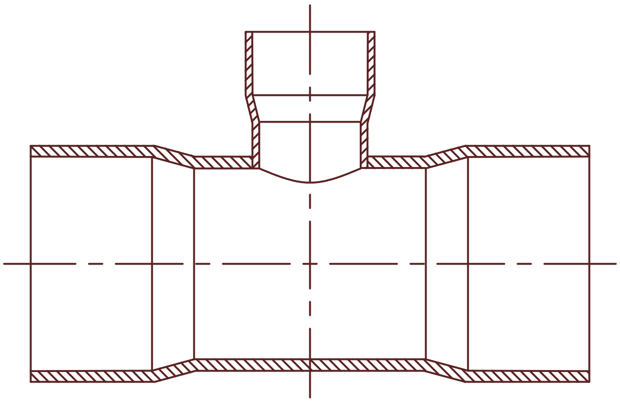
Size : 14"~24"

Cross



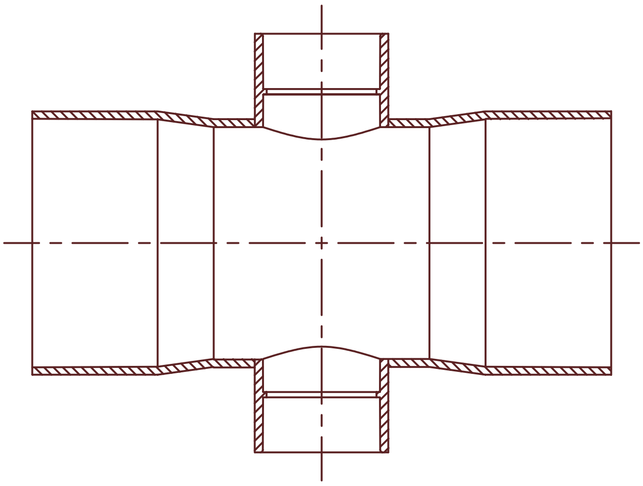
Size : 8"~24"

Reducer Tee



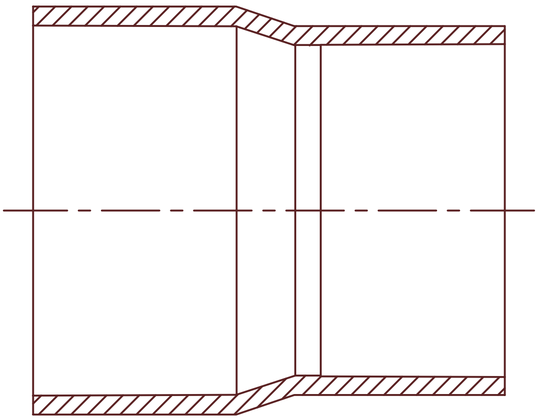
Size : 12" ~ 24"

Reducer Cross



Size : 8"~24"

Reducer Coupling



Size : 6"~24"

Note : Fabricated fittings are custom made items and they are available upon request.

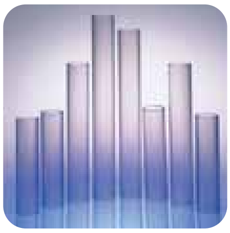
CPVC Advanced
Industrial Piping System
CPVC工業管路系統

Thermoplastic Valves
塑膠閥門(凡而)

UPVC Industrial Piping System
UPVC工業管路系統

CPVC High Performance
Fire Sprinkler System
CPVC高效能消防管路系統

PVC-M1 Cable Tray
防火耐燃電纜線槽



Clear PVC Piping System
PVC透明管路系統

CPVC/HT-PVC Sheet
CPVC / HT-PVC板材

CPVC Hot & Cold water Distribution System
CPVC 熱水管道系統

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