

# Aquarius®

## LEAD-FREE POTABLE WATER TRANSPORT SOLUTIONS PRODUCT CATALOGUE



CIN NO: L25200GJ1996PLC029134

Registered & Corporate Office: Astral Poly Technik Limited

207/1, 'Astral House', B/h Rajpath Club, Off S. G. Highway, Ahmedabad - 380059.

Ph: +91-79 6621 2000 | Fax: +91-79 6621 2121 | E-mail: info@astralpipes.com | Website: www.astralpipes.com

For Export Inquiries : export@astralpipes.com



ASTRAL TOLL FREE  
1800 233 7957  
Please get in touch with us  
between 10 a.m. to 6 p.m.

# CONTENTS



**03**

ABOUT ASTRAL

**04**

INNOVATION &  
RECOGNITIONS

**05**

MARKETING  
NETWORK

**06**

LEADING THE  
LEAD-FREE PIPE  
MOVEMENT

**08**

ABOUT AQUARIUS

**09**

THE DIFFERENCE  
BETWEEN  
uPVC & PVC

**09**

PVC - POLYVINYL  
CHLORIDE

**10**

BENEFITS OF ASTRAL  
AQUARIUS SYSTEM  
OVER OTHER uPVC  
SYSTEMS

**11**

CERTIFICATES  
& APPROVALS

**12**

STANDARDS &  
SPECIFICATIONS

**13**

IMPORTANT FOR  
INSTALLERS & USERS

**14**

KEY  
PROPERTIES

**15**

FIELDS OF  
APPLICATIONS

**16**

PRESSURE PIPES  
AND FITTINGS

**17**

PVC SCHEDULE 40  
AND SCHEDULE 80  
FITTINGS

**18**

BASIC SOCKET  
DIMENSIONS

**19**

PRODUCT  
RANGE

**38**

FRICTION LOSS  
TABLE

**40**

EXPANSION AND  
CONTRACTION OF  
uPVC PIPE

**42**

JOINT CURING &  
SUPPORT SPACING  
FOR uPVC PIPE

**44**

INSTALLATION  
PROCEDURE

**46**

TESTING  
PRESSURE SYSTEM

**47**

UNDERGROUND  
INSTALLATION

**49**

HANDLING  
AND STORAGE

**50**

FREQUENTLY ASKED  
QUESTIONS (FAQs)

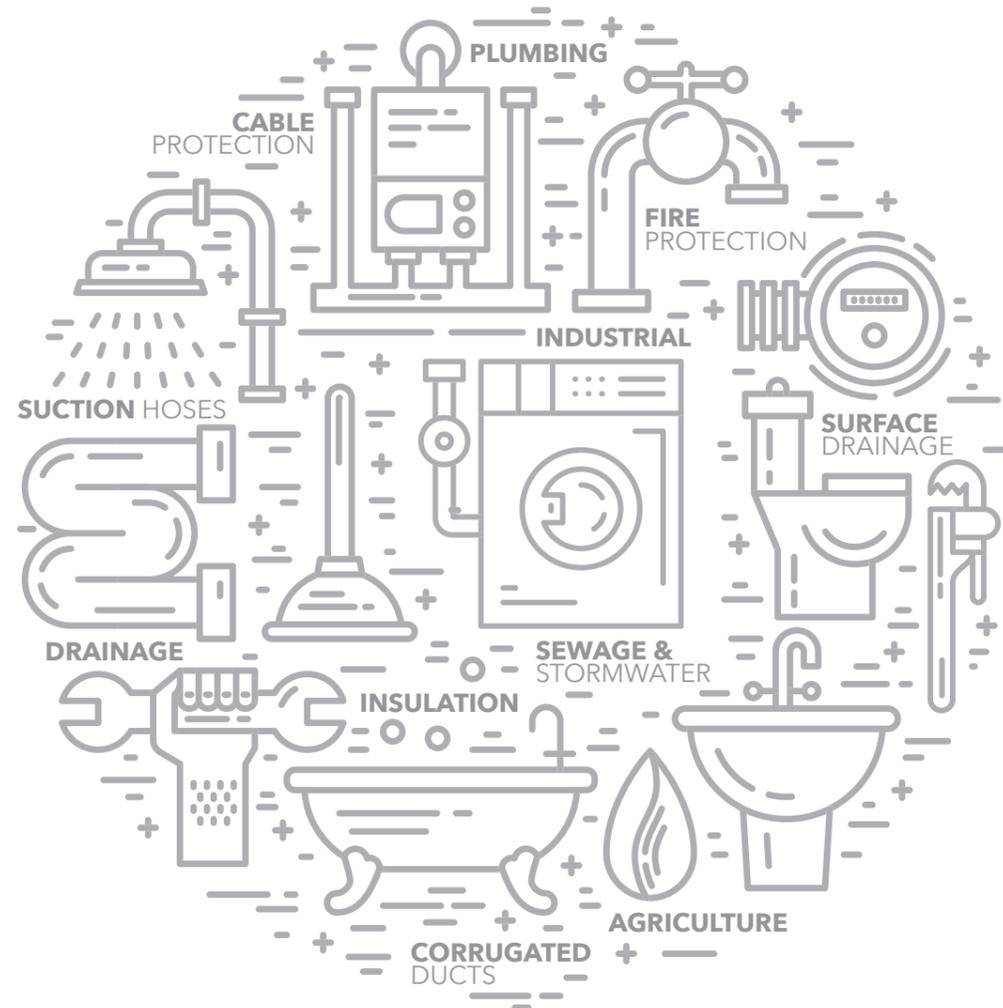
# ASTRAL, INDIA'S PROGRESSIVE PIPE COMPANY

1<sup>st</sup> TO INTRODUCE CPVC IN INDIA

1<sup>st</sup> TO INTRODUCE UPVC LEAD FREE PIPES IN INDIA

1<sup>st</sup> TO INTRODUCE LOW NOISE PP DRAINAGE PIPES IN INDIA

1<sup>st</sup> TO INTRODUCE FOAMED PVC DRAINAGE PIPES IN INDIA



Established in 1996 with the aim to manufacture best-in-globe plastic piping systems, Astral Pipes fulfils emerging piping needs of millions of houses and adds extra mileage to India's developing real estate fraternity with the hallmark of unbeaten quality and innovative piping solutions. Keeping itself ahead of the technology curve, Astral has always been a front runner in the piping category by bringing innovation and getting rid of old, primitive and ineffective plumbing methods. Bringing CPVC in India, and pioneering in this technology, have set Astral apart and its highest quality enabled it to obtain NSF approval for its CPVC pipes and fittings. Astral went beyond the category codes by launching many industry firsts, like launching India's first lead-free uPVC pipes for plumbing as well as for stream water, just to name a few.

Astral Pipes offers the widest product range across this category when it comes to product applications. Astral Pipes is equipped with production facilities at Santej and Dholka in Gujarat, Hosur in Tamil Nadu, Ghiloth in Rajasthan and Sangli in Maharashtra to manufacture plumbing systems, drainage systems, agriculture systems, fire sprinkler piping systems, industrial piping and electrical conduit pipes with all kinds of necessary fittings.

Astral Pipes' Infrastructure division Rex offers a comprehensive product range including corrugated piping for drainage and cables, polyolefin cable channels, sewage treatment plants, plastic sheathing ducts, suction hoses, and sub-surface drainage systems. This range helps Astral to establish a strong foothold in infrastructure and agriculture sector in the constantly evolving business of piping.

In 2014, Astral forayed into the adhesives category by acquiring UK-based Seal It Services Ltd. and Kanpur based Resinova Chemie Ltd., which manufacture adhesives, sealants and construction chemicals. With five manufacturing facilities now in this business segment, Astral has strengthened its presence in the category and made rapid inroads.

1<sup>st</sup> TO INTRODUCE LEAD FREE COLUMN PIPES IN INDIA

1<sup>st</sup> TO INTRODUCE POLYMER BASED INDUSTRIAL PIPING SYSTEM IN INDIA

1<sup>st</sup> TO INTRODUCE NSF APPROVED SOLVENT CEMENT IN INDIA

1<sup>st</sup> TO INTRODUCE CPVC PIPING FOR AUTOMATIC FIRE SPRINKLER SYSTEM IN INDIA



## PIPING

AGRICULTURE  
DRAINAGE INDUSTRIAL  
URBAN INFRASTRUCTURE  
**PLUMBING**  
FIRE PROTECTION  
CONDUIT SURFACE DRAINAGE  
ANCILLARY  
INSULATION

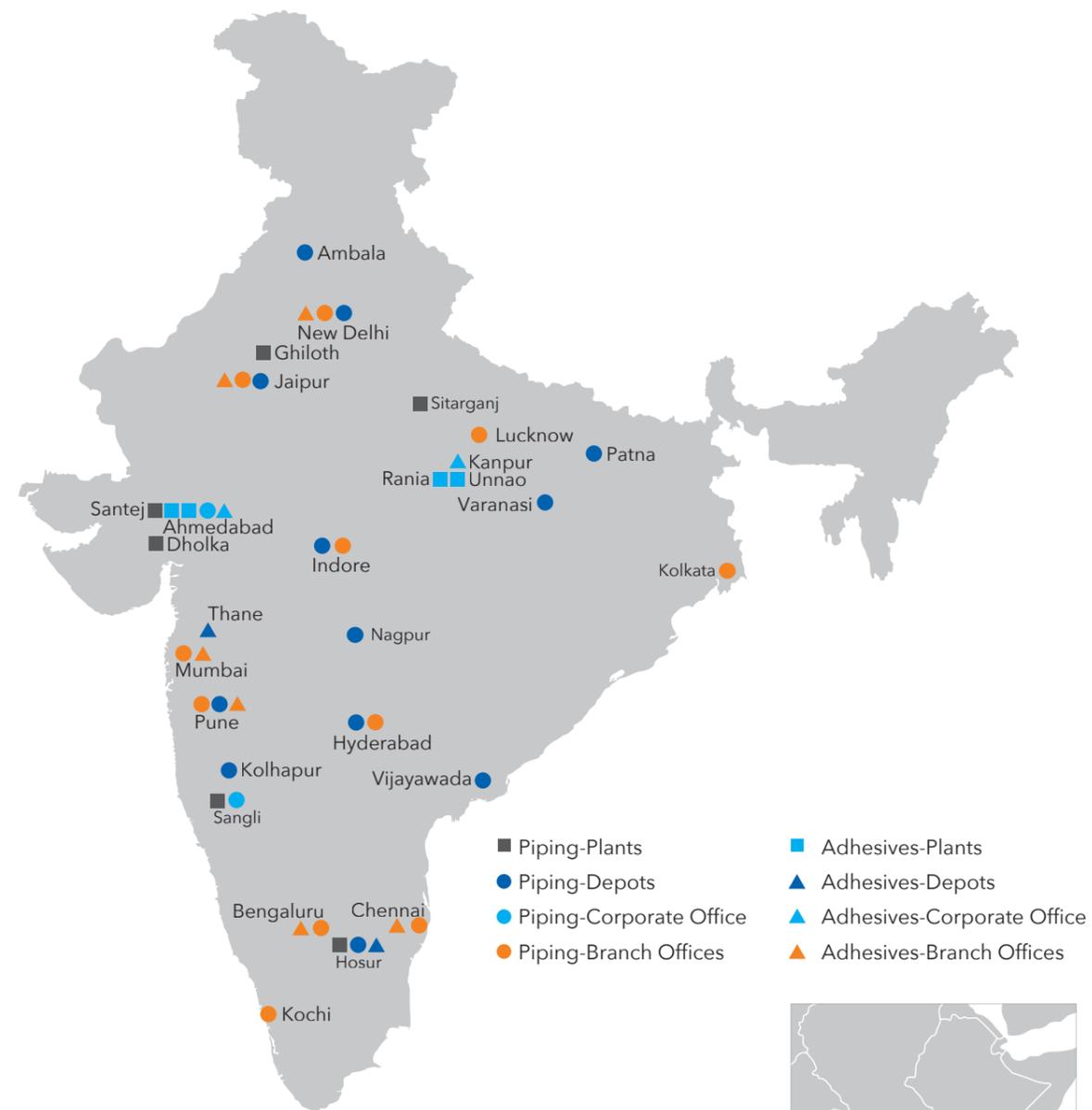
## ADHESIVES

ANAEROBIC ADHESIVES  
**SILICONE SEALANTS**  
CONSTRUCTION CHEMICALS  
**CYANOACRYLATE**  
PVA  
SOLVENT CEMENTS TAPES  
POLYMERIC FILLING COMPOUND  
**EPOXY ADHESIVES & PUTTY**  
INDUSTRIAL ADHESIVES



# MARKETING NETWORK

ASTRAL has a marketing network of more than 800 distributors and 30,000 dealers spread all over India with branch offices at Mumbai, Pune, Delhi, Bengaluru, Chennai, Hyderabad, Jaipur, Lucknow and Kochi. Apart from that ASTRAL has its own warehouses at Bengaluru, Vijaywada, Hyderabad, Delhi, Ghaziabad, Kolhapur, Pune, Nagpur, Indore, Varanasi, Jaipur & Hosur to deliver the material as quick as possible. More than 400 techno marketing professionals and administrative personnel are on the board to coordinate with architects, plumbing contractors and plumbers to utilize the best plumbing techniques and to get the best from the products.



Piping unit  
KENYA



# INNOVATION & RECOGNITIONS

- First to introduce CPVC piping system in India (1999)
- First to launch lead free uPVC piping system in India (2004)
- Corp Excel- National SME Excellence Award (2006)
- First to get NSF Certification for CPVC piping system in India (2007)
- First to launch lead-free uPVC column pipes in India (2012)
- Enterprising Entrepreneur of the year (2012-13)
- Business Standard Star SME of the year (2013)
- Inc. India Innovative 100 for Smart Innovation under category of 'Technology' (2013)
- India's Most Promising Brand Award (2014)
- Value Creator Award during the first ever Fortune India Next 500 (2015)
- India's Most Trusted Pipe Brand Award (2016 & 2019)
- ET Inspiring Business Leaders of India Award (2016)
- India's Most Attractive Pipe Brand Award (2016)
- Fortune India 500 Company (2016)
- Consumer Validated Superbrands India (2017 & 2019)



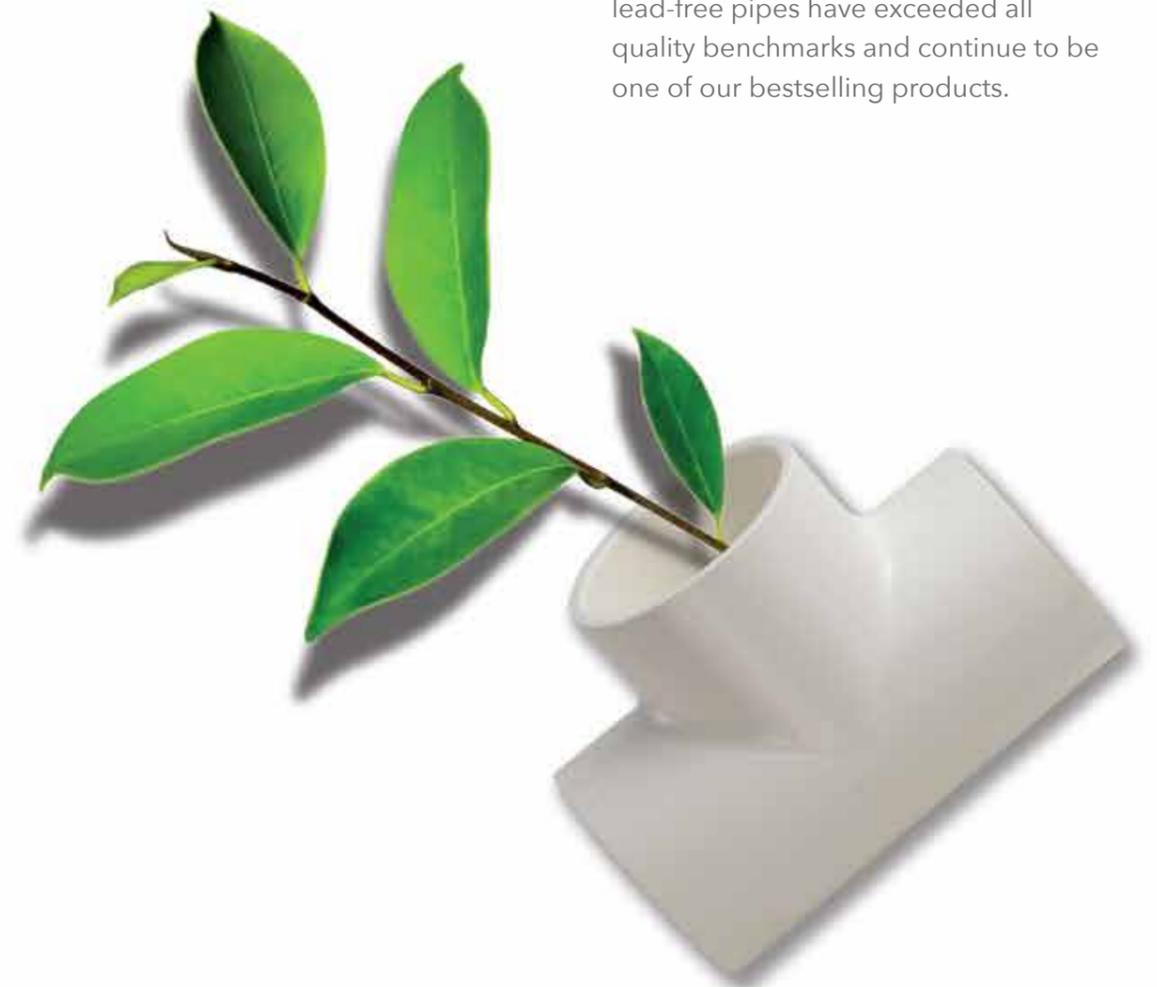
# LEADING THE LEAD-FREE PIPE MOVEMENT

Lead (Pb on the Periodic Table) is one of the most naturally occurring elements on the planet. With little or no known biological benefit to humans, Lead causes a lot of damage and leads to poisoning when imbibed.



The world over, Lead-free piping is the way forward to transport potable water. Something we've been doing at Astral Pipes for over many years now. Our lead-free pipes have exceeded all quality benchmarks and continue to be one of our bestselling products.

The lead can easily leach or dissolve into the water from transportation pipes and can be fatal. High blood lead levels in children can cause consequences which may be irreversible including learning disabilities, behavioural problems and mental retardation.





## ABOUT **ASTRAL** Aquarius®

ASTRAL Aquarius ASTM uPVC pipes and fittings are lead-free and hence non-toxic, easy to install and are made for life time trouble free service. ASTRAL Aquarius pipes and fittings are available in range of 15 mm (½”) to 300 mm (12”) with two different classes - SCH 40 and SCH 80. As the full line leading manufacturer of CPVC pipes and fittings for residential and industrial applications and now with ASTM uPVC pressure pipes and fittings, ASTRAL can be your one stop source for all the plastic piping system which you require for a lifetime plumbing solution.

## THE DIFFERENCE BETWEEN uPVC & PVC

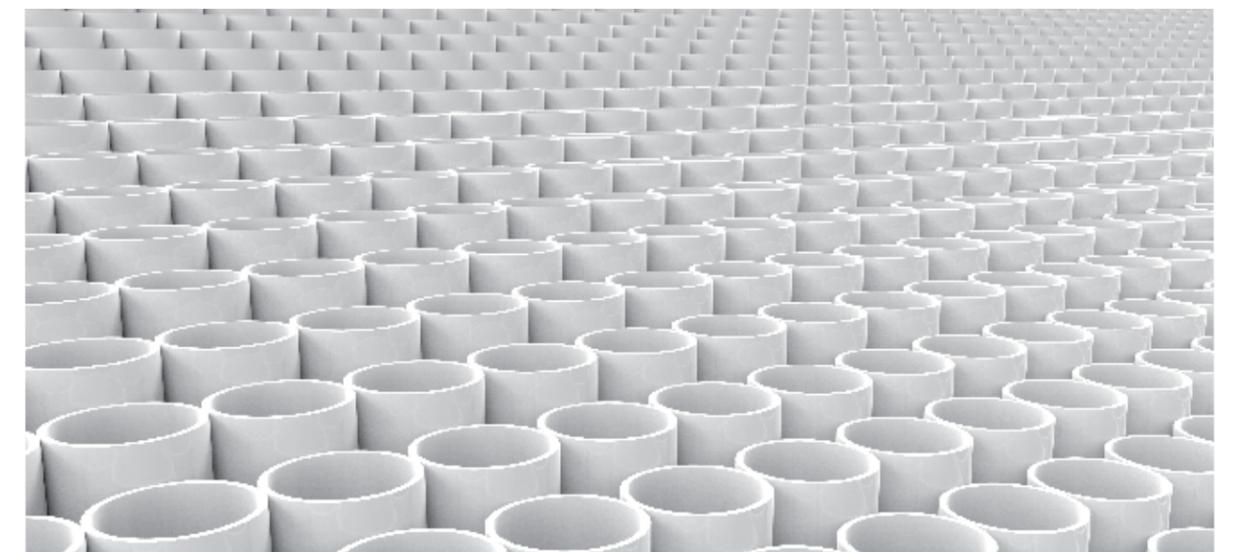
There has been a lot of confusion in the thermoplastics industry regarding the use of the terms uPVC and PVC when specifying thermoplastic piping products. For many years, certain regions of the world have preferred using the term uPVC when specifying unplasticized Polyvinyl Chloride piping products while other regions of the world, The United State of America for instance, prefer the acronym PVC (less the U) when specifying the same unplasticized PVC piping products. So uPVC and PVC both indicate same material - unplasticized or Rigid PVC. The most important aspect of specifying PVC piping products is not the abbreviation but the cell classification of the thermoplastic material. For rigid, unplasticized Type I Grade I PVC material with a hydrostatic design stress of 2000 psi the cell classification is 12454. These numbers indicate the minimum physical properties that a rigid, unplasticized thermoplastic compound must meet as per ASTM D1784 to be used in the manufacturing of pressure piping components. In summary, whether a thermoplastic vinyl piping, product is specified as uPVC is not important, it is the cell classification, and materials' physical properties that is most important.

## PVC - POLYVINYL CHLORIDE

PVC is one of the specified thermoplastic for piping system components, including valves, fittings, flanges and many speciality products. PVC has excellent chemical and corrosion resistance to a broad range of fluids. ASTRAL uPVC materials conform to ASTM Cell Classification 12454-B of ASTM D1784 (formally designated as Type I, Grade I). The maximum recommended service temperature of PVC products is 60°C (140°F).

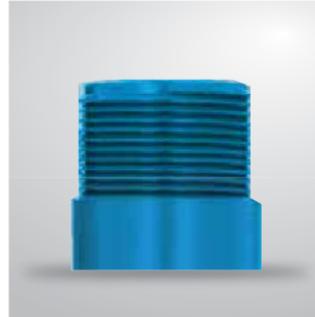
### WHAT MAKES PVC IMPORTANT?

PVC makes a major contribution to the quality, safety and cost-effectiveness of construction materials, as well as helping to reduce the environmental impact of completed projects. PVC is the most widely used polymer in building and construction applications and over 50 percent of Western Europe's annual PVC production is used in this sector. PVC has a versatility that helps to meet modern and future design needs.



# BENEFITS OF ASTRAL AQUARIUS SYSTEM OVER OTHER uPVC SYSTEMS

THREADED uPVC PIPE



SOLVENT WELD uPVC PIPE



ASTRAL Aquarius uPVC pipes being lead free are non-toxic and hence favoured for use in applications such as potable water pipes. ASTRAL Aquarius uPVC plumbing system utilizes NSF (National Sanitation Foundation) approved one-step solvent cement, specifically formulated for the use. Joining is accomplished quickly and efficiently utilizing inexpensive tools thereby greatly reducing labour and installation cost. ASTRAL Aquarius uPVC pipes & fittings exhibit the well-known physical characteristics and other benefits of conventional uPVC piping such as good chemical and corrosion resistance, low thermal conductivity, high strength-to-weight ratio, good impact resistance and ease of installation.



**ASTRAL AQUARIUS UPVC SOLVENT JOINT PLUMBING SYSTEM DOUBLES THE PRESSURE BEARING CAPACITY COMPARED TO THREADED uPVC PIPING SYSTEM.**

# CERTIFICATES & APPROVALS



# STANDARDS & SPECIFICATIONS

- ASTM D 1784 - Rigid Poly Vinyl Chloride (PVC) Compounds
- ASTM D 1785 - Poly Vinyl Chloride (PVC) Plastic Pipes, SCH 40 & SCH 80
- ASTM D 2466 - Socket type Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, SCH 40
- ASTM D 2467 - Socket type Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, SCH 80
- ASTM D 2564 - Solvent Cements for Plastic Pipes & Fittings
- ASTM F 1498 - Taper Pipe threads 60° for Thermoplastics Pipe & Fittings
- ASTM D 2774 - Underground Installation of Thermoplastic Pipes
- ISO 7/1 - Pipe threads where pressure joints are made on threads - Part 1: Designation, Dimension & Tolerances

## DESCRIPTIVE CODES

- ASTM** - American Society for Testing of Materials.
- BSP** - British Standard Pipe
- NPT** - National Pipe Threads (ANSI)
- MIPT** - Male Iron Pipe Threads
- SPIGOT** - Spigot End (IPS)
- MBSP** - Male BSP Threads
- PVC** - Poly Vinyl Chloride
- ANSI** - American National Standards Institute
- IPS** - Iron Pipe Size (ASTM)
- FIPT** - Female Iron Pipe Threads
- SOCKET** - Solvent Weld Socket
- FBSP** - Female BSP Threads
- NSF** - National Sanitation Foundation
- EPDM** - Ethylene Propylene Rubber



# IMPORTANT FOR INSTALLERS & USERS

## WATER HAMMER

ASTRAL recommends that all uPVC plastic piping systems be designed and constructed to avoid excessive WATER HAMMER. Water hammer can cause damage and failure to pipe, valves and fittings within the piping system

## THREADED CONNECTIONS

Use a quality grade thread sealant. Do not use substances that could cause stress cracking to plastic. Major attention must be given while making plastic thread joints. 1 to 2 turns beyond FINGER TIGHT is generally all that is required to make a sound plastic connection. Unnecessary OVER TIGHTENING will cause DAMAGE TO BOTH PIPES & FITTINGS. Also give proper attention while selecting the threaded fittings, as ASTRAL manufacture some fittings with NPT threads & some fittings with BSP threads to give more versatility to customer NPT threads which are not compatible with BSP threads.

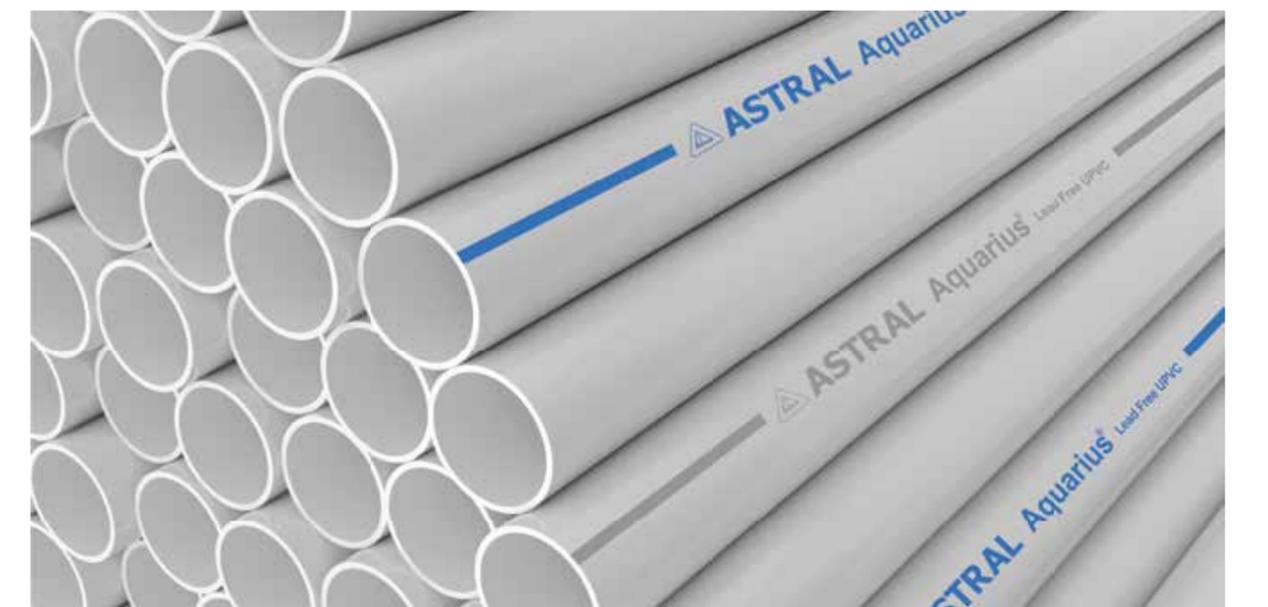
## SEAL & GASKET LUBRICANTS

Some lubricants, including vegetable oils are known to cause stress cracking in thermoplastic materials. A mild soap or commercially available pipe gasket lubricant suitable for uPVC is recommended where lubrication is required for installation or maintenance service (especially with Flange joints). Choice of lubricant is at the discretion of the installer.

## FLOW VELOCITIES

System should not be operated or flushed out at flow velocities greater than 5 feet per second.

The following information is provided as a guide only. Actual allowable working pressure may vary widely according to conditions. Additionally, pressure de-rating at elevated temperatures must be taken into account. Certain fitting configurations may have other assigned pressure limitations (i.e., Wyes, Unions, Flanges, Valves etc). Contact Astral Technical Services for additional information.



# KEY PROPERTIES

## **STRONG AND LIGHT WEIGHT**

ASTRAL Aquarius lead-free plumbing system is tough, durable with high tensile and impact strength. The system is light weight and can be transported easily from one place to another.

## **DURABLE**

ASTRAL Aquarius lead-free plumbing system is durable and free from weaknesses caused by rusting, weathering and chemical action and hence imparts service life of more than 50 years.

## **MAXIMUM FLOW RATE**

Smooth inner surface ensures high flow rate and low frictional losses. The system is leach and scale free.

## **CHEMICAL RESISTANCE**

uPVC is generally inert to most mineral acids, alkalies, salts and paraffinic hydrocarbon solutions. For more information on uPVC chemical resistance refer to Chemical Resistance of Rigid Vinyls Based.

## **FIRE RESISTANT**

ASTRAL Aquarius lead-free plumbing system is inherently difficult to ignite and stops burning once the source of heat is removed. Compared to its common plastic alternatives, uPVC performs better in terms of lower combustibility, flammability, flame propagation and heat release. Newly developed advantages in terms of lower acid emissions, smoke generation and enhanced fire resistance.

## **UV STABILIZED**

ASTRAL Aquarius lead-free plumbing system can be used in sunlight exposed conditions. However, ASTRAL recommends a standard grade of exterior latex paint (water base) which will protect the system adequately.

## **GOOD INSULATOR**

ASTRAL Aquarius pipes are non-conductor of electricity. So it makes the plumbing system safe when working with electrical tools or equipment.

## **WIDE RANGE**

ASTRAL Aquarius lead-free plumbing system is available from 1/2" (15 mm) to 12" (300 mm) with wide range of fittings, transition fittings, valves and specially designed brass inserted fittings to suit any design criteria.

## **EASY TO INSTALL**

ASTRAL Aquarius lead-free pipes can be cut, shaped, welded and joined easily.

## **SAFE MATERIAL FOR DRINKING WATER**

ASTRAL Aquarius pipes are non-toxic and lead-free which makes them a safe material for potable water. It is also the world's most researched and thoroughly tested material for uPVC which meets all international standards for safety and health for both the products and applications.

## FIELDS OF APPLICATION

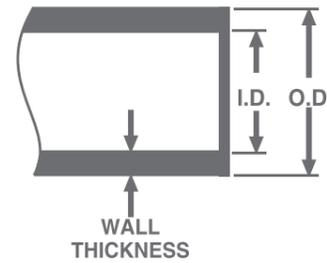
- Cold Water Plumbing Application
- Water Distribution Mains
- Industrial Process Lines
- Swimming Pools
- Plants & Tanning Plants
- Hand Pumps
- Sugar, Paper & Distillery Industries
- Salt Water Line
- Aggressive Corrosive Fluid Transportation
- Coal Washing & Ash Handling
- Down Take Lines



# PRESSURE PIPES AND FITTINGS

## PRESSURE RATING @23°C uPVC SCHEDULE 40

Nominal Size			Average Outside Diameter		Minimum Wall Thickness		Maximum Work Pressure at 73°F (PSI)	Maximum Work Pressure at 23°C (kg/cm <sup>2</sup> )
(cm)	(mm)	(in.)	(in.)	(mm)	(in.)	(mm)		
1.5	15	½	0.840	21.34	0.109	2.77	600	42.19
2.0	20	¾	1.050	26.67	0.113	2.87	480	33.75
2.5	25	1	1.315	33.40	0.133	3.38	450	31.64
3.2	32	1¼	1.660	42.16	0.140	3.56	370	26.01
4.0	40	1½	1.900	48.26	0.145	3.68	330	23.20
5.0	50	2	2.375	60.32	0.154	3.91	280	19.69
6.5	65	2½	2.875	73.02	0.203	5.16	330	21.09
8.0	80	3	3.500	88.90	0.216	5.49	260	18.28
10.0	100	4	4.500	114.30	0.237	6.02	220	15.47
15.0	150	6	6.625	168.28	0.280	7.11	180	12.66
20.0	200	8	8.625	219.08	0.322	8.18	160	11.25
25.0	250	10	10.750	273.05	0.365	9.27	140	9.84
30.0	300	12	12.750	323.85	0.406	10.31	130	9.14



MPa = Mega Pascal 1 MPa = 10 kg / cm<sup>2</sup> 1 kg / cm<sup>2</sup> = 14.223343 PSI.

## PRESSURE RATING @23°C uPVC SCHEDULE 80

Nominal Size			Average Outside Diameter		Minimum Wall Thickness		Maximum Work Pressure at 73°F (PSI)	Maximum Work Pressure at 23°C (kg/cm <sup>2</sup> )
(cm)	(mm)	(in.)	(in.)	(mm)	(in.)	(mm)		
1.5	15	½	0.840	21.34	0.147	3.73	850	59.76
2.0	20	¾	1.050	26.67	0.154	3.91	690	48.51
2.5	25	1	1.315	33.40	0.179	4.55	630	44.29
3.2	32	1¼	1.660	42.16	0.191	4.85	520	36.56
4.0	40	1½	1.900	48.26	0.200	5.08	470	33.04
5.0	50	2	2.375	60.32	0.218	5.54	400	28.12
6.5	65	2½	2.875	73.02	0.276	7.01	420	29.53
8.0	80	3	3.500	88.90	0.300	7.62	370	26.01
10.0	100	4	4.500	114.30	0.337	8.56	320	22.50
15.0	150	6	6.625	168.28	0.432	10.97	280	19.69
20.0	200	8	8.625	219.08	0.500	12.70	250	17.57
25.0	250	10	10.750	273.05	0.593	15.06	230	16.17
30.0	300	12	12.750	323.85	0.687	17.45	230	16.17

MPa = Mega Pascal 1 MPa = 10 kg / cm<sup>2</sup> 1 kg / cm<sup>2</sup> = 14.223343 PSI.

## TEMPERATURE PRESSURE DE-RATING FACTOR

The operating pressure of uPVC pipe will be reduced as the operating temperature increases above 23°C (73°F). To calculate this reduction, multiply the operating pressure with the correction factors shown below at a operating temperature of system :

Operating Temp.°C (°F)	23 (73)	27 (80)	32 (90)	38 (100)	43 (110)	49 (120)	54 (130)	60 (140)
uPVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTES : (1) Valves, Unions and Specialty Products have different elevated temperature ratings than pipes. (2) Threaded valves should not be used at temperature above 110°F (43° C) for PVC (3) Flanged joints have a base pressure rating of 150 PSI at 23° C

# PVC SCHEDULE 40 AND SCHEDULE 80 FITTINGS

The following information is provided as a guide only. Actual allowable working pressure may vary widely according to conditions. Additionally, pressure de-rating at elevated temperatures must be taken into account. Certain fitting configurations may have other assigned pressure limitations (i.e., Wyes, Unions, Flanges, Valves etc). Contact Astral Technical Services for additional information.

## PRESSURE RATING @23°C uPVC SCHEDULE 40

Nominal Size (in.)	Schedule 40 (kg/cm <sup>2</sup> )			Schedule 80 (kg/cm <sup>2</sup> )		
	Pipe1	Solvent Cemented Joint	Standard Threaded Joint3	Pipe1	Solvent Cemented Joint	Standard Threaded Joint3
½	42.19	25.31	21.09	59.76	35.85	29.88
¾	33.75	20.24	16.87	48.51	29.10	24.25
1	31.64	18.98	15.81	44.29	26.57	22.14
1¼	26.01	15.60	13.00	36.56	21.93	18.27
1½	23.20	13.92	11.60	33.04	19.82	16.52
2	19.69	11.81	9.84	28.12	16.87	14.06
2½	21.09	12.65	10.54	29.53	17.71	14.76
3	18.28	10.96	9.13	26.01	15.60	13.00
4	15.47	9.28	7.73	22.50	13.49	11.24
6	12.66	7.59	6.32	19.69	11.81	9.84
8	11.25	6.74	5.62	17.57	10.54	8.78
10	9.84	5.90	4.92	16.17	9.70	8.08
12	9.14	5.48	4.56	16.17	9.70	8.08

NOTES : (1) Water pressure Ratings At 73°F (23°C) for Schedule 40 and Schedule 80 Plastic Pipe, ASTM D 1785 for PVC.

(2) Threading of Schedule 40 plastic pipe is not permitted. Recommended pressures apply to molded fittings only.

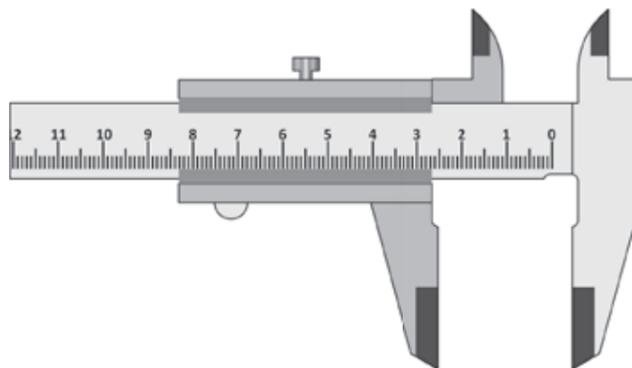
**(Not For Use With Compressed Air or Gas)**

## PHYSICAL PROPERTIES OF PVC MATERIALS

PROPERTY	UNITS	PVC	ASTM NO.
Specific Gravity	g/cc	1.41 - 1.46	D 792
Tensile Strength (73°F)	PSI	7,200	D 638
Modulus of Elasticity in Tension (73°F)	PSI	4,60,000	D 638
Flexural Strength (73°F)	PSI	13,200	D 790
Izod Impact (notched at 73°F)	ft lb/in.	0.65	D 256
Hardness (Durometer D)	----	80 ± 3	D 2240
Hardness (Rockwell R)	----	110 - 120	D 785
Compressive Strength (73°F)	PSI	9,000	D 695
Hydrostatic Design Stress	PSI	2,000	D 1598
Coefficient of Linear Expansion	in./in./°F	3.1 x 10 <sup>-5</sup>	D 696
Heat Deflection Temperature at 66 psi	°F	165	D 648
Coefficient of Thermal Conductivity	BTU/hr/sq. ft/°F/in.	1.2	C 177
Specific Heat	BTU/F/lb	0.25	D 2766
Limiting Oxygen Index	%	43	D 2863
Water Absorption (24 hrs at 73°F)	% weight gain	0.05	D 570
Cell Classification-Pipe	----	12454-B	D 1784
Cell Classification-Fittings	----	12454-B	D 1784

Above data is based upon information provided by the raw material manufacturers. It should be used only as a recommendation and not as a guarantee of performance.

# BASIC SOCKET DIMENSIONS



SCHEDULE 40 AS PER ASTM D-2466, SCHEDULE 80 AS PER ASTM D-2467

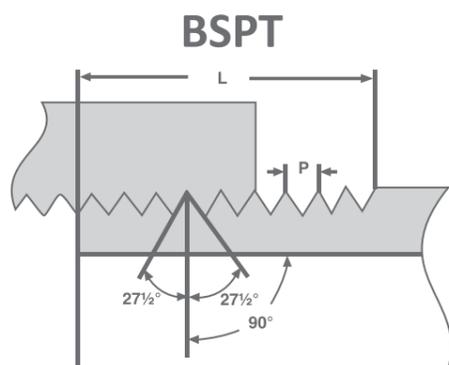
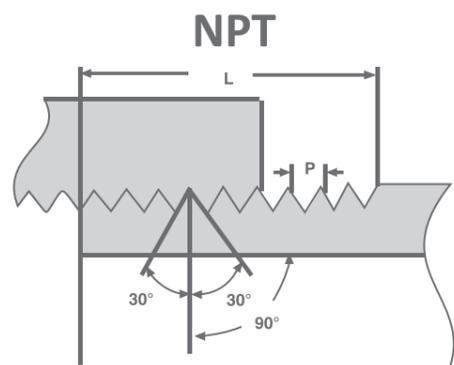
Nominal Size		Diameter (in.)			Socket Length Minimum C (in.)	
		Entrance A	Bottom B	Tolerance	SCH 40	SCH 80
(in.)	(mm)					
1/2	15	0.848	0.836	±0.004	0.688	0.875
3/4	20	1.058	1.046	±0.004	0.719	1.000
1	25	1.325	1.310	±0.005	0.875	1.125
1 1/4	32	1.670	1.655	±0.005	0.938	1.250
1 1/2	40	1.912	1.894	±0.006	1.094	1.375
2	50	2.387	2.369	±0.006	1.156	1.500
2 1/2	65	2.889	2.868	±0.007	1.750	1.750
3	80	3.516	3.492	±0.008	1.875	1.875
4	100	4.518	4.491	±0.009	2.000	2.250
6	150	6.647	6.614	±0.011	3.000	3.000
8	200	8.655	8.610	±0.015	4.000	4.000
10	250	10.780	10.735	±0.015	5.000	5.000
12	300	12.780	12.735	±0.015	6.000	6.000

AMERICAN NATIONAL STANDARD TAPER PIPE THREADS (NPT)  
ANSI STANDARD B1.20.1 ASTM STANDARD F 1498

Nominal Size		Threads per inch	Effective Thread Length L (in.)	Pitch of Thread P (in.)
(in.)	(mm)			
1/2	15	14	0.5337	0.07143
3/4	20	14	0.5457	0.07143
1	25	11 1/2	0.6828	0.08696
1 1/4	32	11 1/2	0.7068	0.08696
1 1/2	40	11 1/2	0.7235	0.08696
2	50	11 1/2	0.7565	0.08696
2 1/2	65	8	1.1375	0.12500
3	80	8	1.2000	0.12500
4	100	8	1.3000	0.12500

BSP ISO 7/1 PARELLEL THREADS

Nominal Size		Threads per inch	Effective Thread Length L (in.)	Pitch of Thread P (in.)
(in.)	(mm)			
1/2	15	14	13.152	1.8143
3/4	20	14	14.514	1.8143
1	25	11	16.714	2.3091
1 1/4	32	11	19.050	2.3091
1 1/2	40	11	19.050	2.3091
2	50	11	23.378	2.3091
2 1/2	65	11	26.698	2.3091
3	80	11	29.873	2.3091
4	100	11	35.791	2.3091



# PRODUCT



**ASTRAL**  
*Aquarius*®

# RANGE

# uPVC PRESSURE PIPES

## AS PER ASTM D-1785



**PIPE SCHEDULE - 40 (3 MTR. LENGTH)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M051400301	50
2.0	¾	M051400302	30
2.5	1	M051400303	20
3.2	1¼	M051400304	15
4.0	1½	M051400305	10
5.0	2	M051400306	08
6.5	2½	M051400307	05
8.0	3	M051400308	03
10.0	4	M051400309	02
15.0	6	M051400310	01
20.0	8	M051400311	01
25.0	10	M051400312	01
30.0	12	M051400313	01



**PIPE SCHEDULE - 40 (6 MTR. LENGTH)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M051400601	30
2.0	¾	M051400602	20
2.5	1	M051400603	15
3.2	1¼	M051400604	10
4.0	1½	M051400605	10
5.0	2	M051400606	06
6.5	2½	M051400607	05
8.0	3	M051400608	03
10.0	4	M051400609	02
15.0	6	M051400610	01
20.0	8	M051400611	01
25.0	10	M051400612	01
30.0	12	M051400613	01

# uPVC PRESSURE FITTINGS

## SCHEDULE 40 AS PER ASTM D2466



**COUPLER - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052401001	1400
2.0	¾	M052401002	300
2.5	1	M052401003	350
3.2	1¼	M052401004	200
4.0	1½	M052401005	150
5.0	2	M052401006	110
6.5	2½	M052401007	50
8.0	3	M052401008	35
10.0	4	M052401009	24
15.0	6	M052401010	02



**ELBOW 90° - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052400501	1000
2.0	¾	M052400502	500
2.5	1	M052400503	250
3.2	1¼	M052400504	150
4.0	1½	M052400505	110
5.0	2	M052400506	65
6.5	2½	M052400507	35
8.0	3	M052400508	25
10.0	4	M052400509	14
15.0	6	M052400510	03

SOC - SOCKET

SOC - SOCKET # Shortly Introducing  
\*Trading items are in grey colour.

# uPVC PRESSURE FITTINGS

## SCHEDULE 40 AS PER ASTM D-2466



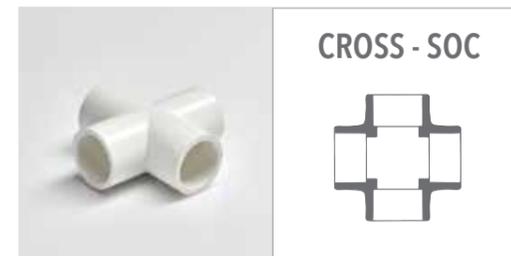
**ELBOW 90° (SOC X THREAD)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052400801	450
2.0	¾	M052400802	250
2.5	1	M052400803	125
3.2	1¼	M052400804	50
4.0	1½	M052400805	60
5.0	2	M052400806	30



**ELBOW 45° - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052402301	500
2.0	¾	M052402302	300
2.5	1	M052402303	325
3.2	1¼	M052402304	100
4.0	1½	M052402305	75
5.0	2	M052402306	40



**CROSS - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052402401	200
2.0	¾	M052402402	100
2.5	1	420-010**	10
3.2	1¼	420-012*	10
4.0	1½	420-015*	10
5.0	2	420-020*	10



**TEE - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052400101	550
2.0	¾	M052400102	300
2.5	1	M052400103	175
3.2	1¼	M052400104	100
4.0	1½	M052400105	70
5.0	2	M052400106	40
6.5	2½	M052400107	27
8.0	3	M052400108	18
10.0	4	M052400109	10
15.0	6	M052400110	02



**TEE - THREAD**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052400401	300
2.0	¾	M052400402	150
2.5	1	M052400403	75
3.2	1¼	M052400404	50
4.0	1½	M052400405	40
5.0	2	M052400406	20

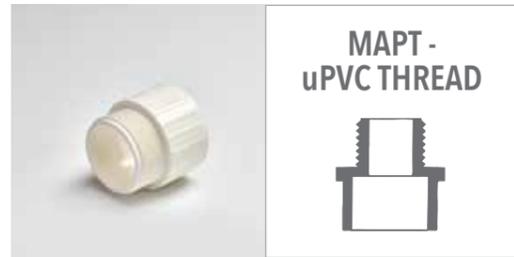


**REDUCER ELBOW 90° (SOC)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052800614	250
2.5 x 1.5	1 x ½	M052800615	150
2.5 x 2.0	1 x ¾	M052800616	150

# uPVC PRESSURE FITTINGS

## SCHEDULE 40 AS PER ASTM D-2466



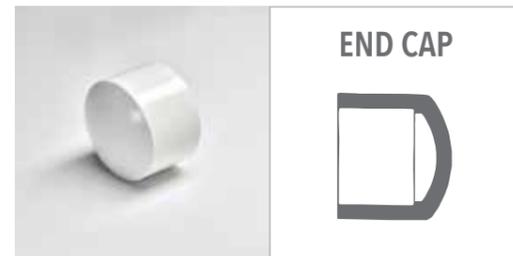
Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052401301	1700
2.0	¾	M052401302	500
2.5	1	M052401303	500
3.2	1¼	M052401304	480
4.0	1½	M052401305	320
5.0	2	M052401306	192



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052401601	1300
2.0	¾	M052401602	400
2.5	1	M052401603	400
3.2	1¼	M052401604	130
4.0	1½	M052401605	100
5.0	2	M052401606	70
2.0x1.5	¾x½	M052401614	700



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052802601	200
2.0	¾	M052802602	120
2.5	1	M052802603	80
3.2	1¼	M052802604	50
4.0	1½	M052802605	80
5.0	2	M052802606	30
6.5	2½	M052802607	15
8.0	3	M052802608	10
10.0	4	M052802609	04
15.0	6	897-060*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052404101	1200
2.0	¾	M052404102	600
2.5	1	M052404103	350
3.2	1¼	M052404104	220
4.0	1½	M052404105	270
5.0	2	M052404106	90
6.5	2½	M052404107	50
8.0	3	M052404108	35
10.0	4	M052404109	22



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052402501	80
2.0	¾	M052402502	60
2.5	1	M052402503	40
3.2	1¼	M052402504	30
4.0	1½	M052402505	20
5.0	2	M052402506	15



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052806501	200
2.0	¾	M052806502	140
2.5	1	M052806503	80
3.2	1¼	M052806504	40
4.0	1½	M052806505	30
5.0	2	M052806506	20



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0	¾	M0528010202	75
2.5	1	M0528010203	60
3.2	1¼	M0528010204	70
4.0	1½	M0528010205	60
5.0	2	M0528010206	35



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	F052806501	80
2.0	¾	F052806502	60
2.5	1	F052806503	40
3.2	1¼	F052806504	18
4.0	1½	F052806505	12
5.0	2	F052806506	08
6.5	2½	F052806507*	15
8.0	3	F052806508*	09



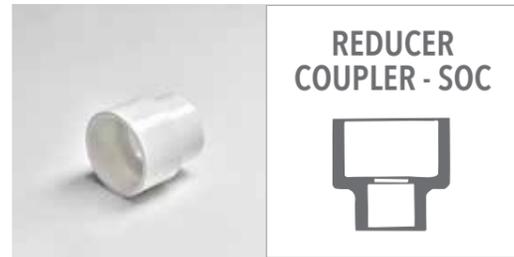
Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052400214	350
2.5 x 1.5	1 x ½	M052400215	200
2.5 x 2.0	1 x ¾	M052400216	175
3.2 x 1.5	1¼ x ½	M052400217	120
3.2 x 2.0	1¼ x ¾	M052400218	120
3.2 x 2.5	1¼ x 1	M052400219	120
4.0 x 1.5	1½ x ½	M052400220	90
4.0 x 2.0	1½ x ¾	M052400221	40
4.0 x 2.5	1½ x 1	M052400222	80
4.0 x 3.2	1½ x 1¼	M052400223	70
5.0 x 1.5	2 x ½	M052400224	60
5.0 x 2.0	2 x ¾	M052400225	60
5.0 x 2.5	2 x 1	M052400226	60
5.0 x 3.2	2 x 1¼	M052400227	50
5.0 x 4.0	2 x 1½	M052400228	50

SOC - SOCKET, THD-THREADED

All the items where product code starts with "F" are fabricated items.  
SOC - SOCKET, SPG-SPIGOT, THD-THREADED # Shortly Introducing

# uPVC PRESSURE FITTINGS

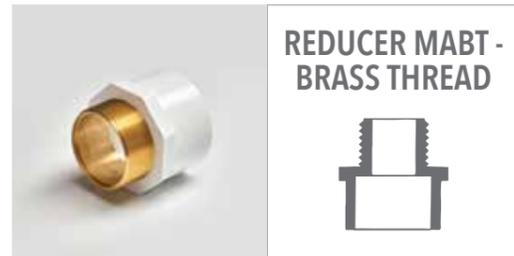
## SCHEDULE 40 AS PER ASTM D-2466



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052401114	400
2.5 x 1.5	1 x ½	M052401115	550
2.5 x 2.0	1 x ¾	M052401116	200
3.2 x 2.0	1¼ x ¾	A052401118	As Req.
3.2 x 2.5	1¼ x 1	M052401119	175
4.0 x 2.5	1½ x 1	M052401122	150
4.0 x 3.2	1½ x 1¼	M052401123	150
5.0 x 2.5	2 x 1	M052401126	120
5.0 x 3.2	2 x 1¼	M052401127	40
5.0 x 4.0	2 x 1½	M052401128	50



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052401914	900
2.5 x 1.5	1 x ½	M052401915	450
2.5 x 2.0	1 x ¾	M052401916	450
3.2 x 1.5	1¼ x ½	M052401917	300
3.2 x 2.0	1¼ x ¾	M052401918	300
3.2 x 2.5	1¼ x 1	M052401919	500
4.0 x 1.5	1½ x ½	M052401920	350
4.0 x 2.0	1½ x ¾	M052401921	200
4.0 x 2.5	1½ x 1	M052401922	350
4.0 x 3.2	1½ x 1¼	M052401923	400
5.0 x 1.5	2 x ½	M052401924	120
5.0 x 2.0	2 x ¾	M052401925	120
5.0 x 2.5	2 x 1	M052401926	100
5.0 x 3.2	2 x 1¼	M052401927	120
5.0 x 4.0	2 x 1½	M052401928	120
6.5 x 3.2	2½ x 1¼	M052401932	25
6.5 x 4.0	2½ x 1½	M052401933	50
6.5 x 5.0	2½ x 2	M052401934	60
8.0 x 4.0	3 x 1½	M052401939	35
8.0 x 5.0	3 x 2	M052401940	35
8.0 x 6.5	3 x 2½	M052401941	35
10.0 x 5.0	4 x 2	M052401947	20
10.0 x 6.5	4 x 2½	M052401948	10
10.0 x 8.0	4 x 3	M052401949	20



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052801414	150
2.5 x 1.5	1 x ½	M052801415	100
2.5 x 2.0	1 x ¾	M052801416	100



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052801714	100
2.5 x 1.5	1 x ½	M052801215	100
2.5 x 2.0	1 x ¾	M052801216	75



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5 x 1.5	½ x ½	M052800701	100
2.0 x 1.5	¾ x ½	M052800714	100
2.0 x 2.0	¾ x ¾	M052800702	75
2.5 x 1.5	1 x ½	M052800715	50
2.5 x 2.0	1 x ¾	M052800716*	50
2.5 x 2.5	1 x 1	M052800703	50



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5 x 1.5	½ x ½	M052800301	100
2.0 x 1.5	¾ x ½	M052800314	50
2.0 x 2.0	¾ x ¾	M052800302	50
2.5 x 1.5	1 x ½	M052800315	25
2.5 x 2.0	1 x ¾	M052800316	25
2.5 x 2.5	1 x 1	M052800303	30
3.2 x 1.5	1¼ x ½	M052800317	20



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052801401	150
2.0	¾	M052801402	100
2.5	1	M052801403	60
3.2	1¼	M052801404	50
4.0	1½	M052801405	40
5.0	2	M052801406	20
6.5	2½	M052801407	09
8.0	3	M052801408	08



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052801701	100
2.0	¾	M052801702	100
2.5	1	M052801703	50
3.2	1¼	M052801704	40
4.0	1½	M052801705	30
5.0	2	M052801706	15
6.5	2½	M052801707	09
8.0	3	M052801708	07
10.0	4	M052801709*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.5 x 1.5	1 x ½	M052802015	250

All the items where product code starts with "A" are assembled items.  
SOC - SOCKET, SPG-SPIGOT

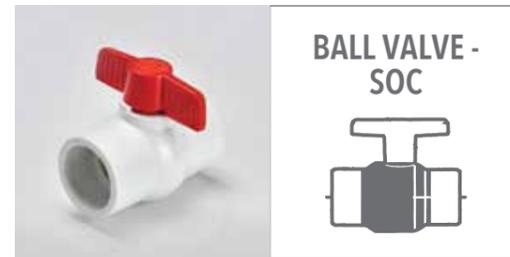
All the items where product code starts with "F" are fabricated items.  
SOC - SOCKET # Shortly Introducing

# uPVC PRESSURE FITTINGS

## SCHEDULE 40 AS PER ASTM D-2466



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052402701	80
2.0	¾	M052402702	100
2.5	1	M052402703	70
3.2	1¼	M052402704	40
4.0	1½	M052402705	30
5.0	2	M052402706	15



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	910-041*	100
2.0	¾	910-061*	100
2.5	1	910-081*	100
3.2	1¼	910-101*	100
4.0	1½	910-121*	48
5.0	2	910-161*	24
6.5	2½	910-171*	12
8.0	3	910-181*	12
10.0	4	910-201*	06



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	F052400901#	120
2.0	¾	F052400902	85
2.5	1	F052400903	50
3.2	1¼	F052400904	30
4.0	1½	F052400905	18
5.0	2	F052400906	12
6.5	2½	F052400907	06
8.0	3	F052400908	05
10.0	4	F052400909#	As Req.
15.0	6	F052400910#	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.5	½ x 1	T143-010M	As Req.
4.0	½ x 1½	T143-015M	As Req.
5.0	½ x 2	T143-020M	As Req.
6.5	½ x 2½	T143-025M	As Req.
8.0	½ x 3	T143-030M	As Req.
10.0	½ x 4	T143-040M	As Req.
12.5	½ x 5	T143-050M	As Req.
15.0	½ x 6	T143-060M	As Req.
2.5	½ x 1	T143-010H	As Req.
4.0	½ x 1½	T143-015H	As Req.
5.0	½ x 2	T143-020H	As Req.
6.5	½ x 2½	T143-025H	As Req.
8.0	½ x 3	T143-030H	As Req.
10.0	½ x 4	T143-040H	As Req.
12.5	½ x 5	T143-050H	As Req.
15.0	½ x 6	T143-060H	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	PVC9120M*	800
2.0	¾	PVC9340M*	500
2.5	1	PVC9100M*	400
3.2	1¼	PVC9105M*	300
4.0	1½	PVC9106M*	250
5.0	2	PVC9200M*	200



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	2622-005*	25
2.0	¾	2622-007*	25
2.5	1	2622-010*	10
3.2	1¼	2622-012*	10
4.0	1½	2622-015*	10
5.0	2	2622-020*	10
6.5	2½	2622-025*	05
8.0	3	2622-030*	03
10.0	4	2622-040*	01
15.0	6	2622-060*	01

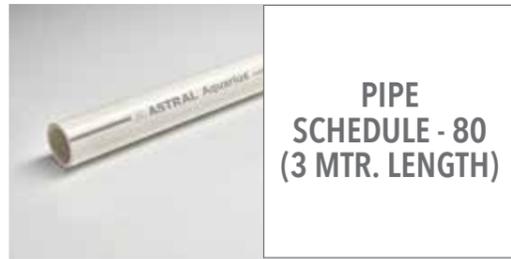


Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	F052402801	90
2.0	¾	F052402802	60
2.5	1	F052402803	30
3.2	1¼	F052402804	25
4.0	1½	F052402805	20
5.0	2	F052402806	10

Note: Ball Valves rated working pressure is 150 psi (10 kgf/cm<sup>2</sup>) at 23°C  
SOC - SOCKET \* Trading items

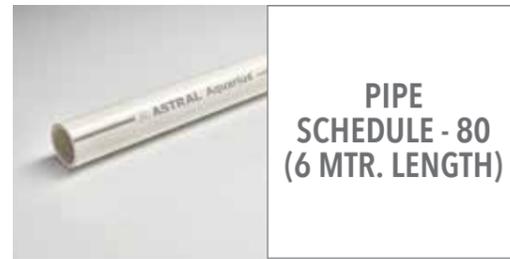
# uPVC PRESSURE PIPES

## SCHEDULE 80 AS PER ASTM D1785



**PIPE  
SCHEDULE - 80  
(3 MTR. LENGTH)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M051800301	50
2.0	¾	M051800302	30
2.5	1	M051800303	20
3.2	1¼	M051800304	15
4.0	1½	M051800305	10
5.0	2	M051800306	08
6.5	2½	M051800307	05
8.0	3	M051800308	03
10.0	4	M051800309	02
15.0	6	M051800310	01
20.0	8	M051800311	01
25.0	10	M051800312	01
30.0	12	M051800313	01



**PIPE  
SCHEDULE - 80  
(6 MTR. LENGTH)**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M051800601	30
2.0	¾	M051800602	20
2.5	1	M051800603	15
3.2	1¼	M051800604	10
4.0	1½	M051800605	10
5.0	2	M051800606	06
6.5	2½	M051800607	05
8.0	3	M051800608	03
10.0	4	M051800609	02
15.0	6	M051800610	01
20.0	8	M051800611	01
25.0	10	M051800612	01
30.0	12	M051800613	01

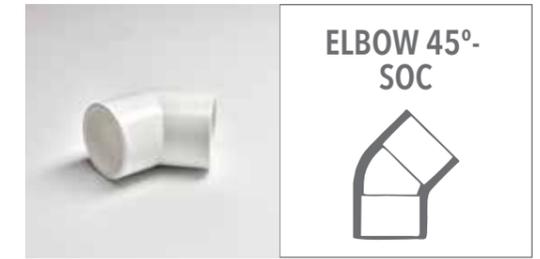
# uPVC PRESSURE FITTINGS

## SCHEDULE 80 AS PER ASTM D2467



**COUPLER-  
SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052801001	400
2.0	¾	M052801002	300
2.5	1	M052801003	150
3.2	1¼	M052801004	80
4.0	1½	M052801005	70
5.0	2	M052801006	50
6.5	2½	M052801007	20
8.0	3	M052801008	15
10.0	4	M052801009	12
15.0	6	M052801010	02
20.0	8	M052801011	01
25.0	10	M052801012	01
30.0	12	M052801013	01



**ELBOW 45°-  
SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052802301	400
2.0	¾	M052802302	200
2.5	1	M052802303	150
3.2	1¼	M052802304	80
4.0	1½	M052802305	60
5.0	2	M052802306	30
6.5	2½	M052802307	20
8.0	3	M052802308	12
10.0	4	M052802309	06
15.0	6	M052802310	02
20.0	8	817-080*	As Req.
25.0	10	817-100*	As Req.
30.0	12	817-120*	As Req.



**ELBOW 90° - SOC**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052800501	300
2.0	¾	M052800502	200
2.5	1	M052800503	125
3.2	1¼	M052800504	60
4.0	1½	M052800505	50
5.0	2	M052800506	25
6.5	2½	M052800507	15
8.0	3	M052800508	10
10.0	4	M052800509	05
15.0	6	M052800510	02
20.0	8	M052800511	01
25.0	10	806-100*	As Req.
30.0	12	806-120*	As Req.



**TEE - SOC**

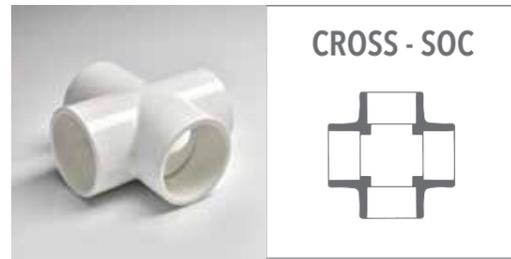
Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052800101	200
2.0	¾	M052800102	125
2.5	1	M052800103	70
3.2	1¼	M052800104	40
4.0	1½	M052800105	30
5.0	2	M052800106	15
6.5	2½	M052800107	12
8.0	3	M052800108	07
10.0	4	M052800109	04
15.0	6	M052800110	02
20.0	8	M052800111	01
25.0	10	801-100*	As Req.
30.0	12	801-120*	As Req.



\* Trading items are in grey colour. SOC-SOCKET

# uPVC PRESSURE FITTINGS

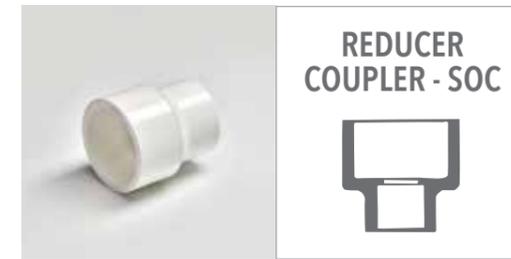
## SCHEDULE 80 AS PER ASTM D2467



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	*820-005	As Req.
2.0	¾	M052802402	50
2.5	1	M052802403	50
3.2	1¼	M052802404	30
4.0	1½	M052802405	25
5.0	2	M052802406	15
6.5	2½	M052802407	09
8.0	3	M052802408	06
10.0	4	820-040*	As Req.
15.0	6	820-060F*	As Req.
20.0	8	820-080F*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052801601	600
2.0	¾	M052801602	400
2.5	1	M052801603	200
3.2	1¼	M052801604	100
4.0	1½	M052801605	80
5.0	2	M052801606	50
6.5	2½	M052801607	30
8.0	3	M052801608	20
10.0	4	M052801609	12
15.0	6	835-060*	As Req.
20.0	8	835-080*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052801114	300
2.5 x 1.5	1 x ½	M052801115	250
2.5 x 2.0	1 x ¾	M052801116	200
3.2 x 1.5	1¼ x ½	M052801117	150
3.2 x 2.0	1¼ x ¾	M052801118	140
3.2 x 2.5	1¼ x 1	M052801119	125
4.0 x 1.5	1½ x ½	M052801120	125
4.0 x 2.0	1½ x ¾	M052801121	100
4.0 x 2.5	1½ x 1	M052801122	100
4.0 x 3.2	1½ x 1¼	M052801123	80
5.0 x 1.5	2 x ½	M052801124	70
5.0 x 2.0	2 x ¾	M052801125	70
5.0 x 2.5	2 x 1	M052801126	75
5.0 x 3.2	2 x 1¼	M052801127	60
5.0 x 4.0	2 x 1½	M052801128	50
6.5 x 3.2	2½ x 1¼	M052801132	48
6.5 x 4.0	2½ x 1½	M052801133	40
6.5 x 5.0	2½ x 2	M052801134	40
8.0 x 4.0	3 x 1½	M052801139	27
8.0 x 5.0	3 x 2	M052801140	25
8.0 x 6.5	3 x 2½	M052801141	25
10.0 x 4.0	4 x 1½	M052801146	16
10.0 x 5.0	4 x 2	M052801147	16
10.0 x 6.5	4 x 2½	M052801148	15
10.0 x 8.0	4 x 3	M052801149	15
15.0 x 5.0	6 x 2	829-528*	As Req.
15.0 x 6.5	6 x 2½	829-529*	As Req.
15.0 x 8.0	6 x 3	829-530*	As Req.
15.0 x 10.0	6 x 4	829-532*	As Req.
20.0 x 10.0	8 x 4	829-582*	As Req.
25.0 x 10.0	10 x 4	829-624F*	As Req.
25.0 x 15.0	10 x 6	829-626*	As Req.
25.0 x 20.0	10 x 8	829-628*	As Req.
30.0 x 20.0	12 x 8	829-668*	As Req.
30.0 x 25.0	12 x 10	829-670F*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052800214	150
2.5 x 1.5	1 x ½	M052800215	100
2.5 x 2.0	1 x ¾	M052800216	100
3.2 x 1.5	1¼ x ½	M052800217	60
3.2 x 2.0	1¼ x ¾	M052800218	60
3.2 x 2.5	1¼ x 1	M052800219	50
4.0 x 1.5	1½ x ½	M052800220	40
4.0 x 2.0	1½ x ¾	M052800221	40
4.0 x 2.5	1½ x 1	M052800222	40
4.0 x 3.2	1½ x 1¼	M052800223	30
5.0 x 1.5	2 x ½	M052800224	30
5.0 x 2.0	2 x ¾	M052800225	25
5.0 x 2.5	2 x 1	M052800226	20
5.0 x 3.2	2 x 1¼	M052800227	20
5.0 x 4.0	2 x 1½	M052800228	20
6.5 x 1.5	2½ x ½	A052800229	As Req.
6.5 x 2.0	2½ x ¾	A052800230	As Req.
6.5 x 2.5	2½ x 1	M052800231	15
6.5 x 3.2	2½ x 1¼	M052800232	15
6.5 x 4.0	2½ x 1½	M052800233	15
6.5 x 5.0	2½ x 2	M052800234	12
8.0 x 1.5	3 x ½	A052800235	As Req.
8.0 x 2.0	3 x ¾	A052800236	As Req.
8.0 x 2.5	3 x 1	M052800237	10
8.0 x 3.2	3 x 1¼	A052800238	As Req.
8.0 x 4.0	3 x 1½	M052800239	10
8.0 x 5.0	3 x 2	M052800240	09
8.0 x 6.5	3 x 2½	M052800241	09
10.0 x 1.5	4 x ½	A052800242	As Req.
10.0 x 2.0	4 x ¾	A052800243#	As Req.
10.0 x 2.5	4 x 1	M052800244	05
10.0 x 3.2	4 x 1¼	M052800245	05
10.0 x 4.0	4 x 1½	M052800246	05
10.0 x 5.0	4 x 2	M052800247	05
10.0 x 6.5	4 x 2½	M052800248	05
10.0 x 8.0	4 x 3	M052800249	05



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052801301	600
2.0	¾	M052801302	400
2.5	1	M052801303	250
3.2	1¼	M052801304	150
4.0	1½	M052801305	100
5.0	2	M052801306	60
6.5	2½	M052801307	30
8.0	3	M052801308	20
10.0	4	M052801309	15
15.0	6	836-060*	As Req.
2.0 x 1.5	¾ x ½	M052801314	400



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052804101	800
2.0	¾	M052804102	500
2.5	1	M052804103	300
3.2	1¼	M052804104	150
4.0	1½	M052804105	100
5.0	2	M052804106	60
6.5	2½	M052804107	40
8.0	3	M052804108	25
10.0	4	M052804109	18
15.0	6	M052804110	15
20.0	8	847-080*	As Req.
25.0	10	847-100F*	As Req.
30.0	12	847-120F*	As Req.

\* Trading items are in grey colour. SOC-SOCKET  
# Shortly introducing

All the items where product code starts with "F" are fabricated items and code starting with "A" are assembled items.  
\* Trading items are in grey colour. # Shortly introducing  
SOC-SOCKET, SPG-SPIGOT, THD-THREADED

# uPVC PRESSURE FITTINGS

## SCHEDULE 80 AS PER ASTM D-2467



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
15.0 x 6.5	6 x 2½	M052800256	As Req.
15.0 x 8.0	6 x 3	M052800257	02
15.0 x 10.0	6 x 4	M052800258	02
20.0 x 15.0	8 x 6	A052800268	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0 x 1.5	¾ x ½	M052801914	300
2.5 x 1.5	1 x ½	M052801915	400
2.5 x 2.0	1 x ¾	M052801916	400
3.2 x 1.5	1¼ x ½	M052801917	250
3.2 x 2.0	1¼ x ¾	M052801918	250
3.2 x 2.5	1¼ x 1	M052801919	250
4.0 x 1.5	1½ x ½	M052801920	150
4.0 x 2.0	1½ x ¾	M052801921	150
4.0 x 2.5	1½ x 1	M052801922	150
4.0 x 3.2	1½ x 1¼	M052801923	150
5.0 x 1.5	2 x ½	M052801924	100
5.0 x 2.0	2 x ¾	M052801925	100
5.0 x 2.5	2 x 1	M052801926	100
5.0 x 3.2	2 x 1¼	M052801927	100
5.0 x 4.0	2 x 1½	M052801928	100
6.5 x 3.2	2½ x 1¼	M052801932	50
6.5 x 4.0	2½ x 1½	M052801933	50
6.5 x 5.0	2½ x 2	M052801934	50
8.0 x 2.5	3 x 1	A052801937	As Req.
8.0 x 3.2	3 x 1¼	A052801938	As Req.
8.0 x 4.0	3 x 1½	M052801939	35
8.0 x 5.0	3 x 2	M052801940	35
8.0 x 6.5	3 x 2½	M052801941	35
10.0 x 5.0	4 x 2	M052801947	20
10.0 x 6.5	4 x 2½	M052801948	20
10.0 x 8.0	4 x 3	M052801949	20
15.0 x 8.0	6 x 3	A052801957	As Req.
15.0 x 10.0	6 x 4	M052801958	06
20.0 x 15.0	8 x 6	M052801968	03
25.0 x 10.0	10 x 4	837-624*	As Req.
25.0 x 15.0	10 x 6	837-626*	As Req.
25.0 x 20.0	10 x 8	837-628*	As Req.
30.0 x 15.0	12 x 6	837-666**	As Req.
30.0 x 20.0	12 x 8	837-668*	As Req.
30.0 x 25.0	12 x 10	837-670*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	F052800901	120
2.0	¾	F052800902#	As Req.
2.5	1	F052800903#	As Req.
3.2	1¼	F052800904#	As Req.
4.0	1½	F052800905#	As Req.
5.0	2	F052800906#	As Req.
6.5	2½	F052800907#	As Req.
8.0	3	F052800908#	As Req.
10.0	4	F052800909	04
15.0	6	F052800910	01



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052803301#	As Req.
2.0	¾	M052803302#	As Req.
2.5	1	M052803303#	As Req.
3.2	1¼	M052803304#	As Req.
4.0	1½	M052803305#	As Req.
5.0	2	M052803306#	As Req.
6.5	2½	M052803307#	As Req.
8.0	3	M052803308	16
10.0	4	M052803309	06
15.0	6	856-060*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	F052802801#	As Req.
2.0	¾	F052802802#	As Req.
2.5	1	F052802803#	As Req.
3.2	1¼	F052802804#	As Req.
4.0	1½	F052802805#	As Req.
5.0	2	F052802806#	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
8.0	3	M052803208	12
10.0	4	M052803209	08



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052803401	120
2.0	¾	M052803402	80
2.5	1	M052803403	60
3.2	1¼	M052803404	50
4.0	1½	M052803405	35
5.0	2	M052803406	25
6.5	2½	M052803407	15
8.0	3	M052803408	12
10.0	4	M052803409	08
15.0	6	M052803410	03
20.0	8	M052803411	01
25.0	10	854-100*	As Req.
30.0	12	854-120*	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052803601	As Req.
2.0	¾	M052803602	As Req.
2.5	1	M052803603	As Req.
3.2	1¼	M052803604	As Req.
4.0	1½	M052803605	As Req.
5.0	2	M052803606	As Req.
6.5	2½	M052803607	As Req.
8.0	3	M052803608	As Req.
10.0	4	M052803609	As Req.
15.0	6	M052803610	As Req.
20.0	8	M052803611	As Req.

\* Trading Item. SOC-SOCKET # Shortly Introducing  
All the items where product code starts with "F" are fabricated items.

Note: Ball Valves rated working pressure is 150 psi (10 kgf/cm<sup>2</sup>) at 23°C  
SOC-SOCKET, SPG-SPIGOT. \* Trading Item. # Shortly Introducing

# uPVC PRESSURE FITTINGS

## SCHEDULE 80 AS PER ASTM D-2467



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052802701	48
2.0	¾	M052802702	36
2.5	1	M052802703	16
3.2	1¼	M052802704	10
4.0	1½	M052802705	08
5.0	2	M052802706	06



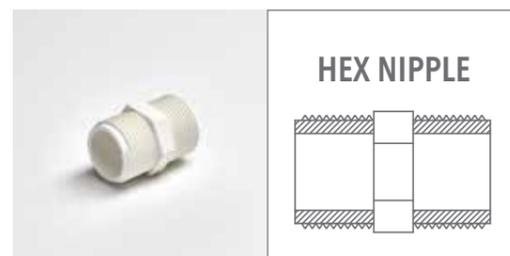
Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052804201	As Req.
2.0	¾	M052804202	As Req.
2.5	1	M052804203	As Req.
3.2	1¼	M052804204	As Req.
4.0	1½	M052804205	As Req.
5.0	2	M052804206	As Req.
6.5	2½	M052804207	As Req.
8.0	3	M052804208	As Req.
10.0	4	M052804209	As Req.
15.0	6	M052804210	As Req.
20.0	8	M052804211	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5	½	M052803701#	As Req.
2.0	¾	M052803702#	As Req.
2.5	1	M052803703#	As Req.
3.2	1¼	M052803704#	As Req.
4.0	1½	M052803705#	As Req.
5.0	2	M052803706#	As Req.
6.5	2½	M052803707#	As Req.
8.0	3	M052803708	As Req.
10.0	4	M052803709	As Req.



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
6.5	2½	853-025*	-
8.0	3	M052803108	20
10.0	4	M052803109	12
15.0	6	853-060*	-



Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
2.0	¾	M0528012702	600
2.5	1	M0528012703	350

# uPVC SOLVENT CEMENT & PRIMER



Qty. (ml)	Product Code	Std. Pkg. (Nos.)
50	TIPS50P705	48
118	TIPS118P705	24
237	TIPS237P705	24
473	TIPS473P705	12
946	TIPS946P705	12



Qty. (ml)	Product Code	Std. Pkg. (Nos.)
22.17	TIPS2217P705	48
44	TIPS44P705	24



Qty. (ml)	Product Code	Std. Pkg. (Nos.)
473	TIPS473P717	12
946	TIPS946P717	12



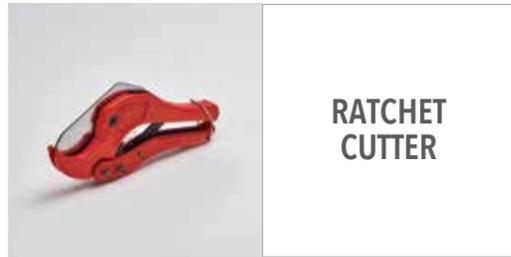
Qty. (ml)	Product Code	Std. Pkg. (Nos.)
473	MIPS473P735	12
946	MIPS946P735	12



Qty. (ml)	Product Code	Std. Pkg. (Nos.)
473	TEZ-221	12
946	TEZ-220	12

Note: Ball Valves rated working pressure is 150 psi (10 kgf/cm<sup>2</sup>) at 23°C  
SOC-SOCKET, SPG-SPIGOT \* Trading Item. # Shortly Introducing

\* Trading Item



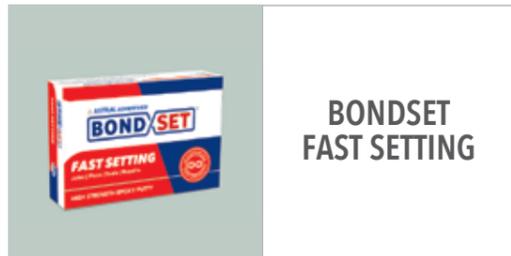
**RATCHET  
CUTTER**

Size (cm)	Size (inch)	Product Code	Std. Pkg. (Nos.)
1.5 - 3.2	½ - 1¼	TTOOLS-1	As Req.



**PTFE TAPE**

Size (Mtr.)	Product Code	Std. Pkg. (Nos.)
5	PTFE-1205	As Req.
10	PTFE-1210	As Req.
20	PTFE-1220	As Req.



**BONDSET  
FAST SETTING**

Qty. (gm)	Product Code	Std. Pkg. (Nos.)
50	BONDSETFS-50	As Req.
100	BONDSETFS-100	As Req.



**RESCUE TAPE**

Size (Ft.)	Product Code	Std. Pkg. (Nos.)
5	RSCU-TAPE-05-CLR	120
5	RSCU-TAPE-05-RED	120
5	RSCU-TAPE-05-BLK	120
10	RSCU-TAPE-10-CLR	120
10	RSCU-TAPE-10-RED	120
10	RSCU-TAPE-10-BLK	120
15	RSCU-TAPE-15-CLR	120
15	RSCU-TAPE-15-RED	120
15	RSCU-TAPE-15-BLK	120



### Carrying Capacity and Friction Loss for Schedule 40 Thermoplastic Pipe

(Independent Variables : Gallons per minute and nominal pipe size O.D.

Dependent Variables : Velocity, friction head and pressure drop per 100 feet of pipe, interior smooth.)

Gallons per Minute	1/2 INCH		3/4 INCH		1 INCH		1 1/4 INCH		1 1/2 INCH		2 INCH		2 1/2 INCH			
	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	
1	1.105	1.107	0.478	28.640	0.623	0.274	0.118	14.710	1.148	0.642	0.278	26.334	0.483	0.078	0.034	9.603
3	3.315	8.485	3.659	85.920	1.686	2.096	0.906	44.130	1.941	1.857	0.715	43.980	0.806	0.202	0.087	16.005
5	5.525	21.801	9.423	143.200	3.113	5.339	2.334	73.550	2.679	3.084	1.333	61.446	1.128	0.376	0.163	22.407
7	7.735	40.654	17.573	200.480	4.358	10.068	4.352	102.970	3.445	4.912	2.123	79.002	1.450	0.599	0.259	28.809
9	0.441	0.031	0.013	7.870	6.226	19.491	8.425	147.100	3.808	5.970	2.580	87.780	1.612	0.728	0.315	32.010
15	0.662	0.066	0.029	11.805					5.742	12.650	5.468	131.670	2.407	4.542	0.667	48.015
20	0.883	0.113	0.049	15.740	0.511	0.030	0.013	8.420	7.656	21.551	9.315	175.560	3.223	20.627	1.136	64.020
25	1.103	0.170	0.074	19.675	0.639	0.045	0.019	10.525	5.489	8.426	3.642	114.925	4.029	3.972	1.717	80.025
30	1.324	0.238	0.103	23.610	0.767	0.063	0.027	12.630	6.586	11.810	5.105	137.910	4.835	5.567	2.406	96.030
35	1.545	0.317	0.137	27.545	0.894	0.084	0.036	14.735	7.684	15.712	6.792	160.895	5.641	7.407	3.202	112.035
40	1.766	0.406	0.176	31.480	1.022	0.107	0.046	16.840	8.780	20.212	8.697	183.880	6.446	9.4885	4.100	128.040
45	1.986	0.505	0.218	35.415	1.150	0.134	0.058	18.945					7.252	11.797	5.099	144.045
50	2.207	0.614	0.265	39.350	1.278	0.162	0.070	21.050	0.561	0.022	0.010	8.250	8.058	14.339	6.198	160.050
60	2.648	0.861	0.372	47.220	1.533	0.228	0.098	25.260	0.674	0.031	0.013	9.900	9.670	20.098	8.687	192.060
70	3.090	1.145	0.495	55.090	1.789	0.303	0.131	29.470	0.786	0.041	0.018	11.550				
80	3.531	1.486	0.634	62.960	2.044	0.388	0.168	33.680	0.898	0.052	0.023	13.200				
90	3.973	1.824	0.755	70.830	2.300	0.483	0.209	37.890	1.011	0.065	0.028	14.850				
100	4.414	2.217	0.958	78.700	2.555	0.587	0.254	42.100	1.123	0.079	0.034	16.500				
125	5.517	3.351	1.449	98.375	3.194	0.887	0.383	52.625	1.404	0.120	0.052	20.626	0.821	0.025	0.011	10.800
150	6.621	4.699	2.031	118.050	3.833	1.243	0.537	63.150	1.684	0.168	0.073	24.750	1.026	0.037	0.016	13.500
175	7.724	6.250	2.701	137.725	4.472	1.654	0.715	73.675	1.965	0.224	0.097	28.875	1.231	0.052	0.023	16.200
200	8.828	8.003	3.459	157.400	5.111	2.117	0.915	84.200	2.246	0.286	0.124	33.000	1.436	0.070	0.030	18.900
250					6.389	3.201	1.384	105.250	2.807	0.433	0.187	41.250	1.642	0.089	0.039	21.600
300					7.666	4.487	1.939	126.300	3.369	0.607	0.268	49.500	1.847	0.111	0.048	24.300
350					8.994	5.969	2.580	147.350	3.930	0.808	0.349	57.750	2.052	0.135	0.058	27.000
400									4.492	1.034	0.447	66.000	2.266	0.159	0.069	30.000
450									5.053	1.286	0.556	74.250	2.478	0.177	0.081	33.000
500									5.615	1.563	0.676	82.500	2.682	0.199	0.100	36.000
750									8.422	3.313	1.432	123.750	3.078	0.286	0.124	40.500
1000													6.474	1.478	0.639	89.000
1250									8.093	2.234	0.966	111.250	5.130	0.319	0.136	45.000
1500									9.711	3.132	1.354	133.500	6.156	0.447	0.190	54.000
1750									7.182	1.375	0.594	94.500	5.056	0.585	0.253	63.000
2000									8.208	1.761	0.761	108.000	5.778	0.750	0.324	72.000

CAUTION: Flow velocity should not exceed 5 feet per second. PVC pipe cannot be used for compressed air service.

### Carrying Capacity and Friction Loss for Schedule 80 Thermoplastic Pipe

(Independent Variables : Gallons per minute and nominal pipe size O.D.

Dependent Variables : Velocity, friction head and pressure drop per 100 feet of pipe, interior smooth.)

Gallons per Minute	1/2 INCH		3/4 INCH		1 INCH		1 1/4 INCH		1 1/2 INCH		2 INCH		2 1/2 INCH			
	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	Maximum Surge Pressure (PSI)	Flow Velocity (Feet Per Second)	Friction Head Loss (Ft Water/100Ft)	Friction Pressure Loss (PSI/100Ft)	
1	1.465	2.198	0.950	44.100	0.779	0.473	0.205	21.570	1.402	1.043	0.451	37.290	0.562	0.113	0.049	13.161
3	4.395	16.816	7.289	132.300	2.338	3.619	1.564	64.710	2.336	2.686	1.161	62.150	0.937	0.291	0.126	21.935
5	7.326	43.310	18.720	220.500	3.896	9.322	4.029	107.800	3.271	5.008	2.165	87.010	1.312	0.543	0.235	30.709
7	10.256	80.763	34.910	308.700	5.455	17.383	7.514	150.900	4.205	7.977	3.448	111.870	1.687	0.865	0.374	39.483
9	0.498	0.042	0.018	10.500	7.792	33.652	14.546	215.700	4.672	9.696	4.191	124.300	1.875	1.052	0.455	43.870
15	0.747	0.089	0.038	15.750					7.008	20.545	8.880	186.450	2.884	2.228	0.963	65.805
20	0.996	0.151	0.065	21.000	0.570	0.039	0.017	11.220	9.344	35.002	15.129	248.600	3.473	3.797	1.641	87.740
25	1.245	0.228	0.099	26.250	0.712	0.059	0.025	14.025	6.473	12.587	5.441	158.675	4.687	5.739	2.481	109.675
30	1.494	0.320	0.138	31.500	0.855	0.082	0.036	16.830	7.768	17.683	7.626	190.410	5.825	8.045	3.477	131.610
35	1.743	0.425	0.184	36.750	0.997	0.109	0.047	19.635	9.062	23.472	10.146	222.145	6.562	10.703	4.626	153.545
40	1.992	0.545	0.235	42.000	1.140	0.140	0.061	22.440	10.357	30.057	12.992	253.880	7.499	13.705	5.924	175.480
45	2.241	0.678	0.293	47.250	1.282	0.174	0.075	25.245					8.437	17.046	7.368	197.415
50	2.490	0.823	0.356	52.500	1.425	0.212	0.092	28.050	0.627	0.029	0.012	11.500	9.374	20.719	8.956	219.350
60	2.988	1.154	0.499	63.000	1.710	0.297	0.128	33.660	7.752	0.040	0.017	13.800	11.249	29.041	12.553	263.220
70	3.486	1.536	0.664	73.500	1.995	0.395	0.171	39.270	0.877	0.054	0.023	16.100				
80	3.984	1.968	0.850	84.000	2.280	0.506	0.219	44.880	1.003	0.069	0.030	18.400				
90	4.482	2.446	1.057	94.5000	2.565	0.629	0.272	50.490	1.128	0.085	0.037	20.700				
100	4.980	2.973	1.285	105.000	2.850	0.765	0.330	56.100	1.253	0.104	0.045	23.000				
125	6.225	4.494	1.943	131.250	3.562	1.156	0.500	70.125	1.567	0.157	0.068	28.750	0.892	0.040	0.017	15.375
150	7.469	6.229	2.723	157.500	4.274	1.620	0.700	84.150	1.880	0.220	0.095	34.500	1.071	0.056	0.024	18.450
175	8.714	8.381	3.622	183.750	4.987	2.155	0.932	98.175	2.193	0.292	0.126	40.250	1.249	0.074	0.032	21.525
200	9.959	10.732	4.639	210.000	5.699	2.760	1.193	112.200	2.560	0.374	0.162	46.000	1.427	0.095	0.041	24.600
250					7.124	4.173	1.804	140.250	3.133	0.566	0.244	57.500	1.784	0.144	0.062	30.750
300					8.549	5.849	2.528	168.300	3.760	0.793	0.343	69.000	2.141	0.202	0.087	36.900
350					9.974	7.781	3.363	196.350	4.386	1.055	0.456	80.500	2.498	0.268	0.116	43.050
400									5.013	1.351	0.584	92.000	2.855	0.343	0.148	49.200
450									5.639	1.680	0.728	103.500	3.212	0.427	0.185	55.350
500									6.266	2.042	0.883	115.000	3.589	0.519	0.224	61.500
750									9.399	4.327	1.870	172.500	5.353	1.100	0.475	92.250
1000									7.137	1.874	0.810	123.000	4.533	0.621	0.269	76.000
1250									8.921	2.833	1.224	153.750	5.667	0.939	0.406	95.000
1500									10.706	3.970	1.716	184.500	6.800	1.316	0.569	114.000
1750									7.984	1.751	0.757	133.000	5.604	0.752	0.325	92.750
2000									9.067	2.243	0.969	152.000	6.404	0.963	0.416	106.000

CAUTION: Flow velocity should not exceed 5 feet per second. PVC pipe cannot be used for compressed air service.

# EXPANSION AND CONTRACTION OF uPVC PIPE

## CARRYING CAPACITY AND FRICTION LOSS FOR SCHEDULE 80 THERMOPLASTIC PIPE

uPVC pipes, like other piping materials, undergo length changes as a result of temperature variations above and below the installation temperature. They expand and contract 4.5 to 5 times more than steel or iron pipe. The extent of the expansion - contraction depends upon the coefficient of linear expansion of piping material. The length of pipe between directional changes, and the temperature differential.

The coefficient of thermal expansion (Y)

for uPVC is  $3.1 \times 10^{-5}$  in./in./°F.

The amount of expansion and contraction can be calculated using the following formula:

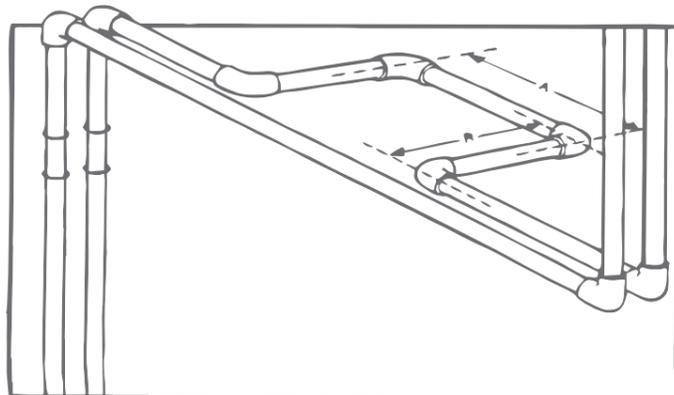
- $\Delta L$  =  $Y(T_1 - T_2) \times L$
- $\Delta L$  = Dimensional change due to thermal expansion or contraction (Inch)
- Y = Expansion coefficient (in./in./°F)
- $(T_1 - T_2)$  = Temperature differential between the installation temperature and the maximum or minimum system temperature, whichever provides the greatest differential (°F).
- L = Length of pipe run between changes in direction (ft.).

There are several ways to compensate for expansion and contraction. The most common method are:

1. Expansion loops which consist of pipe and 90° elbows.
2. Piston type expansion joints\*
3. Flexible bends\*
4. Bellows and rubber expansion joints\*

\* The manufacturers of these devices should be contacted to determine the suitability of their products for the specific application.

Expansion loops are a simple and convenient way to compensate for expansion and contraction when there is sufficient space for the loop in the piping system. A typical expansion loop design is shown below:



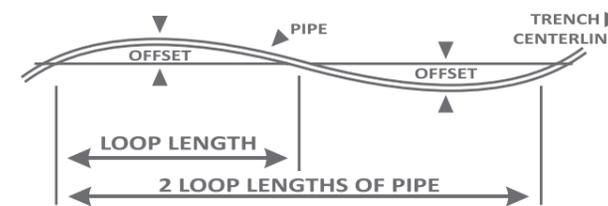
The length of leg "R" can be determined by using the following formula to ensure that it is long enough to absorb the expansion and contraction movement without damage. The length of leg "A" should be 1/2 the length of leg "R"

- R =  $1.44 D \Delta L$
- R = Expansion loop leg length (ft)
- D = Nominal outside diameter of pipe (in.) (See table below.)
- $\Delta L$  = Dimensional change due to thermal expansion or contraction (in.)

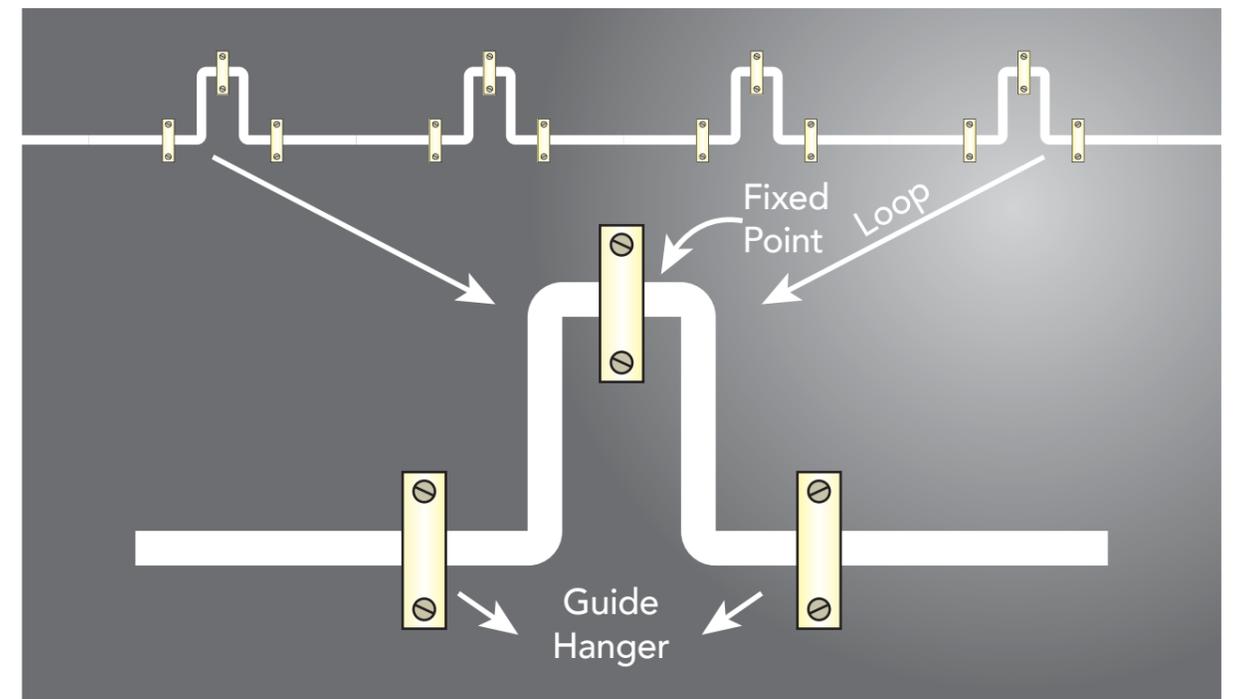
When installing the expansion loop, no rigid or restraining supports should be placed within the leg lengths of the loop. The loop should be installed as closely as possible to the mid-point between anchors. Piping support guides should restrict lateral movement and direct axial movement into the loop. Lastly, the pipe and fittings should be solvent cemented together, rather than using threaded connections.

Compensation for expansion and contraction in underground application is normally achieved by snaking the pipe in the trench. Proper trenching and burial procedures must be followed to protect the piping system.

The table below shows recommended offsets & loop lengths for piping upto 2½ inches nominal sizes.



Loop Offset in Inches	Max. Temp. Variation °F, Between Installation and Final Operation									
	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
20	3.0	3.5	4.5	5.0	6.0	6.5	7.0	7.0	8.0	8.0
50	7.0	9.0	11.0	13.0	14.0	15.5	17.0	18.0	19.0	20.0
100	13.0	18.0	22.0	26.0	29.0	31.5	35.0	37.0	40.0	42.0



# JOINT CURING

## RECOMMENDED INITIAL SET TIMES.

Temperature	Pipe Size	Pipe Size	Pipe Size	Pipe Size
Range	½" to 1¼"	½" to 3"	4" to 8"	10" to 12"
	15 to 32 mm	40 to 80 mm	100 to 200 mm	250 to 300 mm
15.5°C - 37.7°C	15 min.	30 min.	1 hr.	2 hr.
4.4°C - 15.5°C	1 hr.	2 hrs.	4 hrs.	8 hrs.

## RECOMMENDED INITIAL SET TIMES.

Temperature	Pipe Size	Pipe Size	Pipe Size	Pipe Size
Range	½" to 1¼"	½" to 3"	4" to 8"	10" to 12"
	15 to 32 mm	40 to 80 mm	100 to 200 mm	250 to 300 mm
15.5°C - 37.7°C	6 hrs.	12 hrs.	24 hr.	48 hr.
4.4°C - 15.5°C	12 hr.	24 hrs.	48 hrs.	96 hrs.

# SUPPORT SPACING FOR uPVC PIPE

Adequate supports for any piping system is a matter of great importance. In practice, support spacings are a function of pipe size operating temperatures, the location of heavy valves or fittings and the mechanical properties of the pipe material. To ensure the satisfactory operation of a ASTRAL Aquarius uPVC piping system, the location and type of hangers should be carefully considered. Hangers should not compress, distort, cut or abrade the piping.

All piping should be supported with an approved hanger at intervals sufficiently close to maintain correct pipe alignment and to prevent sagging or reversal. Pipe should also be supported at all branch ends and at all changes of direction. Support trap arms as close as possible to the trap. In keeping with good plumbing practices support and brace all closet bends and fasten closet angles.

1. Concentrated loads should be supported directly so as to eliminate high stress concentrations. Should this be impractical then the pipe must be supported immediately adjacent to the load.
2. In systems where large fluctuations in temperature occur, allowances must be made for expansion and contraction of the piping system. Since changes in direction in the system are usually sufficient to allow for expansion and contraction hangers must be placed so as not to restrict this movement.
3. Since plastic pipe expands or contracts approximately five times greater than those of steel, hangers should not restrict this movement.
4. Hangers should provide as much bearing surface as possible. To prevent damage to the pipe, file smooth any sharp edges or burrs on the hangers or supports.
5. Support spacing for horizontal piping systems is determined by the maximum operating temperature the system will encounter. The piping should be supported on uniform centers with supports that do not restrict the axial movement.
6. For vertical lines, it is recommended that an engineer should design the vertical supports according to the vertical load involved.



## SCHEDULE - 40 RECOMMENDED SUPPORT SPACING (IN FEET)

Nom. Pipe Size		Temperature °C				
(in.)	(mm)					
-	-	15.5	26.6	37.7	48.8	60
½	15	4½	4½	4	2½	2½
¾	20	5	4½	4	2½	2½
1	25	5½	5	4½	3	2½
1¼	32	5½	5½	5	3	3
1½	40	6	5½	5	3½	3
2	50	6	5½	5	3½	3
2½	65	6½	6	5½	4	3
3	80	7	7	6	4	3½
4	100	7½	7	6½	4½	4
6	150	8½	8	7½	5	4½
8	200	9½	9	8½	5½	5
10	250	10½	9½	9	6½	5½
12	300	12	10½	9½	7	6

## SCHEDULE - 80 RECOMMENDED SUPPORT SPACING (IN FEET)

Nom. Pipe Size		Temperature °C				
(in.)	(mm)					
-	-	15.5	26.6	37.7	48.8	60
½	15	5	4½	4½	3	2½
¾	20	5½	5	4½	3	2½
1	25	6	5½	5	3½	3
1¼	32	6	6	5½	3½	3
1½	40	6½	6	5½	3½	3½
2	50	7	6½	6	4	3½
2½	65	7½	7½	6½	4½	4
3	80	8	7½	7	4½	4
4	100	9	8½	7½	5	4½
6	150	10	9½	8½	6½	5½
8	200	11	10	9½	7½	6
10	250	12½	11	10½	7½	6½
12	300	13	12	10½	7½	6½

# INSTALLATION PROCEDURE



## 1. CUT PIPE

- Cut pipe square. As joints are sealed at the base of the fitting socket. An angled cut may result in joint failure.
- Acceptable tools include miter saw, mechanical cut off saw or wheel cutter. Wheel type cutters must employ a blade designed for plastics.



## 2. REMOVE BURR & BEVEL

- Remove all burr from inside and outside of pipe with a knife-edge, file or deburring tool. Chamfer (bevel) the end of the pipe 10° -15°.
- Remove surface dirt, grease or moisture with a clean dry cloth.



## 3. DRY FIT

- With light pressure, pipe should go one third to one half of the way into the fitting socket. Pipes and Fittings that are too tight or too loose should not be used.



## 4. APPLICATOR

- Use an applicator that is one half the pipe diameter.
- Too large an applicator will force excessive cement into the inside of small diameter fittings. Too small an applicator will not apply sufficient cement to large diameter systems.

## 5. CEMENT

- Apply a full even layer of cement to the outside of a pipe and medium layer of cement to the inside of a fitting.



## 6. JOIN PIPE & FITTING

- Assemble pipe and fitting socket till it contacts socket bottom. Give pipe a quarter turn. Hold pipe and fitting together until the pipe does not back out.
- Remove excessive cement from the exterior. A properly made joint will show a continuous bead of cement around the perimeter.
- Observe all safety precautions.
- System should be installed in a good and workman like manner consistent with normal industry standards and in conformance with all local plumbing, fire and building code requirements. Failure to follow proper installation practices, procedures or techniques can result in system failure, property damage or personal injury.
- Pipes and fittings should be used for their intended purpose as defined by local plumbing and building codes and the applicable ASTM standards.
- Follow manufacturers instructions for all related products.



uPVC CEMENT FOR SCH 40 AND INTERFERENCE FIT

Pipe Size (in.) (mm)	Cement Type	Min. Vis. (cP)	IPS-Weld On
(1/2-2) (15-50)	Medium Bodied	500	705
(2 1/2-12) (65-300)	Heavy Bodied	1600	717

uPVC CEMENT FOR SCH 80 AND INTERFERENCE FIT

Pipe Size (in.) (mm)	Cement Type	Min. Vis. (cP)	IPS-Weld On
(1/2-2) (15-50)	Medium Bodied	500	705
(1 1/2-12) (40-300)	Heavy Bodied	1600	717

# TESTING PRESSURE SYSTEM

- Prior to testing, safety precautions should be instituted to protect personnel and property in case of test failure.
- Conduct pressure testing with water. DO NOT USE AIR OR OTHER GASES for pressure testing.
- The piping system should be adequately anchored to limit movement. Water under pressure exerts thrust forces in piping systems. Thrust blocking should be provided at changes of direction, change in size and at dead ends.
- Please refer tables given for initial set & cure times before pressure testing.
- The piping systems should be slowly filled with water, taking care to prevent surge and air entrapment. The flow velocity should not exceed 5 feet per second.
- All trapped air must be slowly released. Vents must be provided at all high points of the piping system. All valves and air relief mechanisms should be opened so that the air can be vented while the system is extremely dangerous and it must be slowly and completely vented prior to testing. For sizes 4" & above, ASTRAL recommends to use automatic air relief valves at every 300-400ft. distance & at furthest & highest points of pipeline to avoid any damage to the piping system.

- The piping system can be pressurized to 125% of its designed working pressure. However care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system (valves, unions, flanges, threaded parts etc.)
- The pressure test should not exceed one hour Any leaking joints or pipe must be cut out and replaced and the line recharged and retested using the same procedure.



# UNDERGROUND INSTALLATION

uPVC pipes and fittings can be installed underground, Since these piping systems are flexible systems, proper attention should be given to burial conditions. The stiffness of the piping system is affected by sidewall support, soil compaction, and the condition of the trench, Trench bottoms should be smooth and regular in either undisturbed soil or a layer of compacted backfill. Pipe must lie evenly on this surface throughout the entire length of its barrel, Excavation, bedding and backfill should be in accordance with the provision of the local Plumbing Code having jurisdiction

## TRENCHING

The following trenching and burial procedures should be used to protect the piping system.

1. The trench should be excavated to ensure the sides will be stable under all working conditions. The trench should be wide enough to provide adequate room for the following :
  - A. Joining the pipe in the trench.
  - B. Snaking the pipe from side or side to compensate for expansion and contraction.
  - C. Filling and compacting the side fills.

The space between the pipe and trench wall must be wider than the compaction equipment used in the compaction of the backfill. Minimum width shall not be less than the greater of either the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25 plus 12 inches. Trench width may be different if approved by the design engineer.
2. The trench bottom should be smooth, free of rocks and debris, continuous, and provide uniform support. If ledge rock, hardpan or large boulders are encountered, the trench bottom should be padded with bedding of compacted granular material to a thickness of at least 4 inches. Foundation bedding should be installed as required by the engineer.
3. Trench depth is determined by the pipe's service requirements. Plastic pipe should always be installed at least below the frost level. The minimum cover for lines subject to heavy overhead traffic is 24 inches.
4. A smooth, trench bottom is necessary to support the pipe over its entire length on firm stable material. Blocking should be used charge pipe grade or to intermittently support pipe over low sections in the trench.



# HANDLING AND STORAGE

## BEDDING AND BACKFILLING

1. Even though sub-soil conditions vary widely from place to place, the pipe backfill should be stable and provide protection for the pipe.
2. The pipe should be surrounded with a granular material which is easily worked around the sides of the pipe. Backfilling should be performed in layer of 6 inch with each layer being sufficiently compacted to 85% to 95% compaction.
3. A mechanical tamper is recommended for compacting sand and gravel backfill which contain a significant proportion of fine grained material, such as silt and clay. If a tamper is not available, compacting should be done by hand.
4. The trench should be completely filled. The back fill should be placed and spread in fairly uniform layers to prevent any unfilled spaces or voids. Large rocks, stones, frozen clods, or other large debris should be removed. Heavy tampers or rolling equipment should only be used to consolidate only the final backfill.

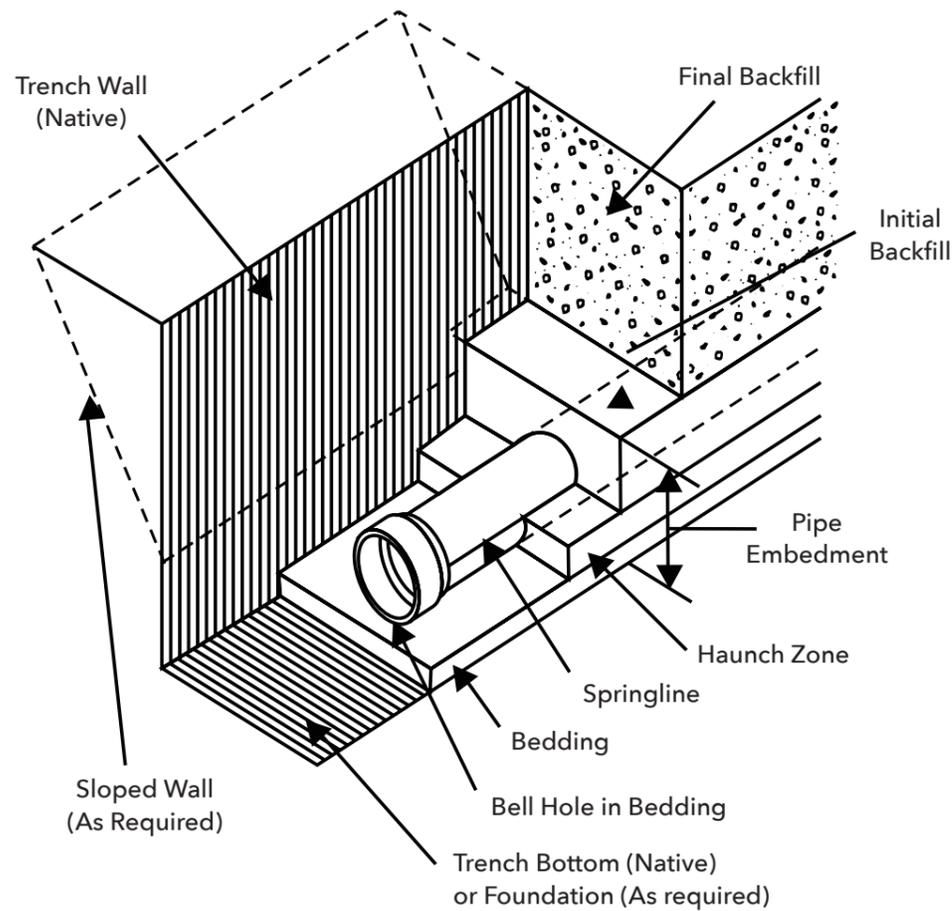


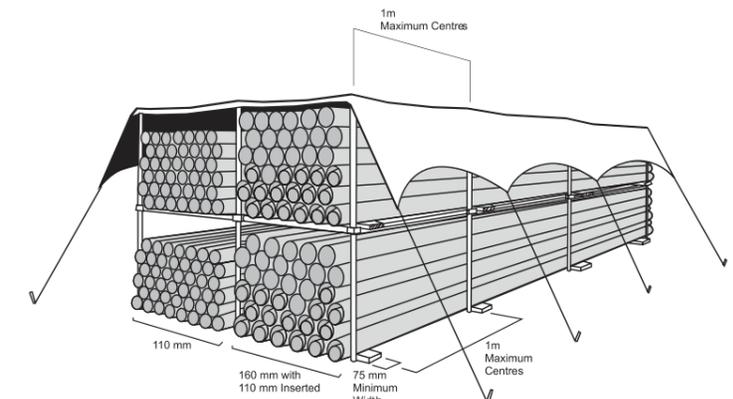
FIG. 1 Installation Terminology

## HANDLING

The pipe should be handled with reasonable care. Because thermoplastic pipe is much lighter in weight than metal pipe, there is sometimes a tendency to throw it around. This should be avoided. The pipe should never be dragged or pushed from a truck bed. Pallets of the pipe should be removed with a fork lift. Loose pipe can be rolled down, as long as the pieces do not fall on each other or on any hard or uneven surface. In all cases, severe contact with any sharp objects (rocks, angle irons, forks on forklifts, etc.) should be avoided.

## STORAGE

If possible, pipe should be stored inside. When this is not possible, the pipe should be stored on level ground which is dry and free from sharp objects. If different schedules of pipes are stacked together, the pipe with the thickest wall should be at the bottom. The pipe should be protected from the sun and be in an area with proper ventilation. This will lessen the effects of ultraviolet rays and help prevent heat built-up. If the pipe is stored in racks, it should be continuously supported along its length. If this is not possible, the spacing of the supports should not exceed three feet (3'). When storage temperatures are below 0°C (32°F), extra care should be taken when handling the pipe. This will help prevent any problems which could be caused by the slightly lower impact strength of uPVC pipe at temperature below freezing point.



## NOT FOR USE WITH COMPRESSED AIR OR GASES

ASTRAL POLY TECHNIK LTD. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above as well as below ground locations, The use of ASTRAL Aquarius product in compressed air or gas systems automatically void any warranty for such products and its use against our recommendation is entirely the responsibility and liability of the installer.

**WARNING:** Do not use compressed air or gas to test any PVC thermoplastic piping product or system, and do not use devices propelled by compressed air or gas to clear systems. These practices may result in explosive fragmentation of system piping components causing serious or fatal bodily injury.

# FREQUENTLY ASKED QUESTIONS (FAQs)

## WHY LEAD-FREE?

Lead is a metal with no known biological benefit to humans. Too much lead can damage various systems of the body including the nervous and reproductive systems and the kidneys, and it can cause high blood pressure and anemia. Lead accumulates in the bones and lead poisoning may be diagnosed from a blue line around the gums. Lead is especially harmful to the developing brains of fetuses and young children and to pregnant women. Lead interferes with the metabolism of calcium and Vitamin D. High blood lead levels in children can cause consequences which may be irreversible including learning disabilities, behavioral problems, and mental retardation. At very high levels, lead can cause convulsions, coma and death. Lead can be dissolved in water when lead pipes are used for transportation of water. So use of such pipes may be harmful to human being. Hence lead free plumbing system is most favoured for potable water transportation.

## WHAT IS THE EXPECTED LIFE OF ASTRAL AQUARIUS SYSTEM?

ASTRAL Aquarius uPVC system design & standards incorporate significant engineering safety factors which should translate to a long service life. ASTRAL Aquarius system have a design service life span of 50 years. ASTRAL Aquarius system is not susceptible to corrosion, scale build up or electrolysis in areas where water, solid and / or atmospheric conditions are aggressive. ASTRAL firmly believes that the system will provide a service life as long or longer than alternative materials in the market.

## WILL ASTRAL AQUARIUS SYSTEM SAVE MY MONEY?

Yes, as a professional, you will quickly realize that uPVC can be installed at least 25% more quickly than metal systems. Financial savings are also realized with regard to lower tool costs and insurance advantage. Even considering the frequent rise and fall of the metal price structure, uPVC offers a continuing material cost advantage, as much as a full 50-60% material savings today.

## WILL ASTRAL AQUARIUS SYSTEM OFFER A FINANCIAL ADVANTAGE TO OWNERS IN TERMS OF UTILITIES EXPENSE?

Yes, the thermal conductivity of a metal system is 2500 times that of a uPVC system. The improved insulating characteristics associated with uPVC can generate long term saving for energy conscious homeowner or tenant. ASTRAL Aquarius will hold the temperature of water for a much longer period of time than metal tubing.

## MUST I USE PLASTIC INSULATORS WHEREVER uPVC PASSES THROUGH A STUD?

Technically, no such provision need to be made when passing through wood stud. When passing through metal studs some form of protection must be used to protect the pipe from abrasion and to prevent noise. This protection may come from plastic insulated rubber grommets, pipe insulation or similar.

## SHOULD SPECIFIC TYPE OF PRIMERS AND SOLVENT CEMENTS BE USED ON uPVC SYSTEM?

ASTRAL always recommends use of solvent cement which is specifically manufactured to meet the requirements of ASTM D 2564. All purpose solvent cement should not be utilized. Primers manufactured for uPVC pipe is acceptable. For more details, refer installation procedure of this manual.

## I HAVE BEEN TOLD THAT UPVC PIPING ENDS MAY SPLIT DURING INSTALLATION. WHY DOES THIS OCCUR? HOW CAN THESE CRACKS BE PREVENTED?

Most cracks are initiated by rough handling. This handling can occur during transportation, while being inventoried at the wholesaler, or while at the job sight. Also, Fine cracks can be caused by cutting the pipe with dull or damaged ratchet cutters. The vast majority cracks occur during colder weather months when temperature is below 10°C, uPVC

like most other plastics such as PP, PEX, CPVC, may become somewhat brittle and should be handled more carefully. To reduce problems resulting from cracked product, several measures can be initiated : (A) Educate your installers. Make them aware of the potential problems and instruct them to handle uPVC in a appropriate way. (B) Use a saw or a circular tubing cutter with a plastic tubing blade to cut your pipe to length. (C) Inspect pipe ends thoroughly prior to making a joint.

Should a crack be evident, cut off any split portion before proceeding. (D) During cold weather, gripping the pipe surrounding the area to be cut for about 10 seconds prior to making the cut will warm the pipe and reduce possible problems.

## WHAT ABOUT HEALTH, SAFETY & FIRE TOXICITY ISSUES?

Tests performed at respected universities and independent laboratories confirm that uPVC is superior to metal systems in terms of water quality effects and "no more toxic than wood" in fire. ASTRAL Aquarius uPVC system is manufactured from a compound which is lead free and hence most favoured system in terms of health and safety. LOI of uPVC is 45, which means uPVC is not reality burnable in atmosphere. Once the burning source is removed, It stops burning.

## IS ASTRAL AQUARIUS SYSTEM RESISTANT TO U.V. EXPOSURE?

Effect of U.V. on polymers: U.V. acts as a strong catalyst for the oxidations process which breaks down the polymer chains, leading weakness in the pipes & fittings and to loss of hydrostatic strength. "Above effect is very much possible with materials like PP & PE. But for uPVC main process is dehydrochlorination and not oxidation. This dehydrochlorination does not break down the polymer chains to any significant extent after outdoor exposure, being mainly limited to a surface discoloration effect only. There is a loss of impact resistance due to impact modifiers losing their efficiency. This may even result in increased modulus. There is no significant loss in stress bearing capacity impact resistance mainly an installation issue (before any U.V. exposure). Still if a portion of the piping system will be left exposed to U.V. light, a standard grade of exterior, latex paint (water base) will protect the pipe adequately.

## IS IT POSSIBLE TO USE ASTRAL AQUARIUS SYSTEM AT TEMPERATURE AROUND 10-15°C?

Practically, Yes. It is very much possible to use ASTRAL Aquarius at a temperature around 10-15°C. Normal temperature range of uPVC compound material is 23°C to 60°C. As temperature decrease beyond 23°C, uPVC becomes brittle like any other thermoplastic material. So it's impact properties decreases as temperature decreases but there is no reduction in hydrostatic strength of material at lower temperatures, So it can be used at lower temperatures but very sound engineering design considerations required at a such low temperatures to eliminate water hammers & impact issues.

## WHAT ABOUT THE NOISE EMISSIONS COMPARE TO METALLIC SYSTEM?

The tendency of sound is to travel in the material with fastest possible velocity. This means in the metal system, the sound travels because the velocity of sound in metal is higher than that of in water and create noise emissions. While in uPVC system, noise will travel in water because the velocity of sound in water is higher than that of in uPVC. So uPVC systems are as quiet as physically possible.

## WHAT ABOUT SCALE BUILD UP?

Scale built up is a function of the roughness of the pipe, as measured by the Hazen - Williams, "C" factor, used in the Hazen Williams formula for calculating friction head losses in piping system.

Higher value for C results in - less friction, less head loss. In metal systems, once corrosion starts, "C" factor will greatly reduce which results in head loss and scale built up. With ASTRAL Aquarius uPVC, there is no corrosion and hence scale built up is inhibited.

## IS IT POSSIBLE TO CONNECT IPS SYSTEM WITH CTS SYSTEM?

IPS (Iron Pipe Size) & CTS (Copper Tube Size) are most widely used systems in plumbing market. Therefore changeability of one to another is very important. ASTRAL has understood this requirement of market and hence developed special transition fittings. These fittings will connect the IPS System (SCH 40 & SCH 80) to CTS system (SDR 11 & SDR 13.5). These transition fittings are joined with one step solvent cement, which gives customer a very fast, efficient & simple solution to join both systems. Available sizes are from 15 mm (½") to 50 mm (2").

