ASTRAL PIPES

Registered & Corporate Office : Astral Poly Technik Ltd.
207/1, Astral House, B/h Rajpath Club, Off S. G. Highway, Ahmedabad - 380059.
Ph: 079 6621 2000 | Fax: 079 6621 2121 | Website: www.astralpipes.com

For Export Enquiries: export@astralpipes.com

Branch Offices: MUMBAI : 022 - 2838 9744 • PUNE : 0 - 84461 14455 • NEW DELHI : 011 - 2616 9461
• BENGALURU : 080 - 2661 7236 • HYDERABAD : 040 - 2790 0023 • CHENNAI : 044 - 4350 6384
• JAIPUR : 0141 - 297 4322 • LUCKNOW : 0522 - 272 8844 • KOCHI : 0484 - 332 8156

ISO 9001:2015 BUREAU VERITAS Certification | UKAS MANAGEMENT SYSTEM 008 | The Reputation Institute - India's Most Reputable Companies 2016 | FORTUNE 500 | Superbrands

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

AAQ/PC/000
REV:01/06/18

ASTRAL PIPES

INDIA'S FIRST LEAD-FREE UPVC PIPE

ASTRAL Aquarius®

STANDARDS REDEFINED

uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

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 Brand Award (2015)
- India's Most Trusted Pipe Brand Award (2016)
- 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)

ONLY THOSE PRODUCTS BEARING THE ABOVE MARKS ARE CERTIFIED

INDEX

ASTRAL Aquarius®
STANDARDS REDEFINED
uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

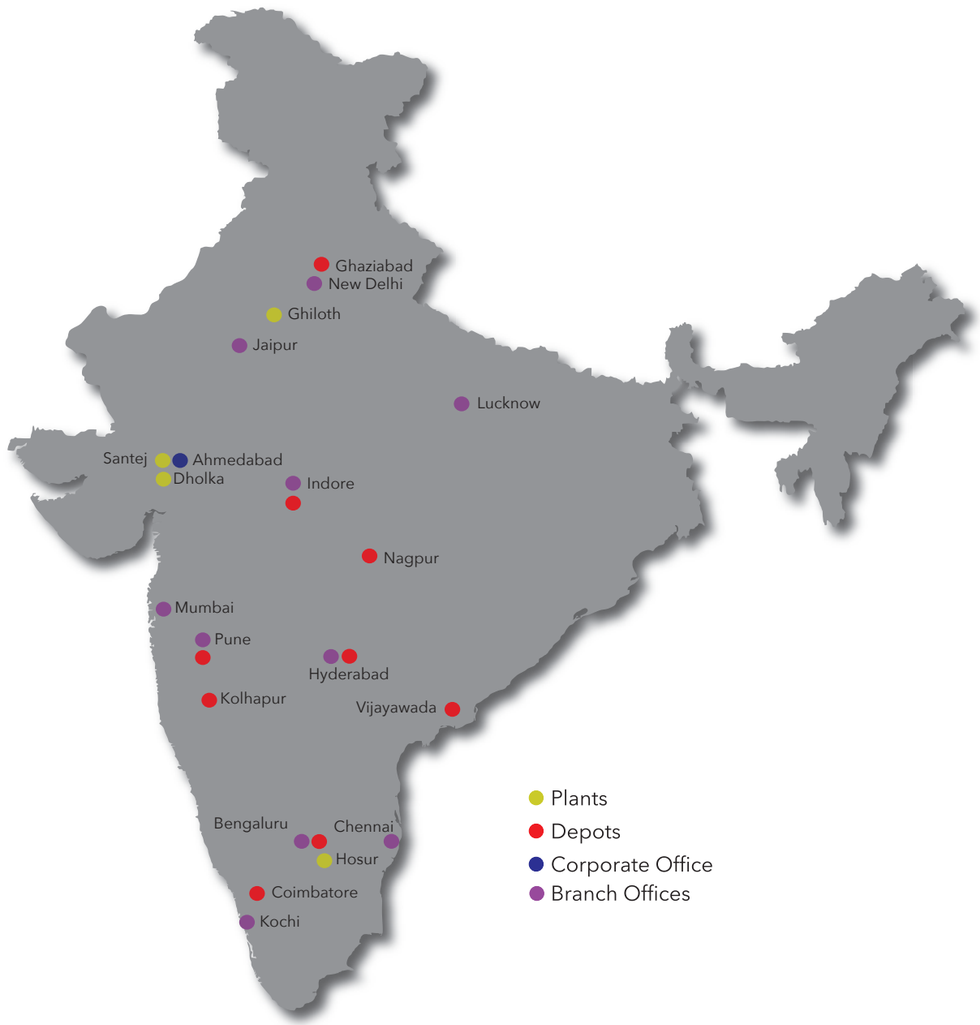
ASTRAL - INDIA'S PROGRESSIVE PIPE COMPANY

Astral Poly Technik Limited was established in 1996 with the aim to manufacture pro-india plumbing and drainage systems in the country. While serving the plumbing needs of millions of houses, the company adds extra milage to india's developing real estate fraternity. Our contribution to the plumbing industry in the form of being pro-innovative bears the hallmark of unbeaten quality. Astral Poly Technik Limited is equipped with production facilities at Santej & Dholka (Gujarat), and Hosur (Tamil nadu) to manufacture Plumbing systems, Drainage ststems, Agriculture Systems, Industrial Piping, Fire Sprinkler Piping Systems and Electrical Conduit Pipes with all kinds of ecessary fittings. We are also known as pro- customers' company as we serve with an intention of taking excellence to new heights. Through our quality products and services we have also achieved the benchmark of being Pro-India Company in numerous ways. Astral Pipes has been awarded as 'ASTRAL – India's Most Trusted Brand in the category of Pipes' according to 'The Brand Trust Report, India Study 2016', and also won place in 'Consumers Superbrands Edition 2016-17' becoming consumer validated Superbrand in Piping category. Our incessant focus on quality piping leads us to be prominent player in the categoty and a wellknown piping brand.

ASTRAL PIPES

MARKETING NETWORK

ASTRAL has marketing network of more than 800 distributors and 25,000 dealers spread all over India with branch offices at Mumbai, Pune, Delhi, Bengaluru, Chennai, Hyderabad, Jaipur, Lucknow, Kochi and Indore apart from that ASTRAL has its own warehouses at Bengaluru, Coimbatore, Hyderabad, Vijaywada, Kolkata, Ghaziabad, Kolhapur, Indore and Nagpur to deliver the material as quick as possible. More than 300 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 product.



ASTRAL Aquarius®
STANDARDS REDEFINED
uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

SUBSIDIARIES

RESINOVA®
an ASTRAL company

Resinova manufactures a diversified range of adhesives, sealants, putties and construction aids. Our products are mostly pioneering efforts where advantages has been taken of our knowledge of different chemistries such as epoxy, silicones, acrylics, cyanoacrylates, UV care, PVA etc. Our products stand for quality and reliability and are marketed through a network of about more than 2000 distributors and 4,50,000 dealers across the country.

bond it - UK
an ASTRAL company

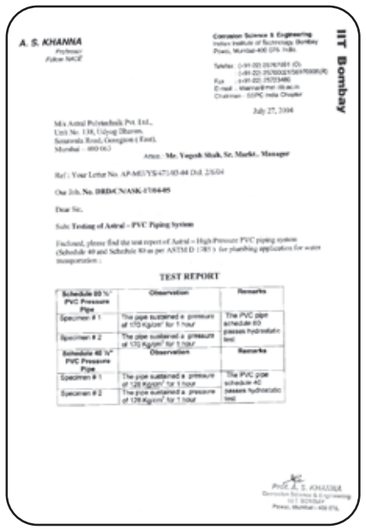
For almost two decades, Bond It has been a manufacturer of high performance, high quality building chemicals such as sealants, adhesives, grouts, cleaners, expanding foams, fillers, decorating sundries, landscaping products and other similar products.

bond it - USA
an ASTRAL company

Seal IT Services Limited, a UK based subsidiary of the Astral Poly Technik Ltd. has entered into U.S. market by acquiring silicone tape business of Rowe Industries Inc., USA.

ASTRAL PIPES

CERTIFICATES & APPROVALS


A. S. KHANNA
Professor
Fellow NICE

Corrosion Science & Engineering
Indian Institute of Technology, Bombay
Powai, Mumbai-400 076. India.

IIT Bombay

July 27, 2004

M/s Astral Polytechnik Pvt. Ltd.,
Unit No. 138, Udyog Bhavan,
Sonawala Road, Goregaon (East),
Mumbai - 400 063

Attn.: Mr. Yogesh Shah, Sr. Market. Manager

Ref : Your Letter No. AP-MU/YS-471/03-04 Dtd. 2/8/04

Our Job. No. IRDC/NASK-0704-05

Dear Sir,

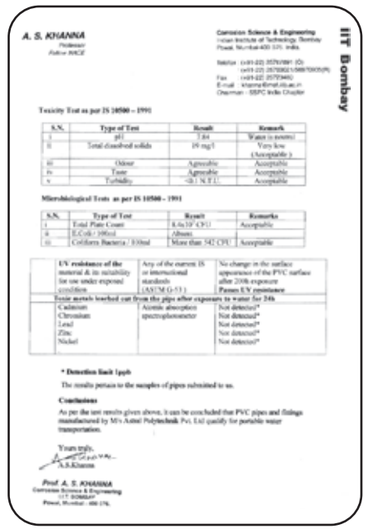
Sub: Testing of Astral - PVC Piping System

Enclosed, please find the test report of Astral – High Pressure PVC piping system (Schedule 40 and Schedule 80 as per ASTM D 1785) for plumbing application for water transportation.

TEST REPORT

Schedule 80 ½" PVC Pressure Pipe	Observation	Remarks
Specimen # 1	The pipe sustained a pressure of 170 Kg/cm² for 1 hour	The PVC pipe schedule 80 passes hydrostatic test
Specimen # 2	The pipe sustained a pressure of 170 Kg/cm² for 1 hour	
Schedule 40 ½" PVC Pressure Pipe	**Observation**	**Remarks**
Specimen # 1	The pipe sustained a pressure of 126 Kg/cm² for 1 hour	The PVC pipe schedule 40 passes hydrostatic test
Specimen # 2	The pipe sustained a pressure of 126 Kg/cm² for 1 hour	

Prof. A. S. KHANNA
Corrosion Science & Engineering
IIT BOMBAY
Powai, Mumbai - 400 076.


A. S. KHANNA
Professor
Fellow NICE

Corrosion Science & Engineering
Indian Institute of Technology, Bombay
Powai, Mumbai-400 076. India.

IIT Bombay

Toxicity Test as per IS 10500 – 1991

S.N.	Type of Test	Result	Remark
i	pH	7.84	Water is neutral
ii	Total dissolved solids	19 mg/l	Very low Unacceptable ≥
iii	Odour	Agreeable	Acceptable
iv	Taste	Agreeable	Acceptable
v	Turbidity	<0.1 N.T.U.	Acceptable

Microbiological Tests as per IS 10500 – 1991

S.N.	Type of Test	Result	Remarks
i	Total Plate Count	8.4x10⁴ CFU	Acceptable
ii	E.Coli / 100ml	Absent	
iii	Coliform Bacteria / 100ml	More than 542 CFU	Acceptable

UV resistance of the material & its suitability for use under exposed condition	Any of the current IS or international standards (ASTM G-53)	No change in the surface appearance of the PVC surface after 2500 exposure Passes UV resistance
Toxic metals leached out from the pipe after exposure to water for 24h		
Cadmium	Atomic absorption spectrophotometer	Not detected*
Chromium		Not detected*
Lead		Not detected*
Zinc		Not detected*
Nickel		Not detected*

* Detection limit 1ppb

The results pertain to the samples of pipes submitted to us.

Conclusions

As per the test results given above, it can be concluded that PVC pipes and fittings manufactured by M/s Astral Polytechnik Pvt. Ltd qualify for portable water transportation.

Yours truly,

A.S.Khanna

Prof. A. S. KHANNA
Corrosion Science & Engineering
IIT BOMBAY
Powai, Mumbai - 400 076.


MUNICIPAL CORPORATION OF GREATER MUMBAI
Executive Engineer's Department

MW / 1.V.S. /EEWW (P.&R.)/GR

2 4 NOV 2016

Executive Engineer Water Works
Planning & Research, Room # 33,
3rd Floor, 'B' Ward Municipal Office,
121, Ramchandra Bhatt 'A' lane,
Opp. J. J. Hospital, Byculla,
Mumbai – 400 008.
TF 91 + 22 + 2377 6041

To,
Mr. Santosh Pandey,
Asst. General Manager
Astral Poly Technik Ltd.,
C 722, Akham, 215,
Andheri-Kurla Road, Andheri (East),
Mumbai -400 059.

Subject : Revised Approval for use of 'AQARIUS' brand Astral PVC piping system and 'ASTRAL CPVC PRO' brand CPVC piping system (non ISI marked) in plumbing systems within MCGM limits.

Reference: 1) Your letter dated 18.10.2016 and subsequent correspondence.
2) Scrutiny fee receipt No. 1000735124 dated 05.11.2016.

Dear Sir,

This has reference to your above cited letter on captioned subject matter. Bydirection, I am pleased to inform you that, your request to issue revised renewal letter for CPVC piping system with change in brand name is acceded and the approval is modified as under –

By direction, I am pleased to inform you that, the approval issued for use of 'AQARIUS' brand Astral PVC piping system and 'ASTRAL CPVC PRO' brand CPVC piping system (non ISI marked) in plumbing systems of buildings within MCGM limits is further renewed for a period up to 31st March 2018, the following categories only, with terms and conditions as mentioned below.

Sr. No.	Description of Item	Diameter Range	Class	Conforming Standards	Remarks / Application Area
1.	M/s Astral Poly Technik Ltd. make 'AQARIUS' PVC brand PVC pipes	6 mm to 160 mm	Schedule 40 and Schedule 80	ASTM D 1784 and ASTM D 1785	For the cold water transportation in buildings i.e. for down takes, uptakes and terrace loops.
2.	M/s Astral Poly Technik Ltd. make 'AQARIUS' PVC brand PVC fittings.	15 mm to 150 mm	Schedule 40 Schedule 80	ASTM D 1784 ASTM D 2466 ASTM D 2467	
3.	M/s Astral Poly Technik Ltd. make 'ASTRAL CPVC PRO' brand CPVC pipes	15 mm to 150 mm	Schedule 40 and Schedule 80	ASTM - F 441/ F	For the hot & cold water transportation in buildings i.e. for down takes, uptakes and terrace loops.
4.	M/s Astral Poly Technik Ltd. make 'ASTRAL CPVC PRO' brand CPVC fittings.	15 mm to 50 mm 65 mm to 150 mm	SDR 11 Schedule 40 Schedule 80	ASTM - D 2846 ASTM - F 438 ASTM F 439	

General conditions:

a) The pipes & fittings to be used in MCGM limits shall fulfill all the requirements as specified in respective ASTM standards and their latest amendments.
b) Solvent cement to be used for jointing PVC pipes & fittings shall be NSF approved and as per ASTM D 2564 standards and for CPVC pipes & fittings as per ASTM F 493 standards.
c) Company shall furnish the list of all authorized dealers in Mumbai.
d) Company to depute trained personnel to supervise the installation and to attend any complaints after installation of above product in MCGM limits.
e) Company shall replace all defective pipes & fittings free of cost within 6 month's time from date of complaint, during warranty period.
f) Each pipe & fitting shall carry unique identification marks such as brand-name, size and pressure category, confirming standards and lot or batch number along with year of manufacturing. The above marking shall be carried out by painting or by molding on external surface of pipes.
g) Company shall carryout the required tests, at its own cost and submits fresh test reports to MCGM for above product. All these tests shall be carried out from the NABL accredited laboratories as & when directed by MCGM.
h) Company shall apply at least two months in advance for renewal of approval with past performance certificates (attested copies) from the users in Mumbai. Company shall pay applicable renewal fees before every renewal of approval.
i) If company fails to renew the approval before due date, the product will be deleted from the MCGM's approved product list and its initial deposit may be forfeited. Any further application from company for renewal will be treated as application for fresh approval.
j) Company shall arrange for a visit for MCGM engineers for inspection at the sites where above pipes are installed / being installed, at its own cost, as & when requested by MCGM.
k) MCGM reserves the right to revoke the registration to their 'AQUARIUS PVC' brand PVC piping system and 'ASTRAL CPVC PRO' brand CPVC piping system (non ISI marked), without assigning any reason.

This approval is valid up to 31st March 2018 and extension will be considered on basis of performance & service reports and compliance of the conditions mentioned above.

Thanking you.

Yours Faithfully,

Executive Engineer Water Works
(Planning and Research)


CIPA / QF / 5.10.1

CENTRAL INSTITUTE OF PLASTICS ENGINEERING AND TECHNOLOGY
(Ministry of Chemicals and Fertilizers, Government of India)
Plot No. 690, Phase IV, G.I.D.C.,
Vatva, Ahmedabad - 382 445
Tele. : 25830666, 25830210, 25830402
Fax : (079) 25830236
E-mail : cipatad1@sancharnet.in

PLASTICS TESTING CENTRE

Issued to :

TEST CERTIFICATE

S. L. No. 7291
374

ASTRAL POLYTECHNIK PVT. LIMITED
Test Report No. :
Dated
Your Ref. No.
Dated

Test Report as per standard :

TEST REPORT NO: 374

TEST RESULTS

TEST METHOD : IS : 4985 : 2000

Sr. No.	Clause	Property	Unit	Test Results	Specified Requirement
1	9.3	Effect On Water			
		a) Lead (first extraction)		0.000	1.0 (Max.)
		b) Lead (third extraction)	Mg/lit	0.000	0.5 (Max.)
		c) Dialkyl Tin Oxide (calculated as higher homologues measured as Tin (Third extraction)		0.003	0.02 (Max.)
		d) Cadmium (All three extracts)		0.000	0.01 (Max.)
		e) Mercury (All three extracts)		0.000	0.001 (Max.)
		f) Other Toxic Substances		NIL	0.01 (Max.)

REMARKS : NIL

NOTE
1. The results related only to the items tested.
2. The report shall not be reproduced in full part without written approval of the laboratory.

Sr. Tech. Officer (IT)
Authorized Signatory

Head Office : CIPET, Chennai - 600 032.


SPEARS MANUFACTURING COMPANY
EXPORT DEPARTMENT
PO Box 9203, , Irvine, California, 92162 USA
17802 Gillette Street, Irvine, California 92614 USA
Phone: (949) 260-1611 Fax: (800) 950-3774

June 29, 2005

To Whom It May Concern:

We hereby confirm that ASTRAL POLYTECHNIK PVT LTD has been the sole distributor of Spears Manufacturing Co. products in India since March 1999. One of their responsibilities is to promote and market our products either directly or through associated companies.

We extend our full support and product warranty to ASTRAL POLYTECHNIK PVT LTD for all Spears Manufacturing Co. products sold and stocked by them and will supply our Certificate of Compliance and Testing for the goods supplied.

Sincerely,

SPEARS MANUFACTURING CO.

Gary Eal
International Sales Manager

Cc: Hair Dainty – Inrep Assoc.

ASTRAL Aquarius®
STANDARDS REDEFINED
uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

INTRODUCTION

Pb
lead-free

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 class SCH 40 and SCH 80.

As the full line leading manufacturer of CPVC pipes and fittings for residential and inzdustrial applications and now with ASTM uPVC pressure pipes and fittings, ASTRAL can be your one stop source for all the plastic piping system you require for lifetime plumbing solution.

PVC - POLYVINYL CHLORIDE

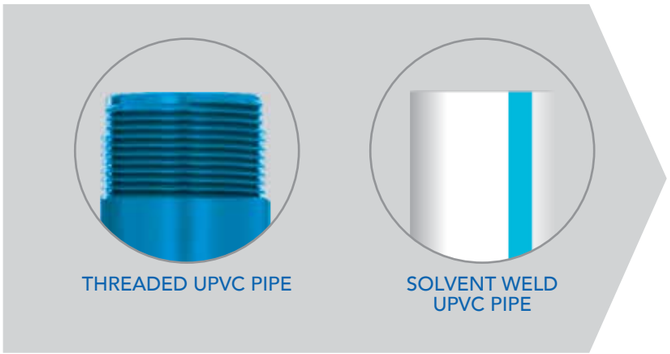
PVC is one of the specified thermoplastic for piping system components, including valves, fittings, flanges and many speciality products. PVC has excellent chemical and corrosion resistance to a broad range of fluids. ASTRAL uPVC materials conform to ASTM Cell Classification 12454-B of ASTM D1784 (formally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

ASTRAL PIPES

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.

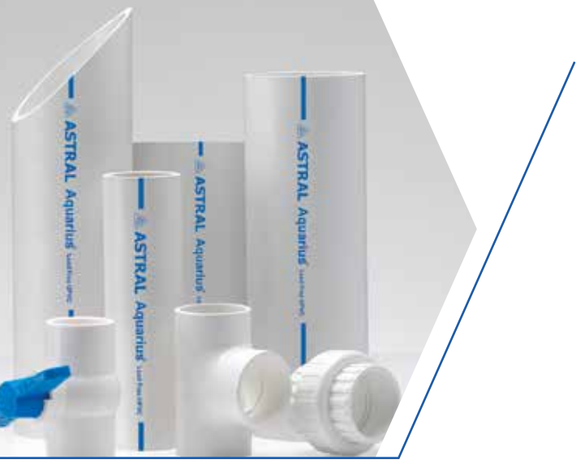


BENEFITS OF ASTRAL AQUARIUS SYSTEM OVER OTHER uPVC SYSTEMS

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 costs.

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 makes its pressure bearing capacity twice than that of the threaded pipe.



KEY PROPERTIES

The key properties of ASTRAL Aquarius high pressure Lead Free Plumbing System are signifi cant with following features

STRONG AND LIGHT WEIGHT

ASTRAL Aquarius Lead Free Plumbing System is tough, durable with high tensile and impact strength. The system is light in weight and can be transported easily from one place to another.

EASY TO INSTALL

ASTRAL Aquarius Lead Free pipes can be cut, shaped, welded and jointed easily.

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 PVC 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 fi re resistance.

DURABLE

ASTRAL Aquarius Lead Free Plumbing System is durable and free from weaknesses caused by rusting, weathering and chemical action and hence last for life time.

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. SIMPLE AND LEAK PROOF JOINTS Jointing can be done speedily with special IPS solvent cement supplied by the company which ensures 100% leak proof joints.

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 PVC which meets all international standards for safety and health for both the products and applications.

MAXIMUM FLOW RATE

Smooth inner surface ensures high fl ow rate and low friction losses. The system is leach and scale free.

GOOD INSULATOR

PVC does not conduct electricity. ASTRAL Aquarius pipes are non conductor of electricity so it make the plumbing system safe when working with electrical tools or equipments.

CHEMICAL RESISTANCE

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

WIDE RANGE

ASTRAL Aquarius Lead Free Plumbing System available from ½" (15 mm) to 12" (300 mm) with wide range of fi ttings, transition fittings, valves and specially designed brass inserted fi ttings to suit any design criteria.

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 Chioride 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. Essentially, both references indicate that the type of PVC required be unplasticized, rigid PVC. The most important aspect of specifying PVC piping products is not the abbreviation but the cell classifi cation of the thermoplastic material. For rigid, unplasticized Type I Grade 1 PVC material with a hydrostatic design stress of 2000psi the cell classifi cation is 12454. These numbers indicate the minimum physical properties that a rigid, unplasticized thermoplastic compound must meet per ASTM D1784 to be used in the manufacture of pressure piping components. In summary, whether a thermoplastic vinyl piping, product is specifi ed as uPVC is not important, it is the cell classifi cation, and materials' physical properties that is most important.

FIELD OF APPLICATIONS

- 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
- Ring Lines
- Down Take Lines

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 fi ttings 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 thereaded fittings, as ASTRAL manufacture some fittings with NPT threads & some fittings with BSP threads to give more versatility to customer NPT threads are not compatible with BSP threads.

SEAL & GASKET LUBRICANTS

Some Lubricants, including vegetable oils are known to cause stress cracking in thermoplastics materials. A mild soap or commercially available pipe gasket lubricants 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:

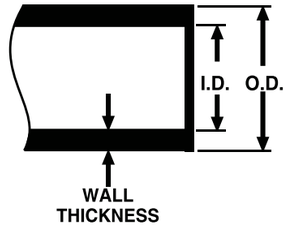
System should not be operated or flushed out at flow velocities greater then 5 feet per second.

PRESSURE PIPES AND FITTINGS

PRESSURE RATING @23°C uPVC SCHEDULE 40

Part No.	Nominal Size		Average Outside Diameter		Minimum Wall Thickness		Maximum Work Pressure at 73°F PSI	Maximum Work Pressure at 23°C (kg/cm²)
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)		
M051400301	½	15	0.840	21.34	0.109	2.77	600	42.19
M051400302	¾	20	1.050	26.67	0.113	2.87	480	33.75
M051400303	1	25	1.315	33.40	0.133	3.38	450	31.64
M051400304	1¼	32	1.660	42.16	0.140	3.56	370	26.01
M051400305	1½	40	1.900	48.26	0.145	3.68	330	23.20
M051400306	2	50	2.375	60.32	0.154	3.91	280	19.69
M051400307	2½	65	2.875	73.02	0.203	5.16	330	21.09
M051400308	3	80	3.500	88.90	0.216	5.49	260	18.28
M051400309	4	100	4.500	114.30	0.237	6.02	220	15.47
M051400310	6	150	6.625	168.28	0.280	7.11	180	12.66
M051400311	8	200	8.625	219.08	0.322	8.18	160	11.25
M051400312	10	250	10.750	273.05	0.365	9.27	140	9.84
M051400313	12	300	12.750	323.85	0.406	10.31	130	9.14

Mpa = Mega Pascal 1 MPa = 10 kg / cm² 1 kg / cm² = 14.223343 PSI.



PRESSURE RATING @23°C uPVC SCHEDULE 80

Part No.	Nominal Size		Average Outside Diameter		Minimum Wall Thickness		Maximum Work Pressure at 73°F PSI	Maximum Work Pressure at 23°C (kg/cm²)
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)		
M051800301	½	15	0.840	21.34	0.147	3.73	850	59.76
M051800302	¾	20	1.050	26.67	0.154	3.91	690	48.51
M051800303	1	25	1.315	33.40	0.179	4.55	630	44.29
M051800304	1¼	32	1.660	42.16	0.191	4.85	520	36.56
M051800305	1½	40	1.900	48.26	0.200	5.08	470	33.04
M051800306	2	50	2.375	60.32	0.218	5.54	400	28.12
M051800307	2½	65	2.875	73.02	0.276	7.01	420	29.53
M051800308	3	80	3.500	88.90	0.300	7.62	370	26.01
M051800309	4	100	4.500	114.30	0.337	8.56	320	22.50
M051800310	6	150	6.625	168.28	0.432	10.97	280	19.69
M051800311	8	200	8.625	219.08	0.500	12.70	250	17.57
M051800312	10	250	10.750	273.05	0.593	15.06	230	16.17
M051800313	12	300	12.750	323.85	0.687	17.45	230	16.17

Mpa = Mega Pascal 1 MPa = 10 kg / cm² 1 kg / cm² = 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%

NOTE :
(1) Valves, Unions and Specialty Products have diff erent 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 eld conditions. Additionally, pressure de-rating at elevated temperatures must be taken into account. Certain tting con gurations 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

	Schedule 40 (kg/cm²)			Schedule 80 (kg/cm²)		
Nominal Size (in.)	Pipe[1]	Solvent Cemented Joint	Standard Threaded Joint[3]	Pipe[1]	Solvent Cemented Joint	Standard Threaded Joint[3]
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 ttings only.

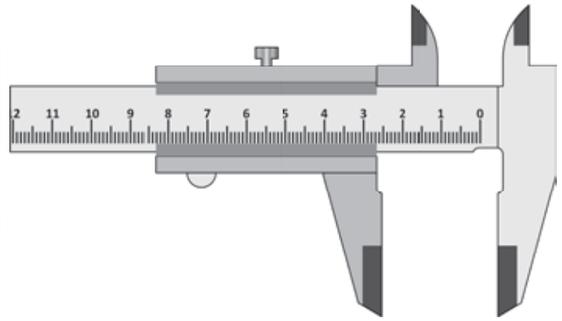
Not For Use With Compressed Air or Gas

PHYSICAL PROPERTIES OF PVC MATERIALS

PROPERTY	UNITS	PVC	ASTM NO.
Speci c Gravity	g/cc	1.41 - 1.46	D 792
Tensile Strength (73°F)	PSI	7,200	D 638
Modulus of Elasticty 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 10-5	D 696
Heat De ection Temperature at 66 psi	degrees °F	165	D 648
Coefficient of Thermal Conductivity	BTU/hr/sq. ft/°F/in.	1.2	C 177
Speci c 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 Classi cation-Pipe	----	12454-B	D 1784
Cell Classi cation-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.) Entrance	Diameter (in.) BOTTOM	Tolerance	Socket Length Minimum C (in.)	
(in.)	(mm)	A	B		SCH 40	SCH 80
½	15	0.848	0.836	±0.004	0.688	0.875
¾	20	1.058	1.046	±0.004	0.719	1.000
1	25	1.325	1.310	±0.005	0.875	1.125
1¼	32	1.670	1.655	±0.005	0.938	1.250
1½	40	1.912	1.894	±0.006	1.094	1.375
2	50	2.387	2.369	±0.006	1.156	1.500
2½	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

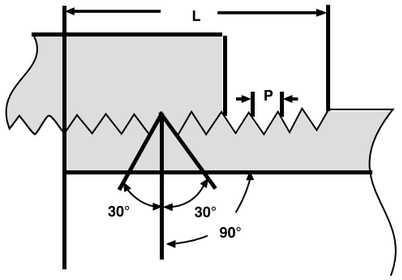
AMERICAN NATIONAL STANDARD TAPER PIPE THREADS (NPT) ANSI STANDARD B1.20.1 ASTM STANDARD F 1498

Nominal Size		Threads	Effective Thread	Pitch of Thread P
(in.)	(mm)	Per in.	Length L	
½	15	14	0.5337	0.07143
¾	20	14	0.5457	0.07143
1	25	11½	0.6828	0.08696
1¼	32	11½	0.7068	0.08696
1½	40	11½	0.7235	0.08696
2	50	11½	0.7565	0.08696
2½	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	Effective Thread	Pitch of Thread P
(in.)	(mm)	Per in.	Length L	
½	15	14	13.152	1.8143
¾	20	14	14.514	1.8143
1	25	11	16.714	2.3091
1¼	32	11	19.050	2.3091
1½	40	11	19.050	2.3091
2	50	11	23.378	2.3091
2½	65	11	26.698	2.3091
3	80	11	29.873	2.3091
4	100	11	35.791	2.3091

NPT



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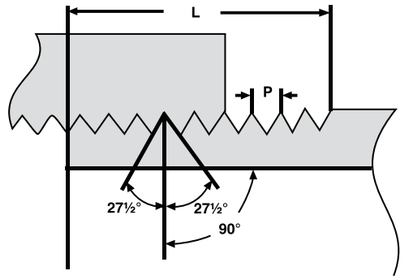
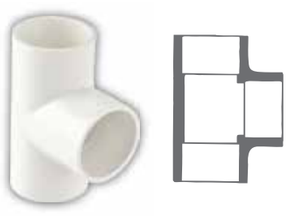


uPVC PRESSURE FITTINGS

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

TEE - SOC



Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
½	15	M052400101	50 / 550	M052800101	50 / 200
¾	20	M052400102	25 / 300	M052800102	25 / 125
1	25	M052400103	25 / 175	M052800103	10 / 70
1¼	32	M052400104	10 / 100	M052800104	10 / 40
1½	40	M052400105	10 / 70	M052800105	5 / 30
2	50	M052400106	5 / 40	M052800106	5 / 15
2½	65	M052400107	1 / 27	M052800107	1 / 12
3	80	M052400108	1 / 18	M052800108	1 / 7
4	100	M052400109	1 / 10	M052800109	1 / 4
6	150	M052400110	1 / 2	M052800110	1 / 2
8	200	–	–	M052800111	1 / 1

REDUCING TEE - SOC

¾ x ½	20 x 15	M052400214	25 / 350	M052800214	25 / 150
1 x ½	25 x 15	M052400215	25 / 200	M052800215	25 / 100
1 x ¾	25 x 20	M052400216	25 / 175	M052800216	25 / 100
1¼ x ½	32 x 15	M052400217	10 / 120	M052800217	10 / 60
1¼ x ¾	32 x 20	M052400218	10 / 100	M052800218	10 / 60
1¼ x 1	32 x 25	M052400219	10 / 100	M052800219	10 / 50
1½ x ½	40 x 15	M052400220	10 / 50	M052800220	10 / 40
1½ x ¾	40 x 20	M052400221	10 / 40	M052800221	10 / 40
1½ x 1	40 x 25	M052400222	10 / 80	M052800222	10 / 40
1½ x 1¼	40 x 32	M052400223	10 / 70	M052800223	10 / 30
2 x ½	50 x 15	M052400224	5 / 60	M052800224	5 / 30
2 x ¾	50 x 20	M052400225	5 / 60	M052800225	5 / 25
2 x 1	50 x 25	M052400226	5 / 60	M052800226	5 / 20
2 x 1¼	50 x 32	M052400227	5 / 50	M052800227	5 / 20
2 x 1½	50 x 40	M052400228	5 / 50	M052800228	5 / 20
2½ x 1	65 x 25	–	–	M052800231	15
2½ x 1¼	65 x 32	–	–	M052800232	15
2½ x 1½	65 x 40	–	–	M052800233	15
2½ x 2	65 x 50	–	–	M052800234	12
3 x 1	80 x 25	–	–	M052800237	10
3 x 1¼	80 x 32	–	–	#M052800238	–
3 x 1½	80 x 40	–	–	M052800239	10
3 x 2	80 x 50	–	–	M052800240	9
3 x 2½	80 x 65	–	–	M052800241	9
4 x 1	100 x 25	–	–	M052800244	5
4 x 1¼	100 x 32	–	–	M052800245	5
4 x 1½	100 x 40	–	–	M052800246	5
4 x 2	100 x 50	* 401-420	5 / --	M052800247	5
4 x 2½	100 x 65	–	–	M052800248	5
4 x 3	100 x 80	* 401-422	5 / --	M052800249	5
6 x 4	150 x 100	* 401-532	1 /--		

TEE - SOC X FIPT

½	15	M052400401	50 / 350		
¾	20	M052400402	25 / 150		
1	25	M052400403	25 / 75		
1¼	32	M052400404	10 / 50		
1½	40	M052400405	10 / 40		
2	50	M052400406	5 / 20		

* Trading Item

uPVC PRESSURE FITTINGS

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

BRASS TEE- SOC X FIPT

Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
½ x ½	15 x 15			M052800301	25 / 100
¾ x ½	20 x 15			M052800314	25 / 50
¾ x ¾	20 x 20			M052800302	25 / 50
1 x ½	25 x 15			M052800315	25 / 25
1 x ¾	25 x 20			M052800316	25 / 25
1 x 1	25 x 25			M052800303	10 / 30
1¼ x ½	32 x 15			M052800317	10 / 20

90° ELBOW - SOC

½	15	M052400501	100 / 100	M052800501	50 / 300
¾	20	M052400502	50 / 500	M052800502	50 / 200
1	25	M052400503	25 / 250	M052800503	25 / 125
1¼	32	M052400504	10 / 150	M052800504	10 / 60
1½	40	M052400505	10 / 110	M052800505	10 / 50
2	50	M052400506	5 / 65	M052800506	5 / 25
2½	65	M052400507	1 / 35	M052800507	5 / 15
3	80	M052400508	1 / 25	M052800508	1 / 10
4	100	M052400509	1 / 14	M052800509	1 / 5
6	150	M052400510	1 / 3	M052800510	1 / 2
8	200	–	–	M052800511	1 / 1

90° ELBOW - SOC X FIPT

½	15	M052400801	100 / 300		
¾	20	M052400802	50 / 200		
1	25	M052400803	25 / 100		
1¼	32	M052400804	10 / 50		
1½	40	M052400805	10 / 40		
2	50	M052400806	5 / 25		

BRASS 90° ELBOW - SOC X FIPT

½ x ½	15 x 15			M052800701	25 / 100
¾ x ½	20 x 15			M052800714	25 / 100
¾ x ¾	20 x 20			M052800702	25 / 75
1 x ½	25 x 15			M052800715	25 / 50
1 x 1	25 x 25			M052800703	10 / 50
# 1 x ¾	25 x 20			M052800716	–

45° ELBOW - SOC

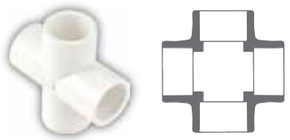
½	15	M052402301	100 / 500	M052802301	100 / 400
¾	20	M052402302	50 / 300	M052802302	50 / 200
1	25	M052402303	25 / 325	M052802303	25 / 150
1¼	32	M052402304	10 / 100	M052802304	10 /80
1½	40	M052402305	15 / 75	M052802305	10 / 60
2	50	M052402306	10 / 40	M052802306	5 / 30
2½	65	* 417-025	5 / --	M052802307	5 / 20
3	80	* 417-030	5 / --	M052802308	1 / 12
4	100	* 417-040	5 / --	M052802309	1 / 6

\# Shortly Introducing

REDUCER ELBOW

Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
¾ x ½	20 x 15	–	–	M052800614	50 / 200
1 x ½	25 x 15	–	–	M052800615	25 / 150
1 x ¾	25 x 20	–	–	M052800616	25 / 150

CROSS - SOC



½	15	M052402401	50 / 200		
¾	20	M052402402	25 / 100		
1	25	* 420-010	10 / --		
1¼	32	* 420-012	10 / --		
1½	40	* 420-015	10 / --		
2	50	* 420-020	10 / --		
2½	65			M052802407	1 / 9
3	80			M052802408	1 / 6

REDUCER COUPLING SOC

¾ x ½	20 x 15	M052401114	100 / 400		
1 x ½	25 x 15	M052401115	50 / 550		
1 x ¾	25 x 20	M052401116	50 / 200		
1¼ x 1	32 x 25	M052401119	25/ 175		
1½ x 1	40 x 25	M052401122	25 / 150	# M052801122	–
1½ x 1¼	40 x 32	M052401123	10 / 150		
2 x 1	50 x 25	M052401126	30 / 120	M052801126	15 / 75
2 x 1¼	50 x 32	M052401127	10 / 40	# M052801127	–
2 x 1½	50 x 40	M052401128	10 / 50	M052801128	10 / 50
2½ x 1¼	65 x 32			M052801132	8 / 48
2½ x 1½	65 x 40	* 429-291	–	M052801133	5 / 40
2½ x 2	65 x 50	* 429-292	–	M052801134	5 / 40
3 x 1½	80 x 40			M052801139	1 / 27
3 x 2	80 x 50	* 429-338	5 / --	M052801140	5 / 25
3 x 2½	80 x 65	* 429-339	–	M052801141	5 / 25
4 x 1½	100 x 40			M052801146	1 / 16
4 x 2	100 x 50	* 429-420	5 / --	M052801147	1 / 16
4 x 2½	100 x 65	* 429-421	–	M052801148	1 / 15
4 x 3	100 x 80	* 429-422	5 /--	M052801149	1 / 15

COUPLING SOC

½	15	M052401001	100/ 1400	M052801001	100 / 400
¾	20	M052401002	50 / 300	M052801002	50 / 300
1	25	M052401003	25/ 350	M052801003	25 / 150
1¼	32	M052401004	10 / 200	M052801004	10 / 80
1½	40	M052401005	10 / 150	M052801005	10 / 70
2	50	M052401006	10/ 100	M052801006	10 / 50
2½	65	M052401007	5 / 50	M052801007	5 / 20
3	80	M052401008	5 / 35	M052801008	5 / 15
4	100	M052401009	1 / 24	M052801009	1 / 12
6	150	M052401010	1 / 2	M052801010	1 / 2
8	200	–	–	M052801011	1 / 1
10	250	–	–	M052801012	1 / 1
12	300	–	–	M052801013	1 / 1

* Trading Item

uPVC PRESSURE FITTINGS
SCHEDULE 40 AS PER ASTM D-2466 AND SCHEDULE 80 AS PER ASTM D-2467

BRASS REDUCER BUSH

Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
1 x ½	25 x 15			M052802015	50 / 250

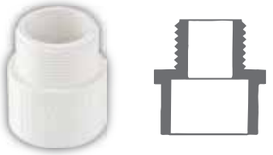
BRASS MALE ADAPTER - SOC X MBSP

½	15			M052801401	50 / 250
¾	20			M052801402	25 / 100
1	25			M052801403	25/ 100
1¼	32			M052801404	10 / 50
1½	40			M052801405	10 / 40
2	50			M052801406	5 / 20
¾ x ½	20 x 15			M052801414	25 / 150
1 x ½	25 x 15			M052801415	25 / 100
1 x ¾	25 x 20			M052801416	25 / 100

BRASS FEMALE ADAPTER - SOC X FBSP

½	15			M052801701	25 / 100
¾	20			M052801702	25 / 100
1	25			M052801703	25 / 50
1¼	32			M052801704	10 / 40
1½	40			M052801705	10 / 30
2	50			M052801706	5 / 15
¾ x ½	20 x 15			M052801714	25 / 100
1 x ½	25 x 15			M052801215	25 / 100
1 x ¾	25 x 20			M052801216	25 / 75

MALE ADAPTER - SOC X MBSP



½	15	M052401301	100 / 1700	M052801301	100 / 600
¾	20	M052401302	50 / 500	M052801302	50 / 400
1	25	M052401303	50 / 500	M052801303	50 / 250
1¼	32	M052401304	20 / 480	M052801304	10 / 150
1½	40	M052401305	16 / 320	M052801305	10 / 100
2	50	M052401306	12 / 192	M052801306	10 / 60
2½	65	* 336-025	10 / --	M052801307	5 / 30
3	80	* 336-030	10 / --	M052801308	5 / 20
4	100	* 336-040	6 / --	M052801309	1 / 15
6	150	* 336-060	3 / --		
¾ x ½	20 x 15	–	–	M052801314	50 / 400

FEMALE ADAPTER - SOC x FBSP

½	15	M052401601	100 / 1300	M052801601	100 / 600
¾	20	M052401602	50 / 400	M052801602	50 / 400
1	25	M052401603	25 / 400	M052801603	25 / 200
1¼	32	M052401604	10 / 130	M052801604	10 / 100
1½	40	M052401605	10 / 100	M052801605	10 / 80
2	50	M052401606	10 / 70	M052801606	10 / 50
2½	65			M052801607	5 / 30
3	80			M052801608	5 / 20
4	100			M052801609	1 / 12
¾ x ½	20 x 15	M052401614	50 / 700		

Shortly Introducing

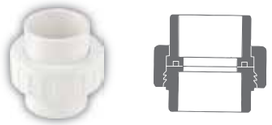
uPVC PRESSURE FITTINGS

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

REDUCER BUSHING (FLUSH STYLE)

Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
¾ x ½	20 x 15	M052401914	100 / 900	M052801914	100 / 300
1 x ½	25 x 15	M052401915	50 / 450	M052801915	50 / 400
1 x ¾	25 x 20	M052401916	50 / 450	M052801916	50 / 400
1¼ x ½	32 x 15	M052401917	25 / 300	M052801917	25 / 250
1¼ x ¾	32 x 20	M052401918	25 / 300	M052801918	25 / 250
1¼ x 1	32 x 25	M052401919	25 / 500	M052801919	25 / 250
1½ x ½	40 x 15	M052401920	25 / 350	M052801920	25 / 150
1½ x ¾	40 x 20	M052401921	25 / 200	M052801921	25 / 150
1½ x 1	40 x 25	M052401922	25 / 350	M052801922	25 / 150
1½ x 1¼	40 x 32	M052401923	25 / 400	M052801923	25 / 150
2 x ½	50 x 15	M052401924	10 / 120	M052801924	10 / 100
2 x ¾	50 x 20	M052401925	10 / 120	M052801925	10 / 100
2 x 1	50 x 25	M052401926	10 / 100	M052801926	10 / 100
2 x 1¼	50 x 32	M052401927	10 / 120	M052801927	10 / 100
2 x 1½	50 x 40	M052401928	10 / 120	M052801928	10 / 100
2½ x 1¼	65 x 32	M052401932	5 / 25	M052801932	5 / 50
2½ x 1½	65 x 40	M052401933	5 / 50	M052801933	5 / 50
2½ x 2	65 x 50	M052401934	5 / 60	M052801934	5 / 50
3 x 1½	80 x 40	M052401939	5 / 35	M052801939	5 / 35
3 x 2	80 x 50	M052401940	5 / 35	M052801940	5 / 35
3 x 2½	80 x 65	M052401941	5 / 35	M052801941	5 / 35
4 x 2	100 x 50	M052401947	5 / 20	M052801947	5 / 20
4 x 2½	100 x 65	M052401948	5 / 10	M052801948	5 / 20
4 x 3	100 x 80	M052401949	5 / 20	M052801949	5 / 20
6 x 3	150 x 80	* 437-530	3 / --		
6 x 4	150 x 100	* 437-532	3 / --	M052801958	1 / 6
8 x 6	200 x 150	* 437-585	1 / --	M052801968	1 / 3

UNION SOC WITH EPDM O-RING SEAL



½	15			M052802601	10 / 200
¾	20			M052802602	10 / 120
1	25			M052802603	10 / 80
1¼	32			M052802604	10 / 50
1½	40			M052802605	10 / 80
2	50			M052802606	5 / 30
2½	65			* 897-025	5 / --
3	80			* 897-030	5 / --
4	100			* 897-040	5 / --
6	150			* 897-060	3 / --

CAP - SOC

½	15	M052404101	100 / 1200	M052804101	100 / 800
¾	20	M052404102	100 / 600	M052804102	50 / 500
1	25	M052404103	50 / 350	M052804103	50 / 300
1¼	32	M052404104	10 / 220	M052804104	10 / 150
1½	40	M052404105	10 / 270	M052804105	10 / 100
2	50	M052404106	10 / 90	M052804106	10 / 70
2½	65	M052404107	5 / 50	M052804107	5 / 40
3	80	M052404108	5 / 35	M052804108	5 / 25
4	100	M052404109	1 / 22	M052804109	1/18
6	150	* 447-060	1 / --	* 847-060	1 / --

* Trading Item

uPVC PRESSURE FITTINGS

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

CAP FIPT

Size (in.)	Size (mm)	SCHEDULE 40 Part No.	SCHEDULE 40 Std Pkg Bag/Case	SCHEDULE 80 Part No.	SCHEDULE 80 Std Pkg Bag/Case
½	15	* 448-005	50 / --		
¾	20	* 448-007	25 / --		
1	25	* 448-010	25 / --		
1¼	32	* 448-012	10 / --		
1½	40	* 448-015	10 / --		
2	50	* 448-020	10 / --		
2½	65	* 448-025	10 / --		
3	80	* 448-030	10 / --		

BALL VALVE (ASTRAL)

½	15	T 2622-005	1/48		
¾	20	T 2622-007	1/36		
1	25	T 2622-010	1/16		
1¼	32	T 2622-012	1/10		
1½	40	T 2622-015	1/8		
2	50	T 2622-020	1/6		

BALL VALVE - SOC

½	15	M052402701	1/80		
¾	20	M052402702	1/100		
1	25	M052402703	1/70		
1¼	32	M052402704	1/40		
1½	40	M052402705	1/30		
2	50	M052402706	1/15		
2½	65	* 2622-025	6 / --		
3	80	* 2622-030	4 / --		
4	100	* 2622-040	1 / --		
6	150	* 2622-060	1 / --		

uPVC PRESSURE FITTINGS

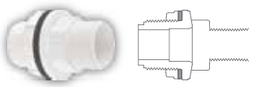
LONG RADIUS BEND 90°

Size (in.)	Size (mm)	Part No.	Std Pkg Bag/Case
½	15	F052800901	120
¾	20	F052400902	85
1	25	F052400903	50
1¼	32	F052400904	30
1½	40	F052400905	18
2	50	F052400906	12

STEP OVER BEND

½	15	A052402801	90
¾	20	A052402802	60
1	25	A052402803	30
1¼	32	F052402804	25
1½	40	F052402805	20
2	50	F052402806	10

TANK ADAPTER



½	15	M052402501	10 / 80
¾	20	M052402502	10 / 60
1	25	M052402503	10 / 40
1¼	32	M052402504	10 / 30
1½	40	M052402505	10 / 20
2	50	M052402506	5 / 15

* Trading Item

TANK ADAPTOR (SOCKET TYPE)

Size (in.)	Size (mm)	Part No.	Std Pkg Bag/Case
¾	20	M0528010202	60
1	25	M0528010203	75
1¼	32	M0528010204	-
1½	40	M0528010205	-
2	50	M0528010206	-

TANK ADAPTOR (SPIGOT TYPE)

½	15	M052806501	-
¾	20	M052806502	-
1	25	M052806503	-
1¼	32	M052806504	-
1½	40	M052806505	-
2	50	M052806506	-

TANK ADAPTER (PIPE THREAD STYLE)

½	15	F052806501	10 / 80
¾	20	F052806502	10 / 60
1	25	F052806503	5 / 40
1¼	32	F052806504	6 / 18
1½	40	F052806505	4 / 12
2	50	F052806506	4 / 8

END PLUG THREADS

½	15	M014002901	300
¾	20	M014002902	200

METAL STRAP

½	15	PVC9120M	100 / 800
¾	20	PVC9340M	100 / 500
1	25	PVC9100M	100 / 400
1¼	32	PVC9105M	50 / 300
1½	40	PVC9106M	50 / 250
2	50	PVC9200M	50 / 200

VANSTONE FLANGE - SOC

½	15	M052803401	10 / 120
¾	20	M052803402	10 / 80
1	25	M052803403	10 / 60
1¼	32	M052803404	5 / 50
1½	40	M052803405	5 / 35
2	50	M052803406	5 / 25
2½	65	M052803407	1 / 15
3	80	M052803408	1 / 12
4	100	M052803409	1 / 8
6	150	M052803410	1 / 3
8	200	M052803411	1 / 1

BLIND FLANGE

Size (in.)	Size (mm)	Part No.	Std Pkg Bag/Case
2½	65	* 853-025	5 / --
3	80	M052803108	1 / 20
4	100	M052803109	1 / 12
6	150	* 853-060	1 / --

ONE PIECE FLANGE - SOC

2½	65	* 851-025	5 / --
3	80	M052803208	1 / 12
4	100	M052803209	1 / 8
6	150	* 851-060	1 / --

VANSTONE FLANGE - SPIG

2½	65	* 856-025	5 / --
3	80	M052803308	1 / 10
4	100	M052803309	1 / 6
6	150	* 856-060	1 / --

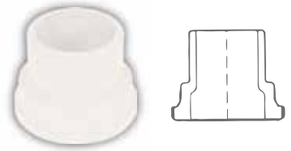
FLANGE RING

2½	65	M052804207	1 / --
3	80	M052804208	1 / --
4	100	M052804209	1 / --
6	150	M052804210	1 / --
8	200	M052804211	1 / --

FLANGE HUB CL 150

2½	65	M052803607	1 / --
3	80	M052803608	1 / --
4	100	M052803609	1 / --
6	150	M052803610	1 / --
8	200	M052803611	1 / --

FLANGE HUB - SPIGOT



3	80	M052803708	1 / --
4	100	M052803709	1 / --

* Trading Item

UPVC PRESSURE PIPES

uPVC PRESSURE PIPES SCHEDULE 40 & SCHEDULE 80 AS PER ASTM D-1785

		Schedule 40		Schedule 80	
Size (In.)	Size (mm)	Part No.	Std. Pkg Bag/Case 3MTR	Part No.	Std. Pkg Bag/Case 3MTR
½	15	M051400301	50	M051800301	50
¾	20	M051400302	30	M051800302	30
1	25	M051400303	20	M051800303	20
1¼	32	M051400304	15	M051800304	15
1½	40	M051400305	10	M051800305	10
2	50	M051400306	8	M051800306	8
2½	65	M051400307	5	M051800307	5
3	80	M051400308	3	M051800308	3
4	100	M051400309	2	M051800309	2
6	150	M051400310	1	M051800310	1
8	200	M051400311	1	M051800311	1
10	250	M051400312	1	M051800312	1
12	300	M051400313	1	M051800313	1

uPVC SOLVENT CEMENT & PRIMER

AS PER ASTM D-2564

MEDIUM BODIED PVC 705	Part No.	Std. Pkg. Case
22 ml	M053010101	48
44 ml	M053010102	24
50 ml	M053010103	48
118 ml	M053010104	24
237 ml	M053010105	24
473 ml	M053010106	12
946 ml	M053010107	12

AS PER ASTM D-2564

MEDIUM BODIED PVC 705	Part No.	Std. Pkg. Case
473 ml	M053030404	12
946 ml	M053030505	12

AS PER ASTM D-2564

MEDIUM BODIED PVC 705	Part No.	Std. Pkg. Case
473 ml	M033050101	12
946 ml	M033050201	12

INSTALLATION PROCEDURE

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.

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 10O -15O.

CLEAN

- Remove surface dirt, grease or moisture with a clean dry cloth.

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.

APPLICATOR

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

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.

JOIN PIPE & FITTING

- Assemble pipe and fitting socket till it contacts socket bottom. Give pipe a quarter turn. Hold pipe and fitting together until th pipe dose not back out.
- Remove excessive cement from the exterior. A properly made joint will show a continue bead of cement around the perimeter.
- Observe all safety precautions.
- Systems should be installed in a good and workmanlike 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**
½-2	Medium	500	705
15-50 mm	Bodied		
2½-12	Heavy	1600	717
65-300 mm	Bodied		

uPVC cement for SCH 80 and interference fit			
Pipe Size (In.) (mm)	**Cement Type**	**Min. Vis. (cP)**	**IPS-Weld On**
	Medium	500	705
15-32 mm	Bodied		
	Heavy	1600	717
40-300 mm	Bodied		

JOINT CURING

Recommended initial set times.

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

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 uctuations 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 ve 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, le 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 (in.)	(mm)	Temperature °C 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 (in.)	(mm)	Temperature °C 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




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 Minut		½ INCH	¾ INCH	1 INCH	1¼ INCH	1½ INCH	2 INCH	2½ INCH	3 INCH	4 INCH	6 INCH	8 INCH	10 INCH	12 INCH
		Maximum Surge Pressure (PSI)												
		Friction Pressure Loss (PSI/100Ft)												
		Friction Head Loss (Ft Water/100Ft)												
		Flow Velocity (Feet Per Second)												
1		1.105	0.623	0.274	0.118	0.034	0.011	0.004	0.001					
3		3.315	1.686	2.096	0.906	0.259	0.087	0.031	0.004					
5		5.525	2.809	5.339	2.334	0.667	0.163	0.058	0.008					
7		7.735	3.932	10.068	4.352	1.243	0.303	0.107	0.015					
9		3.973	5.603	16.036	6.931	1.981	0.483	0.171	0.023					
10		4.414	6.226	19.491	8.425	2.409	0.587	0.207	0.028					
15		6.621		41.305	17.863	5.107	1.244	0.440	0.059	0.030				
20		8.828		70.330	30.414	8.695	2.118	0.749	0.101	0.051				
25				106.300	45.970	13.142	3.201	1.132	0.153	0.077				
30				149.000	64.430	18.420	4.487	1.587	0.214	0.108				
35				198.300	85.750	24.514	5.971	2.112	0.285	0.144				
40				253.800	109.750	31.380	7.643	2.703	0.365	0.184				
45				315.600	136.500	39.020	9.504	3.361	0.454	0.229				
50				383.600	165.900	47.430	11.550	4.085	0.552	0.278				
60														
70														
80														
90														
100														
125														
150														
175														
200														
250														
300														
350														
400														
450														
500														
750														
1000														
1250														
1500														
1750														
2000														

CAUTION: Flow velocity should not exceed 5 feet per second. PVC pipe cannot beused 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 Minut	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)	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)	Maximum Surge Pressure (PSI)
	½ INCH				¾ INCH				1 INCH				1¼ INCH				1½ INCH											
1	1.465	2.198	0.950	44.100	0.779	0.473	0.205	21.570																				
3	4.395	16.816	7.289	132.300	2.338	3.619	1.564	64.710	1.402	1.043	0.451	37.290	0.277	0.248	0.107	19.041	0.562	0.113	0.049	13.161								
																					2 INCH				2½ INCH			
5	7.326	43.310	18.720	220.500	3.896	9.322	4.029	107.800	2.336	2.686	1.161	62.150	1.295	0.639	0.276	31.735	0.937	0.291	0.126	21.935								
7	10.256	80.763	34.910	308.700	5.455	17.383	7.514	150.900	3.271	5.008	2.165	87.010	1.812	1.191	0.515	44.429	1.312	0.543	0.235	30.709	0.781	0.154	0.066	17.059	0.546	0.064	0.028	12.173
	3 INCH																											
9					7.013	27.686	11.967	194.100	4.205	7.977	3.448	111.870	2.330	1.898	0.820	57.123	1.687	0.865	0.374	39.483	1.005	0.245	0.106	21.933	0.702	0.102	0.044	15.651
10	0.498	0.042	0.018	10.500	7.792	33.652	14.546	215.700	4.672	9.696	4.191	124.300	2.589	2.306	0.997	63.47	1.875	1.052	0.455	43.870	1.116	0.298	0.129	24.370	0.780	0.124	0.054	17.390
					4 INCH																							
15	0.747	0.089	0.038	15.750					7.008	20.545	8.880	186.450	3.884	4.887	2.112	95.205	2.812	2.228	0.963	65.805	1.674	0.631	0.273	36.555	1.169	0.264	0.114	26.085
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	5.178	8.326	3.599	126.940	3.750	3.797	1.641	87.740	2.232	1.075	0.465	48.740	1.559	0.449	0.194	34.780
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	2.790	1.625	0.702	60.925	1.949	0.679	0.293	43.475
30	1.494	0.320	0.138	31.500	0.855	0.082	0.036	16.830					7.768	17.643	7.626	190.410	5.825	8.045	3.477	131.610	3.348	2.278	0.985	73.110	2.339	0.951	0.411	52.170
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	3.906	3.030	1.310	85.295	2.728	1.266	0.547	60.865
40	1.992	0.545	1.235	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	4.465	3.881	1.677	97.480	3.118	1.621	0.701	69.560
									6 INCH																			
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	5.023	4.827	2.086	109.665	3.508	2.016	0.871	78.255
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	5.581	5.866	2.536	121.850	3.898	2.450	1.059	86.950
60	2.988	1.154	0.499	63.000	1.710	0.297	0.128	33.660	0.752	0.040	0.017	13.800					11.249	29.041	12.553	263.220	6.697	8.223	3.554	146.220	4.667	3.434	1.484	104.340
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									7.813	10.940	4.729	170.590	5.457	4.569	1.975	121.730
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									8.929	14.009	6.055	194.960	6.237	5.851	2.529	139.120
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									10.045	17.424	7.531	219.330	7.016	7.277	3.146	156.510
													8 INCH															
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									11.161	21.178	9.154	243.700	7.796	8.845	3.823	173.900
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									9.745	13.372	5.780	217.375
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												
																	10 INCH											
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	0.907	0.032	0.014	15.200								
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	1.133	0.048	0.021	19.000								
																					12 INCH							
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	1.360	0.067	0.029	22.800								
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	1.587	0.089	0.038	26.600	1.121	0.038	0.016	18.550				
400									5.013	1.351	0.584	92.000	2.855	0.343	0.148	49.200	1.813	0.114	0.049	30.400	1.281	0.049	0.021	21.200				
450									5.639	1.680	0.728	103.500	3.212	0.427	0.185	55.350	2.040	0.142	0.061	34.200	1.441	0.061	0.026	23.850				
500									6.266	2.042	0.883	115.000	3.589	0.519	0.224	61.500	2.267	0.172	0.074	38.000	1.601	0.074	0.032	26.500				
750									9.399	4.327	1.870	172.500	5.353	1.100	0.475	92.250	3.400	0.365	0.158	57.000	2.402	0.157	0.068	39.750				
1000													7.137	1.874	0.810	123.000	4.533	0.621	0.269	76.000	3.202	0.267	0.115	53.000				
1250													8.921	2.833	1.224	153.750	5.667	0.939	0.406	95.000	4.003	0.403	0.174	66.250				
1500													10.706	3.970	1.716	184.500	6.800	1.316	0.569	114.000	4.803	0.585	0.244	79.500				
1750																	7.934	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 beused for compressed air service.

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 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 300-400mt. 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.

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 coeffi cient 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 x 10^{-5} in./in./°F.

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

Δ L = Y (T1-T2) x L1

Δ L = Diamensional change due to thermal expansion or contraction (in).

Y = Expansion coefficient (in./in./°F)

(T1-T2) = Temperature differential between the installation temperature and the maximum or minimum system temperature, whichever provides the gratest differential (°F).

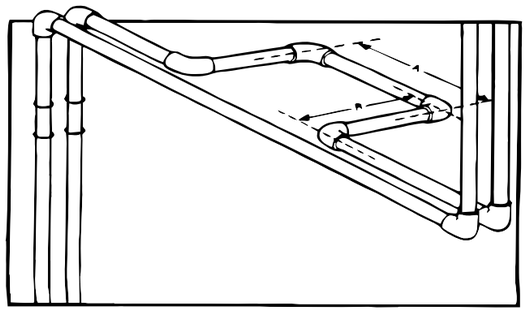
L = Length of pipe run between changes in direction (ft)

There are several ways to compensate for expansion and contraction. The most common methods 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 Δ L

R = Expansion loop leg length (ft)

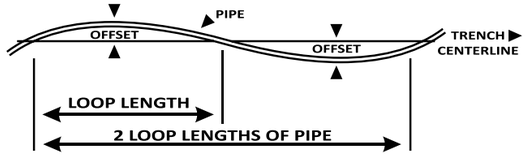
D = Nominal outside diameter of pipe (in). (See table below.)

Δ L = Diamensional change due to thermal expansion or contraction (in).

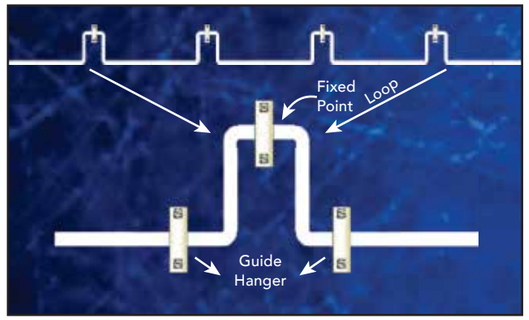
When installing the expansion loop, no rigid or restraining supports should be placed within the leg lengths of the loop. The loop should be installed as closely as possible to the mid-point between anchors. Piping support guides should restrict lateral movement and direct axial movement into the loop. Lastly, the pipe and fi ttings 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 off sets and loop lengths for piping up to 2½" nominal size.



	Max. Temp. Variation °F, Between Installation									
	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
Loop Length in Feet	Loop Offset in Inches									
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



ASTRAL Aquarius® STANDARDS REDEFINED
uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

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. Jointing 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 of 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.

ASTRAL PIPES

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.

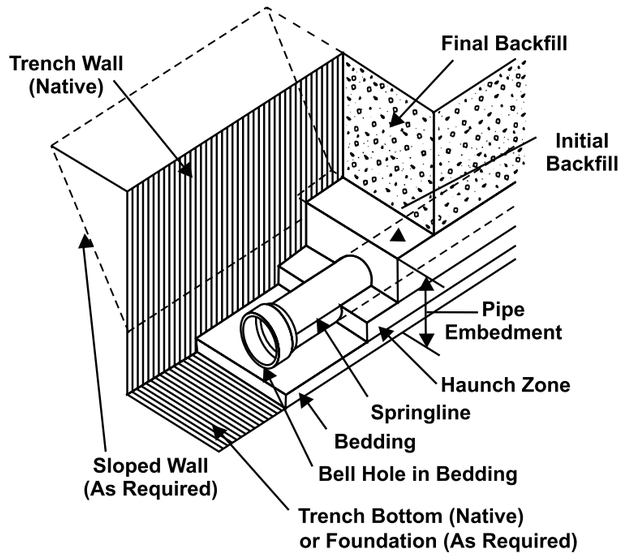


FIG. 1 Installation Terminology

ASTRAL Aquarius®
STANDARDS REDEFINED
uPVC PLUMBING SYSTEM FOR OUTER LOOP LINES

HANDLING AND STORAGE

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 for pipe should be removed with a fork lift. Loose pipe can be rolled down timbers, 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.

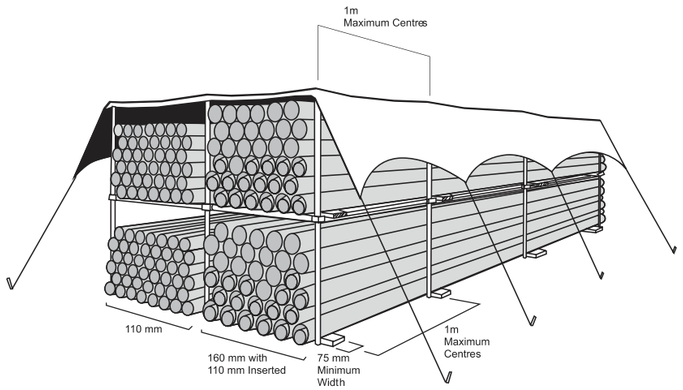
STORAGE

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 walls 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.

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.



ASTRAL PIPES

FREQUENTLY ASKED QUESTIONS ABOUT ASTRAL AQUARIUS®

01 Why Lead Free ?

Lead is a metal with no known biological benefi t 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 Vitamins D. High blood lead levels in children can cause consequences which maybe 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.

02 What is the expected life of a ASTRAL Aquarius System?

ASTRAL Aquarius uPVC system design & standards incorporate signifi cant 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.

03 Will ASTRAL Aquarius System save me 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 materials cost advantage, as much as a full 50 60 % material savings today.

04 Will ASTRAL Aquarius System off er a fi nancial 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.

05 Must I use plastic insulators wherever uPVC passes through a stud ?

Technically, no such provision need 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 insulation rubber grommets, pipe insulation or similar.

06 Should specifi c type of Primers and solvent cements be used on uPVC system?

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

07 I have been told that uPVC tubing ends may split during installation. Why should 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 temperatures are 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 tubing highly around the area to be cut for about 10 seconds prior to making the cut will warm the tubing and reduce possible problems.

08 What about health, safety & fi re toxicity issues?

Tests performed at respected universities and independent laboratories confi rm that uPVC is superior to metal systems in terms of water quality eff ects and “no more toxic than wood” in fi re. 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.

09 Is ASTRAL Aquarius System resistant to U.V. exposure ?

- Eff ect 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 & fi ttings and to loss of hydrostatic strength. “Above eff ect 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 signifi cant extent after outdoor exposure, being mainly limited to a surface discoloration eff ect only.

There is a loss of Impact resistance due to impact modifi erslosing effi ciency.

This may even result in increased modulus.

There is no signifi cant 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.

10 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 its impact properties decrease as temperature decrease 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.

11 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 metal system, the sound travels in metal 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.

12 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 - Less friction,

- Less head loss.

with metal systems, once corrosion starts “C” factor will greatly reduce which result in head loss and scale built up. With ASTRAL Aquarius uPVC, there is no corrosion and hence scale built up is inhibited.

13 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 much important. ASTRAL has understood this requirement of market and hence developed special transition fi ttings. These fi ttings will connect the IPS System (SCH 40 & SCH 80) to CTS system (SDR 11 & SDR 13.5). These transition fi ttings are joined with one step solvent cement, which gives customer a very fast, effi cient & simple solution to join both systems. Available sizes are from 15mm (½”) to 50mm (2”).

Notes