ASTRAL®
PIPES

OPVC PRO

ORIENTED POLYVINYL CHLORIDE PIPING SYSTEM FOR WATER DISTRIBUTION




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1st TO INTRODUCE CPVC IN INDIA

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1st TO INTRODUCE LOW NOISE PP DRAINAGE PIPES IN INDIA

1st TO INTRODUCE FOAMED PVC DRAINAGE PIPES IN INDIA



1st TO INTRODUCE LEAD FREE COLUMN PIPES IN INDIA

1st TO INTRODUCE POLYMER BASED INDUSTRIAL PIPING SYSTEM IN INDIA

1st TO INTRODUCE NSF APPROVED SOLVENT CEMENT IN INDIA

1st TO INTRODUCE CPVC PIPING FOR AUTOMATIC FIRE SPRINKLER SYSTEM IN INDIA

ASTRAL, INDIA'S PROGRESSIVE BUILDING MATERIALS COMPANY

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, Sangli & Aurangabad in Maharashtra, Cuttack in Odisha and Sitarganj in Uttarakhand 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 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.

In the year 2020, Astral has expanded its product portfolio and entered into the Water Tanks Segment. The water tank segment is an expanded domain of plumbing and water supply with a huge nationwide potential. Astral Pipes manufactures water tanks from its Santej, Aurangabad, Cuttack, Hosur & Ghiloth manufacturing facilities. A wide range of water storage tanks has helped Astral to become a versatile player in the industry.

Extending the product portfolio further, in the year 2022 Astral forayed into the categories of Faucets and Sanitaryware, followed by acquisition of Bangalore based Gem Paints to enter in the Paints category. This expansion will help Astral march firmly towards becoming a holistic building materials company.

ADHESIVES

- EPOXY ADHESIVES & PUTTY
- SILICONE SEALANTS
- CONSTRUCTION CHEMICALS
- PVA
- CYANOACRYLATE
- SOLVENT CEMENTS
- TAPES
- POLYMERIC FILLING COMPOUND
- ANAEROBIC ADHESIVES
- INDUSTRIAL ADHESIVES
- INSTANT HAND SANITIZER
- SURFACE CLEANING PRODUCTS

PIPING

- PLUMBING PIPES & FITTINGS
- CPVC, PVC & PEX
- SEWERAGE DRAINAGE PIPES & FITTINGS
- AGRICULTURE PIPES & FITTINGS
- INDUSTRIAL PIPES & FITTINGS
- FIRE SPRINKLERS PIPES & FITTINGS
- CONDUIT & CABLE PROTECTION
- ANCILLARY PRODUCTS
- URBAN INFRASTRUCTURE
- DUCTING

WATER TANKS

PAINTS

FAUCETS

SANITARYWARE



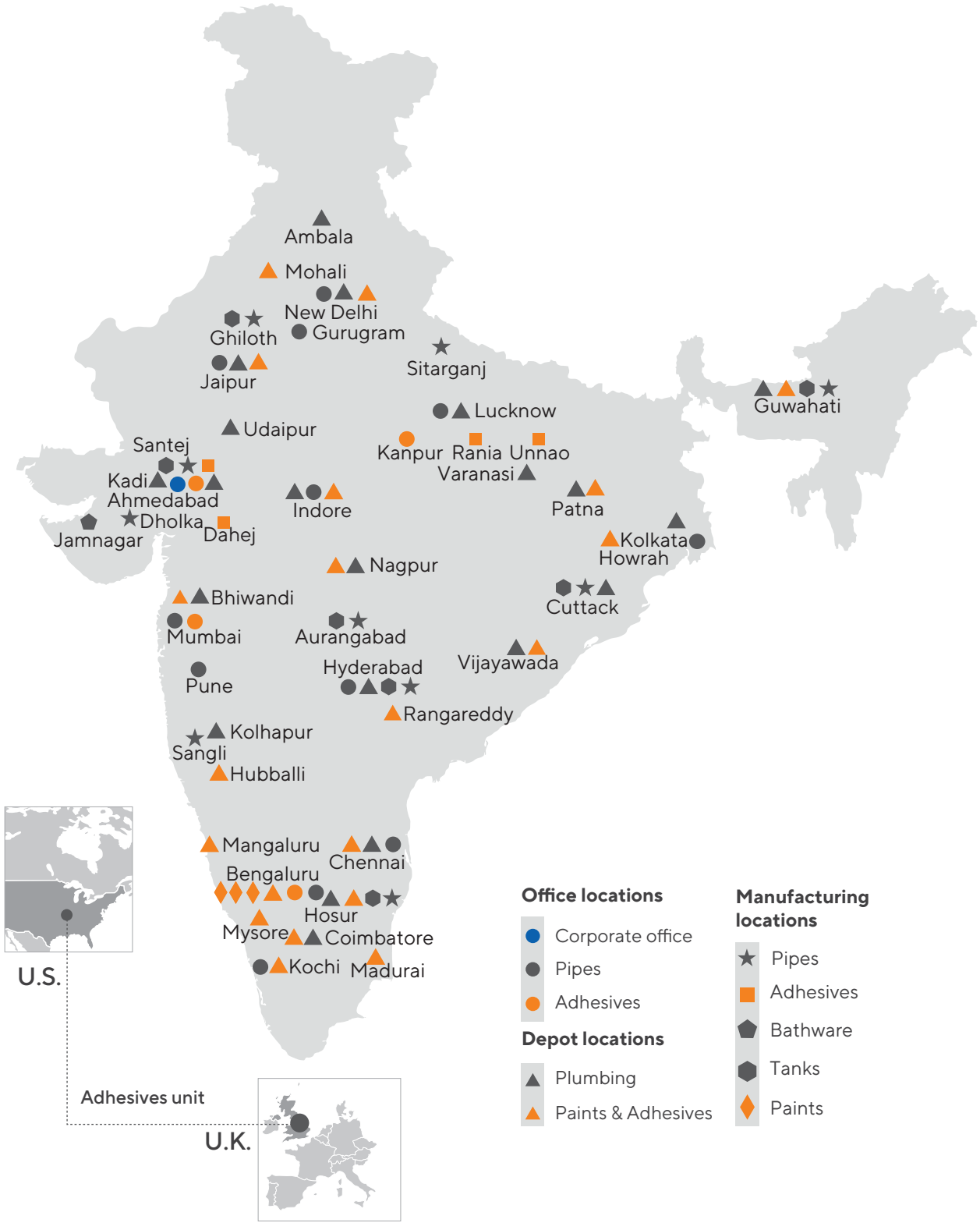


INNOVATION & RECOGNITIONS

- 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, 2020, 2022 & 2023)
- ET Inspiring Business Leaders of India Award (2016)
- India's Most Attractive Pipe Brand Award (2016)
- Fortune India 500 Company (2016)
- India's Most Desired Pipe Brand Award (2022)
- Consumer Validated Superbrands India (2017, 2019, 2021-2022 & 2023)

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 Vijaywada, Hyderabad, Delhi, Kolhapur, Kolkata, Nagpur, Indore, Patna, Varanasi, Jaipur, Hosur & Guwahati 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.



ABOUT OPVC

A new advancement in pipe manufacturing has led to the development of Polyvinyl Chloride Oriented (PVC-O) pipes. Unplasticized polyvinyl chloride (uPVC) pipes have long been used around the world in water supply systems. The PVC-O technology aligns the molecular structure in both circumferential and axial directions, significantly enhancing the pipe's strength and durability. This makes PVC-O pipes especially suitable for high-pressure applications.

PVC-O is produced by heating and stretching PVC, aligning the polymer chains in a specific direction. This molecular orientation results in a material that is up to five times stronger and more impact-resistant than traditional PVC. PVC-O pipes are particularly suitable for high-pressure water supply and irrigation systems, where durability and long service life are crucial.

Astral OPVC PRO's enhanced strength and flexibility allow it to withstand extreme conditions, including high pressures, harsh weather, and physical impact, which reduces the risk of failure. These pipes have a longer lifespan of lasting over 50 years.

In addition, PVC -O is environmentally friendly, with a lower carbon footprint during production and the ability to be recycled.

The new technology of PVC-O pipe manufacturing has led to the development of a standard that guides manufacturers in producing these advanced pipes and assists users in their procurement and application. PVC-O pipes are suitable for both underground and above-ground use, provided they are not directly exposed to sunlight.

MOLECULAR ORIENTATION IN PVC: THE KEY TO ADVANCED PIPE TECHNOLOGY

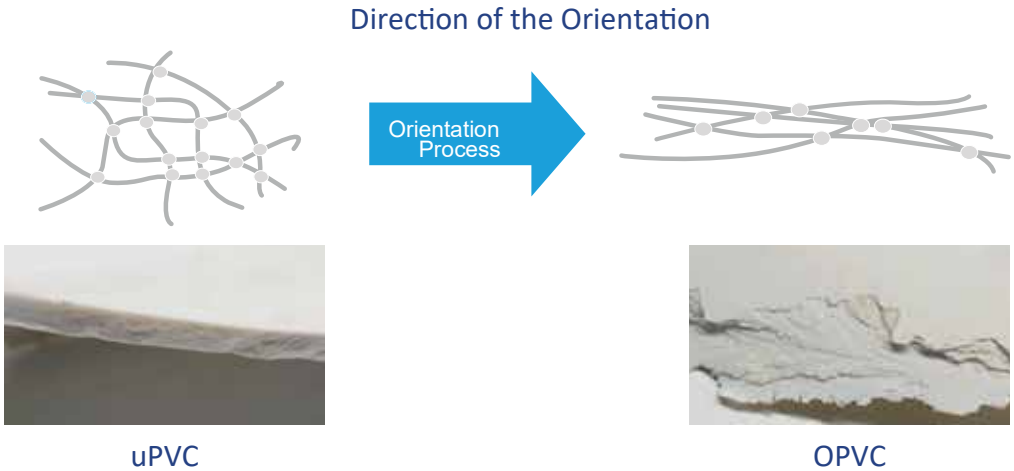
ASTRAL PVC-O pipes are recognized as the most advanced solution for the efficient transport of high-pressure water, thanks to their exceptional features tailored for this purpose. This is made possible by a technique known as Molecular Orientation.

Normally, PVC is a disordered polymer with randomly arranged molecules. However, by applying specific conditions of pressure, temperature, and speed, the material is stretched, causing the polymer molecules to align in the direction of the stretch.

The extent of this molecular alignment is influenced by the process settings and stretch ratio, resulting in a material with a unique layered structure, significantly enhancing its durability and efficiency.

The ASTRAL Orientation process modifies the PVC's structure by giving the polymer's molecules a linear orientation.

Orientation Effects on Polymer Structure: Enhancing Strength and Performance



When used in high-pressure water pipelines, ASTRAL OPVC PRO pipes offer exceptional resistance and an extended lifespan. This contributes to energy efficiency and sustainability, both during manufacturing and throughout the pipe's service life. Additional benefits include cost savings and reduced installation times.
As a result, ASTRAL OPVC PRO pipes are the ideal choice for medium and high-pressure water networks, making them suitable for various applications, including irrigation systems, potable water supply, fire protection networks, and pumping systems.

TECHNOLOGY

STATE-OF-THE-ART TECHNOLOGY FOR WATER INFRASTRUCTURE

- The process of Molecular Orientation is achieved through the careful application of consistent temperature and high pressures (up to 35 bars), supported by comprehensive quality checks and throughout the production line.

- In contrast to the traditional intermittent production method, Astral OPVC Pro pipes are created via a continuous, fully automated manufacturing process, ensuring enhanced control and consistent product quality throughout.

UNMATCHED RELIABILITY AND PERFORMANCE

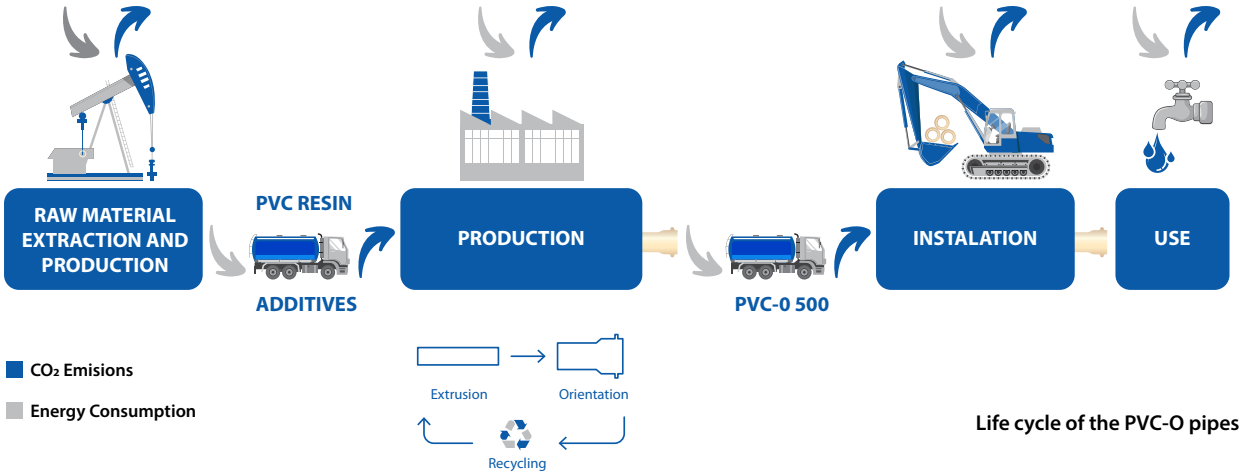
Through advanced technology in the ASTRAL manufacturing system, we ensure unmatched reliability, security, and several distinct advantages over competing products:

- **Top-Class Molecular Orientation:** Achieving Class 500 per IS 16647:2017, ISO 16422:2014, and EN 17176-2 standards, guaranteeing superior mechanical performance.

- **Increased Product Reliability:** Offering enhanced reliability and durability in the final product.
  Strict Dimensional Control: Adhering to precise dimensional tolerances.

THE MOST ECO-FRIENDLY PIPES FOR SUSTAINABLE INFRASTRUCTURE:

The environmental influence of a piping system is contingent on its composition and application. The primary factors determining efficiency and sustainability throughout its lifespan include the raw material type, production process, finished product, and the pipe's life expectancy.
ASTRAL OPVC PRO stands out as the most eco-friendly solution available in the market. This is attributed to its significant contribution to the proper sustainable development of the planet, as affirmed by various global studies. These pipes exhibit environmental benefits at every stage of their life cycle, making them the most energy-efficient option.



Life cycle of the PVC-O pipes

OPTIMIZING RESOURCES

The exceptional mechanical properties of pipes lead to significant savings in raw materials. Compared to other plastic alternatives with the same external nominal diameter, requires less PVC.

With only 43% of its PVC composition relying on oil, the demand for this resource is considerably lower than that of other plastic solutions.

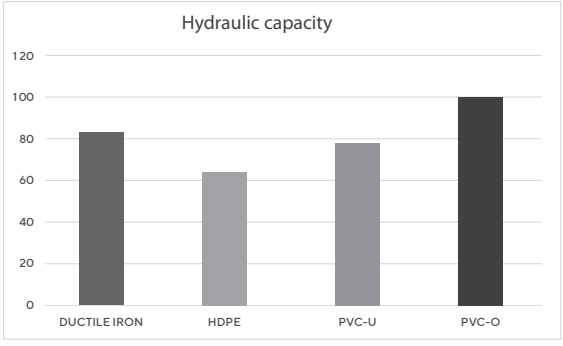
Furthermore, energy consumption is reduced at every stage of the product's life cycle, from raw material extraction to pipe manufacturing and usage. Throughout its lifespan, ASTRAL helps minimize unnecessary energy consumption and reduces CO2 emissions, contributing to a more sustainable environment.

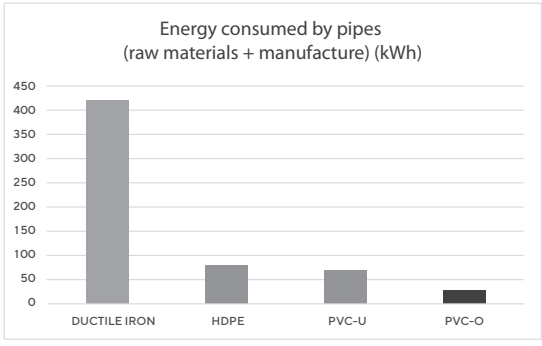
Optimal use of water resources:

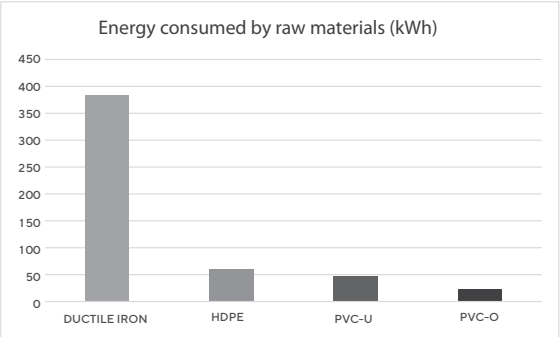
Due to their extended lifespan and excellent water-tightness, OPVC PRO pipes become essential partners in the judicious utilization of water resources. Current water supply networks constructed with conventional materials experience leakage rates of up to 25%, leading to chemical degradation and premature replacement of relatively new piping system.

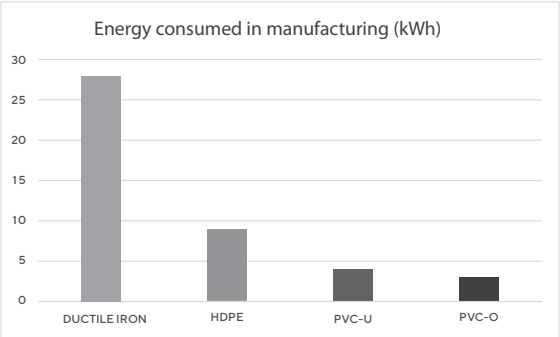
Water pipes should not only withstand pressure but also efficiently convey the maximum amount of water with minimal energy consumption. The exceptionally smooth inner surface of OPVC PRO pipes minimizes pressure loss, reducing the energy needed for transportation.

Infrastructures built using OPVC PRO pipes prove to be outstanding assets for water resource management across generations.









Eco-Friendly Manufacturing and Recycling Initiatives

PVC-O is 100% recyclable, and ASTRAL integrates this sustainable material into its production processes. By minimizing environmental impact through thoughtful product design, the company demonstrates its commitment to sustainability. Through the implementation of circular economy strategies, ASTRAL reduces waste and contributes to a more eco-conscious manufacturing environment.

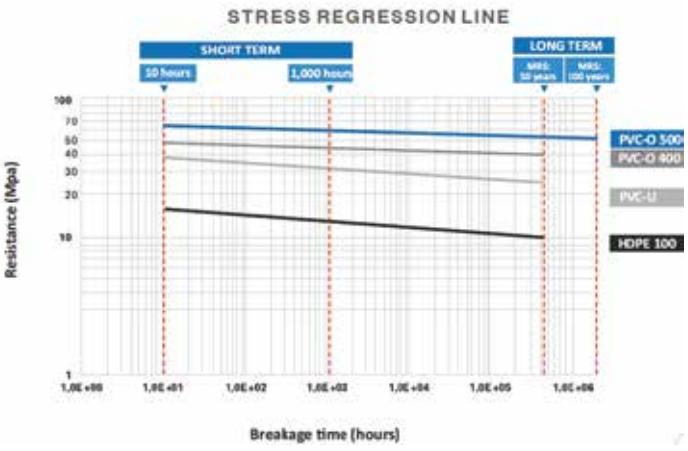
KEY FEATURES

EXCEPTIONAL TENSILE STRENGTH:

The stress-strain behaviour of ASTRAL OPVC PRO pipes shows a notable deviation from conventional plastics, exhibiting a performance closer to that of metals. This remarkable transformation in mechanical strength is made possible by PVC-O Class 500, which gives ASTRAL OPVC PRO pipes their unrivalled tensile resistance and overall mechanical performance.

HYDROSTATIC RESISTANCE FOR LONG-TERM PERFORMANCE

Creep, or the gradual loss of mechanical properties under sustained stress, is significantly minimized in OPVC PRO Class500, offering superior long-term performance compared to regular plastics. Astral OPVC Pro pipes, with their excellent fatigue and chemical resistance, retain the Class 500 standards for over a century. This durability has been confirmed by independent testing (10,000 hours) in compliance with ISO 9080:2013 and UNE – EN ISO 1167:2006 standards, demonstrating that the pipes can maintain their nominal pressure for more than 100 years without deterioration, ensuring a service life well beyond a Fifty Years.



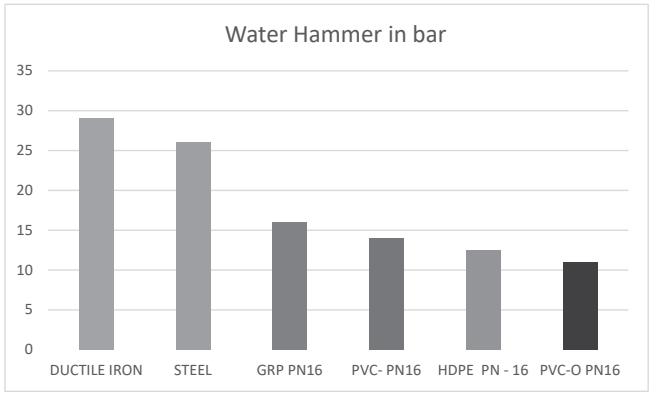
WATER HAMMER AND PRESSURE SURGES IN PIPING SYSTEMS:

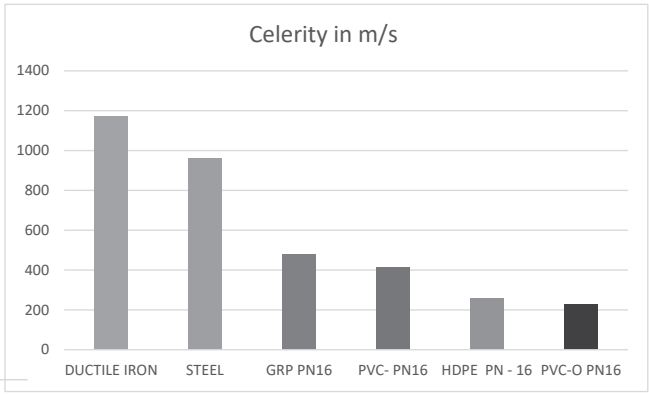
Water hammer is a phenomenon that occurs when liquid flow is abruptly halted, often due to the opening or closing of valves, the starting or stopping of pumps, or the movement of air locks in the pipe. These events can generate pressure spikes that exceed the pipe's designed working pressure, potentially causing breakage, especially if the pipe has been compromised by impacts or corrosion.

The severity of water hammer (P) is affected by celerity (a), the wave speed, and the change in fluid velocity (V). The value of celerity is mainly determined by the pipe's dimensions (external diameter to wall thickness ratio) and the material properties, such as the young's modulus (E), which reflects the material's stiffness.

Lower Celerity of PVC-O Pipes: Astral OPVC PRO pipes exhibit a much lower celerity compared to pipes made from other materials, especially when compared to metal piping. This difference is particularly significant, as water hammer effects are much more pronounced in metal pipes. The reduced celerity of PVC-O pipes helps mitigate the severity of these pressure surges, making them a more reliable choice for preventing damage from water hammer.

$$P = \frac{a.V}{g} \; ; \quad a = \frac{9900}{\sqrt{48.3 + K_c \cdot \frac{D_m}{e}}} \; ; \quad K_c = \frac{10^{10}}{E}$$





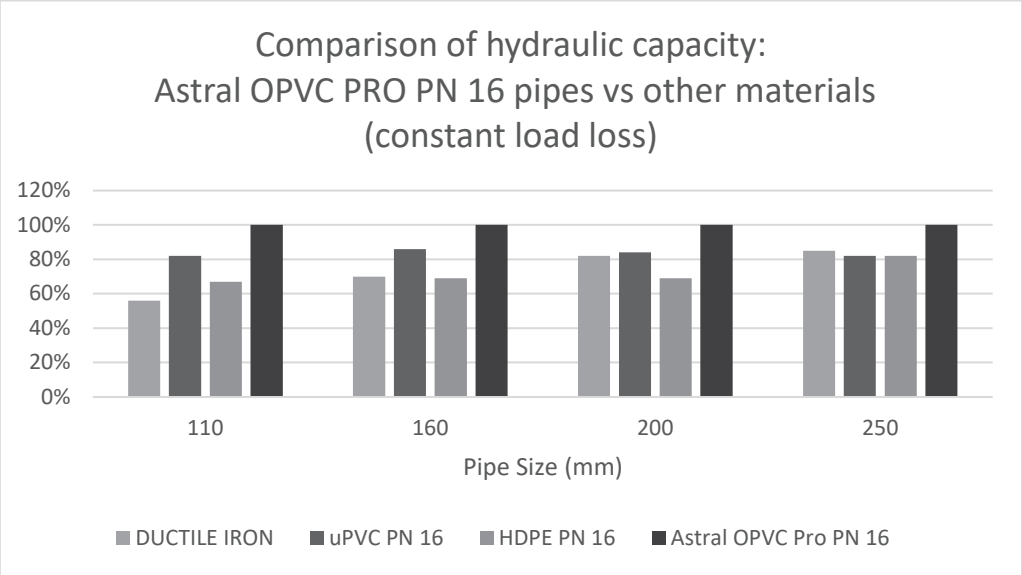




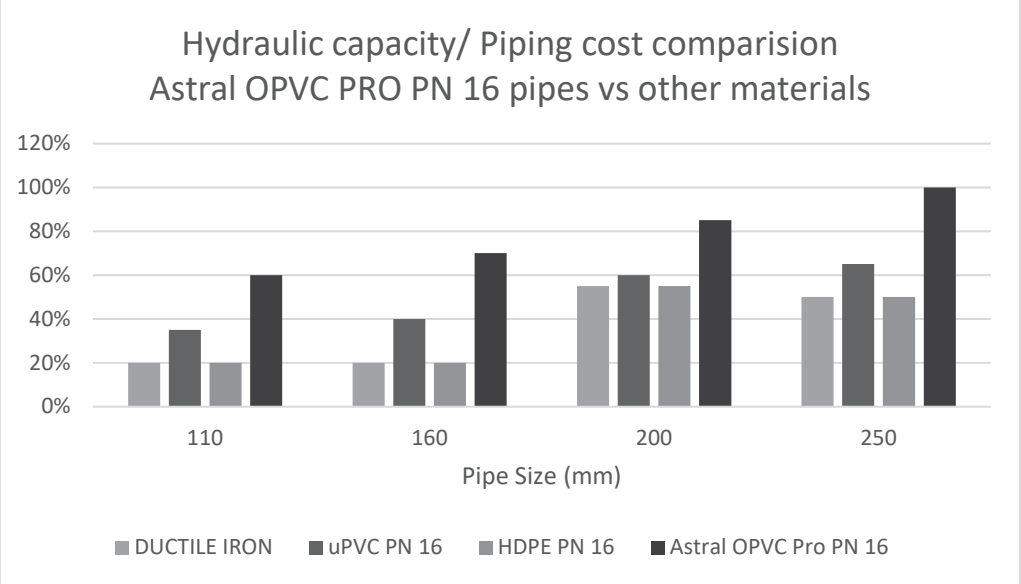
ENHANCED HYDRAULIC CAPACITY WITH ASTRAL OPVC PRO PIPES:

Water pipes face not only pressure resistance challenges but also the need to efficiently transport large volumes of water while minimizing energy consumption. PVC-O pipes address this by featuring thinner walls than conventional plastic pipes and smoother interior surfaces compared to metal pipes, which collectively result in improved hydraulic capacity.

COMPARISON OF HYDRAULIC CAPACITY: Astral OPVC Pro PN16 PIPES VS OTHER MATERIALS (CONSTANT LOAD LOSS)



Selecting pipes with lower hydraulic capacity often necessitates using a larger nominal diameter, leading to higher costs for both the infrastructure and overall project. By choosing Astral OPVC Pro pipes, you can achieve superior hydraulic capacity, ensuring a better return on investment without compromising on performance.



BENEFITS



EXCEPTIONAL IMPACT RESISTANCE

Astral OPVC Pro pipes boast exceptional resistance to impact, minimizing the risk of damage during installation or from contact with rough surfaces such as stones. The Molecular Orientation process further enhances the material's strength by inhibiting the spread of cracks and scratches, preventing rapid crack formation. The result is a significant extension of the pipe's durability and operational life.



OUTSTANDING HYDROSTATIC RESISTANCE FOR LONG-TERM PERFORMANCE

Astral OPVC Pro pipes are designed to withstand internal pressures up to twice their nominal rating (32 bar for PN16 pipes or 400 psi for PN200 pipes). This impressive resistance allows the pipes to endure sudden pressure spikes, such as water hammers or network issues. Furthermore, the material's low creep behaviour guarantees the pipes will maintain their integrity and performance for over a century when operating at nominal pressure.



SUPERIOR WATER HAMMER RESISTANCE

Astral OPVC Pro pipes demonstrate significantly reduced celerity, being one-fourth that of ductile iron pipes. This characteristic leads to fewer water hammers caused by rapid changes in water volume and pressure. The reduced celerity greatly lowers the risk of breakage during network operation, such as when valves open and close or during pump start-ups, protecting all components in the water system.



ENHANCED HYDRAULIC CAPACITY

The process of Molecular Orientation increases the internal diameter of Astral OPVC Pro pipes, creating a larger flow area. The exceptionally smooth internal surface further reduces friction losses and prevents the accumulation of deposits. As a result, Astral OPVC Pro pipes provide 15% to 40% higher hydraulic capacity compared to pipes of similar external dimensions made from other materials.



MAXIMUM FLEXIBILITY FOR LONG-TERM RELIABILITY

The unique elasticity of Astral OPVC Pro pipes enables them to tolerate significant deformations to their internal diameter. In scenarios such as crushing or mechanical incidents, these pipes quickly recover their original shape, reducing the risk of damage caused by soil shifts or sharp edges from rocks and machinery. Furthermore, their robust load-bearing capacity guarantees top-tier performance in underground installations.



COMPLETE CORROSION PROTECTION

Astral OPVC Pro pipes, made from oriented PVC, are fully resistant to corrosion and impervious to natural chemicals, as well as damage from micro- and macro-organisms. This ensures that the pipes remain non-degradable throughout their lifespan. Furthermore, they do not require any additional protective coatings, leading to cost-effective long-term solutions.



UNCOMPROMISED WATER QUALITY

The Water flowing through ASTRAL OPVC PRO pipes maintains its quality consistently, as the material is resistant to corrosion and prevents any migration from the pipes.



GUARANTEED WATER-TIGHT SEALS

Astral OPVC Pro pipes feature joints that are entirely water-tight, providing a secure connection that won't shift after installation. The simplicity of their design allows for quick and easy installation by workers with basic qualifications.



COST-EFFECTIVE AND QUICK INSTALLATION

Astral OPVC Pro pipes are lighter and easier to handle than alternatives, often eliminating the need for heavy machinery during installation. Their easy connection, flexibility, and impact resistance further enhance their cost-effectiveness, performance, and installation efficiency, making them a superior choice over other materials.

APPLICATION



WATER SUPPLY



RECLAIMED WATER



IRRIGATION



WATER INFRASTRUCTURE



INDUSTRIAL APPLICATIONS



INFRASTRUCTURE NETS

APPLICABLE STANDARDS

IS 16647: Oriented Unplasticized Polyvinyl Chloride (PVC-O) Pipes for Water Supply - Specification

MATERIAL PROPERTIES

Comparison of Piping and Material Mechanical Properties

The following table summarizes the key technical characteristics of Astral OPVC Pro Pipes, comparing them to other commonly used plastic pipes. This comparison highlights the superior mechanical properties of Astral OPVC Pro, including tensile strength, impact resistance, flexibility, and pressure endurance, showcasing why Astral OPVC Pro pipes offer enhanced performance in demanding applications.

		ASTRAL OPVCPRO	PVC	HDPE 100	HDPE 80
Product Standard	Units	ISO 16422 EN 17176	ISO 1452	EN 12201	EN 12201
Minimum required strength (MRS)	MPa	50.0	25.0	10.0	8.0
Overall service coefficient (C)	-	1.4	2.0*	1.3	1.3
Design stress (σ)	MPa	36.0	12.5	8.0	6.3
Short term elasticity modulus(E)	MPa	4000.0	>3000	1100.0	900.0
Resistance to uniaxial traction	MPa	≥48	≥45	19.0	19.0
Resistance to hoop traction	MPa	>85	≥45	19.0	19.0
Shore hardness D at 20 °C	-	81-85	70-85	60.0	65.0

*For pipes with a Dia ≥ 110

PHYSICAL PROPERTIES

Property	Units	Value
Density	Gm/cm^3	1.40-1.46
PVC Resin K value	-	>64
Poisson coefficient	-	0.4
Vicat temperature	°C	≥80
Lineal expansion coefficient	°C*	7.10-5
Thermal conductivity	Kcal/mh°C	0.14-0.18
Specific heat at 20 °C	cal/g°C	0.20-0.28
Dielectric stiffness	kV/mm	20-40
Dielectric constant at 60 Hz	-	3.2-3.6
Transverse resistivity at 20 °C	Ω/cm	>1016
Absolute roughness (ka)	mm	0.007
Absolute roughness (Hazen Williams)	$m^{0.37}/s$	150
Manning roughness coefficient (n)	$m^{-1/3}s$	0.009
Elastomer sealing ring hardness	IRHD	60 ± 5

*Although the standard allowance includes this range.

MATERIAL CLASSIFICATION AND SUPERIOR PERFORMANCE OF ASTRAL OPVC PRO PIPES

IS: 16647 and its standards provide a classification system for PVC-O materials, based on the Minimum Required Strength (MRS). The degree of Molecular Orientation varies according to the manufacturing technique. ASTRAL OPVC PRO pipes are produced exclusively in the top-tier PVC-O Class 500, ensuring maximum orientation and delivering exceptional mechanical performance, making them a superior choice compared to other materials.

Astral OPVC Pro			
	PN 12.5	PN16	PN25
Material class	500	500	500
MRS (Mpa)	50.0	50.0	50.0
Nominal pressure (bar)	12.5	16	25
Burst pressure over 50 years (bar)*	17.5	22.4	35
Burst pressure over 10 hours (bar)*	23.1	28.9	48.1
Maximum trial pressure onsite (bar)#	17.5	21	30
Circumrenal stiffness (kN/m^2)^	5	7	20
Colour	White	White	White

*With a temperature of 20° C.
#According to EN 805:2000 standard with estimated water hammer.
^Average stiffness per pipe according to established tolerances.

PIPE DIMENSIONS

Nominal Outside Diameter dn (mm)	Mean Outside Diameter, (mm)		Wall Thickness Minimum(mm)		
	min	max	PN 12.5	PN 16	PN 25
90	90	90.3	1.70	2.10	3.30
110	110	110.4	2.00	2.60	4.00
160	160	160.5	2.90	3.70	5.80
200	200	200.6	3.60	4.60	7.20
250	250	250.8	4.50	5.80	9.00

LIST OF TESTING DETAILS

The Astral OPVC PRO Piping System is manufactured under stringent and continuous quality control, covering every stage from raw material selection to production, dimensional accuracy, and product identification. This thorough testing and monitoring process ensures the system's high reliability, superior performance, and long-lasting efficiency.

Sr. no	Test
1	Density
2	Opacity
3	Diameter
4	Wall Thickness
5	Effective length
6	Dimension of Integral Socket
7	Pipe Ends
8	Resistance to Hydrostatic Pressure
9	Resistance to external blows at 0 °C
10	Ring Stiffness
11	Orientation factor
12	Vicat Softening temperature
13	Effect on water
14	Resistance to Di-chloromethane at a specific temperature (Degree of gelation)
15	Alternate test for resistance to Dichloromethane test - Uni-axial tensile test
16	Short term pressure test for leak tightness of assemblies
17	Short term negative pressure test for leak tightness of assemblies
18	Long term pressure test for leak tightness
19	Sealing Ring

DIMENSIONS OF SOCKETS FOR ELASTOMERIC SEALING RING JOINTS

Nominal Diameter (mm)	Minimum Depth of Engagement, M min (mm)	Minimum Mean Inside Diameter of Socket (mm)
90	61	90.4
110	64	110.5
160	71	160.6
200	75	200.7
250	81	250.9

Reduction Ratios: Temperature and Application

When high temperatures (above 25 °C) or aggressive and challenging applications are involved, the Allowable Operating Pressure (PFA) of pipes is typically lower than the Nominal Pressure (PN). The formula provided is:

PFA=PN-fT-fA

Where:
PFA = Allowable Operating Pressure
PN = Nominal Pressure
fT = Derating factor based on temperature (can be derived from a graph)
fA = Derating factor based on the system's application (to be determined by the Project Manager)

The derating factor (fT) based on the operating temperature can be obtained from the provided graph. The application-specific derating factor (fA) must be determined by the Project Manager.

Note: The responsibility for project design lies with the Project Manager, while the Contractor is responsible for the execution.

OPVC PRO Pressure De-Rating	
Operating Temp.°C (°F)	
27 (80)	1.00
32 (90)	0.87
37 (99)	0.77
42 (108)	0.69
45 (113)	0.64

*With a temperature of 20° C.

#According to EN 805:2000 standard with estimated water hammer.

^Average stiffness per pipe according to established tolerances.

PRODUCT RANGE:

6 METRE PIPE

Size (cm)	Size (inch)	Product Code (PN 12.5)	Product Code (PN 16)	Product Code (PN 25)
9.0	3	M661125608	M661160608	-
11.0	4	M661125609	M661160609	M661250609
16.0	6	M661125612	M661160612	M661250612
20.0	8	M661125614	M661160614	M661250614
25.0	10	M661125616	M661160616	M661250616

INSTRUCTIONS FOR MAKING JOINTS

- Cutting the Pipe: If necessary, the pipe can be cut to the required length using a hand saw or powered cutting disc. After cutting, chamfer the end of the pipe, removing 25% of the wall thickness at an angle of 10 to 15 degrees, using a field-lathing tool.
- Marking the Insert Length: To match the socket depth, make a clear insert length marking on the spigot end of the pipe.
- Cleaning and Inspecting: Clean both the spigot and socket ends thoroughly. Ensure the elastomeric seal is undamaged and properly aligned. If any defects are found, replace the seal.
- Lubricating the Spigot End: Apply lubricant to the spigot end, covering it completely up to the insert length marking.
- Aligning the Pipes: Before inserting the spigot end into the socket, ensure that the pipes are properly aligned in a straight line.
- Inserting the Spigot End: Apply a small longitudinal force and smoothly insert the spigot end into the socket until the insert length marking reaches the socket end.
- Ensuring Full Insertion: Ensure the pipe is fully inserted into the socket. Under-insertion may lead to leakage at the joints due to the potential for pipe contraction from thermal effects.
- Avoiding Mechanical Force: Do not use uncontrolled mechanical forces, such as hammers or backhoes, to insert the pipe. Ensure the insertion is done smoothly without forceful impact.





JOINTS AND WATERTIGHT SEALS

To connect the pipes, the male end is inserted into the socket of the other, where an elastic joint is placed. This joint, consisting of a Polypropylene ring and a synthetic rubber lip, ensures the watertight seal is perfectly integrated with the pipe, preventing displacement during installation. Astral OPVC Pro pipes feature a spigot mark that acts as the designated limit for the male end's insertion depth, ensuring water tightness. The pipe assembly length is determined by measuring from the bevelled end of the pipe to the printed cutting mark.

Each version communicates the same technical details but with slight variations in phrasing and structure to provide options for clarity and style.

QUICK, LOW-PRICED INSTALLATION



Astral OPVC Pro pipes offer significant advantages over traditional materials like PVC, HDPE, and ductile iron in terms of weight and installation efficiency. These pipes weigh less than half of PVC and HDPE pipes and are six to twelve times lighter than ductile iron pipes of the same nominal external diameter. Their lightweight nature allows for manual lifting without the need for cranes, making installations more cost-effective—especially for diameters up to DN315 mm.

Thanks to their high resistance, Astral OPVC Pro pipes are particularly beneficial during unloading, trench installation, and pipe-to-pipe connections. Their ease of connection also contributes to faster performance and makes them accessible for installation by less experienced workers, eliminating the need for heavy machinery for pipes up to DN315 mm. As a result, Astral OPVC Pro pipes enable a higher number of meters installed per installation hour compared to alternative materials.

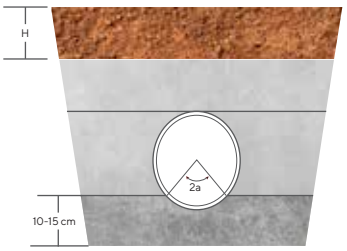
TRENCH PREPARATION GUIDELINES

The trench must be free of stones along the bottom and sides. Small stones (10–20 mm) are acceptable, but they must not dominate the soil composition.
The minimum trench width depends on the pipe's nominal diameter and/or trench depth, as detailed in the table below.

Depth Requirements:

- Without road traffic: Minimum cover over the pipe crown is 0.6 m
- With road traffic: Minimum cover is 1.0 m

Sr No.	Nominal Diameter (mm)	Minimum Width of Trench (m)
1	90 to 250	0.60



Depth Of Trench H (m)	Minimum width if trench B (m)
H < 1.00	0.60
1.00 < H < 1.75	0.80
1.75 < H < 4.00	0.90
H > 400	1.00

BEDDING AND FILLING THE TRENCH – PIPE INSTALLATION GUIDELINES

Pipes must be installed following the steps below:
a) Prepare a sand bed (or fine granular material) 10–15 cm thick before placing the pipe. Ensure the pipe is properly aligned and levelled.
b) Lay the pipe directly on the sand bed. Make sure the entire lower surface is well supported, allowing it to settle into the bed and increase the support angle at the pipe's sides (kidneys).
c) After placing the pipe, fill the side chambers with selected material and compact to >95% Proctor Normal (P.N.).
d) Continue filling the trench with selected material and compact laterally until the pipe is covered by at least 30 cm.
e) Steps (a) to (d) may be completed using natural material from the excavation, provided it contains no large stones or rocks and is capable of withstanding internal pipe pressure.

Filler Material Requirements:
- Natural soil can be used as filler if it meets the following:
- No angular stones or similar sharp materials.
- No particles larger than those specified in below table.
- No soil clumps exceedingly twice the maximum particle size in below table.
- From 30 cm above the pipe to ground level, the trench can be filled with non-selected natural material, compacted directly over the entire surface.

Maximum Particle Size	
Nominal Diameter, dn (mm)	Maximum Particle Size (mm)
dn < 100	10
100 < dn< 300	20
300 < dn< 600	30
dn >600	40

STANDARD FIELD-TESTING PROCEDURE

- **Testing Conditions:** The test should be carried out after the entire pipeline is laid. Seal the ends of each pipeline and fill it with water for the test.
- **Pre-Test Requirements:** Ensure proper backfilling and a solid foundation in the trenches before initiating the test.
- **Test Pressure:** The maximum allowed test pressure should be 1.5 times the maximum design pressure.
- **Exposed Joints for Inspection:** Keep mechanical joints and flanged connections exposed for visual inspection of leaks during the test.
- **Movement of Joint Markings:** Slight movement of the insertion length marking from the socket is normal and can be disregarded, as it is due to pipe contraction under circumferential working stress.
- **Test Completion:** If there is no pressure drop and no make-up water is required after the designated inspection time, the pipe passes the field test.

TRANSPORTATION & STORAGE

Transportation

- When transporting pipes of different diameters, always place the largest diameter pipes at the bottom.
- Alternate between socketed ends and free ends to keep the socket ends free.

Storage

- Avoid dropping or throwing pipes onto hard or sharp surfaces, as this may cause defects or deep scratches.
- Pipes with scratches deeper than 10% of their diameter should be rejected for pressure applications.
- Store pipes horizontally on a flat surface with adequate spacing, supported every 1.5 meters to prevent bowing.
- Stack pipes in layers, alternating between socket and free end so the socket doesn't bear any load.
- Do not stack pipes higher than 1.5 meters to prevent excess weight that could lead to sagging.

To prevent overheating and bowing from direct sunlight, cover the pipes with light-colored opaque material to reflect solar radiation and ensure proper ventilation.



DI (DUCTILE IRON)PIPE, HDPE PIPE VS OPVC PRO PIPE COMPARISION

Parameter	DI (Ductile Iron) Pipe	HDPE Pipe	OPVC Pro Pipe
Design Friction Manning's Coefficient (n Value)	0.011	0.017	0.007-0.009
Flexibility of Pipe Joint Alignment	20-50	Flexible Pipe	9° per socket for 110mm pipe; 2° per socket for larger pipes. Flexible pipe
Type of Fittings Used	CI / DI	MS / CI / DI / HDPE	DI / Majority PVC-O
Availability of Fittings	Readymade fittings widely available	Readymade fittings available	Readymade fittings available
Expected Salvage Value after 30 years	Rs 25,000/MT	Rs 500/MT	100% recyclable, 50% of PVC value
Direct Tapping Facility	Directly by ferrule	Direct tapping not possible; saddle strap used	Direct tapping: saddle strap to be used
Damping Capacity	High specific damping (15-40%) due to graphite flake, low notch sensitivity	Medium	Medium
Application	All applications	Not recommended for high- pressure pumping mains, solvent transport, high-temperature water systems, or aggressive environments	1. Pumping mains / raising mains for water supply and sewage 2. Lift irrigation 3. High-pressure drain and storm water 4. Industrial parks 5. Powerplant water networks 6. Smart city water supply lines
Not Suitable For	Extremely aggressive soils/waters (unless high-performance protection is specified)	High-pressure pumping mains, solvents, chemicals with pH <3 or >12, hot water >60°C continuous, above-ground installation, contaminated ground, major carriageways, risk of third-party damage	Above-ground installation, ground contaminated with organic chemicals, major carriageways, risk of third-party damage
Nature and Frequency of Damage	Impact failure or bursting due to cracks or water hammer is rare. Frequency of damage: very low.	Often damaged by third-party interference, failure due to material degradation is common. Frequency of damage: medium	Frequency of damage: very low. Easy to repair damage with PVC-O service joints.
CO_2 Emission	High from cradle to crate	High due to the use of PE material	Lowest due to 47% ethylene, remainder salt; lightweight, less material

PVC PIPE VS OPVC PRO PIPE COMPARISON

Product Standard	PVC (Polyvinyl Chloride) Pipe	OPVC PRO (Oriented Polyvinyl Chloride) Pipe
Material Structure	Rigid thermoplastic, non-oriented polymer.	Oriented (stretched)polymer, improving strength.
Strength	Moderate tensile strength.	Higher tensile strength due to orientation.
Friction Coefficient (Manning's n value)	0.011-0.017	0.007-0.009
Flexibility	Rigid, with limited flexibility.	More flexible due to the molecular orientation.
Pipe Joint Flexibility	Moderate flexibility in joints.	Higher flexibility at joints, especially in larger diameters (e.g., 9° for 110mm, 2° for large diameter pipes.)
Type of Fittings	Readymade fittings available	Fittings are typically made of DI or OPVC or DI
Availability of Fittings	Widely available	Available but may be more limited compared to standard PVC.
Damage Resistance	Susceptible to damage from impact and UV exposure.	More resistant to impact, with lower damage frequency.
CO_2 Emission	High due to production and material usage.	Lower due to reduced material use lower logistic costs, and lightweight properties.
Resistance to environmental factors	Moderate UV and chemical resistance.	Excellent resistance to UV, chemicalsm and environmental degradation.
Expected Lifespan	50+ years under normal conditions.	50+ years with higher performance in aggressive conditions.
Installation Ease	Standard installation techniques.	Easier installation due to lower weight and flexibility.
Weight	Heavier compared to PVC-O.	Lighter, up to 50% lighter than standard PVC.
Cost	Relatively lower cost.	Higher initial cost but more efficient in long-term use due to durability and lower operational costs.
Use in High-pressure systems	Can be used in moderate pressure applications.	Specifically designed for high-pressure systems, such as pumping mains, sewage and industrial systems.

DOs & DON'Ts

Do's	Dont's
1. Do follow proper handling procedures: Always handle PVC-O pipes carefully to avoid dropping, impact, or damage.	1. Don't use excessive force for joining: Never use uncontrolled mechanical forces such as hammers, backhoes, or any heavy machinery to insert pipes into fittings. This can cause damage to both the pipe and the joint.
Pipes should be lifted properly using appropriate equipment (e.g., slings, hoists) to avoid distortion.	Use smooth, steady pressure to insert pipes to prevent deformation of the pipe or damage to the elastomeric seals.
2. Do ensure proper storage: Store PVC-O pipes in a cool, dry environment, away from direct sunlight, excessive heat, or humidity. Pipes should be placed on a flat surface to prevent bowing or distortion. Ensure pipes are kept off the ground to avoid soil contamination.	2. Don't exceed recommended operating pressures: Always adhere to the maximum pressure rating specified by the manufacturer. Exceeding this pressure can cause the pipe to fail. Never subject the pipes to high pressures for extended periods.
3. Do use appropriate fittings: Always use fittings specifically designed for PVC-O pipes to ensure proper connection and sealing. Ensure that the fittings match the pipe's diameter and pressure rating.	3. Don't use damaged pipes: Inspect each pipe before installation. Do not use pipes with visible cracks, chips, or any other form of damage. Damaged pipes can compromise the integrity of the system. Do not attempt to install any pipe that appears deformed or has been improperly stored.
4. Do inspect before installation: Before installation, visually inspect the pipes and fittings for defects such as cracks, cuts, or warping. Check for any deformation or misalignment that could affect the integrity of the joint.	4. Don't install above ground without protection: PVC-O pipes should not be installed above ground in areas prone to heavy traffic or external physical damage unless the installation is properly protected. Install protective covers or use appropriate barriers when pipes are installed above ground.
5. Do follow installation guidelines: Adhere strictly to the manufacturer's installation instructions. Follow recommended alignment techniques to ensure pipes are installed correctly. Ensure that pipes are aligned properly before joining them to prevent strain on the joints.	5. Don't use PVC-O for solvents or highly corrosive fluids: PVC-O pipes should not be used for transporting solvents, chemicals with extreme pH values (less than 3 or greater than 12), or highly corrosive materials unless the manufacturer specifies it is suitable. If using PVC-O for chemical transportation, always check the compatibility of the pipe material with the fluid.
6. Do consider temperature limits: PVC-O pipes are designed to perform well under a range of temperatures, but excessive heat or cold can affect their structural integrity. Check the manufacturer's guidelines for acceptable temperature ranges and operating conditions for your specific installation.	6. Don't overtighten joints: Over-tightening joints can damage the elastomeric seals and may lead to leakage or joint failure. Ensure that the proper torque is applied as specified by the manufacturer. Tighten fittings gradually, and avoid excessive force when securing joints.
7. Do plan for expansion and contraction:	7. Don't store pipes unprotected in direct sunlight:

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