

COMPOSITE PIPES

TECHNOLOGY · APPLICATIONS · ADVANTAGES

The Next-Gen Multi-Layer Composite Piping System



CORROSION
RESISTANT



HIGH
STRENGTH



LIGHTWEIGHT
& FLEXIBLE



THERMAL
STABILITY



LONG SERVICE
LIFE

INNOVATIVE · RELIABLE · SUSTAINABLE

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1. Introduction & The Evolution of Fluid Dynamics

The modern built environment demands a fundamental shift in infrastructure reliability. For decades, specifying engineers were forced into a compromise: the structural rigidity of metallic pipes plagued by corrosion, or the chemical inertness of polymers hampered by high thermal expansion. The transition to multi-layer composite systems represents a paradigm shift, eliminating the mechanical limitations of polymer-only systems through metallic reinforcement. Backed by a 40-year legacy of engineering excellence, Prayag's PE-AL-PE systems provide a definitive solution for building longevity and fluid safety.

Technically defined, a composite pipe is a next-generation pressure solution manufactured in strict compliance with IS 15450:2022. This architecture utilizes a PE-AL-PE (Polyethylene-Aluminum-Polyethylene) structure, engineered to neutralize the oxidative vulnerabilities of traditional metal while providing the form-stability that standard plastics lack.

By integrating a form-stable aluminum core, this evolution solves the dual problem of plastic's thermal instability and metal's corrosive degradation. However, understanding the strategic value of this system requires a granular analysis of its physical architecture.

Stronger Materials. Smarter Solutions. Better Tomorrow.

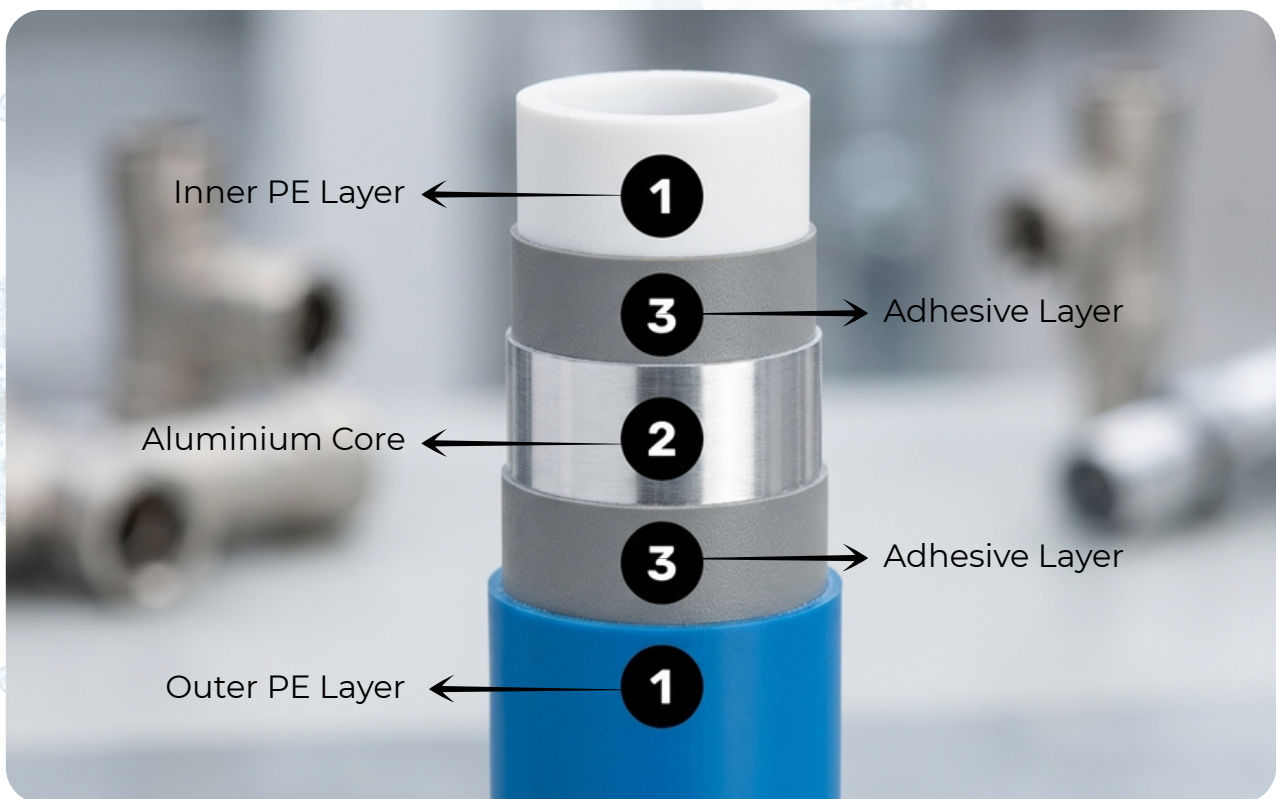


2. The Anatomy of a Composite Pipe: Manufacturing & Layers

In high-performance engineering, material synergy is the foundation of system integrity. A single-material pipe is bound by its inherent molecular weaknesses; conversely, a five-layer composite structure leverages the discrete strengths of each material to create a superior mechanical whole.

The Five-Layer Structural Breakdown:

- **Inner PE Layer:** Composed of Food Grade Polyethylene, this layer ensures hygienic fluid transport. Its exceptionally smooth bore reduces surface friction, significantly lowering pressure drops and preventing scale accumulation.
- **Adhesive Layers (Dual):** These specially formulated bonding agents are the critical interface. They ensure permanent lamination and prevent delamination even under extreme fluctuations in temperature and pressure.
- **Aluminum Core:** Featuring overlap-welded aluminum, this core serves as a 100% oxygen and light barrier. This specific welding technique is the driver of "form-stability," allowing the pipe to retain its shape after bending without any "spring-back."
- **Outer PE Layer:** Provides the primary defense against environmental stressors, including UV radiation, corrosive soil conditions, and site wear.



This physical robustness is the prerequisite for the highly specialized applications found across industrial and commercial sectors.

3. Product Portfolio & Versatile Industry Applications

In complex infrastructure, "color-coded safety" is a non-negotiable organizational standard. Prayag's portfolio is strategically classified by flow type, allowing for immediate identification of the medium — a vital factor in risk mitigation and emergency protocols.

Product Line	Color Code	Strategic Application
LIFE flow	Black	Standard Water Supply / ISI-compliant applications.
EVER flow	White	PRT (Potable/Residential) Water supply systems.
SAFE flow	Yellow	LPG and Natural Gas pipeline supply.
OXY flow	Blue	Medical Air & Oxygen supply (Healthcare/Industrial).

Key Strategic Application Areas:

- **Healthcare Infrastructure:** Specialized OXY flow systems for hospital headwalls.
- **High-Rise Residential:** Vertical risers and horizontal distribution networks where pressure integrity is paramount.
- **Food Processing:** Utilizing food-grade inner layers for safe packaging and processing.
- **Automotive Assembly:** Robust compressed air delivery for heavy industrial lines.



These diverse applications are enabled by a design that offers distinct competitive advantages over traditional materials.

4. The Engineering Edge: Comparative Strategic Advantages

From a project management perspective, material choice is a strategic business decision centered on the Total Cost of Ownership (TCO). While the initial procurement cost of composite systems is a factor, the long-term reduction in project risk and lifecycle maintenance labor offers a superior ROI.

- **Thermal Stability:** The aluminum core ensures an extremely low expansion rate, preventing the "sagging" seen in standard polymers during thermal cycling.
- **Hydraulic Efficiency:** The smooth interior bore facilitates 30% more flow than traditional alternatives, reducing energy consumption in pumping systems.
- **Mechanical Integrity:** The overlap-welded core allows for hand-bending with no spring-back, simplifying complex routing and drastically reducing the number of joints required.
- **Risk Mitigation:** By utilizing coil lengths up to 300m, the system eliminates up to 80% of potential leak points compared to rigid 6-meter pipe sections.

ENGINEERED FOR EXCELLENCE.BUILT TO LAST.

Our composite pipes are designed to deliver superior performance, long-term reliability, and unmatched value across every application.



50 YEARS WORK LIFE

Engineered for a long service life of up to 50 years, ensuring lasting reliability.



MADE FROM FOOD GRADE MATERIAL

Safe, non-toxic, and compliant with food-grade standards for pure and clean flow.



LIGHTWEIGHT

Up to 70% lighter than metal pipes, making handling, transportation & installation easier.



EASILY BENDABLE

Flexible design allows for easy bending and routing—ideal for complex layouts.



EASY INSTALLATION

Saves time and labor with simple cutting, joining, and quick installation.



EXCELLENT UV RESISTANCE

Built to withstand harsh sunlight and outdoor conditions without degradation.

5. Technical Specifications & Material Classification

Precision tolerances are mandatory for safety-critical installations. The following data represents the more rigorous industrial standards for the PE-AL-PE system.

Aluminum Thickness & Tolerance			
S.No.	Nominal Pipe size (OD) (mm)	Minimum Aluminium Thickness (mm)	Tolerance on minimum Aluminium Thickness (mm)
1	14	0.18	0.03
2	16	0.18	0.03
3	20	0.23	0.03
4	25	0.23	0.03
5	32	0.28	0.03
6	40	0.33	0.03

Operational Dimensions & Coil Lengths					
Description	1216 (16mm)	1620 (20mm)	2025 (25mm)	2532 (32mm)	3240 (40mm)
Equivalent NB Size (Inch)	1/2"	3/4"	1"	1¼"	1½"
Minimum Wall Thickness (mm)	1.7	1.9	2.3	2.9	3.4
Maximum Coil / Straight Length (m)	300	250	200	150	150

PE Compound Characteristics:

- Base Density: 940.4 – 948.0 kg/m³ (IS 7328).
- Melt Flow Rate: 0.4 – 0.8 g/10 min (IS 2530).
- Carbon Black Content: 2.5 ± 0.5% by mass.

6. Rigorous Quality Assurance & Test Methodologies

Technical tolerances are meaningless without the empirical verification of a multi-stage QA protocol. Quality Assurance is the bridge between a specification and a functional reality.

Standardized Testing Protocols:

- **Thermal Stability:** Oxidation Induction Time (OIT) >20 minutes at 200°C as per Annex B of IS 4984.
- **Material Integrity:** Tested via IS 2530 (MFR and Carbon Black) and IS 7328 (Density).
- **Multi-Layer Bonding:** Rigorous checks to ensure zero delamination under sustained pressure.
- **Dimensional Verification:** Constant monitoring of wall thickness and out-of-roundness (tolerances up to 1.00mm for size 3240).

Architect's On-Site Quality Checklist:

- Confirm IS 15450:2022 marking and batch traceability.
- Verify OIT >20 minutes via manufacturer test reports.
- Inspect cross-section: Aluminum core must be centered and overlap-welded.
- Validate color coding against the intended medium (e.g., Blue for Medical Air).



7. Professional Installation: Tools, Fittings, and Best Practices

The jointing system is the "weakest link" in any fluid network. Prayag's ecosystem is designed to mitigate this risk through high-precision mechanical jointing.

The Fittings & Tools Ecosystem:

- **Nylon Fittings:** High-strength, modular components including Union Couplers (20-40mm), Equal Elbows, and Tees.
- **Composite Brass Fittings:** Designed for harsh environments. This includes Unequal Couplers, Male Threaded Adapters, and 2-way/3-way Manifolds for complex industrial assembly.
- **Tools:** Engineered to adhere best fitting practices. This includes Crimping Tool for permanent, leak-proof joints, Pipe Cutter for clean, perpendicular cuts up to 36mm, Bevelling Calibrator for protecting the fitting's O-rings during insertion, Inner and outer Bending Springs to achieve tight radii without kinking.

Nylon Fittings	Brass Fittings		Tools
Union Coupler	Unequal Coupler	Equal Elbow 90°	Out Spring
Equal Elbow 90°	Male Threaded Adapter	Unequal Elbow 90°	Inner Spring
Equal Tee	Unequal Tee	Union Coupler	Pipe Cutter
Female Elbow	Female Threaded Adapter	Equal Tee	Crimping Tool
Female Tee	Female Threaded Tee	Manifold - 2 Way Outlet	Manual Pipe Bending
Female Threaded Adapter	Male Threaded Elbow 90°	Manifold - 3 Way Outlet	Bevelling Calibrator
Male Threaded Adapter	Female Threaded Elbow 90°		

Strategic Perspective: By utilizing long coil lengths (up to 300m) and "no spring-back" bending, contractors can achieve minimal installation downtime and a significantly lower risk of leakage compared to traditional materials.

The Best Practices

1. Professional Preparation and Jointing

Properly preparing the pipe before attaching a fitting is the most critical step in ensuring a long-lasting connection:

- **Square Cutting:** Always use a dedicated pipe cutter to ensure the cut is perfectly square. An uneven cut can prevent the pipe from seating correctly in the fitting, leading to potential leaks.

- **Calibrating and Bevelling:** After cutting, you must use a bevelling calibrator. This tool rounds out the pipe end (which may have been slightly flattened during cutting) and creates a bevel on the inner edge. This ensures the pipe slides smoothly over the fitting's O-rings without damaging them.
- **Secure Crimping:** For permanent, professional installations, use a crimping tool. This tool provides the necessary mechanical force to create a uniform, high-pressure seal between the pipe and the fitting.

2. Selecting the Right Fitting Material

Choosing between nylon and brass fittings depends on the environment and the technical requirements of the project:

- **Use Brass for Harsh Environments:** Brass fittings are recommended for harsh environments due to their high strength and long service life.
- **Use Nylon for Economy:** Nylon fittings are a suitable, cost-effective choice for standard water supply installations where the extra strength of brass is not required.
- **Unequal Connections:** If you need to transition between different pipe sizes (e.g., from 25mm to 20mm), you must use brass unequal couplers, tees, or elbows, as these specialized configurations are generally only available in the brass range.

3. Minimizing Fittings Through Strategic Bending

A key best practice for this system is to minimize the number of fittings used. Because composite pipes are flexible and form-stable, you can often bend the pipe instead of using an elbow fitting:

- **Use Bending Springs:** When making a turn, use an inner or outer spring. This prevents the pipe from kinking or collapsing, maintaining the full flow diameter and structural integrity of the aluminum core.
- **Leverage Long Coil Lengths:** By using coils up to 200m, you can run long sections of pipe without intermediate union couplers, which reduces the total number of potential failure points and improves flow efficiency.

4. Advanced System Routing

- **Manifold Distribution:** For complex layouts, such as in bathrooms or industrial stations, use 2-way or 3-way brass manifolds. This allows for a centralized distribution point, making the system easier to manage and reducing the overall number of individual fittings required across the network.
- **Threaded Transitions:** When connecting to existing metal fixtures or appliances, ensure you use the appropriate male or female threaded adapters to maintain a secure and professional transition between different piping materials.



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