



**SINGLE STACK  
AERATOR SYSTEM**

**AERATOR**  
SINGLE BODY STRUCTURE

## The Hydraulics in High-Rise Building Wastewater Stacks

In high-rise stacks, falling wastewater creates a powerful "piston effect" (plug formation). This results in two major problems:

**Positive Pressure:** Compresses air below the plug, forcing sewer gases and dirty water back up into fixtures on lower floors.

**Negative Pressure:** Creates a vacuum above the plug, siphoning water out of fixture traps and allowing foul sewer gases into living spaces.

## Prince Pipes Engineered Solution

The Prince Aerator is an innovative, single-stack solution designed to transform SWR systems in multi-Storey buildings by integrating the traditional three-stack (soil, waste, and vent) drainage system into a single, efficient pipe.

Our new single-piece **AERATOR** gravity drainage fitting is the definitive solution for the challenges outlined above, actively managing pressure within the vertical building drainage stack. Its unique, integrated design ensures seamless hydraulic performance by:

- **Active Plug Prevention (Air-Water Separation):** Utilizes a dedicated mixing chamber and vent aperture to introduce air, breaking the free-falling water column and preventing hydraulic plug formation.
- **Optimised Flow & Velocity Control:** The internal geometry creates a controlled, smooth, swirling flow along the pipe walls, which significantly reduces turbulence and prevents pressure surges.
- **Continuous Pressure Equalisation:** Strategically introduces air into the wastewater stream, equalizing internal pressure to near-atmospheric levels and guaranteeing that all fixture trap seals remain intact.

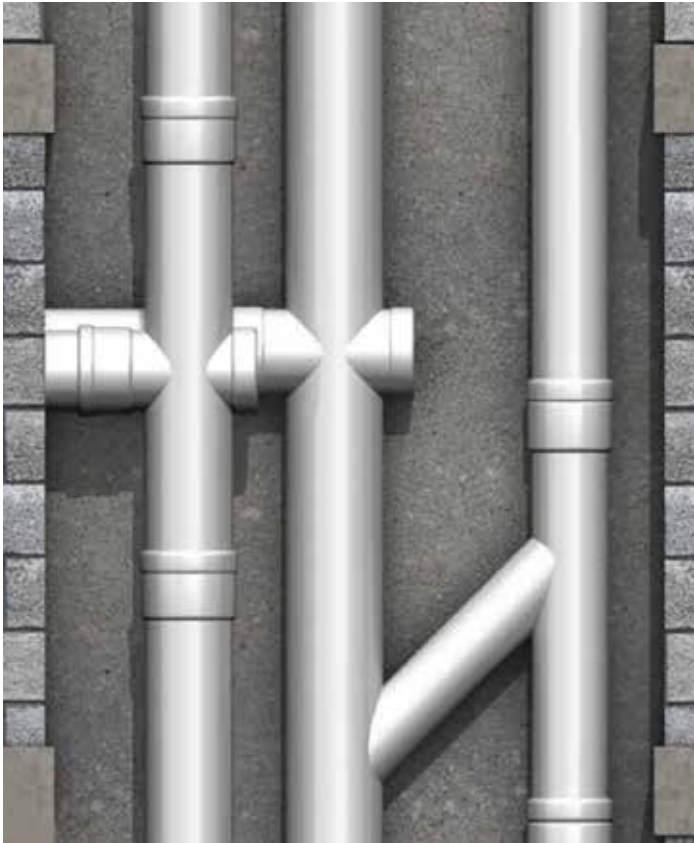


## Applications

The Prince Aerator's single-stack technology provides a superior, reliable, and hygienic drainage solution, making it ideal for a wide range of multi-Storey constructions:

- **High-Rise Residential Buildings:** Essential for large apartment and housing complexes to ensure a stable, safe, and odour-free drainage system for all units by preventing trap seal loss.
- **Commercial and Office Towers:** Crucial for managing the high-velocity discharge from numerous fixtures on multiple floors, guaranteeing consistent performance under heavy, simultaneous usage.
- **Hospital and Healthcare Buildings:** Critical for infection control and hygiene by maintaining the integrity of drainage traps, ensuring the sewer gas barrier remains functional and protecting patients and staff.
- **Shopping Malls and Entertainment Complexes:** Allows the drainage system to effectively handle peak visitor flows in public restrooms without the risk of unhygienic splashing or foul odours.
- **Educational Institutes:** Ensures reliable drainage performance in multi-Storey dormitories and university buildings, providing a system that can safely handle high-density and simultaneous fixture use.

## Advantages Between 3-Stack System v/s Single Stack System with Aerator



Feature	Single Body Aerator System	Conventional Two-Pipe System
<b>Piping and Cost</b>	Significantly reduced piping and labor costs by eliminating the need for a separate vent stack. This makes installation faster and less complex.	Requires extensive, costly, and labor-intensive vent piping throughout the building height.
<b>Pressure Control</b>	Actively manages pressure within the stack using specialized aerator fittings and a pressure relief line at the base. This prevents both positive and negative pressure buildup, which can siphon a fixture's water seal.	Passively relies on vent pipes, which may be insufficient to handle large or sudden pressure fluctuations in tall buildings stack. This can lead to siphonage of water seals, allowing sewer gases to enter the building.
<b>Space Optimization</b>	Minimizes the footprint of the drainage system, maximizing usable floor space on each floor level of building.	Consume valuable building space due to separate vent pipe system and its angled connection with stack.
<b>Reliability</b>	Increases reliability with its single-piece construction, which reduces the number of joints and potential points of failure. Fewer connection points minimize the risk of leaks and future maintenance issues.	Relies on multiple joints and fittings, making the system more susceptible to leaks and wear over time.
<b>Best Suited For</b>	Ideal for medium to high-rise buildings where cost savings, space efficiency, and high performance are primary concerns.	Commonly used in older or smaller buildings where traditional plumbing methods are sufficient. Less efficient for modern, large-scale projects.

## Key Benefits of the Prince Aerator System

The Prince Aerator delivers unmatched performance, efficiency, and hygiene, offering distinct advantages over conventional systems:

- 1. Guaranteed Pressure Stability:** Highly effective at actively managing pressure created by both gas (pneumatic) and wastewater (hydraulic) forces, ensuring a safe and stable system.
- 2. Maximum Connection Flexibility (Up to 6 Outlets):** Provides supreme design flexibility with up to six connection options at a single floor level (Refer to Fig. 1):
  - 3 outlets of 110 mm for soil waste
  - 3 outlets of 75 mm for liquid waste
- 3. Significant Cost & Space Savings:** Eliminates the need for extensive vent piping, resulting in a system that saves material, reduces joints, and maximizes usable duct space.
- 4. Simplified Installation:** Achieves a complete single-stack system, requiring no separate ventilation pipes and greatly simplifying the overall installation process.
- 5. Optimised Flow Dynamics:** Acts as a velocity reducer on every floor, actively controlling the flow to prevent destructive hydraulic plug formation.
- 6. Superior Hygiene Protection:** Reliably protects the trap seal in the sanitary system, which is critical for maintaining hygiene and preventing foul sewer gases from entering living spaces.
- 7. Ease of Use:** Engineered for quick, easy installation and streamlined long-term maintenance.

## Product Specification

### Connection Options

Each Aerator allows 6 branch connections:

- 3 x 110mm (for all fixtures)
- 3 x 75mm (for all fixtures except WCs)

## Joining Method

Rubber ring / Push-fit joints  
(with Prince lubricant)

## Available in

Light grey, Dark grey and Light Blue colours

## Item Details

Code	Category	Material	Dimension
SIM107275	ULTRAFIT	PE	110mm
SIM107290	ULTRAFIT	PE	110mm
SIM108289	DECILO	PE	110mm

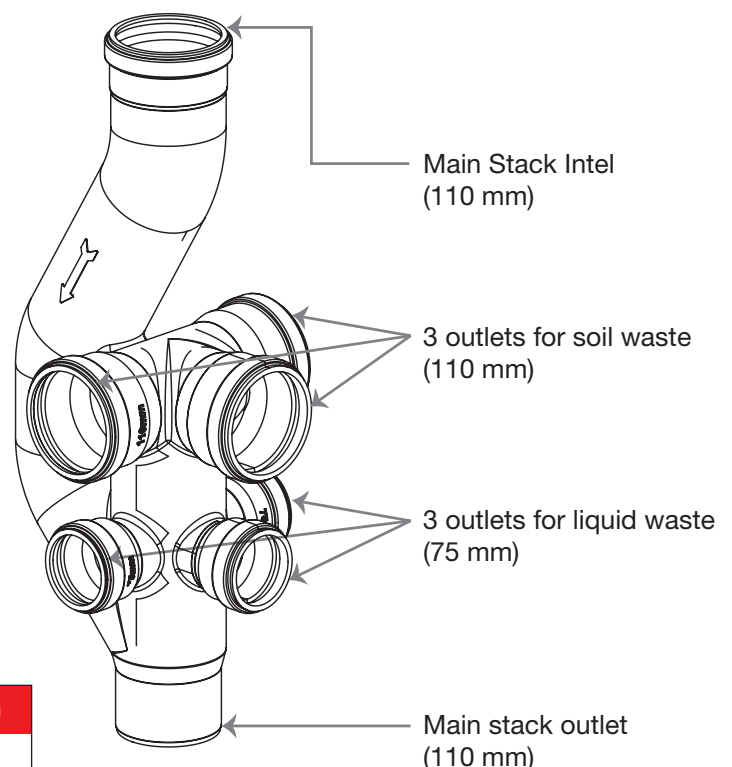


Fig. 1

## How Prince Single Piece Aerator Works?

The Prince Aerator fitting consists of three primary components:

### 1. Deviation Chamber

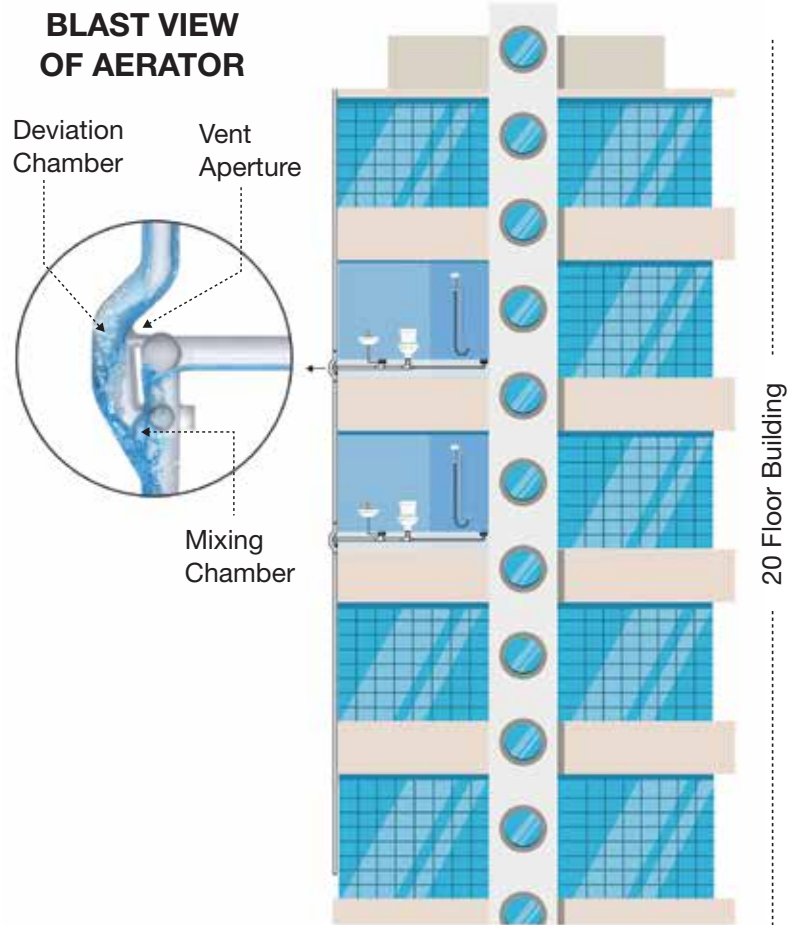
Fast moving wastewater from upper floor can create a solid plug in vertical drainage stack. The deviation chamber acts as a special compartment designed to catch this falling wastewater. Its purpose is to slow down the falling wastewater flow by reducing velocity before the wastewater flow attains terminal velocity.

### 2. Mixing Chamber

The mixing chamber allows wastewater entering from floor on which Aerator is installed and smoothly mix with wastewater coming from upper floors through vertical stack. Mixing chamber mix both flows without splashing, turbulence and diverts wastewater flow downwards in stack.

### 3. Vent Aperture

The vent aperture of an Aerator fitting facilitates pressure equalization within the wastewater vertical drainage stack. A vent aperture allows air to enter the main vertical pipe to prevent the formation of negative pressure which could siphon water seals from the fixture's traps. Simultaneously, it permits excess air to escape, preventing positive pressure surges which may cause gurgling noise. By ensuring balanced air pressure.



Thus, our Aerator design ensures that all the wastewater flows down smoothly and efficiently, without gurgling noises, bad smells & pressure problems throughout the entire stack of building.

## Aerator Stack Flow Capacity

Our Aerator is engineered for high-rise single-stack drainage systems.

Specification	Value
<b>Calculated Flow Rate</b>	Up to 7.21 lps (litres per second). Maximum capacity for a 96 mm stack diameter.
<b>Design Basis</b>	Industry-standard stack capacity formula with stack fullness ratio of 0.27.
<b>Recommendation</b>	All specific project designs and calculations must be verified by a qualified plumbing engineer to ensure compliance with local codes and project requirements.

## Hydraulic Basis for Calculation (According to EN 12056-2)

Wastewater flow is calculated using Discharge Units (DU) assigned to each sanitary appliance, combined with a Frequency Factor (K) based on the building's usage.

### 1. Discharge Units (DU's)

Discharge Units represent the flow rate of water for a specific appliance (in l/s).

Appliance	Discharge Units (DU's)
Wash basin, Bidet	0.5
Shower without plug	0.6
Shower with plug	0.8
Urinal with cistern	0.8
Urinal with flushing valve	0.5
Bath/Bathtub	0.8
Kitchen Sink	0.8
Dishwasher (household)	0.8
Washing Machine 6.0 kg	0.8
WC with 6.0/7.0 litres	2.0*
WC with 9.0 litres	2.5*

**Note:** \*Values for WC with siphon flush cisterns only.

### 2. Temperature Handling (Material)

- Our Aerator is made from a durable plastic called polyethylene.
- **Hot Water Tolerance:** Designed to handle short-term hot water discharges up to 60°C (140°F).
- **Suitability:** Suitable for typical household use (e.g., sink, dishwasher discharge).
- **Limitation:** Not intended for a continuous flow of hot water. Specific needs for non-domestic applications (like commercial kitchens) must be determined individually by a professional.

### 3. Wastewater Flow Rate Calculation for AERATOR

- The expected wastewater flow rate (QA) is calculated using the total sum of discharge units ( $\Sigma DU$ ) and a frequency factor (K):
- $Q_A = 0.5 \cdot \sqrt{\Sigma DU}$
- The Frequency Factor (K) accounts for the typical simultaneous usage of sanitary appliances in the building:

Usage Of Appliances	K (Frequency Factor)
<b>Intermittent use</b> (e.g., dwelling, guesthouse, office)	0.5
<b>Frequent use</b> (e.g., hospital, school, restaurant, hotel)	0.7
<b>Congested use</b> (e.g., public toilets and/or showers)	1.0
<b>Special use</b> (e.g., laboratory)	1.2

# Example Calculation: Residential High-Rise

**Scenario:** 24 Storey's Residential building with 2 flats on each floor, with the following appliances per floor:

Appliance	Numbers	DU each	Total DU's
Wash basin	2	0.5	1.0
WC's 7.5 litres	2	2.0	4.0
Bath/Bathtub	2	0.8	1.6
Kitchen Sink	2	0.8	1.6
Total Discharge per floor ( $\Sigma$ DU)			8.2
Total Discharge from 24 floors i.e. ( $\Sigma$ DU* 24)			196.8

Simultaneous flow from 24 floors =  $Q_A = 0.5 \cdot \sqrt{\Sigma DU} = Q_A = 0.5 \cdot \sqrt{196.8} = 7.01$  lps

Maximum flow rate of Aerator = 7.21 lps

Hence Aerator stack of 110mm is suitable for 24 storeys and 2 flats on each floor with above appliances is suitable.

**Result:** Since 7.01 lps < 7.21 lps, the 110 mm Aerator stack is suitable for this 24-storey residential configuration.

## Design Support

Prince Pipes offers comprehensive design support for drainage and water supply systems.

The company provides end-to-end assistance that covers key aspects of project planning and execution, including:

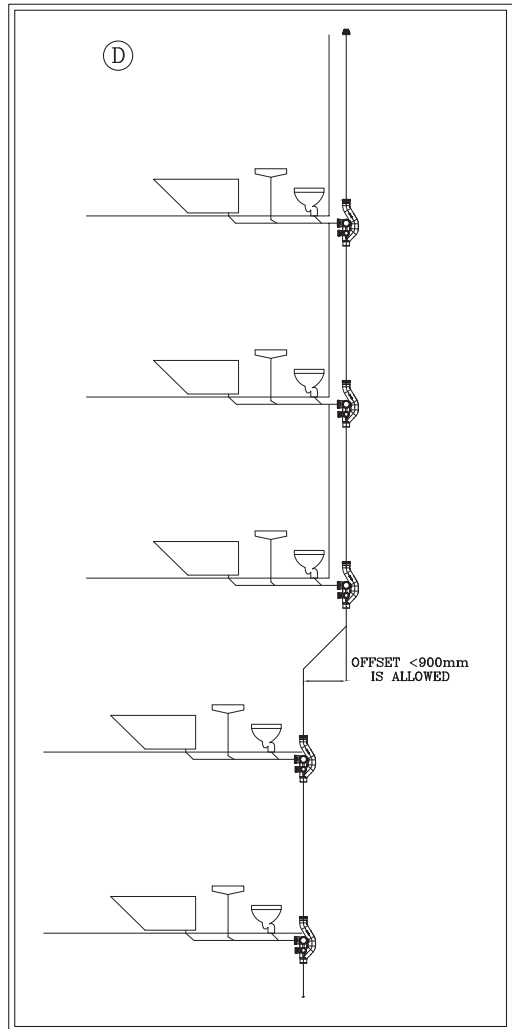
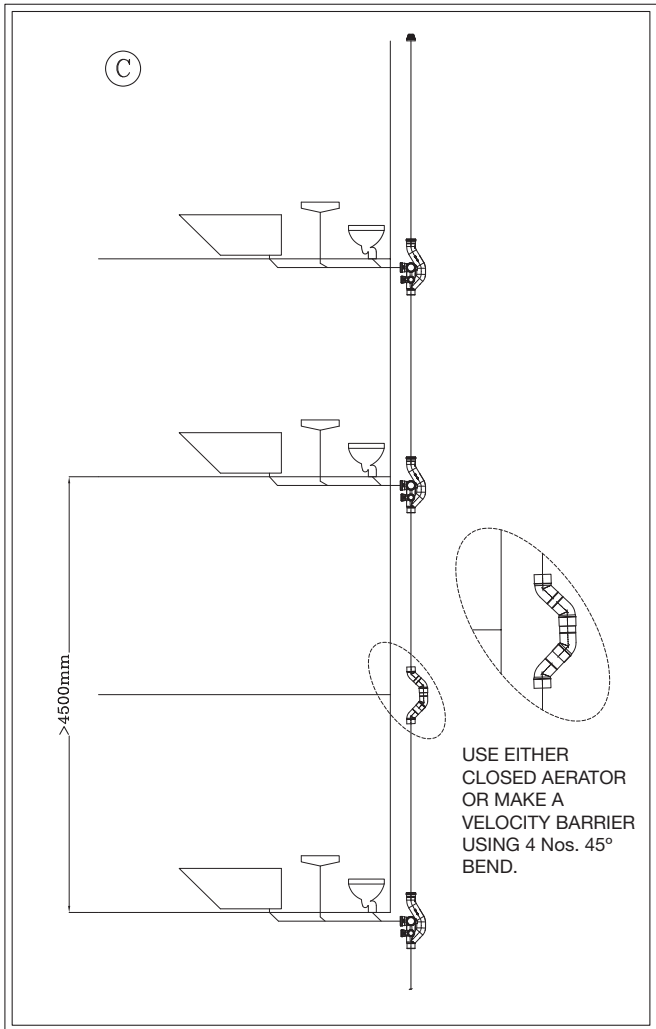
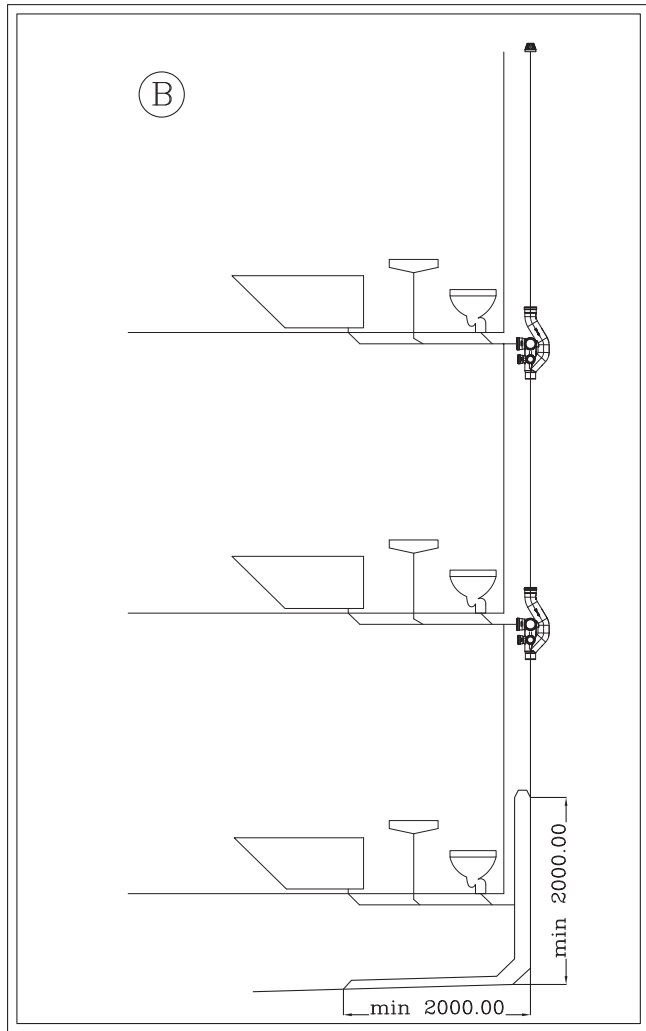
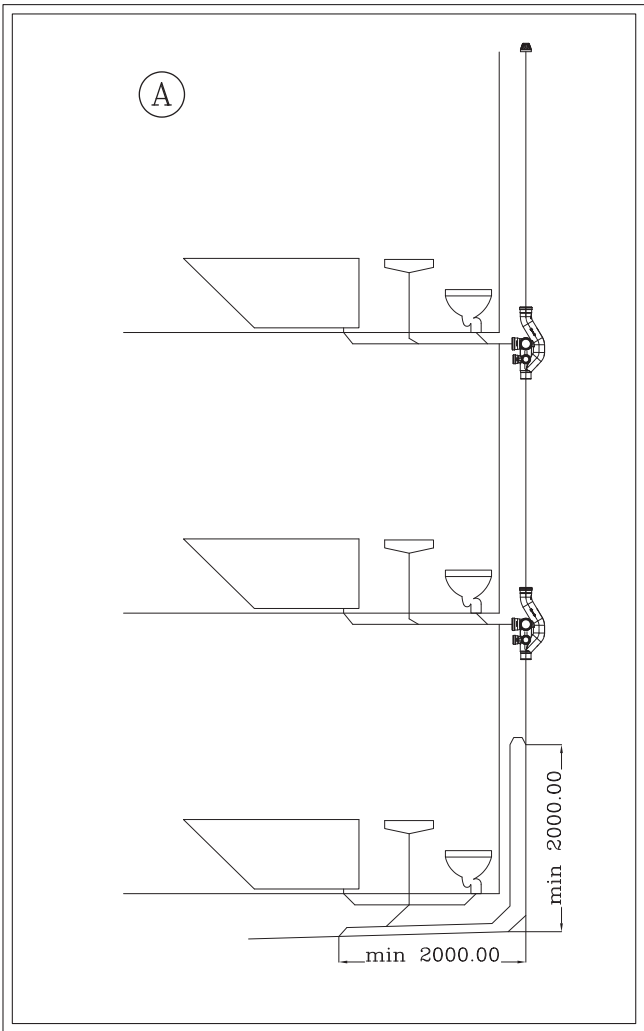
- System Design
- Detailed Product Information
- Installation Guidelines
- Support for Piping Layout Optimisation
- BOQ (Bill of Quantities) Optimisation Support
- Pre and Post-Installation Support
- On-Site Audits

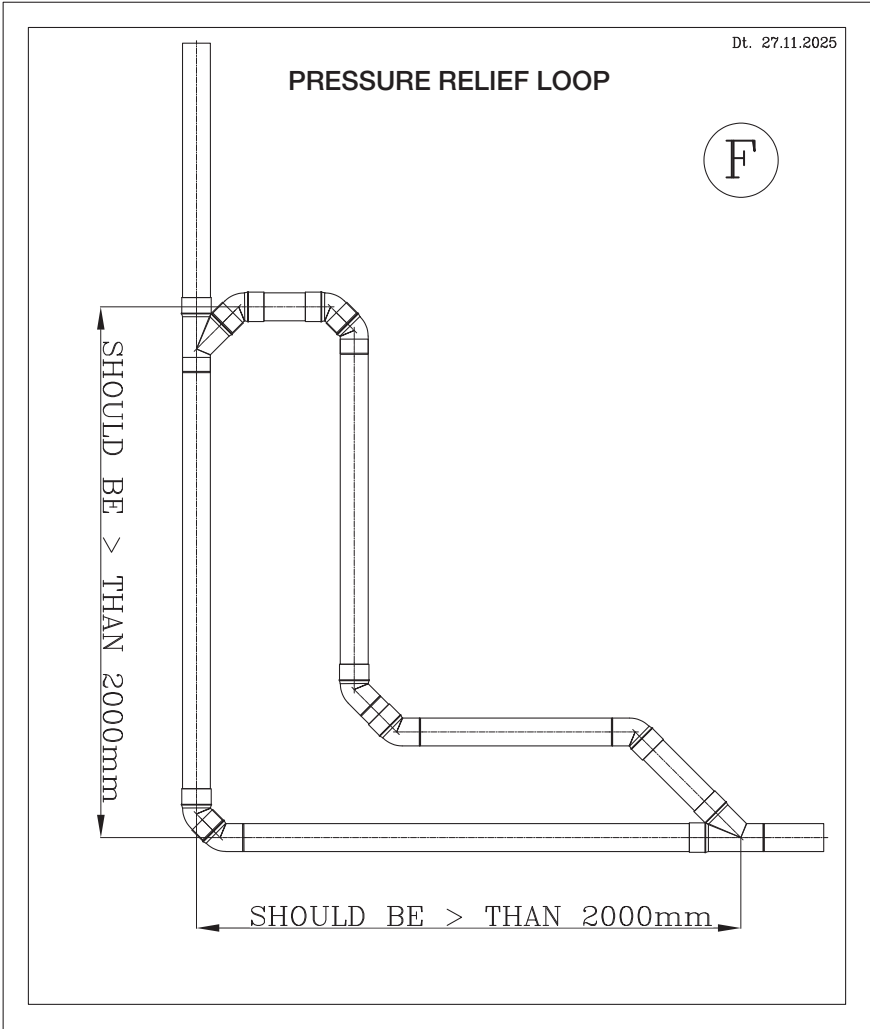
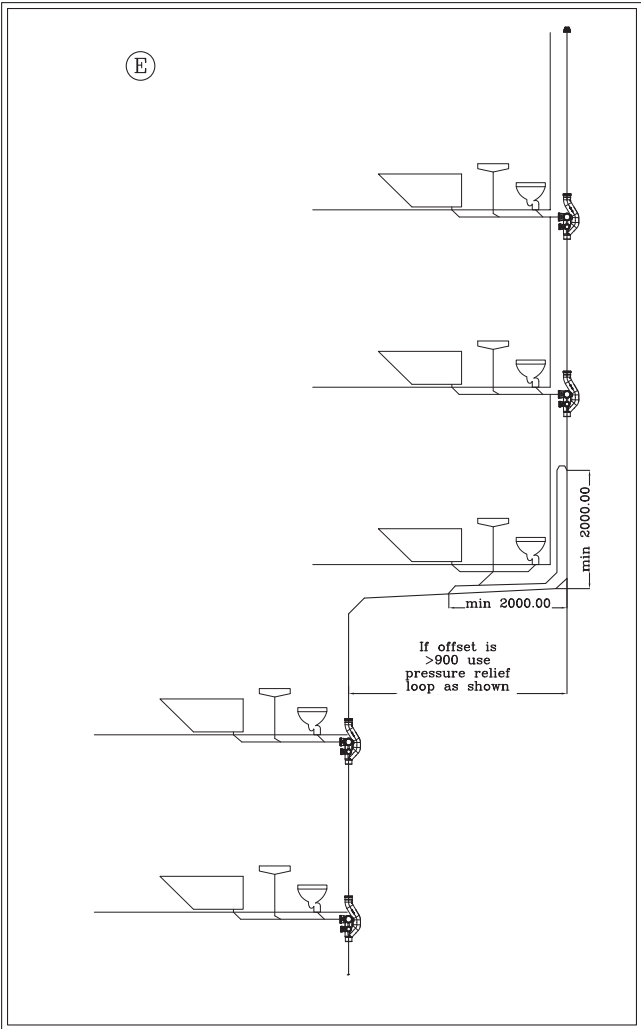
By leveraging these resources, designers and project planners can confidently design and implement plumbing systems using Prince Pipes, ensuring efficient, reliable, and high-quality installations.

## Simplified Key Installation Guidelines

To guarantee the long-term performance and safety of the drainage system, adhere to these key installation guidelines.

- **Pressure Relief Loop:** A pressure relief loop is mandatory at the base of the vertical stack and at major horizontal offsets. This critical component ensures a smooth transition of wastewater flow. **(Figure F)**  
**Note:** The lowest floor's branch connection must be made to the horizontal pipe of this loop, never directly to the vertical stack. **(Refer figure A & B)**
- **Maintain Consistent Diameter:** The vertical aerator stack pipe must maintain a constant size from top to bottom. Do not reduce or widen the diameter, as this can disrupt the hydraulic balance.
- **Spacing and Offsets:** To ensure optimal pressure management, the vertical distance between two aerators should not exceed 4.5 meters **(Refer Figure C)**. Offsetting the stack by more than 0.9 meters is not permitted without a dedicated pressure relief loop to manage the resulting turbulence. **(Refer Figure D & E)**
- **Ground Floor Connections:** Ground floor fixture drains should be connected to the pressure relief loop's horizontal or side branch, never directly to the vertical stack. **(Refer figure A & B)**
- **Access Fittings:** For ease of future maintenance, install access fittings at least every five stories.





# Case Study - Our drainage systems in real life projects



From residential projects to commercial spaces, Prince Pipes's Aerator has been installed to provide reliable and efficient drainage management. Let's get an insight into why our systems were selected for the projects below.

## Tulip Yellow Residential Township

Its construction began in 2019, our Aerator is used in the prestigious project of Tulip Yellow – Gurgaon, which is a township of ground +40 floors with 6 towers, more than 600 apartments.

### Challenge

#### Managing Foul Gases and Multiple Pipelines in Large Projects

### Solution

- 1) Our Aerator reduced the need for multiple pipelines by combining them into **single stack system**.
- 2) It facilitated smooth passage of foul gases generated during the waste flow, thus contributing to the overall efficiency and hygiene of the drainage system of this township.



## Goel Ganga "Altus" High-Rise

The modern 21 storey building in the Kharadi area of Pune, Maharashtra comprises 2 towers with 400 apartments.

### Challenge

#### Limited Duct Space and Risk of Leaks

### Solution

- 1) Improved drainage performance:  
The **single stack system** approach reduced the number of joints which also helped in prevention of maintenance and leakage issues.
- 2) Space saving:  
**Single stack system** helped save the duct space which benefited this highrise project.



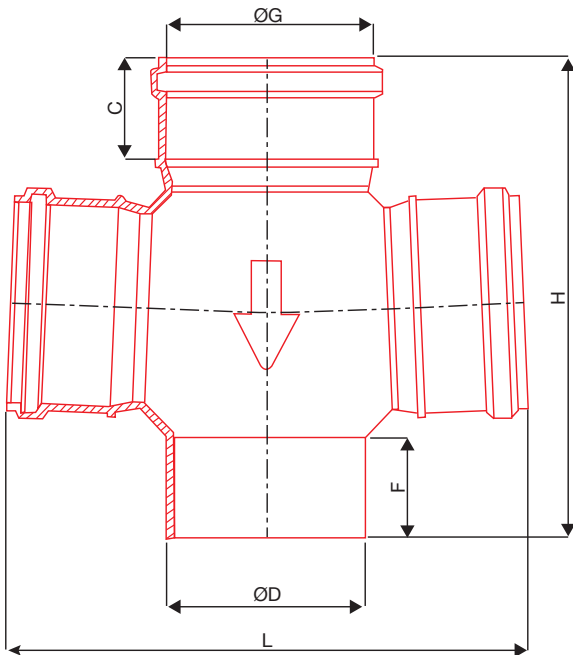
# Ball Fitting 180° Tee

## For Low Rise Building

Imagine the pipes that take all the used water (from your sinks, toilets, and even rainwater) out of your house – that's your SWR system. Normally, this involves several complex connections.

Now, think about a special plumbing piece, like a "T" shape, but even smarter. Prince Pipes has made something called the "Ball Fitting 180° Tee".

## Technical Specs:



SIZE	C	ØG	ØD	F	H	L
110mm	56.50	110.00	110.00	57.00	267.00	289.00



## Item Details

Code	Category	Dimension
SIM107291	ULTRAFIT	110mm
SIM107188	ULTRAFIT	110mm
SIM108290	DECILO	110mm

Here's why it's a big deal for **low-rise buildings** (like houses or smaller apartments):

## Key Advantages of the Ball Fitting 180° Tee

**One Piece, Many Jobs:** Instead of needing multiple parts to connect different drain lines (for toilet waste, sink water, and rainwater), this "Ball Fitting 180° Tee" is a single, ready-to-use piece.

**Built-in Seal:** It has a rubber ring inside its connections. This means when you push the pipes into it, you get a super tight, leak-proof seal.

**Optimal Flow & Ventilation:** Its smooth, rounded "ball design" maximizes water flow, prevents clogs, and has built-in air ventilation. This often eliminates the need for a separate vent pipe, balancing air pressure and preventing gurgling.

**Saves Space:** It brilliantly combines soil, waste, and even vent lines into a single pipe. This significantly reduces the space needed for plumbing in walls or ceilings during construction.

**Economical:** By requiring fewer pipes and fittings overall, it helps lower both construction and long-term operational costs.

**Lightweight:** Its design makes it easy to handle, transport, and install, saving time and effort on-site.

Thus, the "Ball Fitting 180° Tee" is an innovative, all-in-one plumbing connector that makes installing reliable drainage systems in smaller buildings much simpler, more efficient, and cost-effective. It's a smart choice for both professionals and homeowners seeking a durable and easy-to-install solution.

## Details:

• **Size:** 110mm, with two side connections • **Joining:** Easy "Push Fit" using the internal rubber ring.



## **PRINCE PIPES AND FITTINGS LIMITED**

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