

The design of modern building drainage and ventilation systems has been developing since the 19th century.

To date, national codes have given guidance on drainage and ventilation pipework sizing based on steady state flow calculations (constant flow). A soil or waste stack is only in a steady state when it is at rest; once a WC is flushed or a kitchen sink discharged the pipework system is in an unsteady state (transient flow).

It is essential to have the correct design for a drainage system in order to ensure protection of the water trap seal.

A minimum of 50mm of water is all that protects the built environment from potentially harmful sewer gases and 'particulates'. Therefore a good design/designer must consider this trap seal and protect it from being lost. One way of doing this is to consider the air flow within the system as this is the primary reason for trap seal breach.

The flow of air within the drainage pipework system is equally as important as the flow of water in maintaining a safe and hygienic drainage system.

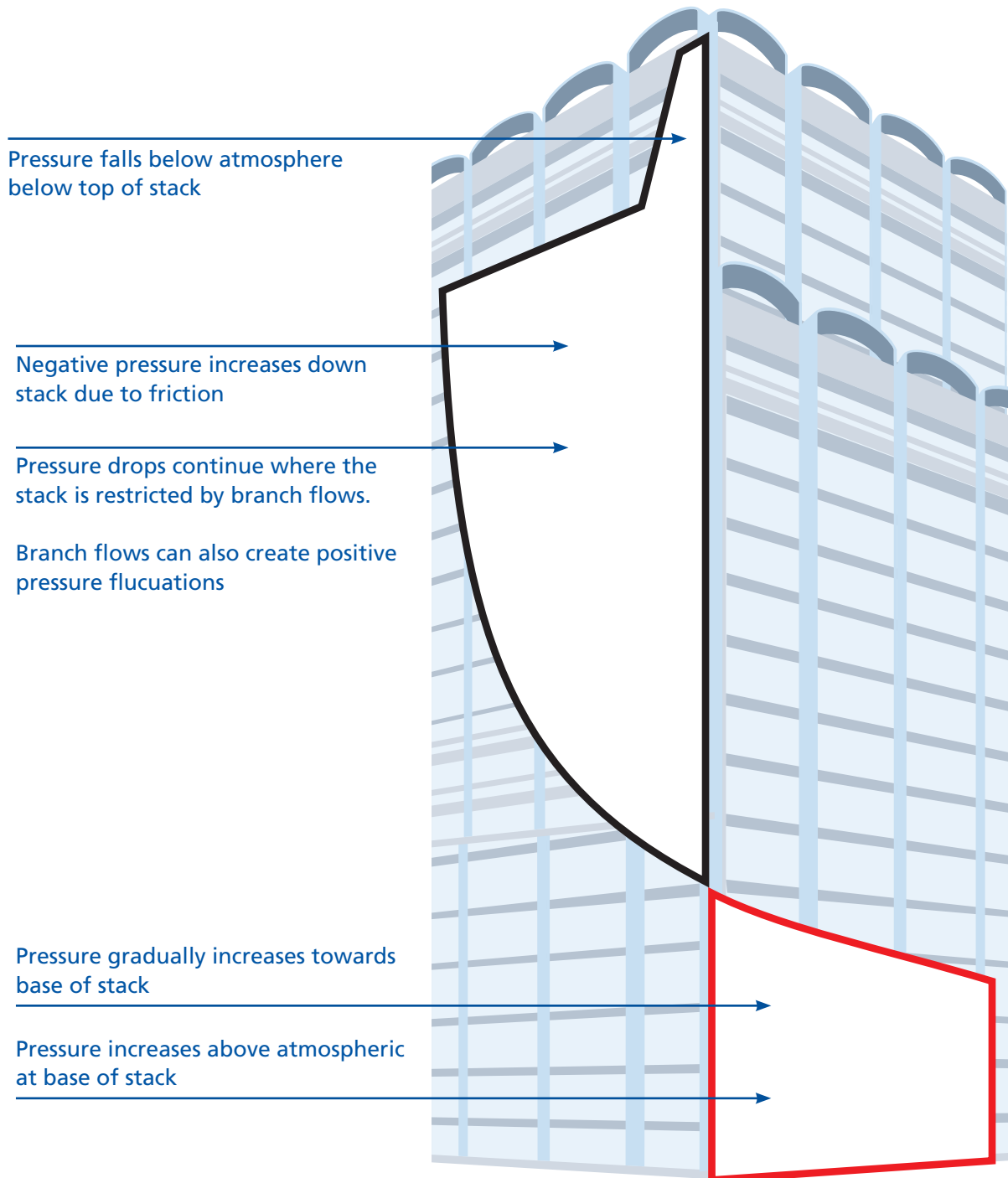
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The unsteady (transient) flow of water through the pipework creates both positive and negative air fluctuations which can compromise water trap seals.

To maintain a state of equilibrium in a drainage pipework system, it is necessary to respond to an increase or decrease in air pressure: this response time is critical for protecting trap water seals. Traditionally, the installation of a secondary ventilation stack and branch pipework system has been incorporated into drainage design and installations to overcome transient air fluctuations.

Secondary ventilation pipework is costly to install and more importantly, can be an inefficient solution as the time lag to communicate an increase or decrease in the ambient pipework air flow can result in an unsafe drainage pipework system.

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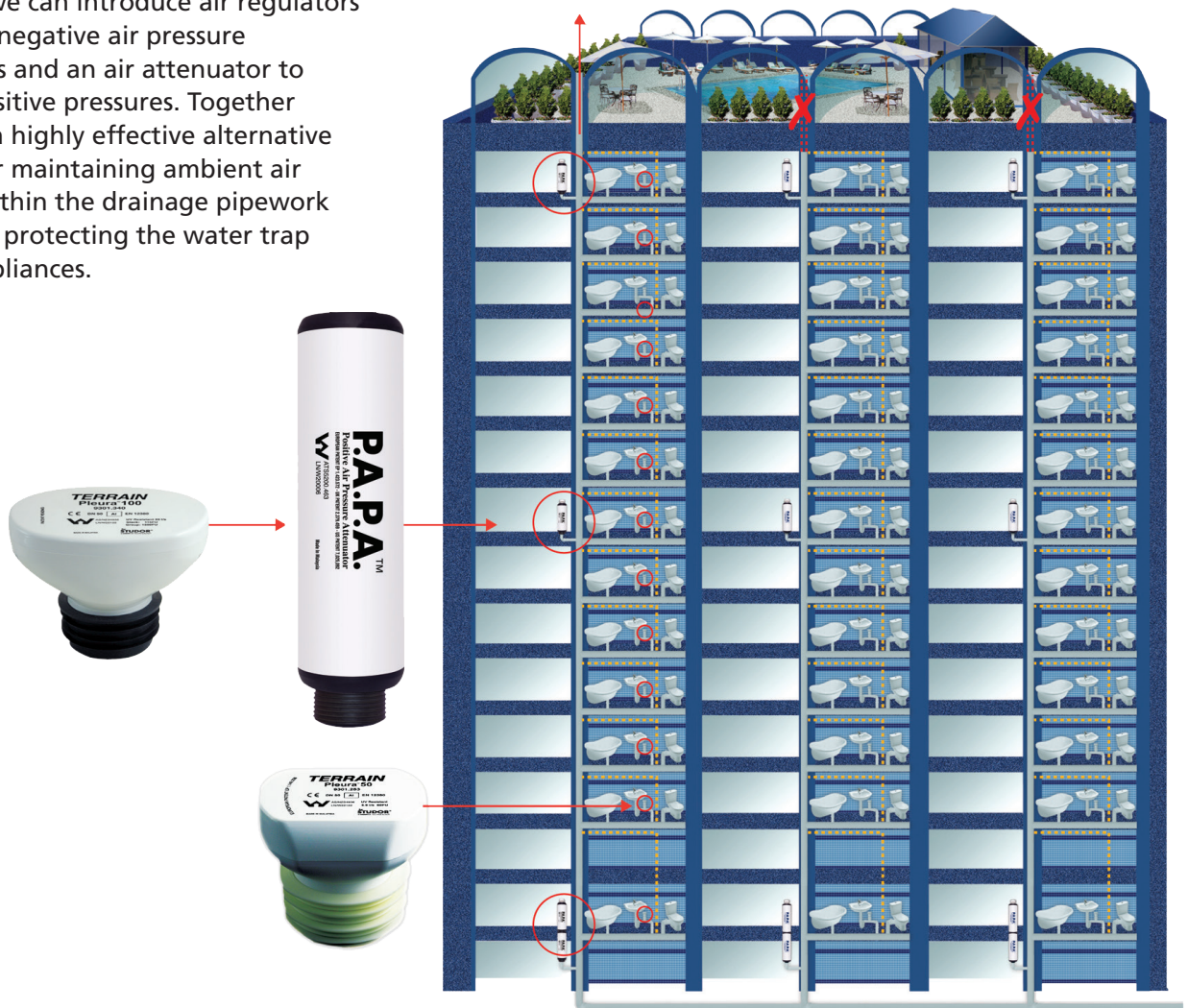
Typical Pressure Profile in a Multi-Storey Building

### The Terrain Pleura Drainage Ventilation System

Following several years of theoretical and practical research at Heriot-Watt University, Edinburgh, Scotland and in partnership with Studor, into both positive and negative transient pressure fluctuations in drainage systems, the Terrain Pleura system provides both an intelligent and integrated solution for balancing the ambient air pressure within a drainage system.

#### The Terrain Pleura System: how it works.

By removing the secondary ventilation pipework we can introduce air regulators to balance negative air pressure fluctuations and an air attenuator to balance positive pressures. Together they form a highly effective alternative solution for maintaining ambient air pressure within the drainage pipework system and protecting the water trap seals of appliances.



X No roof penetrations     
 ----- Unnecessary piping  
 Refer to local regulations for open vent requirements

### The Terrain Pleura System

- Replaces extensive ventilation pipework, saving costs in material and installation.
- Allows more flexibility in the layout and design of internal drainage systems for engineers, architects and design professionals.
- Offers a point-of-need solution that quickly responds to transient air fluctuations.

#### Terrain Pleura 50

The Terrain Pleura 50 air regulator provides ventilation to branch pipework. It is generally installed on the pipe behind the appliance trap.

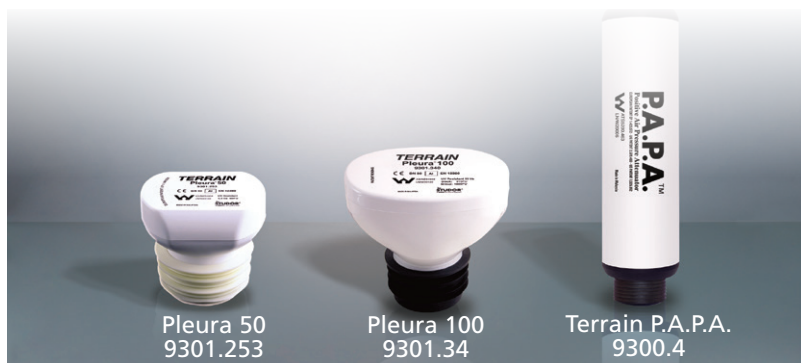
The Terrain Pleura 50 opens and admits fresh air into the branch pipe when the negative (suction) pressure occurs from an appliance discharging into the pipework system. This equalises the ambient air pressure within the pipework and protects the trap seal.

When the flow stops and the internal ambient air pressure in the pipework balances, the Terrain Pleura 50 closes by gravity and prevents foul air entering the built environment.

#### Terrain Pleura 100

The Terrain Pleura 100 air regulator can be fitted on to the top of a foul or waste stack, or at the end of long low gradient branch drains, to provide ventilation.

The Terrain Pleura 100 opens and admits fresh air under condition of reduced pressure in the discharge pipes and prevents trapped water seals being drawn. As the internal ambient air pressure in the pipework balances, the Terrain Pleura 100 closes by gravity and prevents foul air entering the built environment.



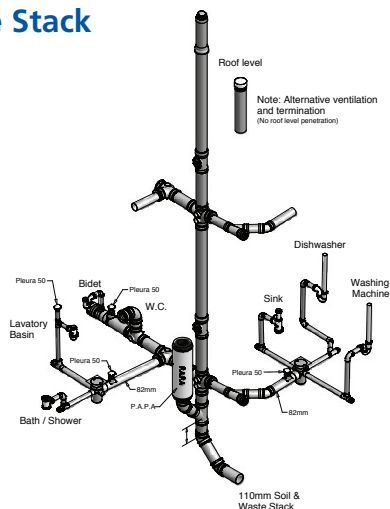
#### Terrain P.A.P.A.

The Terrain P.A.P.A. is a positive air pressure attenuator, designed to mitigate the affects of positive air fluctuations in the drainage pipework system. As water descends down the drainage stack it creates a negative pressure; if that flow is interrupted or is approaching a change of direction, the negative pressure changes to a positive pressure and moves up the pipe. This low amplitude air wave travels typically at 320m/s, the speed of sound. As the positive air fluctuation approaches the branch-off point for the Terrain P.A.P.A., the bladder within the unit reacts very quickly, within 0.2 seconds, and starts to expand; this creates a pressure differential at the branch-off point. The branch to the Terrain P.A.P.A. then becomes the path of least resistance and the majority of the positive air pressure is absorbed within the unit.

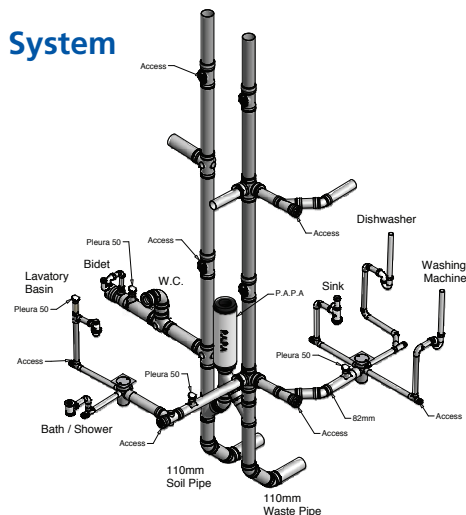
As the ambient air pressure within the pipework starts to equalise, the bladder slowly releases the small volume of air into the pipework system at only 12m/s which will have no effect on the trap seals.

- There are significant benefits to be obtained when incorporating the Terrain Pleura alternative ventilation system:
- Improved control and balancing of air pressures within the drainage pipework system
- Traditional vent pipework requirements are replaced, saving costs in materials, installation, testing and time
- More flexibility during the design process for engineers, architects and design professionals
- Reduced risk through the installation of a fully researched and engineered system that enhances overall performance to protect water trap seals.

### Single Stack



### Two Pipe System



### Three Pipe System

