TERRAIN

PASB2 - PG | September 2011

Terrain Pleura

Alternative engineered drainage ventilation system

Polypipe

Alternative Engineered Ventilation System

Terrain soil & waste products represent the industry benchmark for quality, installation, flexibility and product innovation, backed by the highest levels of customer service. Terrain systems comprise of an extensive range of soil & waste drainage products, including the Terrain Pleura system, a unique alternative ventilation solution for high-rise buildings.

- Unique products offering unrivalled installation options
- High quality finish
- Suitable for all types of commercial and residential high-rise buildings
- Extensive technical experience to support and advise on all aspects of design and installation
- Fully accredited product systems

As you would expect from a market leader our products come with all relevant standards including:

Manufacturing Standards

BS EN 12380 A1 Air Admittance Valve (Pleura System)

Quality Management Systems Standards

EN ISO 9001:2008 Management System
EN ISO14001:2004 Management System
BS OHSAS 18001:2007 Management System
PASS 99:2006 Integrated Management Registration

Pleura 50
9301.253

Pleura 100
9301.34

Terrain P.A.P.A.
9300.4

STUDOR®
INVENTIVE TECHNOLOGY

Contents

Terrain Pleura

D1 Tower, Dubai, UAE

Studor valves and P.A.P.A. are installed in D1 Tower, an 80 floor Luxury residential building, providing a simplified, but efficient drainage ventilation system.

Yas Marina Hotel, Yas Island, Abu Dhabi, UAE

A 500-room hotel in the United Arab Emirates alongside the Yas Marina Formula 1 circuit. Developers chose P.A.P.A. technology for its speed, ease and durability.

Ferrari World, Yas Island, Abu Dhabi, UAE

Studor valves and P.A.P.A. are installed in the first theme park designed around the Ferrari brand. The leisure complex which opened in 2010 features a racetrack, theatre, and a variety of driving activities.

Ventilation Drainage Pipework Systems

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.

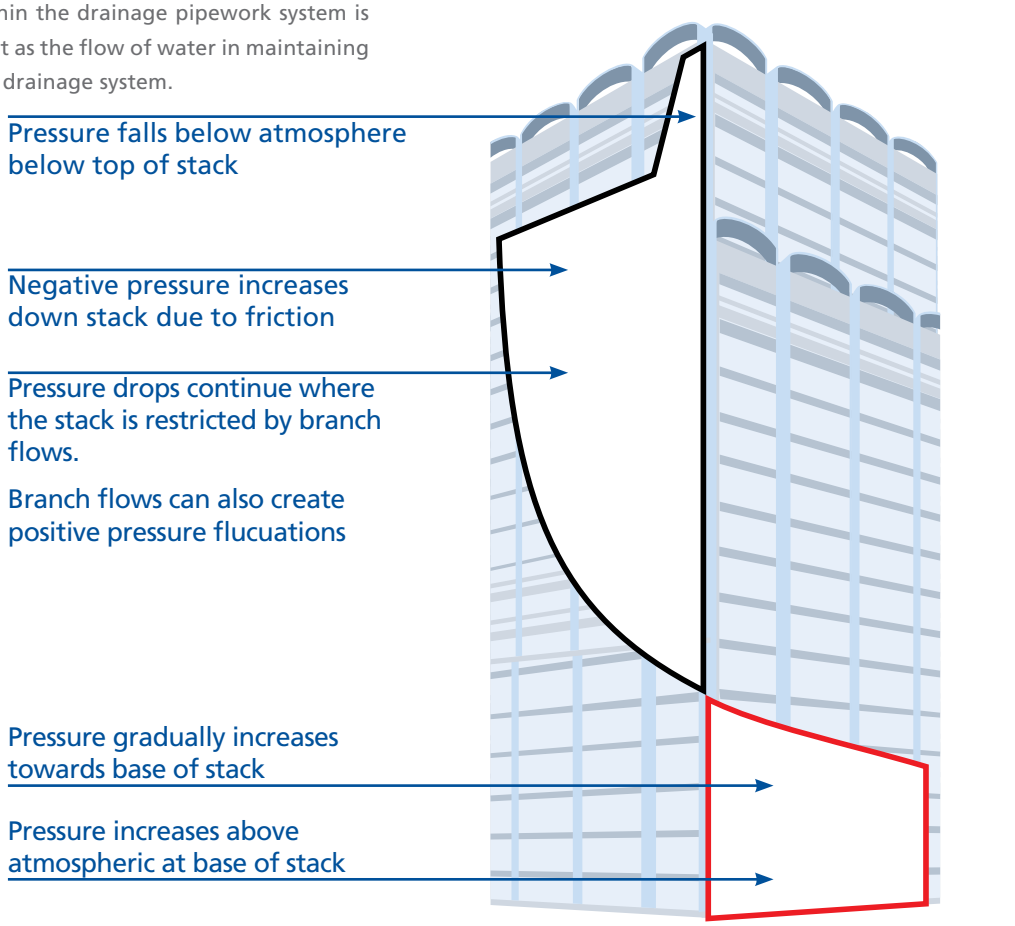
The flow of air within the drainage pipework system is equally as important as the flow of water in maintaining a safe and hygienic drainage system.

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.



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.

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.

Pleura 50
9301.253

Pleura 100
9301.34

Terrain P.A.P.A.
9300.4

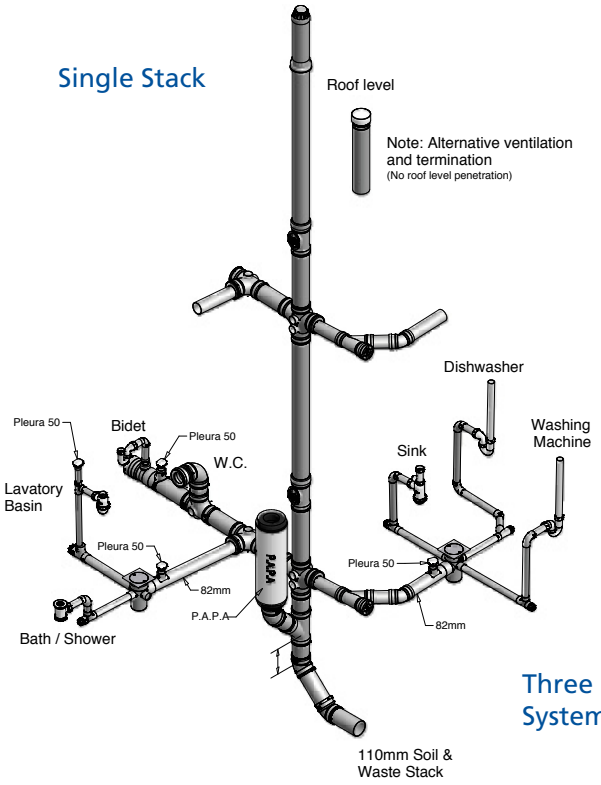
Benefits of the Terrain Pleura System

There are significant benefits to be obtained when incorporating the Terrain Pleura alternative ventilation system:

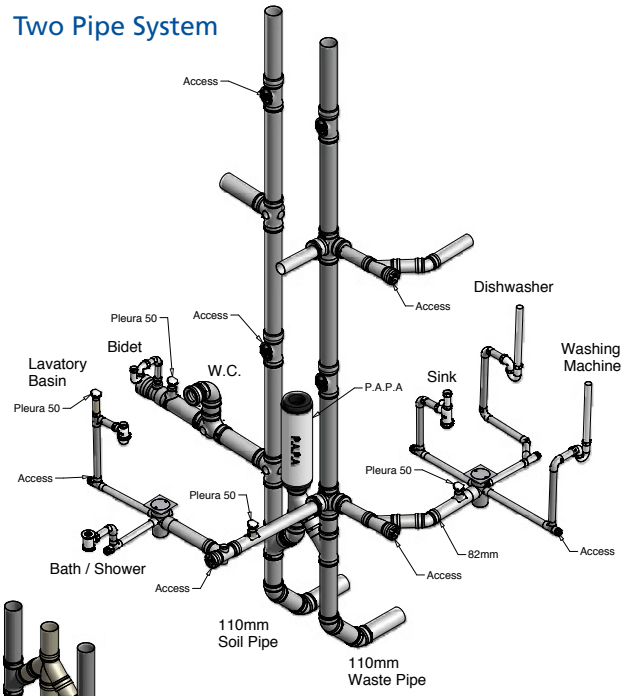
- Improved control and balancing of air pressures within the drainage pipework system
- Traditional vent pipework requirements are replaced, saving costs in materials, installation, testing and time
- More flexibility during the design process for engineers, architects and design professionals
- Reduced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

Alternative Engineered Drainage Ventilation Systems

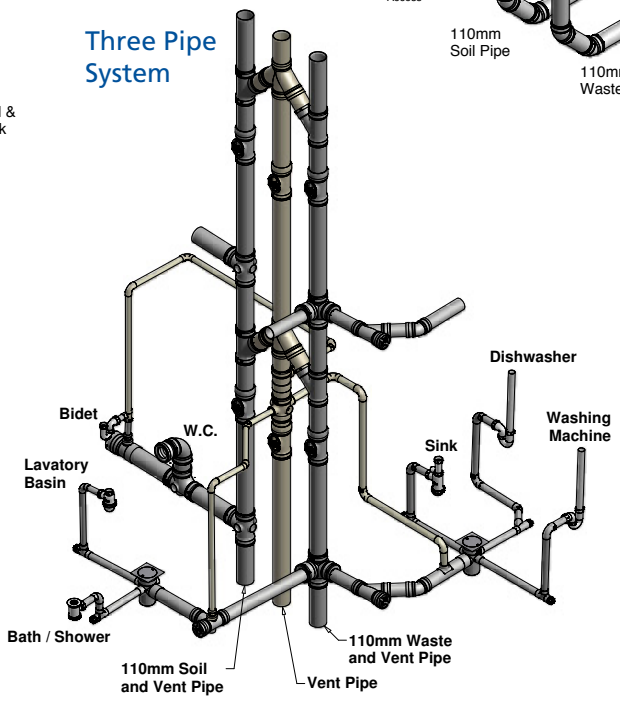
Single Stack



Two Pipe System



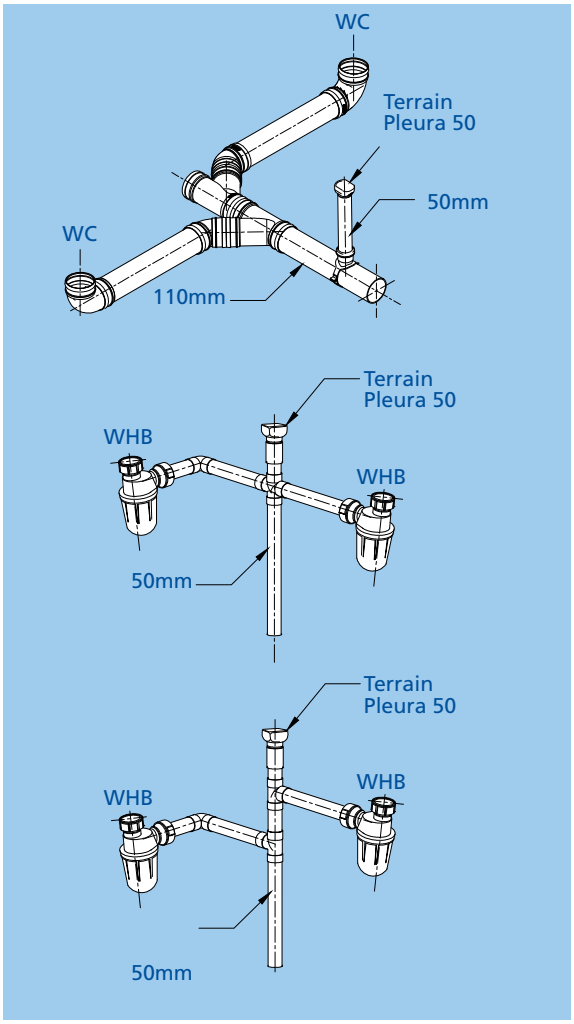
Three Pipe System



Design Details - Vents

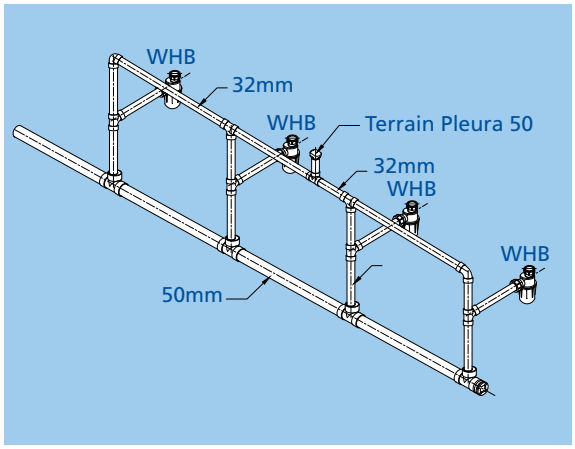
There are many design applications that can use Terrain's Pleura valves. These isometric drawings are intended to show some of the acceptable applications; however, several alterantives are also acceptable.

COMMON VENT



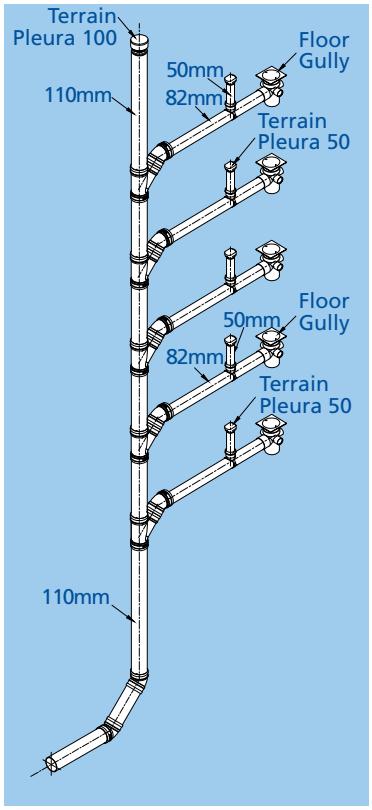
The common vent serves two or more fixtures. The Terrain Pleura 50 can be located in close proximity to the fixtures being vented.

BRANCH VENT



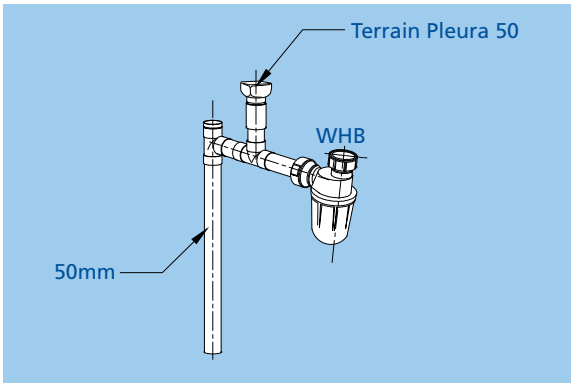
When various vents connect to a branch vent a Terrain Pleura 50 can serve a replacement for a traditional vent to the main stack.

STACK VENT



The Terrain Pleura 100 serves as the vent at a stack. The maximum height of the drainage stack that is ventilated with Pleura 100 and Pleura 50 floors.

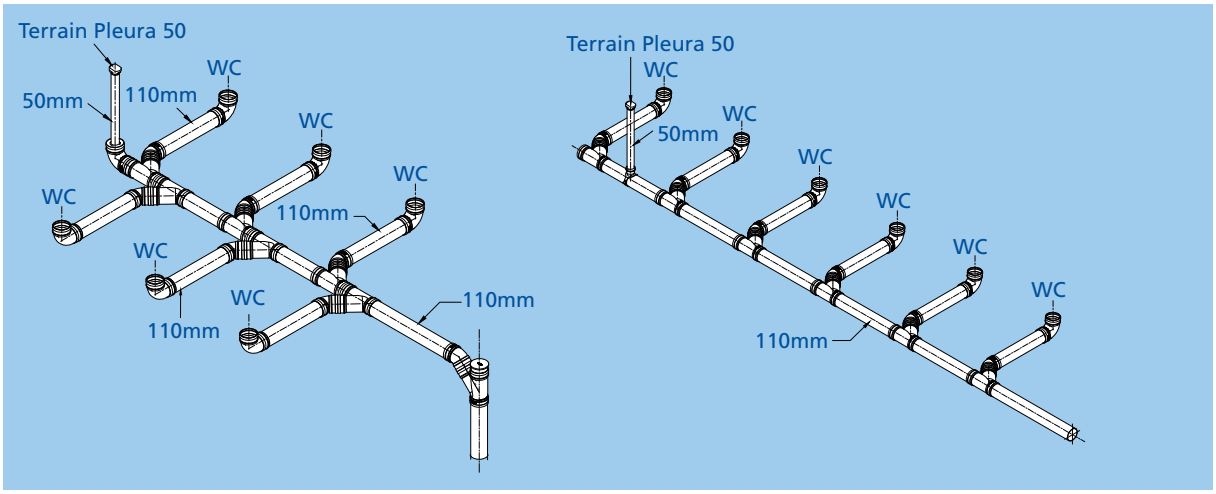
INDIVIDUAL VENT



The simplest form of venting is an individual vent. With the Terrain Pleura 50, the vent terminal, an effective alternative method of venting fixtures or fixture located in a remote location can be achieved.

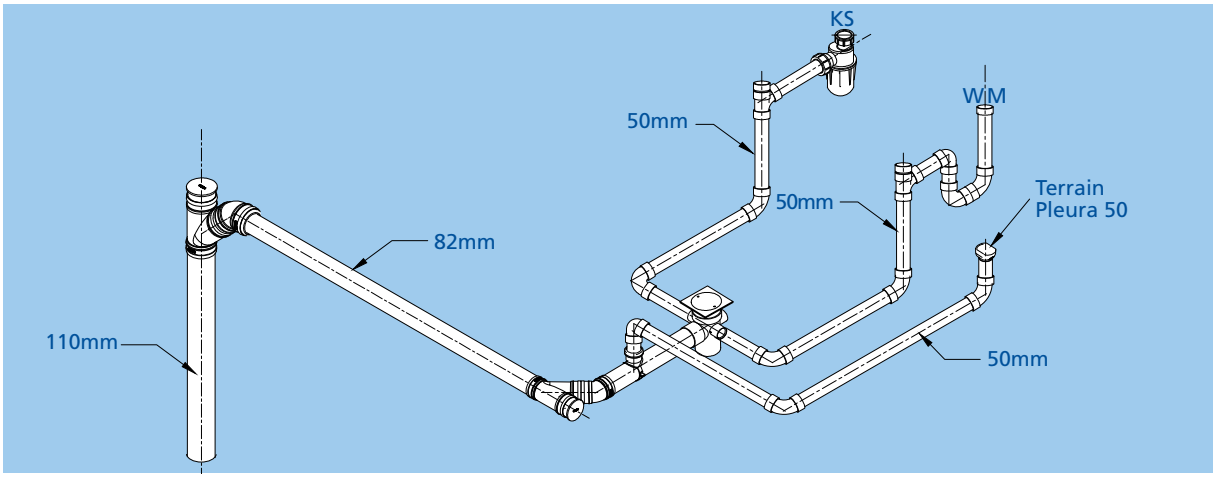
CIRCUIT VENT

This is a single vent serving as the vent for the group of fixtures. The Terrain Pleura 50 serves as the circuit vent.



WASHING MACHINE

This is the ventilation of two or more fixtures connecting into the floor gully. The Terrain Pleura 50 can be located in close proximity to the gully to be vented.



Design Details - Terrain P.A.P.A.

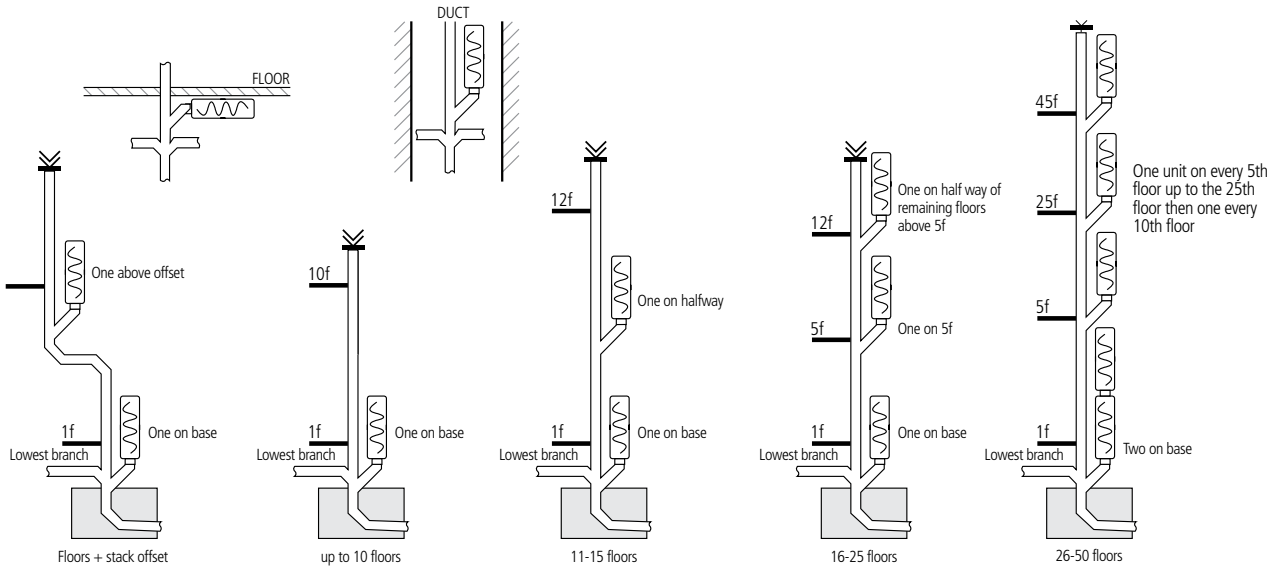
Terrain P.A.P.A. Design Criteria

There are several issues which need to be recognised as the drainage and vent system respond to positive transients propagation:

- The pressure profile is constantly changing
- The area of risk to trap water seals is dynamic and constantly changing

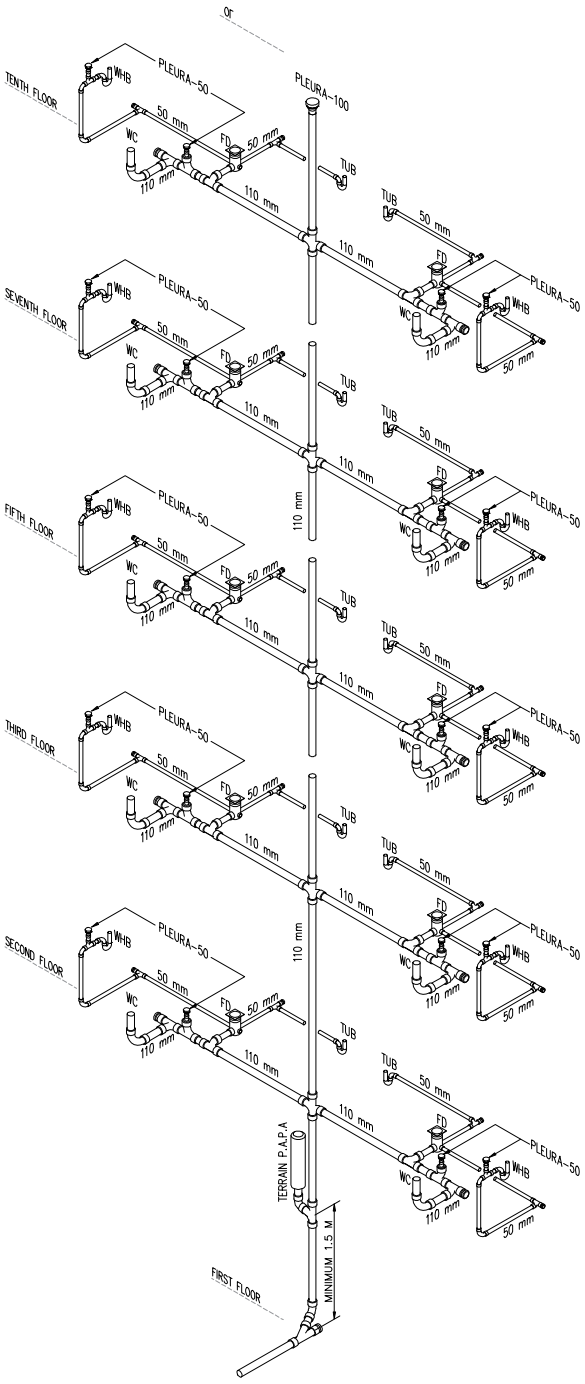
To deal with these certainties the Terrain P.A.P.A. device should be distributed throughout the system. The following is only a guideline of how many Terrain P.A.P.A. devices would be required per stack. This would vary depending on the plumbing design. Please consult Terrain with any questions regarding the design of the system.

5-10 floors	One unit on the base
11-15 floors	One on the base, one halfway
16-25 floors	One on base, one on 5F, one half way or remaining floors above 5F
26-50 floors	Two units in series on the base, then one unit on every fifth floor up to the 25th floor, and then one every 10th floor
51 or more	To be advised up on consultation with manufacturer for best practice



MINIMUM DISTANCE
Stack extending no more than 5 floors above the base of the stack or offset: 0.60 metres
Stack extending more than 5 floors above the base of the stack or offset : 1 meter
Stack receiving suds discharges: as close as possible to the first horizontal branch
Minimum distance shall be measured from center to center

When the Terrain P.A.P.A. units are installed throughout the system, the protection against positive transients would never be more that 10 floors away. Therefore the transient is dealt with before it can affect the whole system. It is essential to recognise that to be effective, a pressure transient attenuator must be placed between the source of the transient and the fixture to be protected.



The Terrain P.A.P.A. unit is a maintenance free product and we recommend that it is accessible. Fluids and suds entering the device will not restrict the device's ability to neutralise the negative effects of pressure transients nor will they compromise the life expectancy of the device.

The use of the Terrain P.A.P.A. devices in conjunction with Terrain Pleura valves when correctly designed and installed is necessary to ensure full warranty of the system.

Terrain Pleura Riser - with Terrain P.A.P.A. device & Pleura Valves

The following standard details have been prepared to demonstrate Terrain's recommended installation of its products. In addition to Terrain recommendations, there may be other national, state or local specifications that are pertinent to this application.

Terrain standards do not supersede any national, state or local specification and Terrain recommends that those requirements must be reviewed and consulted with Terrain prior to the installation of Terrain products. Terrain has not authorised, and it bears no responsibility for, any revisions, alterations or deviations from this. **There must be a minimum of one vent to open atmosphere per building system**

Installation Details

Installation of the Terrain Pleura 50 & 100

- Terrain Pleura valve location must allow for adequate air to enter the valve. Locating the valve in a sink or vanity cabinet is acceptable.
- The valves must not be located in sealed void or within solid walls.
- Terrain Pleura valves must be accessible.
- Terrain Pleura valves must be installed in a vertical, upright position. A maximum deviation (in either direction) from plumb of 15 degrees is acceptable.
- Terrain Pleura valves must be located a minimum of 100mm above the horizontal branch discharge levels.
- The Terrain Pleura 100 must be installed 100mm above the highest flood level of the fixtures being vented in stack applications.
- A minimum of one vent pipe must be extended to the open atmosphere for each building drainage system for relief of positive pressure. The size of this vent is not specified, because this single vent does not determine the total amount of aggregate cross sectional area of the vent system. The total amount of the cross sectional area of vents combined on the system must equal the aggregate cross sectional area of the building drain. When properly installed, a Terrain Pleura valve in the system is equivalent to an open vent pipe having the same cross sectional area as any other vent. It is recommended that this kind of open air vent be located as close as possible to the connection between the building drain and building sewer.

Pleura 50

Pleura 100

Installation of the Terrain P.A.P.A.

- The Terrain P.A.P.A. can be connected directly to the 100mm branch bend or socket by slipping its synthetic rubber connector (provided) onto the fitting.
- The Terrain P.A.P.A. can be installed as a stand-alone unit with and/or without the Terrain Pleura 100.
- The Terrain P.A.P.A. unit can be mounted vertically or horizontally.
- When mounted vertically (parallel to the waste stack), the P.A.P.A. unit should be independently supported by an anchor connected to its housing.
- When horizontally mounting the Terrain P.A.P.A. unit, it is advisable to maintain a minimum of a 10-degree slope so as to induce self-draining.
- When the Terrain P.A.P.A. unit is configured horizontally, the Terrain Pleura 100 vent can be fitted, but the Terrain Pleura 100 vent must be in a vertical position.

Note: The Terrain P.A.P.A. unit does not solve the problem of a slow build-up of pressure or a sustained positive pressure originating from deposits blocking the pipes, the blockage of a public sewer, an overloaded septic tank, and so on. This is an inherent problem that must be resolved with or without the installation of Terrain P.A.P.A. unit(s) or Terrain valve(s).

P.A.P.A.

Product Specification

Terrain Pleura 100 - Drainage Ventilation System

The Terrain Pleura 100 is an accepted alterative to replace all forms of conventional stack venting, using active air pressure control, and allowing the air to enter the system at the point of need.

The Terrain Pleura 100 admits air under conditions of reduced pressure in the discharge pipes and prevents water seals in traps from being drawn, thus contributing to the ventilation of the main drain to which the discharge stacks incorporating the Terrain Pleura 100 are connected.

FEATURES

- Includes screening on the inside and outside of the Terrain Pleura 100 to protect the sealing membrane from foreign objects.
- Has a protective cover for the air intake and additional insulation against extreme temperatures.
- Can divert condensation away from the sealing membrane.
- Prevents the release of foul air from the drainage system.
- Available in white ABS.

PIPE SIZES

Europe	AU/NZ	USA
DN 75-110	DN 80-100	3" - 4"

DIMENSIONS - Terrain Pleura 100 Dimensions for line drawings

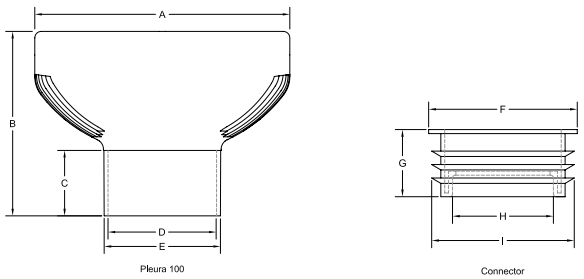
Dimension	Metric (mm)	Imperial (Inches)
A	195	7 15/16
B	141	5 5/8
C	50	2 1/16
D	83	3 3/8
E	89	3 5/8
F	111	4 1/2
G	50	2 1/16
H	75	3 1/16
I	106	4 5/16

INSTALLATION

- The Terrain Pleura 100 should be connected to the piping in accordance with Terrain's installation instructions.

WARRANTY

The Terrain Pleura system products have a lifetime warranty equivalent to that of the drainage system in which they are installed.



Pleura 50
9301.253

PERFORMANCE PARAMETER

Temperature Range	-20° C to +60° C (CE) -40° F to + 150° F (ASSE)
Open pressure	-70 Pa 0.0072
Max. pressure rating Tightness	10,000 Pa (1m/40" H_20) at 0Pa or higher

Air flow capacity	Branch	Stack
Europe	32l/s	32l/s
AU/NZ	32l/s/1000FU	32l/s/140FU
USA	1 to 160 DFU	72 to 500 DFU

MATERIALS

Pleura 100 Body	ABS
Pleura 100 Valve	POM
Seal	NBR
Internal insulation	PEIX
Connector	Rubber

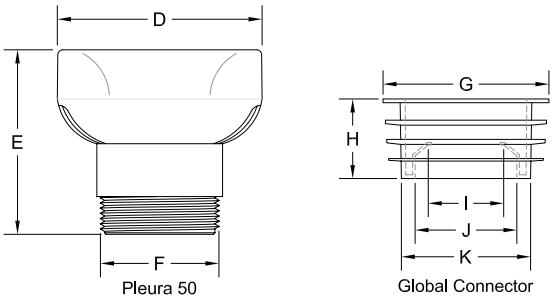
Product Specification

Terrain Pleura 50 - Drainage Ventilation System

The Terrain Pleura 50 is an accepted alternative to replace all forms of conventional branch and stack venting. With localised active ventilation of the building drainage system it has been proven that the Terrain Pleura 50 provides greater protection to prevent induced and self-siphonage of the fixture traps.

The Terrain Pleura 50 opens and admits fresh air when the negative (suction) pressure occurs from a fixture discharging into the system. This equalises the pressure within the system and protects the trap seal. When the flow stops, the Terrain Pleura 50 closes by gravity, preventing any transmission of foul air.

The Terrain Pleura 50 is used as an alternative to extending the vent pipes through the roof or side wall.



Pleura 100
9301.34

FEATURES

- Includes screening on the inside and outside of the Terrain Pleura 50 to protect the sealing membrane from foreign objects.
- Has a protective cover for the air intake and additional insulation against extreme temperatures.
- Can divert condensation away from the sealing membrane.
- Prevents the release of foul air from the drainage system.
- Available in white ABS

INSTALLATION

The Terrain Pleura 50 should be connected to the piping in accordance with Terrain's installation instructions.

Refer to you local area regulations for open vent requirements.

WARRANTY

The Terrain products have a lifetime warranty equivalent to that of the drainage system in which they are installed.

PIPE SIZES

Europe	AU/NZ	USA
DN 32-63	DN 32-63	1 ¼" - 2"

DIMENSIONS - Terrain Pleura 50 Dimensions for line drawings

Dimension	Metric (mm)	Imperial (Inches)
A	195	7 15/16
B	141	5 6/8
C	50	2 1/16
D	81	3 5/16
E	73	3
F	DN 40	1 ½
G	67	2 ¾
H	32	1 5/16
I	30	1 4/16
J	40	1 5/8
K	52	2 1/8

PERFORMANCE PARAMETRE

Temperature Range	-20° C to +60° C (CE) -40° F to + 150° F (ASSE)
Open pressure	(-70 Pa (-0.010PSI))
Max. pressure rating Tightness	10,000 Pa (1m/40" $H_2$0) at 0Pa or higher

Air flow capacity	Branch	Stack
Europe	(5.7) l/s	(5.7) l/s
AU/NZ	(5.7) l/s/60FU)	(5.7) l/s/7FU)
USA	1 to 160 DFU	8 to 24 DFU

MATERIALS

Pleura 50 Body	ABS
Pleura 50 Membrane	Synthetic Rubber
Global Connector	TPE

Terrain P.A.P.A.

The Terrain P.A.P.A. (Positive Air Pressure Attenuator) is a revolutionary world-first product developed to solve the problems of positive pressures (transients, back pressure) within drainage systems of multi-storey developments.

Research and development into the solution over several years resulted in this intelligent product, which allows multi-storey building designers to simplify their design of sanitary waste systems. The Terrain P.A.P.A. - in conjunction with the approved Terrain Pleura valves - deals with negative and positive pressures.

FEATURES

- Lightweight
- Easy to install
- Includes push-fit connector
- Suitable for installation on commercial sites
- Robust construction
- Resistant to many chemicals
- Can be installed vertically or horizontally.

A Terrain Pleura 100 may be installed on the top of the Terrain P.A.P.A. (when installed vertically) turning it into a positive and negative transient protection device.

INSTALLATION

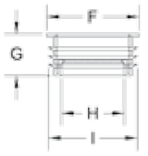
The Terrain P.A.P.A. should be connected to the piping in accordance with Terrain's installation instructions.

Refer to your local area regulations for open vent requirements.

WARRANTY

The Terrain Pleura system products have a lifetime warranty equivalent to that of the drainage system in which they are installed.

P.A.P.A.



Connector

Terrain P.A.P.A. 9300.4

PIPE SIZES

Europe	USA
DN 75-110	3" - 4"

DIMENSIONS - Terrain P.A.P.A.

Dimension	Metric (mm)	Imperial (Inches)
A	200	ø7 7/8
B	652	25 11/16
C	104	ø4 1/8
D	83	ø3 1/4
E	89	ø3 1/2
F	111	ø4 3/8
G	50	1 15/16
H	75	ø2 15/16
I	106	ø4 3/16

PERFORMANCE PARAMETRE

Temperature Range	-20° C to +60° C -40° F to + 150° F (ASSE)
Max. pressure rating	10,000 Pa (1m/40" $H_2$0) at 0Pa or higher

VOLUME CAPACITY

Series Assembly	Litres
1 unit	3.785
2 units	7.570
3 units	11.355
4 units	15.140

MATERIALS

P.A.P.A. Body	ABS
Internal Container Connector	Isoprene Rubber

Terrain Pleura

Polypipe Gulf FZ LLC

Dubai Media City
Loft Office No. 03
Entrance A, 4th Floor
Office no. 404
P.O. Box 502320, Dubai
United Arab Emirates
Tel: +971 (0)4 454 8328
Fax: +971 (0)4 454 2949

international@polypipe.com
www.polypipegulf.com

Polypipe Terrain

New Hythe Business Park
College Road
Aylesford
Kent
ME20 7PJ
United Kingdom
Tel: +44 (0)1622 795200
Fax: +44 (0)1622 716796

commercialenquiries@polypipe.com
www.terraindrainage.com