

Installation for Attenuation Systems

5.3 Ventilation

Every attenuation tank requires at least one vent to avoid stagnant water. An infiltration tank does not need a vent. Large attenuation tanks need a vent for every 7500m² of drained catchment area.

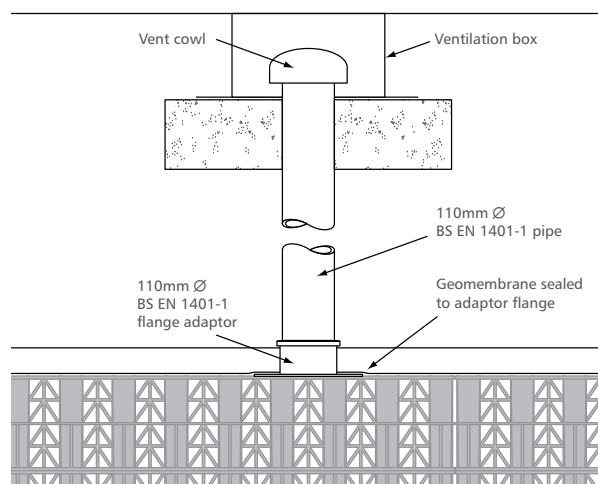
Figure 5-15 shows a vertical vent pipe with a cowl (SCV40). Figure 5-16 shows a horizontal vent pipe that connects to a catchpit.

5.3.1 Air vent connection and installation

Polystorm attenuation structures will require ventilation to ensure maximum hydraulic performance and avoid placing additional stress on the encapsulating geomembrane. Ensure vents are protected from damage during construction.

Attach a 110/160mm flange adaptor to a Polystorm cell from the top layer using cable ties on all four corners of the adaptor base and seal geomembrane around the flange, the same way as making an inlet or outlet connection and seal. Insert a 110/160mm dia vertical vent pipe into the flange and make connection.

Large attenuation tanks need a vent for every 7500m² of drained catchment area. A vent has a minimum size of 100mm diameter.



An alternative vertical vent pipe detail is available. Please call the Polypipe WMS technical support team.

Figure 5-15 Vertical vent pipe with cowl

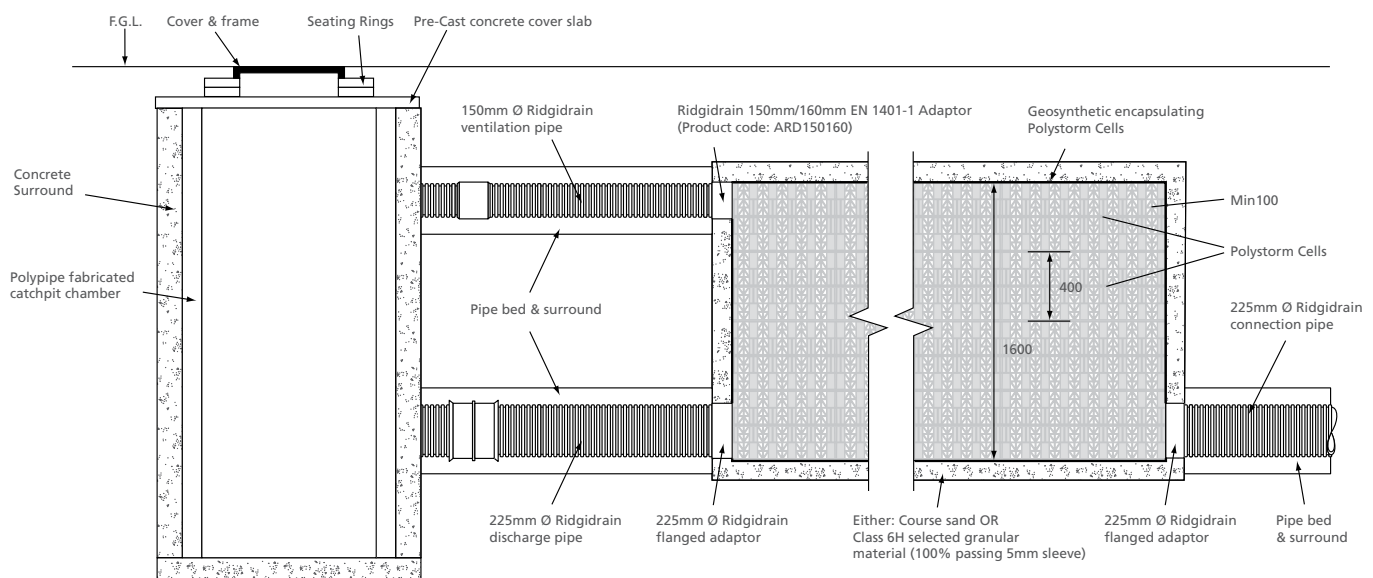


Figure 5-16 Horizontal vent pipe

5.3.2 Inlet and outlet connections and installations

A flange adaptor is attached at both the inlet and outlet points as this gives a flat surface for the membrane to be attached to. The flange adaptor will require a hole punching in each corner of the base. Ensure the flange adaptor is fastened securely to the cell using cable ties. Once the adaptor has been secured, insert the pipe and seal connection.



Sealing and Testing Connections

All pipes entering and leaving the structure must be sealed in accordance to the contractor's method statement. Ensure the geomembrane around all connection areas are clean and free from moisture before sealing. All sealing equipment should be tested at the start of each day to ensure consistency is maintained throughout the installation of the structure.

The inlet and outlet connections need a bung inserted into the hole to prevent siltation and water entering the structure whilst installation is carried out.

Once the connections have been sealed, testing should be carried out to check for leaks. This procedure should be carried out in accordance to the contractor's method statement. All testing equipment should be tested at the start of each day.

For advice on procedures for testing joints refer to CIRIA SP 124 – Barriers, liners and cover systems for containment and control of land contamination.

Encasing Geotextile

Complete the geosynthetic encapsulation of the entire Polystorm structure, forming joints where appropriate. Re-examine the geomembrane and/or geotextiles for damage and joint integrity. Avoid walking on the geosynthetic as this may cause punctures or tears to the material. The equipment used to form joints must be tested at the start of each day to ensure consistency is maintained throughout the process. For advice on procedures for testing joints refer to CIRIA SP 124 – barriers, liners and cover systems for containment and control of land contamination.

5.3.3 Lateral backfilling

Backfill around the sides of the encapsulated units, forming a 100mm thick layer of coarse sand or Class 6H selected granular material immediately adjacent to the cells.

Where required, remaining excavated areas around the units should be backfilled with Class 6N or 6P selected granular material, in accordance with MCHW, Volume 1, or similarly approved specification.

5.3.4 Cover backfilling

Backfill around the sides of the encapsulated cells, forming a 100mm thick layer of coarse sand or Class 6H selected granular material immediately adjacent to the cells.

Where required, remaining excavated areas around the units should be backfilled with Class 6N or 6P selected granular material, in accordance with MCHW, Volume 1 or similarly approved specification.

Final backfilling of the installation and surfacing is dependent on the expected operational loads. (NB Compaction plant over and immediately adjacent to the Polystorm cells shall not exceed 2300 kg/m width).

Above the wrapped Polystorm cells, place and lightly compact a minimum 100mm thick layer of either coarse sand or Class 6H selected granular material (with 100% passing the 5mm sieve), in accordance with MCHW, Volume 1, Series 600.

Installation for Attenuation Systems

5.3.5 Field conditions

(e.g. landscaped areas)

The backfill material that lies within 300mm above the Polystorm cells should be free from particles exceeding 40mm in diameter, in accordance with Class 8 material to Series 600, Volume 1, MCHW. Final backfilling up to finished ground level may be achieved using selected as-dug material. Backfill material should be placed and compacted in layers no greater than 300mm, or in compliance with the approved specification.

5.3.6 Lightly trafficked

(e.g. restricted access car park)

Backfill with Class 1 or 2 material in accordance with MCHW, Volume 1, Series 600. Backfill material should be placed and compacted in layers not greater than 150mm. Where the Polystorm cells are installed beneath a paved area, the pavement sub-base may form part of the backfill material provided that minimum cover depths are maintained. Complete pavement construction or landscaping over the Polystorm system.

5.3.7 Heavy trafficked

(e.g. roads used by HGV's)

Contact Polypipe WMS technical support team for further information and guidance.

5.3.8 Inspection

After installation and prior to handover, any silt collection chambers or control manholes should be examined to ensure they are free from debris. All chambers and manholes require the insertion of bungs at the inlet and outlet to prevent siltation during construction. Bungs should then be removed at commissioning.



Installation for Soakaway Systems

5.4 Typical Installation Procedure - Soakaway

5.4.1 Excavation and preparation

Place and compact a 100mm thick bedding layer of either coarse sand or Class 6H selected granular material (with 100% passing the 5mm sieve), in accordance with the Manual of Contract Documents for Highway Works (MCHW), Volume 1, Series 600. Install the permeable geotextiles, forming joints in accordance with the manufacturer's recommendations, making an allowance for the connecting pipework or adapters.

5.4.2 Geotextile layer (Permeable)

The type of geosynthetic material used to encapsulate the Polystorm cells will determine the installation requirements. Please note the following information is generic and advice from the geosynthetic manufacturer should be sought to ensure that the appropriate protective measures are taken to comply with any proprietary requirements.

Physical Properties		
Material	Typically Polypropylene/Polyethylene	
Mass	Min 125g/m ²	EN 965
Mechanical Properties		
CBR puncture resistance	Min 1500 N	EN ISO 12236
Peak tensile strength	Min 8kN/m ²	EN ISO 10319
Hydraulic properties		
Water flow rate normal to plane	Min 100 l/m ² .s (@ 50mm Head	EN ISO 11058
Pore size O90	Typically 100 µm	EN ISO 12956
pH	Resistance to all naturally occurring soil acids and alkalis	
Chemical/biological resistance	Resistance to all substances found to naturally occur in soils and rainwater. Detailed information would need to be provided to geosynthetic manufacturer in instances of contaminated land.	

Table 5-7 Permeable Geotextile

All joints should be sealed, using proprietary methods recommended by the manufacturer. Please refer to CIRIA SP 124 – Barriers, liners and cover systems for containment and control of land contamination, for advice on seam testing procedures.

Before the cells are installed the geotextile should be laid over the subgrade level. The sheet of geotextile should be large enough such that it can overlap over the edge of the modules by 200mm.

5.4.3 Polystorm cell installation

Place the Polystorm cells on the geotextile in accordance with the construction drawings and Polypipe connection details. Ensure cells are arranged so that they are in the correct alignment with the adjoining pipework (see pages 50-51).

5.4.3.1 Shear connection

Vertical connections are formed with the Polypipe shear connector (see pages 50-51).

5.4.3.2 Clip connectors

Polypipe clips connect horizontally adjacent cells (see pages 50-51).

5.4.4 Polystorm cell connections

Pipe Connections

160mm EN 1401-1 pipes connect directly into the convenient knock-out incorporated in the end of each cell.

Connection to 110mm EN 1401-1 pipes or other products is accommodated through the use of standard Polypipe adapters. Polystorm cells are also available with either a 225mm or 300mm fabricated Ridgidrain pipe connection (see pages 50-51).

5.4.5 Encasing geotextile

Complete the geosynthetic encapsulation of the entire Polystorm structure, forming joints where appropriate.

Re-examine the geomembrane and/or geotextile for damage and joint integrity.

5.4.6 Lateral backfilling

Backfill around the sides of the encapsulated cells, forming a 100mm thick layer of coarse sand or Class 6H selected granular material immediately adjacent to the cells.

Where required, remaining excavated areas around the cells should be backfilled with Class 6N or 6P selected granular material, in accordance with MCHW, Volume 1, or similarly approved specification.

5.4.7 Cover backfilling

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Where required, remaining excavated areas around the cells should be backfilled with Class 6N or 6P selected granular material, in accordance with MCHW, Volume 1, or similarly approved specification.

Above the wrapped Polystorm cells, place and lightly compact a minimum 100mm thick layer of either coarse sand or Class 6H selected granular material (with 100% passing the 5mm sieve), in accordance with MCHW, Volume 1, Series 600.

Final backfilling of the installation and surfacing is dependent on the expected operational loads. (NB Compaction plant over and immediately adjacent to the Polystorm cells shall not exceed 2300 kg/m width).

5.4.7.1 Field conditions (e.g. landscaped areas)

The backfill material that lies within 300mm above the Polystorm cells should be free from particles exceeding 40mm in diameter, in accordance with Class 8 material to Series 600, Volume 1, MCHW. Final backfilling up to finished ground level may be achieved using selected as-dug material. Backfill material should be placed and compacted in layers no greater than 300mm, or in compliance with the approved specification.

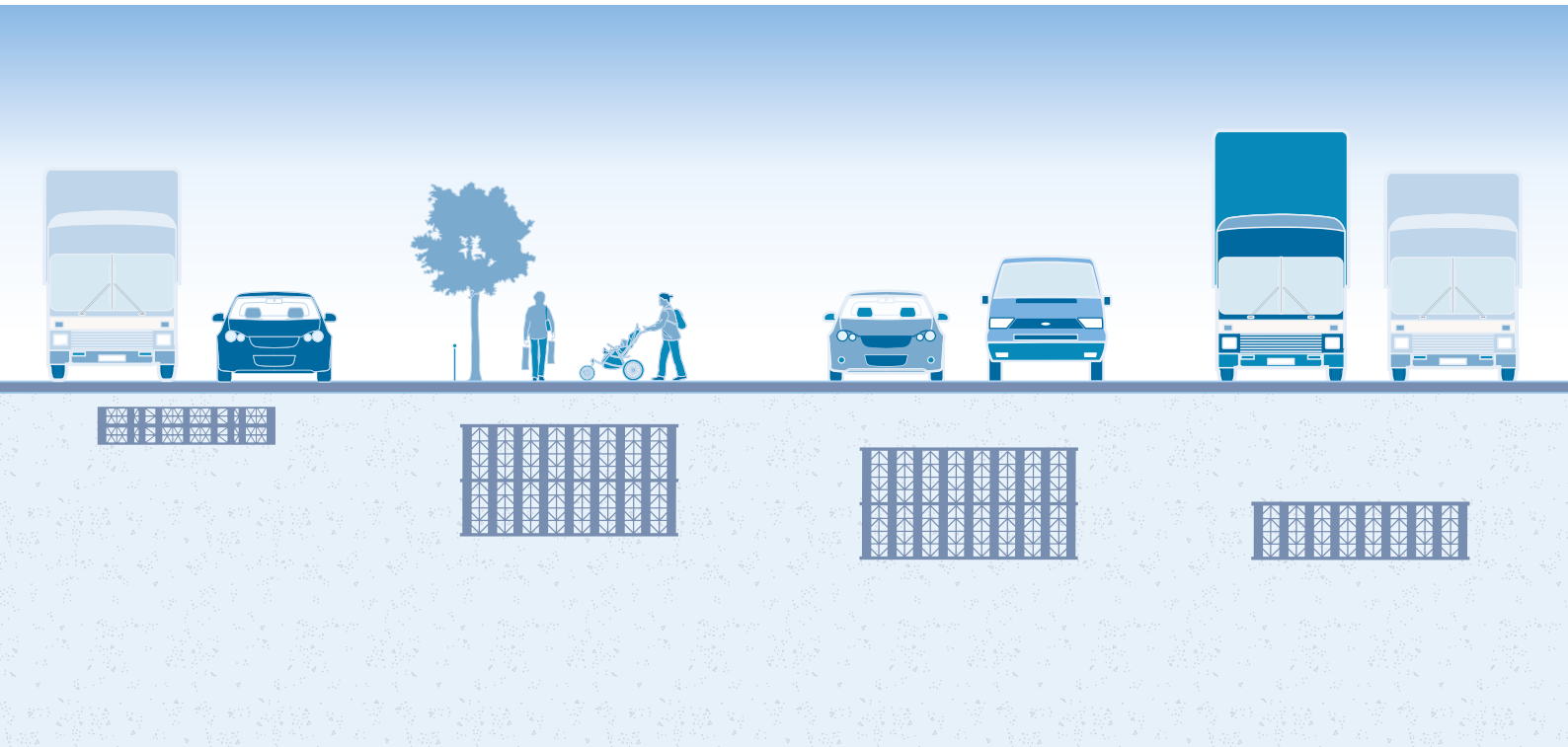
5.4.7.2 Lightly trafficked (e.g. restricted access car park)

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5.4.8 Inspection

After installation and prior to handover, any silt collection chambers or control manholes should be examined to ensure they are free from debris or contamination.

Water Management Solutions



Geocellular Systems

The widest range of geocellular solutions



Because every site is different, Polypipe offers the widest range of geocellular solutions for surface water management and pollution control that are adaptable enough to suit the precise requirements of each individual project, whether used in isolation or combination.

As climate change makes itself felt in increasingly frequent storms and floods, geocellular systems offer a versatile method of creating bespoke solutions that deliver all your objectives for surface water management including attenuation and soakaway systems. By addressing the unique climatic and ground conditions of your site, they allow a value-engineered response to your exact specifications.

Tailored to your project

Every site is different and many have significant challenges to the successful design and construction of an efficient and cost-effective drainage system. It is not unusual to be faced with space constraints, abnormal ground conditions such as contaminated soils on brownfield developments, high water tables or shallow rock dig. Similarly, temporary and permanent loadings associated with the construction process and trafficking of the constructed pavements impact on the design and programming of the drainage system.

Source Control Techniques

With an increasing emphasis being placed on the implementation of source control drainage solutions, which involves the effective management of water volume and water quality as close as possible to where rainfall lands, Polypipe has responded by incorporating Permavoid systems into its existing range of Polystorm geocellular water management solutions.

Whatever your requirements or challenges, whether shallow or deep or a combination of both, Polypipe offers by far the widest range of high strength geocellular products and systems - not to mention the most comprehensive design and technical support services to help you translate your plans into an effective and reliable surface water management solution.

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Legislation and regulations

The Flood and Water Management Act 2010

The Flood and Water Management Act provides for better management of flood risk for people, homes and businesses. It places particular emphasis on the prevention and management of surface water flooding.

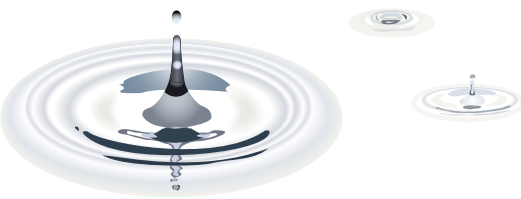
Water Framework Directive

The Water Framework Directive is a piece of EU legislation to improve water quality in watercourses and coastal areas. It identifies the treatment of pollution at source as one of the most effective ways of reducing pollution and improving water quality.

Our geocellular solutions can meet that challenge by integrating a number of surface water treatment and water management control systems into your attenuation and soakaway structures.

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) has replaced PPS 25 Development and Flood Risk, however the policy principles remain the same. The NPPF ensures that developments are not located in flood risk areas if land is available elsewhere. If high-risk areas can't be avoided, it sets out the steps to be taken to protect people and property.



The Growing Importance of SUDS

‘Making Space for Water’ is an integrated, forward-thinking strategy for managing future flood risk in England, first published in 2004.

Among its many recommendations is the adoption of a ‘joined-up’ approach to drainage management in high-risk urban areas, and the widespread use of Sustainable Urban Drainage Solutions (SUDS) to control the rate at which rainwater runs off paved areas and into sewer networks and rivers.

Engineered water management solutions provide an effective means of managing flood risk from surface water and because they are often buried below ground, they maximise the amount of land available for amenities.

SUDS

Building regulations

Building Regulations Approved Document H3 requires rainwater to be either stored in a tank or discharged in the following order of preference:

- (a) Soakaway or other infiltration
- (b) Rivers and watercourses
- (c) Direct to sewers

In other words, the traditionally preferred method of rainwater disposal – total discharge to the sewer network – may only be considered where other forms of re-use or drainage are not possible.

CIRIA C697

The SUDS Manual, published by CIRIA 2007 (CIRIA C697) defines that a sustainable urban drainage system should consider certain basic requirements, including:

- Run-off from a developed area should be no greater than the run-off prior to development
- Run-off from a developed area should not result in any down-grading of downstream watercourses or habitat
- Consideration should be given at the development feasibility stage to water resource management and control in the developed area
- Run-off should replicate as far as possible the natural response of the site to rainfall

The Code For Sustainable Homes

The Code for Sustainable Homes provides a points-based sustainability rating across nine key areas.

The most significant part of the code for Drainage Engineers is the requirement for run-off rates from a new housing development to be no greater than the rate for the previously undeveloped land, and for new homes to be protected from flooding in the event of a drainage failure.

On both counts, our geocellular systems can help by storing water at source for controlled release into engineered and/or natural SUDS features.

The Code covers 9 areas:

1. Energy & CO ₂ Emissions	6. Pollution
2. Water	7. Health & Wellbeing
3. Materials	
4. Surface Water Run-off	8. Management
5. Waste	9. Ecology

A Code level is awarded by first reaching a set of mandatory minimum standards then gaining credits in each of the categories above. These credits are then converted into points to arrive at an overall Code score.

Geocellular solutions for shallower depths

Polypipe already provides the widest range of geocellular solutions to meet the needs of Drainage Engineers in every application.

Now Permavoid, our latest geocellular system, extends the choice and flexibility of the Polypipe range by providing robust, effective source control through attenuation or soakaway at shallower levels.

Why a shallower application?

Shallower attenuation or soakaway structures are often necessary because the ground at greater depths presents a construction challenge of one kind or another. This could be the presence of chemicals or contamination left over from previous land use, underground watercourses or an unusually high water table. Some drainage engineers prefer a shallower approach because it does not rely on expensive pumping equipment. Shallower methods also have a reduced environmental impact because they require less excavation and fewer trips to transport infill and rubble to and from the site.



Permavoid Modular Cell
95% void ratio



Traditional Aggregate
30% void ratio



Benefits of the Permavoid System:

- Designed and tested for attenuation or soakaway at shallower depths
- Provides effective source control
- Interlocking raft for rigidity and a high compressive and tensile strength under load
- Can be installed above a high water table
- Allows water to be spread across a wide area
- Suitable for use beneath porous and non-porous surfaces
- Ideal for brownfield or contaminated sites
- Removes the requirement for pumping stations
- Reduction in excavation depth and cost
- No need for trench supports or plant to deliver and remove trench support panels
- Provides treatment to remove silt and hydrocarbon deposits
- Oil interception at source – no need for petrol interceptors
- Can be used in combination with the full range of Polystorm geocellular solutions for deeper applications

Permavoid System – A Comprehensive Source Control Water Management Solution

The Permavoid System comprises of high strength modular cells suitable for sub-base replacement in trafficked pavements, channel and gully components incorporating silt/oil gravity separation features, floating oil treatment devices, special oil treatment geotextiles and shallow flow control devices.



It offers drainage engineers a means of providing integrated source control drainage solutions that can meet the volume control and water treatment demands of current guidance and regulations. The systems can also facilitate better use of conventional landscaped SUDS features such as pervious pavements, swales and shallow basins. To assist designers in developing the most efficient arrangement of the system, Polypipe provides a complimentary design support service that is manned by a team of qualified engineers, experienced in the provision of SUDS solutions.

The Permavoid system comprises of:



Permavoid

Cellular sub-base replacement system that locks together to form an interlocking raft of exceptional high compressive and tensile strength.



Permachannel

A channel drain that combines run-off collection, silt and effluent interception and water treatment functions.



Permavoid Biomaterial

Comprising of a high strength, low density, oil treating, geosynthetic floating mat.



Permafilter Geotextile

A non-woven geotextile designed for hydrocarbon pollution treatment.



Geomembrane

An impermeable membrane for wrapping around Permavoid structures to form watertight tanks.



Permaties

Fully interlocking tapered tie connections to securely link Permavoid cells together in a single structure and to transfer tensile loads.