

5.1 Installation - health and safety

5.1.1 Health and safety

Under the Construction (Design and Management) Regulations 2007, unless they are a domestic client, all parties involved in construction or building work have legal duties. These include:

Clients

- Check competence and resources of all appointees
- Ensure there are suitable management arrangements for the project welfare facilities
- Allow sufficient time and resources for all stages
- Provide pre-construction information to designers and contractors

Designers

- Eliminate hazards and reduce risks during design
- Provide information about remaining risks

Contractors

- Plan, manage and monitor own work and that of workers
- Check competence of all their appointees and workers
- Train own employees
- Provide information to their workers
- Comply with the specific requirements in Part 4 of the Regulations
- Ensure there are adequate welfare facilities for workers

It should be noted that additional legal duties are imposed where construction work is notifiable.

All installation activities should be carried out observing the requirements of The Health and Safety at Work Etc. Act 1974; and The Management of Health and Safety at Work Regulations 1999.

Polystorm Benefits for CDM Compliance

Storage applications using Polystorm Water Management Systems are actually beneficial to CDM compliance. This is because the system avoids or reduces several risks associated with the construction of traditional storage tanks which can involve deep excavations and construction of large engineered structures. Specific advantages of Polystorm in this respect are:

- Individual Polystorm components are lightweight - making it easier for individual lifting of Polystorm cells
- Installation of Polystorm is quick - so open excavation time is minimised and high numbers of manpower and machinery is reduced

5.1.2 Risk assessment

Contractors are required to submit a method statement which includes a methodology for installation and risk assessment for the work to be carried out.

5.1.3 Site guidance

Good Practice Guide

The following are good practice principles for the handling and storage of all Polystorm cells on-site:

- Store units away from direct sources of heat including sunlight for excessive periods
- Place packs of cells on level ground: DO NOT stack filled pallets on-site
- Store loose individual cells NO MORE THAN 5 cells high
- Ensure a well positioned and secure stand for platform issued to remove the top layer of Polystorm cells from the pallet
- Although Polystorm cells contain an inhibitor giving ultra violet resistance for up to 6 months, avoid prolonged storage in direct sunlight
- DO NOT store cells near fuel bowsers, fuel tanks or any other solvents
- Although Polystorm cells are very robust and resistant to damage when handled normally, store in locations where impacts from vehicles and site plant will be avoided
- Ensure Polystorm cells are kept clean at all times
- Broken/cracked cells should not be installed. Broken/ cracked cells should be recycled wherever possible
- Individual Polystorm Lite cells weigh 7kg and Polystorm 9kg so they can normally be safely lifted on-site in accordance with current manual handling regulations
- Avoid walking on the geosynthetic membrane to reduce risk of puncturing or tearing the textile
- Care must be taken when placing the cells into the excavation
- Install 1st layer of cells to minimise walking on the geomembrane textile

5.1.4 Floatation

When placed below the ground water table as an attenuation system (i.e. wrapped in a geomembrane) there is a risk that the buoyancy of a tank may cause it to float. This can be prevented by placing a sufficient weight of soil on top of the tank to counteract the upward forces. Our Technical Team can assist with groundwater calculations. Please contact Polypipe WMS technical support team. Also see section 4.

5.1.5 Excavation and preparation

Excavate to the required plan dimensions and level, ensuring that the excavation orientation will allow easy installation of connecting pipework. Consideration should be given to maintaining construction plant access for reinstating around the installed Polystorm cells. Ensure that the ground bearing capacity at the formation level is sufficient for the proposed operational loads. The base of the excavation should be smooth and level, free of large or sharp stones and soft spots to avoid punctures or tears of the geomembrane. Any soft spots should be excavated and replaced with suitable compacted granular material. Place and compact a minimum 100mm thick layer of bedding material (typically coarse sand). If required, line the base and sides of the excavation with a protective geotextile before placement of the impermeable geomembrane. Excavation should be carried out in accordance with BS6031, paying particular attention to safety procedures.

5.1.6 Handling and installation

All materials used should be checked before and after installation for any damage such as punctures or tears to the membrane. 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.

Impermeable geomembrane		
Physical properties		
Thickness	Min 0.75 to 1.0mm	ASTM D5199
Density	900kg/m ³	ASTM D1505
Mechanical properties		
Tensile strength, at yield	Min 1600N/m ³	ASTM D4885
Elongation at break	>500%	ASTM D4885
Puncture resistance	Min 170N	ASTM D4833
Tear resistance	Min 67N	ASTM D1004 Die C
Impact resistance	Min 15 Joules	ASTM 3998 mod
Stress crack resistance	Min 200 hrs	ASTM D5391 (SP=-NCTL)
Permeability coefficient	Max 2.0 x 10-12	ASTM D
pH	Resistant 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 geomembrane manufacturer in instances of contaminated land.	

Table 17



5.1 Health and safety

Clip Connectors

Polypipe clips connect horizontally adjacent units.

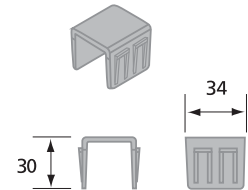


Figure 31

Shear Connector

Vertical connections are formed with the Polypipe shear connector.

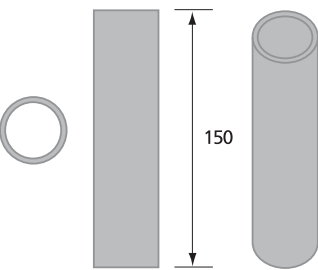


Figure 32

Before cells are installed a geomembrane should be laid over the subgrade level. Positioning of sheeting is undertaken by machinery or hand. After unrolling the sheeting, its position is adjusted so that a suitable overlap is achieved for the welding process. Before welding, the sheet must be checked for any damage including punctures or tears. If damage has occurred re-patch the damaged area with additional geomembrane material and weld over damaged area. Ensure the damaged area is overlapped by a minimum of 400mm. Joint each sheet of geomembrane together according to the suppliers' recommendations.

5.1.7 Polystorm cell installation

Before proceeding with the installation please ensure you carefully read and understand the Good Practise Guidelines stated earlier in the document. Ensure cells are arranged so that they are in the correct alignment with the adjoining pipework. Wherever possible, minimise the amount of walking on the geomembrane to reduce the chances of punctures or tears to the material by laying the first layer of cells.

5.1.8 Connecting Polystorm cells

Place the Polystorm cells on the geomembrane in accordance with the construction drawings. Ensure the Polystorm cells are abut and the corners align with each other. During installation, Polystorm cells should be securely connected using clips and shear connectors. Clips and shear connectors are supplied in sealed polythene bags of 60 and 30.

Location of points for clips and shears

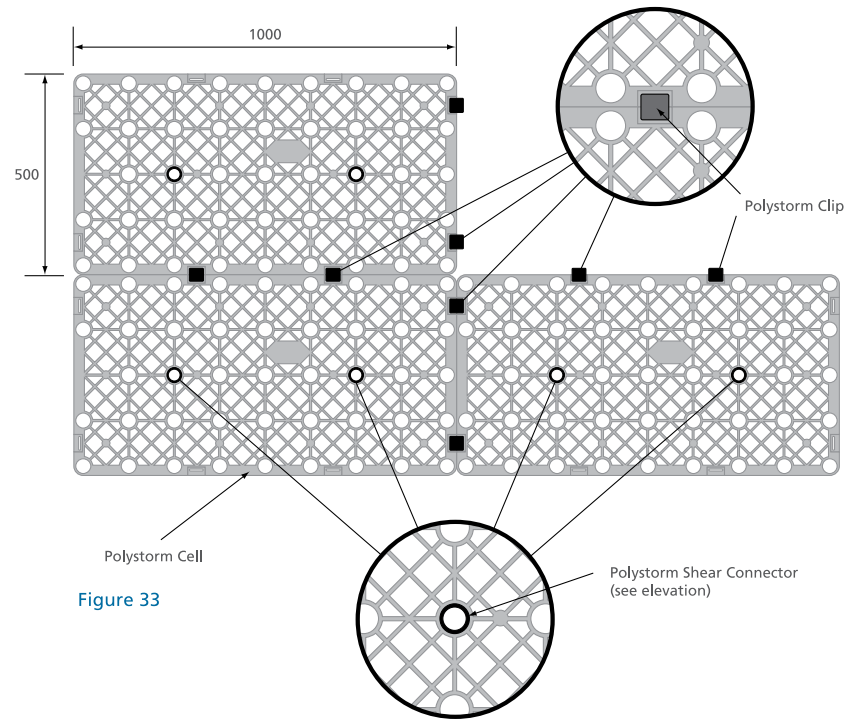


Figure 33

Shear connector installation

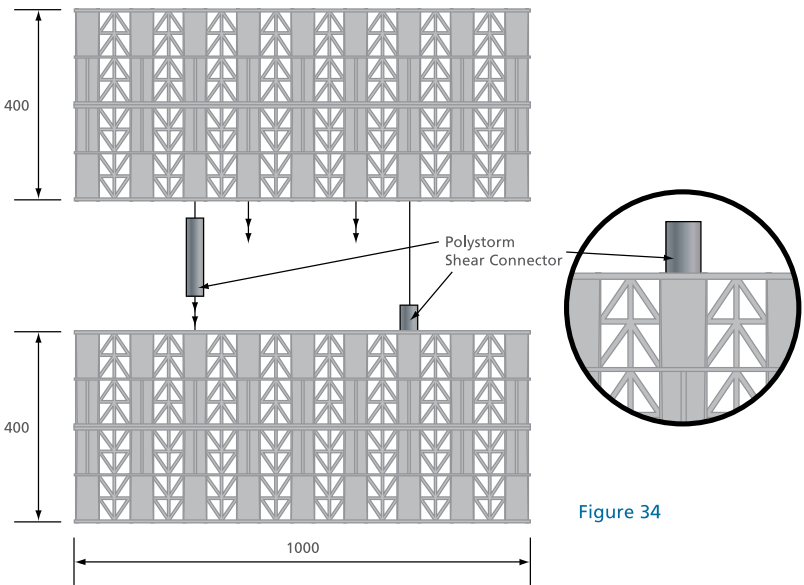


Figure 34

Insert shear connectors into Polystorm cell as shown. Ensure the shear connector is fully inserted before mounting the Polystorm cell.

5.1.9 Clip connector installation

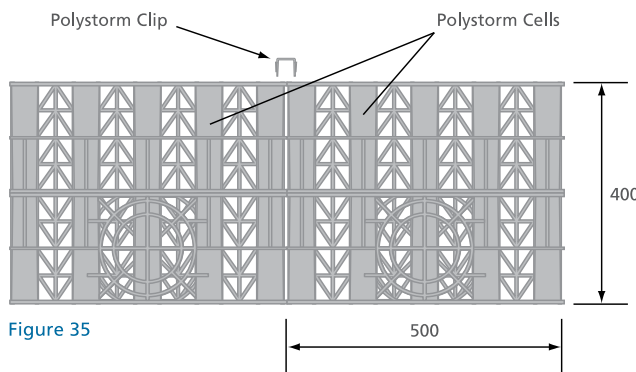
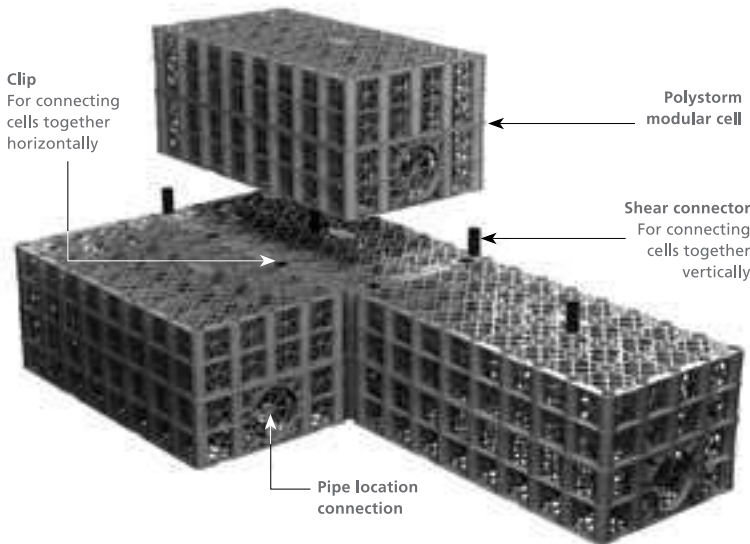


Figure 35

Polystorm cells are adjacently connected by clipping the two units together.



5.2 Connections

5.2.1 Types of connections 160mm – 300mm (direct to cells)

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.

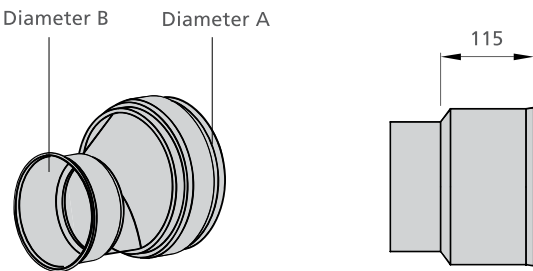


Figure 36
160/110mm invert level reducer

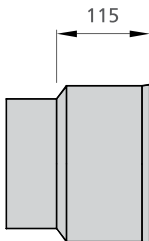


Figure 37
160mm diameter adaptor

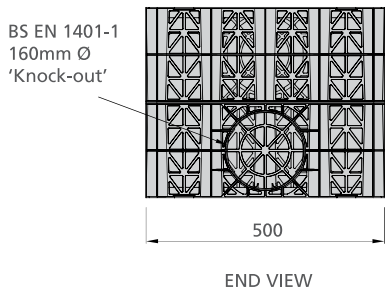


Figure 38
Polystorm cell 160mm diameter knockout

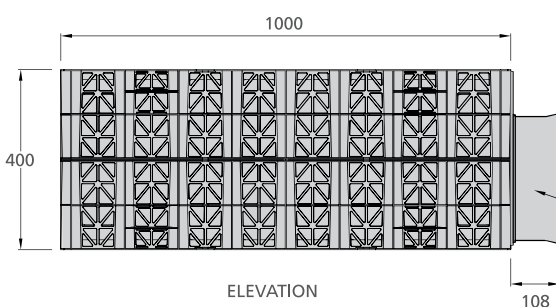


Figure 39
Fabricated Polystorm cell allowing 225mm diameter pipe connection

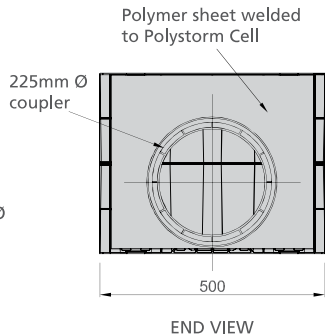


Figure 40
Fabricated Polystorm cell allowing 300mm diameter pipe connection

5.2.2 Types of connections 450mm – 600mm (direct to cells)

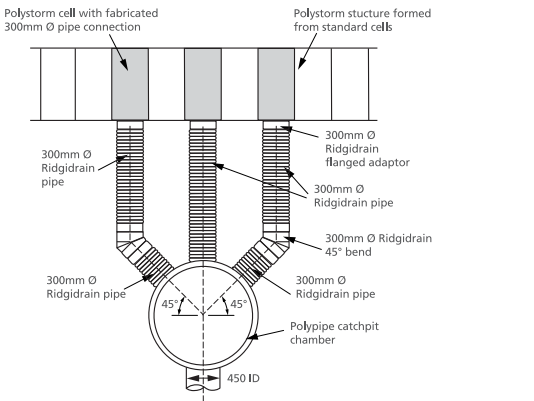


Figure 41
Typical Polystorm 450mm inlet manifold detail

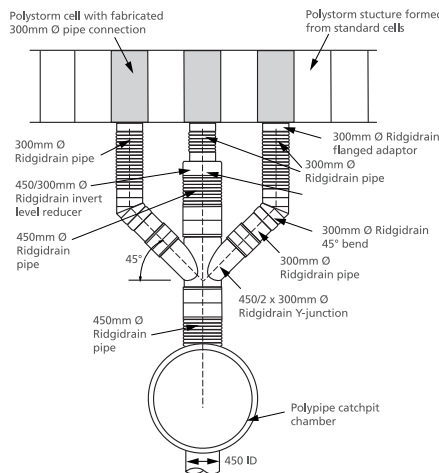


Figure 42
Typical Polystorm 450mm inlet manifold detail

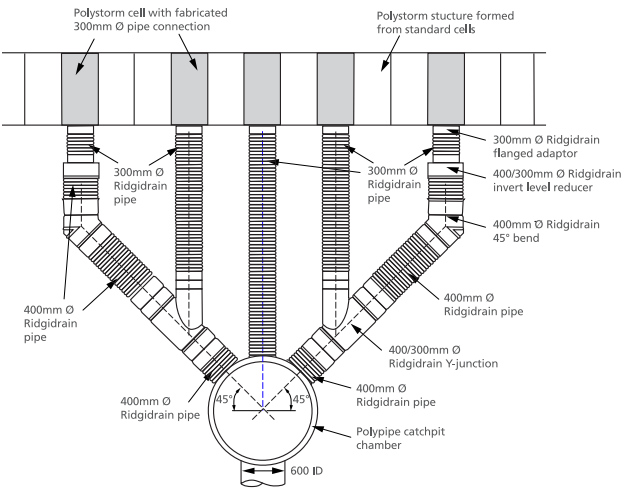


Figure 43
Typical Polystorm manifold detail

Note: For inlets larger than 600mm please contact Polypipe WMS technical team.

Please also visit www.polypipewms.co.uk for downloadable Auto CAD files of the illustrations on this page.

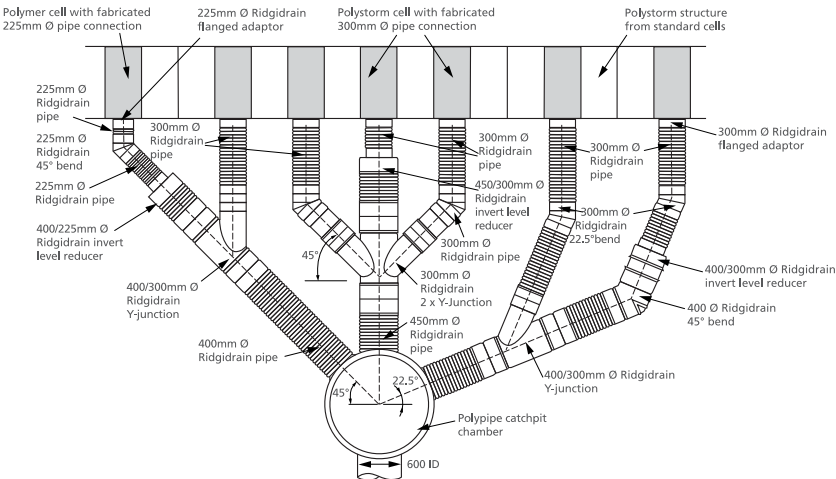


Figure 44
Typical Polystorm 600mm inlet manifold detail

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. The illustrations below show a vertical vent pipe with a cowl (SCV40) and 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.

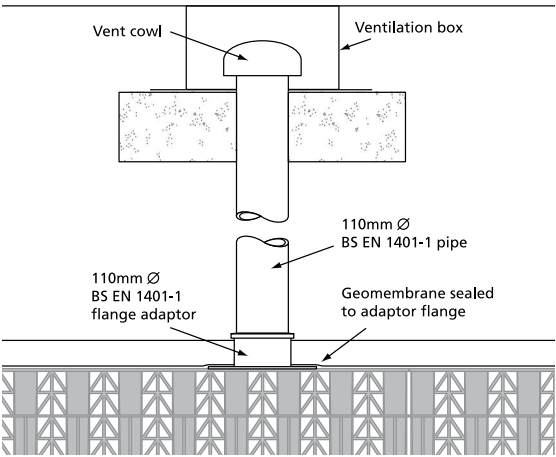


Figure 45 Vertical vent pipe with cowl
An alternative vertical vent pipe detail is available.
Please call the Polypipe WMS technical support team.

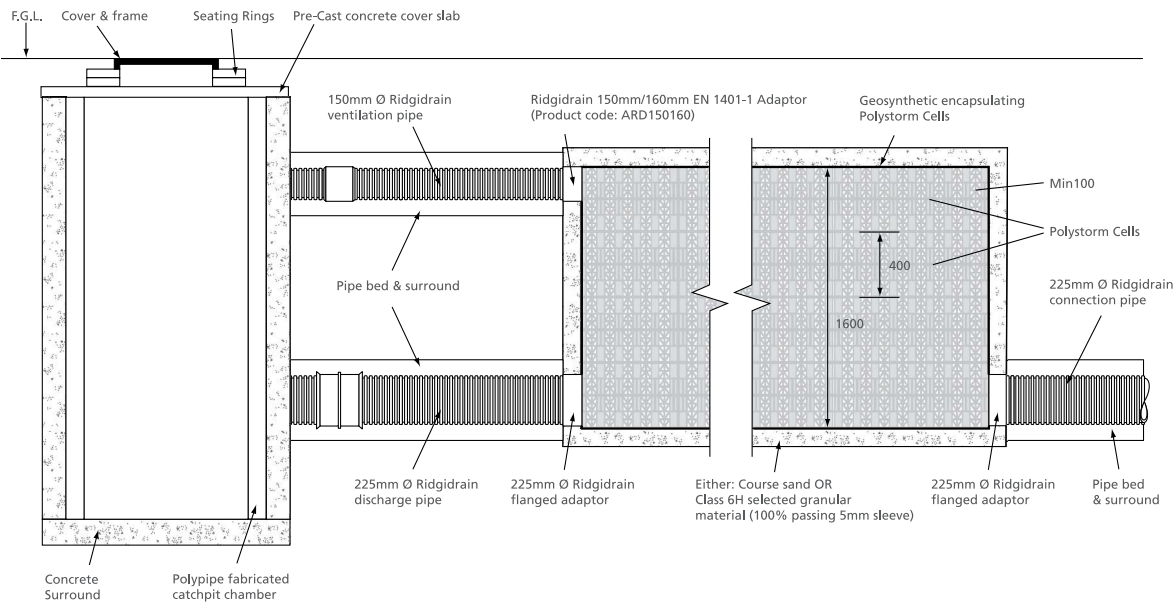


Figure 46 Horizontal vent pipe

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.

5.3.3 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.

5.3.4 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.

5.3.5 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 Ventilation



5.3.6 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.



5.3.7 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.

5.3.8 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.



5.3.9 Heavy trafficked (e.g. roads used by HGV's)

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

5.3.10 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.

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.



Permeable geotextile		
Physical properties		
Material	Typically Polypropylene/Polyethylene	
Mass	Min 125g/m ²	EN 965
Mechanical properties		
CBR puncture resistance	Min 1500N	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	Resistant 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 18

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 Typical installation procedure

- soakaway

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 54 & 55).

5.4.4 Shear connection

Vertical connections are formed with the Polypipe shear connector (see pages 54 & 55).

5.4.5 Clip connectors

Polypipe clips connect horizontally adjacent cells (see pages 54 & 55).

5.4.6 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 56 & 57).

5.4.7 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.

5.4.8 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.

5.4.9 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 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).

5.4.10 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.

5.4.11 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.

5.4.12 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.

5.5 Maintenance

5.5.1 Maintenance

The customer is responsible for maintenance

For soakaways to individual houses, the only necessary maintenance of the system is to keep gullies clear of debris such as leaves. For large installations or where the receiving waters are environmentally sensitive, a system of regular inspections should be established to prevent siltation of the system which, if allowed to develop, would reduce effectiveness. They should also be inspected after every major storm event.



It is recommended that a silt trap is incorporated into the pipework at the inlet to the tank (see Figure 47) there must be a maintenance plan that ensures regular cleaning of the trap to ensure correct performance.

Note: To download Auto CAD drawings and BBA certificates please visit www.polypipewms.co.uk.

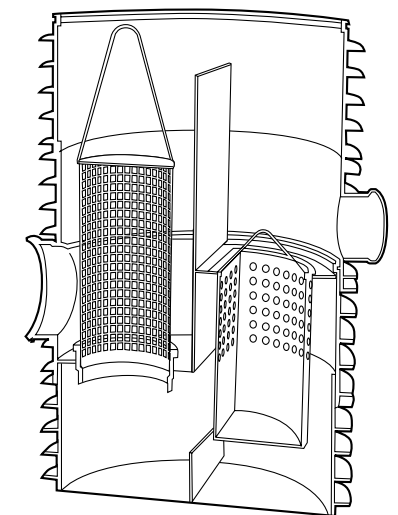


Figure 47

6.0 Associated products



A full range of complementary products including stormwater treatment filters, catchpits and flow controls, alongside bespoke solutions from our dedicated in-house Fabrications team.

Associated products

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6.1 Stormcheck



One aim of Sustainable Drainage Systems is to mimic greenfield run-off rates from developed sites. One way of achieving this aim is by stormwater storage and attenuation. The Stormcheck chamber allows precise control of site discharge rates and when combined with our storage systems provides an industry recognised flow attenuation system.

6.1.1 Stormcheck vortex flow control chamber

The Stormcheck vortex flow control chamber comprises of a pre-fabricated plastic chamber, in a range of diameters, with integral vortex flow control device.

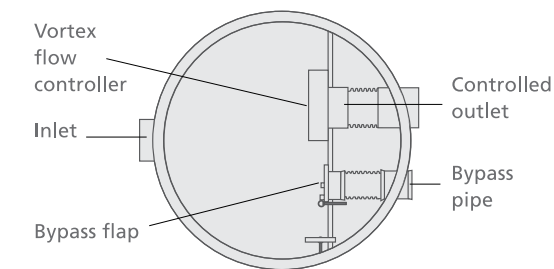


Figure 48 Manual bypass design

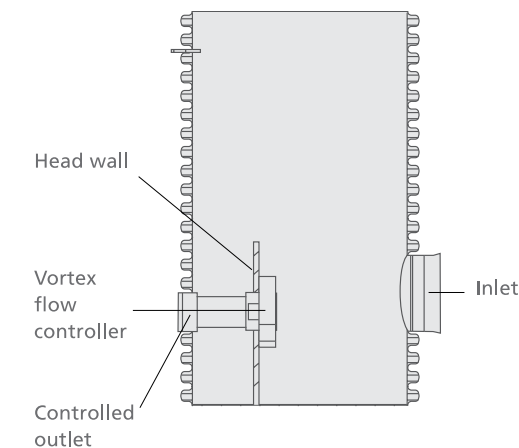


Figure 49 Auto bypass design

6.1.2 Chamber types

Non-bypass chamber for sites where discharge rates must be guaranteed and not exceeded.

6.1.3 Manual bypass design

Offers a bypass to the flow control device which is manually operated from the surface. The activation of the bypass system opens a door in the head wall allowing water in the chamber to drain down via the bypass pipe.

6.1.4 Auto bypass design

Stormcheck chambers with automatic bypass systems are also available, please contact the Polypipe WMS Technical support team.

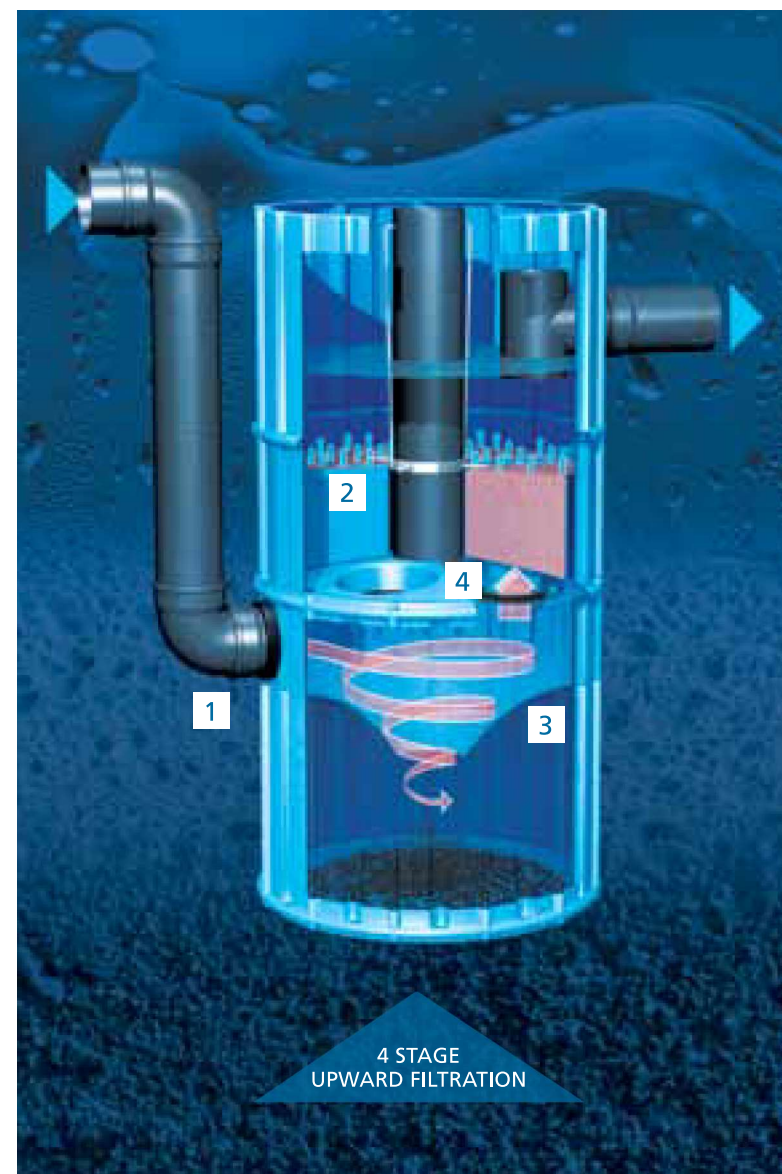
6.1.5 Key benefits

A complete system will include the following items:

- A sealed chamber produced in our dedicated fabrications department, built to exacting specifications and delivered to site ready to be installed
- The factory fitted vortex flow control device saves the time and expense of on-site construction
- Vortex flow control devices are widely recognised as being the most hydraulically efficient means of flow regulation. The unique design utilising no moving parts which means they are virtually maintenance free
- Stormcheck chambers are manufactured with an integral sump for silt catchment and an optional drain down system to ease maintenance and silt removal
- The Stormcheck chamber can be integrated with any Polypipe SUDS Solution and the market leading Ridgidrain ADS System

6.2 Storm-X4 - stormwater treatment system for roof and surface water run-off

The use of the Storm-X4 advanced four stage filtration system can dramatically improve the quality of the surface water entering the receiving water course, improving biodiversity and aiding with compliance of the Water Framework Directive.



6.2.1 Function principles

1. Contaminated surface water run-off is fed into the basal section of the filter. The angled inlet generates a radial flow pattern.
2. The hydrodynamic separator converts the radial flow to generate particle sedimentation to remove heavy debris and silt from the contaminated water. The sediment is then retained in a silt trap chamber below the separator for easy maintenance and access.
3. The filter element is housed in the central section of the Storm-X4. The filter element is specifically designed for traffic, heavy traffic or roof applications and filters out fine materials in an up-flow process. Dissolved materials are absorbed by the filter, which will need to be replaced every two years on average.
4. Situated above the filter element is an oil retention unit which removes the remaining contaminants from the surface water run-off. The clean water then flows via the outlet to the soakaway or watercourse.

6.2.2 Stormwater treatment

Storm-X4 is capable of cleaning surface water run-off from roofs, car parks and the most polluted roads, even in heavily trafficked areas. Storm-X4 has been designed to remove heavy particles, silt and nutrients and heavy metals such as copper, zinc and cadmium from the surface water to provide an environmentally sound solution which benefits the natural watercourse and increases biodiversity.

6.2.3 Improved surface water quality

Storm-X4 minimises pollution of the natural watercourse and enables clean surface water run-off to be discharged from site. In line with new legislation and guidelines such as the Water Framework Directive, Storm-X4 offers a regulatory compliant solution for dealing with the issues of water quality. With the support, technical expertise and knowledge of Polypipe WMS, developers can be confident that a long-term, affordable, sustainable solution can be designed.

6.2.4 Source control

By using Storm-X4 developers can improve water quality even before discharge from site by treating surface run-off as close to its source as possible. Once it has passed through the Storm-X4 filter and used in conjunction with attenuation and flow control devices from Polypipe WMS, water run-off can be discharged from site at an agreed rate, reducing the risk of downstream flooding.



6.2 Storm-X4 - stormwater treatment system for roof and surface water run-off



6.2.5 Low maintenance

The advanced four stage filtration system within Storm-X4 utilises no moving parts, providing a low maintenance solution for all surface water run-off applications. The filters within the unit only need to be replaced on average every two years, providing an easily maintainable solution on-site.

6.2.6 Easy to install

Polypipe WMS can supply Storm-X4 as a standalone unit, or housed within a bespoke plastic chamber. When housed within a chamber, the units are constructed off-site and delivered to site ready to install, making installation quicker, safer and easier with a much lower development footprint.

6.2.7 Storm-X4 1000 traffic

- Surface water filter complying with DIN 1989-2 Type A
- For drained traffic areas to 500m²
- Connections: at DN150 or DN200
- 4 Filter Elements:
Material, Filter, Substrate, Traffic
Weight per element: 16kg



6.2.8 Storm-X4 1000 heavy traffic

- Surface water filter complying with DIN 1989-2 Type A
- For drained traffic areas to 500m²
- Connections: at DN150 or DN200
- 4 Filter Elements:
Material, Filter, Substrate, Heavy Traffic
Weight per element: 32kg

6.2.9 Storm-X4 1000 roof

- Surface water filter complying with DIN 1989-2 Type A
- For drained roof areas to 1000m²
- Connections: at DN150 or DN200
- 4 Filter Elements:
Material, Filter, Substrate, Roof
Weight per element: 16kg

This table shows capabilities of Storm-X4 to reduce chemical pollutants.

Parameter	Unit	Main road, distributor		Aims of LAWA ^a	Drinking water ^b	Seepage ^c	Storm-X4
		From	To	Permissible limit	Permissible limit	Control value	Aim ^e
Physio-chemical parameters				90-percentile			
El. cond.	(µS/cm)	110	2400	–	2500	–	<1500
pH	(-)	6.4	7.9	–	6.5 - 9.5	–	7.0 - 9.5
Nutrients							
P _{tot}	(mg/L)	0.23	0.34	–	–	–	0.10
NH ₄	(mg/L)	0.5	2.3	–	0.5	–	0.3
NO ₃	(mg/L)	0.0	16.0	–	50.0	–	–
Heavy metals							
Cd	(µg/L)	0.3	13.0	1.0	5.0	5.0	<1.0
Zn	(µg/L)	120	2.000	500	–	500	<500
Cu	(µg/L)	97	104	20	2000	50	<50 ^d
Pb	(µg/L)	11	525	50	10	25	<25 ^d
Ni	(µg/L)	4	70	50	20	50	<20
Cr	(µg/L)	6	50	50	50	50	<20
Organic substances							
PAH (EPA)	(µg/L)	0.2	17.1	–	0.1 (6 Subst.)	0.2	<0.2
MOTH	(mg/L)	0.1	6.5	–	–	0.2	<0.2

- a. Aims of the German Working Group on water issues of the Federal States and the Federal Government (LAWA) for surface water usage as potable drinking water (1998).
b. Permissible limit of the German Drinking Water Ordinance (2001).
c. Control value for seepage of the German Federal Soil Protection Act an Ordinance (1999) according to §8 1,2.
d. For copper and lead roofs a second treatment step is necessary.
e. The aims of the system refer to average annual loads.

Critical parameter, treatment necessary	
Treatment may be necessary, not generally	
Non critical parameter	

Table 19

6.3 Fabrications

Polypipe WMS is in the unique position of being able to offer its customers bespoke fabrications from its highly skilled in-house Fabrications team.



Due to the variety of solutions available from Polypipe WMS, the fabrications department has become an integral part of the company. Whether you need a bend with a specialist angle or a complex chamber. Polypipe WMS are able to design and manufacture products to exact customer specifications. As well as delivering the products to site as a complete unit, ready for installation.

Having an in-house fabrication facility means we can respond quickly to customers needs. Liasing directly with the customer, through our own team of WMS specialists enables us to design and manufacture bespoke specialist fabrications to specific customer requirements. Examples of which can be seen in the following section. Due to the bespoke nature of these products, it is impossible to demonstrate every permutation available. For assistance please contact our sales department on 01509 615100.

6.3.1 Key benefits

- Design and manufacture of bespoke fabrications
- Purpose built 30,000 square metres fabrications facility
- All fabrications are constructed off-site and delivered as a complete unit
- Reduced Health and Safety risks in handling, storage and installation
- Increased versatility
- Strong yet light weight nature of plastic pipes enables a reduction of on-site plant requirements
- All Polypipe WMS fabricators are fully trained by The Welders Institute



6.3.2 The range

The range of products available is from standard applications to one-off bespoke solutions covering:

- Catchpits
- Surface water and sewer manholes manufactured to adoptable standards
- Rainwater harvesting tanks for both commercial and residential applications
- Sediment and leaf filters pre-fabricated within chambers
- Full range of fittings and accessories

6.3.3 Technical information online

The Polypipe WMS website, available at www.polypipewms.co.uk includes comprehensive technical information and installation guides, CAD drawings and BBA certificate downloads for the full Polystorm Modular Cell range. The ease of navigation and clear, concise information presented on the site has been designed to offer users more detailed and relevant information when looking to specify Polystorm products. Also included within the homepage is a product search facility to give easy and direct access to the information available on the site.



7.0 Project solutions



We have considerable project experience in sustainable drainage projects, providing tailor made solutions for our customers' requirements.

Project solutions

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7.1 Polystorm - for commercial development Lytham St. Annes

Two stormwater management systems were supplied by Polypipe WMS within 12 months of one another on adjoining sites in Lytham St. Annes - a BMW garage and a Vauxhall Chevrolet and SAAB dealership.



Working closely alongside contractor James West Ltd and consultant Atkinson Peck, who specified the drainage on-site, Polypipe WMS supplied several cubic metres of Polystorm cells to provide an attenuation unit for absorbing vast quantities of rainwater. The Polystorm cells were also installed on the area surrounding the new car storage point, as this provided easy access to the large outfall drain and would further reduce the possibility of water logging on-site. 200 metres of Polysewer and 4000 metres of general purpose duct were also supplied alongside 400 metres of 150mm and 375 metres of Ridgidrain pipe.

7.2 Polystorm Lite - for new school development



A Polystorm Lite attenuation solution was implemented by Galliford Try on the development of a primary school in Heywood, Greater Manchester.

The project, at the New Central Heywood Primary School was part of a development to accommodate the integration of three local schools into one site. Over 1100 Polystorm Lite cells, along with the Stormcheck Vortex Flow Control Chamber were installed on the site to provide an integrated, robust and durable attenuation tank system. Once locked together, the cell structure was wrapped in a geotextile membrane to prevent silt migration. With a capacity of 350,000 litres and with a discharge rate set to ten litres per second, the Polystorm Lite cells were selected to provide the most effective SUDS solution for the long-term future of the development.



7.3 Hybrid drainage system

- for Knight Build site

Over 14,000 cells of Polystorm Lite and Polystorm were installed on the Knight Build site as part of a bespoke hybrid SUDS attenuation solution.



The site, a former private school which has been developed into apartments, consisted of various constraints meaning that the cells needed to be installed on a slope. The solution was a hybrid modular system containing both Polystorm Lite and Polystorm cells which accommodated the differing burial depths resulting in 2,700m³ of capacity.

Over 1800 metres of Ridgidrain pipes were supplied to facilitate the transportation of drainage water to and from the tank structure. Whilst Polystorm Lite, Polystorm and Ridgidrain can all be used effectively as standalone solutions, it was the ability of the products to be integrated together which offered Knight Build the most viable solution.



7.3 Hybrid drainage system

- for RAF Northolt project

A bespoke hybrid drainage system for the RAF Northolt Ministry of Defence site in Cambridgeshire, utilising both its Polystorm Lite and Polystorm modular cell solutions.



Approximately 3000 Polystorm Lite and Polystorm cells have been installed on-site to provide an attenuation solution to cope with surface water run-off from both hard standing and roof areas. The original project specification was changed from a concrete box culvert due to issues with rising material costs and concerns over the performance of the product in times of high-flow water run-off. However, a solution was needed that was capable of storing the required water capacity whilst accommodating difficult site constraints. The modular construction of Polystorm Lite and Polystorm allows the cells to be connected together to form almost any shape and storage capacity.

8.0 The company - ground breaking technology, innovative products and total solutions

Polypipe is one of Europe’s largest and fastest growing manufacturers of piping systems for the residential, commercial and infrastructure sectors. Polypipe is now the UK’s leading manufacturer of cable protection, drainage, sewerage and water management systems for the UK construction industry.



The company

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8.1 Manufacturing - breadth and strength



8.1.1 Manufacturing facilities

There are two manufacturing sites in the UK, in Loughborough and Horncastle with an operations site in Glasgow. Polypipe has undergone a continuous programme of investment in manufacturing over recent years to further enhance its market leading position.

Operating from sites in Loughborough, Horncastle and Glasgow, Polypipe Civils employs over 300 people, with 35 production lines producing over 20 different product ranges consisting in excess of 1600 individual line items. With investment levels of £11m in 2006/07 Polypipe Civils prides itself in having the most extensive manufacturing capabilities in its sector.



8.1.2 Polystorm range

The use of modular cell systems has risen dramatically in recent years as consulting engineers, contractors and developers seek to manage surface water run-off on developed sites. In order to meet this growing demand and offer improved service levels and shorter lead times to its customers, Polypipe has made a further commitment to extend its production capacity. This includes a 12,000 sq.ft. extension to the Horncastle production line with 4 new injection lines and a fully automated 6 axis robot system.

8.2 Innovation, research & development - our continuous commitment



8.2.1 Innovation

Polypipe has dedicated research and development facilities setting the highest standard in the industry. In the last six years there has been extensive investment in laboratory facilities including the independent UKAS accredited Berry & Hayward laboratory. Our laboratories allow product development and certification testing to be undertaken in-house therefore shortening time to market and maximising product benefits for our customers.

8.2.2 Quality control

Polypipe take pride in providing a consistently high level of product quality with the most advanced and diverse range including accreditation from BSI to ISO 9001 : 2008. There are 2 quality control laboratories in action 24 hours a day and a fully equipped modern materials laboratory for development and analysis.

8.3 Health & safety and environmental policies



8.3.1 Polypipe health and safety policy

The Health and Safety of employees is an integral part of Polypipe's business activities. Health and Safety is a responsibility and statutory duty that each and every employee and visitor to our sites must share. To enable this, it is our intent that responsibility for Health and Safety be accepted and effectively carried out at all levels within our organisation.

All Polypipe companies shall, as far as possible, ensure that:

- We provide a safe working environment for our employees, where hazard and risk are effectively assessed and eliminated or adequately controlled
- We use suitable and sufficient controls to ensure that non-employees who may be affected by our activities are not exposed to risks to their Health and Safety
- We meet or exceed all current legislation and regulation relating to Health and Safety
- We clearly define and communicate organisational responsibilities for the management of Health and Safety
- Employee involvement in matters relating to Health and Safety is actively encouraged
- Adequate information, instruction and training are provided to all employees
- We properly investigate accidents and cases of work-related ill health
- We monitor and review Health and Safety performance using appropriate measures and methods
- There are good working relationships with regulatory authorities, neighbours, customers, suppliers and stakeholders on Health and Safety

8.3.2 Polypipe environmental policy

Polypipe Civils operates an Environmental Management System which complies with the requirements of ISO14001. At Polypipe we consider the positive management of the potential environmental impact of our activities as an integral part of our business undertaking. It is our intent to minimise the lasting impact of our operations on the environment and to take account of sustainability in our product design and applications.

The manufacture of these products consumes both raw materials and energy and Polypipe therefore has introduced proactive sustainability policies to manage both their usage and environmental impacts.

The Group shall ensure, as far as possible, that:

- We meet or exceed all current legislation and regulation relating to the environment
- We clearly define and communicate organisational responsibilities for the management of environmental protection
- Employee involvement in matters relating to the environment is actively encouraged
- Adequate information, instruction and training are provided to all employees
- We properly investigate environmental incidents
- We monitor and review performance using appropriate measures and methods
- We optimise the use of water and utilities
- There are good working relationships with regulatory authorities, neighbours, customers, suppliers and stakeholders on Environmental matters, energy management and Conservation Policy



8.4 Environmental commitments

- sustainability is not just a pipe dream

8.4.1 Sustainability is not just a pipe dream

Sustainability is not just about making products from recycled material, or helping to reduce energy consumption, there are many more elements to consider. Polypipe Civils makes a conscious effort to ensure as much is being done to help the external environment as possible. Products supplied to the market by Polypipe Civils are manufactured with sustainability in mind, making sure we provide sustainable solutions for generations to come. We constantly evaluate our systems and procedures so that the whole process of production is as sustainable as possible from material use through to product application.



8.4.2 Recycled product

Using recycled product is imperative and for the past 15 years it has been our policy to use as much recycled material as possible, either from other industries or post consumer waste. To this end Polypipe Civils use over 45% recycled material in the production of our pipes, which allows us to maintain the exacting standards of quality and durability that we strive to obtain and help to protect the environment.

8.4.3 100% Recyclable

As our products are manufactured in plastic, they are 100% recyclable at the end of their useful life, creating a sustainable path back into reuse.

8.4.4 Lowering energy consumption

Investing in new machinery has been key to the whole Polypipe Group and we have strived to ensure that our energy consumption has been addressed to make our new machinery more energy efficient.

An excellent example of this is the replacement of 17 injection moulding machines at a manufacturing site in 2006. The new machines saved between 18-20% in energy consumption over the outgoing machinery.

8.4 Sustainable - materials



8.4.5 Using less transport

Utilising our own transport fleet, Polypipe Civils ensure that the number of vehicles delivering product to site is kept to a minimum. For example, 1km of 450mm plastic drainage pipes will only require 3 deliveries, compared to concrete pipes which would require 12 deliveries. Not only will this benefit the environment but it also minimises the risk of on-site traffic related accidents, providing further Health and Safety benefits on-site.

8.4.6 Reducing our fuel usage

Our transport network plays a significant role in reducing our fuel consumption and as part of this, we have made sure that our vehicles run on bio-diesel. Polypipe Civils has also adopted the use of low rolling resistance tyres saving 5% on fuel. We also limit our vehicles to 54mph as opposed to the standard 56mph to save a further 5% on fuel.

8.4.7 Recovering site waste

In the distribution of some products, Polypipe Civils use wooden pallets. In order to help reduce on-site waste and reduce consumption we have introduced a collection scheme, whereby we collect any pallet or strapping used on our products. Collection of pallets and strapping is easy and hassle-free and can be arranged by telephone.

8.4.8 Helping our communities

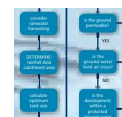
Polypipe Civils is committed to supporting our communities as much as possible. Whether it be supplying a local childrens hospice with decorations for their gardens, sponsoring youth sports teams and associations or holding one of the largest sailing regattas in the UK which brings the whole construction industry together to raise money for various charities. Sustainability is about the whole environment and Polypipe Civils takes pride in helping to create a sustainable environment wherever possible.

8.5 Support information

- www.polypipewms.co.uk

8.5.1 Website

The Polypipe WMS website provides an overview, key benefits and a technical summary of each product supported by product and technical literature downloads. The next level of information is to provide the design engineer or contractor with more detail and guidance when specifying. CAD downloads are available in both PDF and DWG format plus specification clauses, assessment forms and BBA certificates. Legislative guidance from the Water Framework Directive, to the Code for Sustainable Homes is available plus Design Manuals from CIRIA, the BRE and much more. With FAQ's on Rainstream, Ridgistorm-XL and an 'Ask the Experts' section, the website is a comprehensive and essential source of water management information.



Selection and Design



BBA Certificates



CAD Drawings



Calculation Tools



Installation Guides



Assessment Forms



Health and Safety



Specification Clauses



Legislative Guidance



FAQ's



Ask the Experts

8.5 Support information

- literature

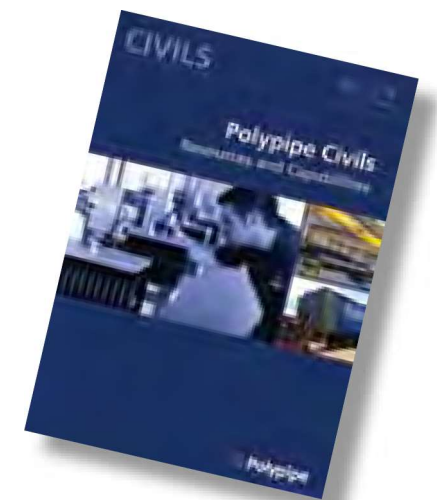
A range of specific product literature is also available from Polypipe WMS each with further details and support information. The literature is also available on the Polypipe WMS website (www.polypipewms.co.uk) as PDF downloads.

8.5.2 Product literature

To request a printed piece of product literature please contact Polypipe WMS on 01509 217671 or visit www.polypipewms.co.uk and click into choice of product, then 'Request brochure' which takes you to a simple request form. Complete the form before you submit your brochure request then click onto the 'Submit Request' panel.

8.5.3 Resources and Capabilities brochure

To know more about Polypipe WMS and Polypipe Civils there is the Polypipe Civils Resources and Capabilities brochure. The brochure encapsulates the company's investments and achievements made over recent years which is testimony to the leading position that Polypipe Civils and WMS currently has in the marketplace. There is information of additional products and solutions from Polypipe Civils with an overview of proven case studies and market sectors.



Bespoke Fabrications Brochure



Polypipe Civils Product and System Selector



Water Management Solutions Product and System Selector

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Polypipe Water Management Solutions Modular Cells Technical Guide

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