



Permavoid Geo-Cellular Modules

Performance Specification

Example Specification

July 2014

Permavoid Geo-Cellular Modules

SCOPE OF WORKS

The geo-cellular structural system shall be installed in accordance with:

- CIRIA report C680 (2008); *Structural design of modular geocellular drainage tanks*
- BS 7533-13: 2009; *Pavements constructed with clay, natural stone or concrete pavers. Part 13 - Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay paviours.*
- BS EN 752: 2008; *Drain and sewer systems outside buildings*
- BS 8582: 2013; *Code of practice for surface water management for development sites*
- The Local Regulations and requirements

A modular storm water attenuation/infiltration system for shallow water management requirements consisting of modular polypropylene structural geo-cellular units, interlocking tensile pins and shear connectors. All geosynthetics and associated connections shall be installed in accordance with this specification and the Engineer's drawings and details.

ENGINEERED DESIGN REQUIREMENTS

Designs shall be based on sound structural calculations supported with clear laboratory test results and shall consider both collapse and unit deflection. Consideration should also be given to the effect of unit deflection on the overlying surface materials.

Permanent Dead loads (including lateral loads) from overlying fill to be based upon the construction drawings and the associated ground conditions and materials given in the site specific geotechnical report.

Live loadings from vehicles and activities at the surface should be considered. Modular geo-cellular systems must be designed as structural components, using structural design theory in accordance with CIRIA Report C680.

All calculations shall be submitted to the Engineer prior to any works commencing.

Product substitution will only be allowed on an equal or approved basis and should only be considered if accompanied by all relevant structural calculations to demonstrate equality of performance.

Consideration should be given to the selection of appropriate geotextiles and/or geomembranes, taking into account:

- System usage, retention (attenuation) or permeability (soakaway)
- Site investigation to establish soil parameters
- Determine permeability requirements and anti clogging requirements (infiltration only) to prevent premature clogging.

- Durability requirements, ensure suitability if subjected to significant chemical/hydro-carbon exposure present in stormwater run-off or within the ground water.

PERMAVOID GEOCELLULAR UNITS

PERMAVOID 150

Manufacturer:	Polypipe Civils
Product Code:	PVPP150
Material:	Polypropylene
Nominal Dimension(s)	
- Length [mm]:	708
- Width [mm]:	354
- Depth [mm]:	150
Nominal Weight [Kg]:	3.0
Nominal Unit Volume(s)	
- Structure [m ³]:	0.037
- Storage [m ³]:	0.036 (36 litres)
Porosity (Void Ratio):	95%
Average Effective Perforated Surface Area:	52%
Nominal Compressive Strength (at Yield)	
- Vertical [kN/m ²]:	715
- Lateral [kN/m ²]:	156
Nominal Short Term Deflection	
- Vertical [kN/m ² per mm]:	126.0
- Lateral [kN/m ² per mm]:	15.0

PERMAVOID 85

Manufacturer:	Polypipe Civils
Product Code:	PVPP85
Material:	Polypropylene
Nominal Dimension(s)	
- Length [mm]:	708
- Width [mm]:	354
- Depth [mm]:	85
Nominal Weight [Kg]:	2.25

Nominal Unit Volume(s)

- Structure [m ³]:	0.021
- Storage [m ³]:	0.019 (19 litres)

Porosity (Void Ratio): 92%

Average Effective Perforated Surface Area: 52%

Nominal Compressive Strength (at Yield)

- Vertical [kN/m ²]:	715
- Lateral [kN/m ²]:	156

Nominal Short Term Deflection

- Vertical [kN/m ² per mm]:	126.0
- Lateral [kN/m ² per mm]:	15.0

Permaceptor

Permaceptor is a high-strength mini oil separator designed to be incorporated within the pavement construction zone adjacent to road/ yard gullies. The system is connected to the outlet pipe from the gully and incorporates prefabricated weir and baffles to separate floating oils, providing source control treatment of sub-catchment run-off to meet the requirements of PPG3 treatment levels.

Manufacturer: Polypipe Civils

Material: Polypropylene

Nominal Dimension(s)

- Length [mm]:	1062
- Width [mm]:	708
- Depth [mm]:	300

Nominal Weight [Kg]: 20.0

Nominal Compressive Strength (at Yield)

- Vertical [kN/m ²]:	715
- Lateral [kN/m ²]:	156

Oil retention [litres] 25

PERMAVOID Biomat

Permavoid Biomat is designed to provide additional water treatment within a Permavoid surface water attenuation or infiltration structure.

Manufacturer: Polypipe Civils

Product Code: PV150BM

Material:

- Geocellular unit: Polypropylene
- Biomat: Proprietary tri-laminate composite

Nominal Dimension(s)

- Length [mm]: 708
- Width [mm]: 354
- Depth [mm]: 150

Nominal Weight [Kg]: 3.0

Nominal Unit Volume(s)

- Structure [m³]: 0.037
- Storage [m³]: 0.034 (34 litres)

Porosity (Void Ratio): 92%

Average Effective Perforated Surface Area: 52%

Nominal Compressive Strength (at Yield)

- Vertical [kN/m²]: 715
- Lateral [kN/m²]: 156

Nominal Short Term Deflection

- Structure [m³]: 126
- Storage [m³]: 15.0

Oil retention [g/m²]: 56

Effluent Discharge [ppm at max oil loading]: 10

ANCILLARY PERMAVOID COMPONENTS

Permavoid Permatie

Permavoid shear connector

PERMAVOID Medium Duty with Biomat

Permavoid Medium Duty is designed to provide additional water treatment within a Permavoid/Polystorm surface water attenuation or infiltration structure.

Manufacturer: Polypipe Civils

Product Code: PSM1BM

Material:

- Geocellular unit: Polypropylene
- Biomat: Proprietary tri-laminate composite

Nominal Dimension(s)

- Length [mm]: 1000
- Width [mm]: 500
- Depth [mm]: 400

Nominal Weight [Kg]: 9.0

Nominal Unit Volume(s)

Storage [m³]: 0.19 (190 litres)

Porosity (Void Ratio): 95%

Nominal Compressive Strength (at Yield)

- Vertical [kN/m²]: 650
- Lateral [kN/m²]: 65

Nominal Short Term Deflection

- Vertical [kN/m²]: 1mm per 70.1
- Lateral [kN/m²]: 1mm per 4.4

Oil retention [g/m²]: 56

Effluent Discharge [ppm at max oil loading]: 10

PERMAVOID Permachannel

Permavoid Permachannel is designed to function as a combined surface water linear collection, silt and oil interception system

Manufacturer: Polypipe Civils

Product Code: PV03001 ¹⁾

Material:

- Channel: Polymer concrete
- Grating: Ductile iron (Heel-safe)

Nominal Dimension(s)

- Length [mm]: 1000
- Width [mm]: 150
- Depth [mm]: 210

Nominal Weight [Kg]: 29.0

Load Rating: D 400 ²⁾

Notes

1. Ancillary items required to complete channel installation; refer to Polypipe Civils technical guidance.
2. In accordance with BS EN 1433:2002. Minimum concrete bed and haunch installation to channel required.

HANDLING AND STORAGE

The transport, handling and storage of materials shall be carried out in accordance with the manufacturer's recommendations, subject to the approval of the engineer.

Shear connectors and clips shall be packed in sealed polythene bags and stored in shaded areas out of direct sunlight.

Geocellular units shall be carefully unloaded and stored on level ground.

Geocellular units to be stored within a shaded compound and shall not be exposed to direct sunlight.

Effective precautions shall be taken to prevent damage to materials. Any Permavoid unit suffering damage, resulting from any means, will be immediately rejected from the site. Making good of damaged Permavoid units will not be permitted.

MATERIAL

Unless otherwise specified in the Project Specification the material, equipment and systems to be provided under this section must conform to the following requirements;

1. Life expectancy shall be in excess of 25 years
2. All components of the system must be able to resist the types and quantities of chemicals likely to be found in the native soils and surface water run-off.

3. A straight forward means of inspecting, cleaning and maintaining the system must be available;
4. Minimum 92 % storage volume
5. Ventilation must be provided to the structure using an open air vent. One 110mm air vent should be provided for every 7500m² of impermeable catchment area to be drained.
6. All material components shall be able to resist any imposed load(s), generated by both transient (live) and permanent (dead) actions, that may be expected in the vicinity of the proposed Permavoid installation. This shall include all temporary loads that may occur during the whole construction works on the site.

INSTALLATION

The installation shall be carried out by trained installers.

Excavation should be carried out in accordance with BS 6031:2009, *Code of practice for earthworks*.

The modular tank shall be installed on a firm, stable, uniform and level base without dips or humps.

The base shall be inspected for soft spots and any present shall be excavated and made good with suitably compacted granular material.

The geocellular units shall be installed in accordance with the Polypipe Civils technical guidance and Engineer's drawings. Care shall be taken to ensure that all units with preformed sockets are correctly aligned with the connecting inlet and outlet pipes.

The geotextile (infiltration structure) or geomembrane (attenuation structure) encapsulation of the 'tank' shall be completed in accordance with the manufacturer's requirements. It should be noted that the geosynthetic manufacturer may recommend the use of an additional protective geotextile fleece be incorporated within the works.

All connections and joints shall be installed in accordance with the manufacturer's specifications and fully inspected and tested on site prior to the commencement of any backfilling.

All joints for Attenuation tanks should be sealed using proprietary techniques recommended by the manufacturer. Advice on seam testing procedures is given in CIRIA report SP124.

The installer shall ensure that all expected temporary construction loads have been considered as part of the structural design. Any load additional/unplanned to that considered as part of the structural design shall be immediately brought to the attention of the Engineer. All necessary precautions shall be taken to prevent the overloading of the Permavoid structure.

SPECIFICATION CLAUSE

The shallow geocellular modular stormwater attenuation/infiltration system shall be Permavoid as manufactured and supplied by **Polypipe Civils**.

Polypropylene modular units shall be 758mm L x 354mm W x 150mm D and provide 3 dimensional flow, within a minimum 95% void.

Modular units shall be connected using proprietary interlocking tensile ties and shear connectors and surrounded by appropriate geosynthetic(s). The system shall conform to CIRIA C680 and BS 7533-13:1999 (if appropriate), with a short term vertical compressive strength and deflection not less than 715kN/m² and 126 kN/m² per mm respectively.

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