R12 DRAINAGE BELOW GROUND

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STORAGE TANKS – PLASTIC UNITS

Manufacturer: Polypipe Civils
Product reference: Permavoid™
Material: Recycled plastic
Size: 708mm x 354mm x 150mm
Weight: 3kg
Storage Volume: 35.71 litres

Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 95% void ratio the system will provide either an attenuation or infiltration drainage solution.

Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drawings xxxxxxx

Physical Properties of the Geocellular Units:

- **Element**          | **Value** | **Unit**
- Unconfined Compressive Strength | 715      | KN/m²
- Volumetric Void Ratio       | 95       | %
- Effective Perforated Surface Area | 52     | %
- Flow rate per m width @ zero Gradient | 9     | l/s
- Flow rate per m width @ 5% gradient | 21   | l/s

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.

- The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
- The constructed conduits shall be surrounded with a suitable separation/filtration geotextile prior to carefully backfilling with material approved by The Engineer. Bedding layers and backfills shall be as specified by the Engineer.
- Jointing: each unit shall be connected to adjacent units with purpose made structural interlocking ties to prevent lateral displacement.
- The tie arrangement shall be in accordance with the design drawings.
- Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations.

Accessories: Permavoid Permatie, Permavoid Shear Connector.
Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 92% void ratio the system will provide either an attenuation or infiltration drainage solution. Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drawings xxxxxxx

Physical Properties of the Geocellular Units:

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
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<tbody>
<tr>
<td>Unconfined Compressive Strength</td>
<td>715</td>
<td>KN/m²</td>
</tr>
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<td>Volumetric Void Ratio</td>
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</tr>
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<td>Effective Perforated Surface Area</td>
<td>52</td>
<td>%</td>
</tr>
<tr>
<td>Flow rate per m width @ zero Gradient</td>
<td>4</td>
<td>l/s</td>
</tr>
<tr>
<td>Flow rate per m width @ 2% gradient</td>
<td>7</td>
<td>l/s</td>
</tr>
</tbody>
</table>

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.

• The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
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• Jointing: each unit shall be connected to adjacent units with purpose made structural interlocking ties to prevent lateral displacement.
• The tie arrangement shall be in accordance with the design drawings.
• Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations.

Accessories: Permavoid Permatie, Permavoid Shear Connector

SOAKAWAY SYSTEMS – PLASTIC UNITS

Manufacturer: Polypipe Civils
Product reference: Permavoid™
Material: Recycled plastic
Size: 708mm x 354mm x 150mm
Weight: 3kg
Storage Volume: 35.71 litres
Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 95% void ratio the system will provide either an attenuation or
infiltration drainage solution. Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drawings xxxxxxx

Physical Properties of the Geocellular Units:

- Element                          Value   Unit
- Unconfined Compressive Strength   715     KN/m²
- Volumetric Void Ratio            95      %
- Effective Perforated Surface Area 52     %
- Flow rate per m width @ zero Gradient 9     l/s
- Flow rate per m width @ 5% gradient 21     l/s

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.

- The Geocellular units shall be installed strictly in accordance with the manufacturer's recommendations and in a manner that will not cause damage.
- The constructed conduits shall be surrounded with a suitable separation/filtration geotextile prior to carefully backfilling with material approved by The Engineer. Bedding layers and backfills shall be as specified by the Engineer.
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- The tie arrangement shall be in accordance with the design drawings.
- Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations.

Accessories: Permavoid Permatie, Permavoid Shear Connector

Manufacturer: Polypipe Civils
Product reference: Permavoid™
Material: Recycled plastic
Size: 708mm x 354mm x 85mm
Weight: 2.25kg
Storage Volume: 19.17 litres
Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 92% void ratio the system will provide either an attenuation or infiltration drainage solution. Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drawings xxxxxxx

Physical Properties of the Geocellular Units:

- Element                          Value   Unit
- Unconfined Compressive Strength   715     KN/m²
- Volumetric Void Ratio            92      %
- Effective Perforated Surface Area 52     %
• Flow rate per m width @ zero Gradient 4 l/s
• Flow rate per m width @ 2% gradient 7 l/s

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.
• The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
• The constructed conduits shall be surrounded with a suitable separation/filtration geotextile prior to carefully backfilling with material approved by The Engineer. Bedding layers and backfills shall be as specified by the Engineer.
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• The tie arrangement shall be in accordance with the design drawings.
• Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations.

Additional Information:

Accessories: Permavoid Permatie, Permavoid Shear Connector

**GROUNDWATER PRESSURE RELIEF DRAIN FOR SURFACE/ SUB SURFACE WATER**

Manufacturer: Polypipe Civils
Product reference: Permavoid™
Material: Recycled plastic
Size: 708mm x 354mm x 150mm
Weight: 3kg
Storage Volume: 35.71 litres
Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 95% void ratio the system will provide either an attenuation or infiltration drainage solution. Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drwings xxxxxxx

Physical Properties of the Geocellular Units:

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</tr>
<tr>
<td>Flow rate per m width @ 5% gradient</td>
<td>21</td>
<td>l/s</td>
</tr>
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Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.
• The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
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Accessories: Permavoid Permatie, Permavoid Shear Connector

Manufacturer: Polypipe Civils
Product reference: Permavoid™
Material: Recycled plastic
Size: 708mm x 354mm x 85mm
Weight: 2.25kg
Storage Volume: 19.17 litres

Permavoid™ is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft. Having a 92% void ratio the system will provide either an attenuation or infiltration drainage solution. Consult with Polypipe Civils for recommendations and details. Refer to Engineer Drawings xxxxxxx.

Physical Properties of the Geocellular Units:

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<td>7</td>
<td>l/s</td>
</tr>
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</table>

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.

Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.

• The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
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• Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations

Accessories: Permavoid Permatie, Permavoid Shear Connector

GEOTEXTILE MEMBRANES – FILTER

Manufacturer: Polypipe Civils
Product reference: Permafilter SuDS Treatment Geotextile
Material: Non-woven, dimpled, needle punched polymeric material comprising a proprietary blend of polyester fibres
Size: 2.4m x 100m roll or 5.25 x 50m roll
The dimpled geotextile shall incorporate hydrophilic (water attracting / oil repellent) and hydrophobic (oil attracting / water repellent) properties to achieve oil retention. Physical Properties shall be:

<table>
<thead>
<tr>
<th>Element</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight per unit</td>
<td>g/m²</td>
<td>300</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>KN/m</td>
<td>9 / 12</td>
</tr>
<tr>
<td>Elongation at max. load</td>
<td>%</td>
<td>56 / 55</td>
</tr>
<tr>
<td>Static puncture</td>
<td>N</td>
<td>1575</td>
</tr>
<tr>
<td>Push-through displacement</td>
<td>mm</td>
<td>27</td>
</tr>
<tr>
<td>Characteristic opening size, O₉₀</td>
<td>µm</td>
<td>77</td>
</tr>
<tr>
<td>Water permeability</td>
<td>L/m²/s</td>
<td>57</td>
</tr>
<tr>
<td>Air permeability</td>
<td>L/m²/s</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum Oil Retention</td>
<td>L/10 m²</td>
<td>6</td>
</tr>
<tr>
<td>Effluent discharge at max. oil loading</td>
<td>ppm</td>
<td>10</td>
</tr>
</tbody>
</table>

Jointing: 300mm overlap
Installation: Remove humps and sharp projections and fill hollows before laying. Protect from damage due to:
• Exposure to light, except during laying (maximum five hours)
• Contaminants
• Materials listed as potentially deleterious by geotextile manufacturer
• Damage, until fully covered by fill
• Wind uplift, by laying not more than 15 m before covering with fill
GEOTEXTILE MEMBRANES – IMPERVIOUS

Manufacturer: Polypipe Civils
Product reference: Heavy Duty Impermeable Geomembrane
Material: Polypropylene
Size: 2m x 100m, 3m x 100m and 6m x 100m roll
A single layer cold applied robust welded flexible membrane suitable for waterproofing to structures and for water containment. Membrane to be nominal 1mm thick laid with welded seams.

Physical Properties shall be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM D-751</td>
<td>1</td>
<td>mm</td>
</tr>
<tr>
<td>Density</td>
<td>ASTM D-792</td>
<td>0.9</td>
<td>g/cm³</td>
</tr>
<tr>
<td>Tensile Stress</td>
<td>ASTM D-638</td>
<td>18</td>
<td>N/mm</td>
</tr>
<tr>
<td>Elongation</td>
<td>ASTM D-638</td>
<td>&gt;700</td>
<td></td>
</tr>
<tr>
<td>Puncture Resistance</td>
<td>FTMS 101C (method 2065)</td>
<td>150</td>
<td>N</td>
</tr>
<tr>
<td>Tear Resistance</td>
<td>ASTM D-1004</td>
<td>60</td>
<td>N</td>
</tr>
<tr>
<td>Dimensional Stability</td>
<td>ASTM D-1204 (1hr @ 100°C)</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td>Stress Crack Resistance</td>
<td>ASTM 5397</td>
<td>100</td>
<td>%</td>
</tr>
<tr>
<td>Volatile Loss (5% loss max)</td>
<td>ASTM D-1203 (method A)</td>
<td>0.2</td>
<td>%</td>
</tr>
<tr>
<td>Ozone Resistance</td>
<td>ASTM D-1149</td>
<td>No Cracks</td>
<td></td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM 1603</td>
<td>2-3</td>
<td>%</td>
</tr>
<tr>
<td>Moisture Vapour</td>
<td>ASTM E96</td>
<td>&lt;0.1</td>
<td>g/m²/day</td>
</tr>
</tbody>
</table>

Jointing: min. 120mm overlaps
- Application temperature of membrane shall be greater than 4°C
- Primer not required
- Number of Layers: One
- Extrusion welding shall be accepted only in areas where twin seam welding is in-appropriate

Installation: Remove humps and sharp projections and fill hollows before laying. Protect from damage due to:
- Exposure to light, except during laying (maximum five hours)
- Contaminants
- Materials listed as potentially deleterious by geotextile manufacturer
- Damage, until fully covered by fill
- Wind uplift, by laying not more than 15 m before covering with fill

GEOTEXTILE PROTECTION FLEECE

Manufacturer: Polypipe Civils
Product reference: Permatex 300 Protection Fleece
Material: Polypropylene
Size: 2.4m x 100m roll or 5.25 x 50m roll
Heavy Duty reinforced protection geotextile fleece is a 3 layer composite, scrim reinforced, low elongation, heavy-duty needle punched geotextile, applied to all external surfaces of Permavoid attenuation tanks. The Geotextile is to be used as a protection layer in conjunction with Heavy Duty Waterproof Impermeable Geomembrane.

Physical Properties shall be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass per unit area</td>
<td>EN ISO 9864</td>
<td>300</td>
<td>g/sq.m</td>
</tr>
<tr>
<td>Thickness under load 2kPa</td>
<td>EN ISO 9863-1</td>
<td>2</td>
<td>Mm</td>
</tr>
<tr>
<td>CBR puncture resistance</td>
<td>EN ISO 12236</td>
<td>4000</td>
<td>N</td>
</tr>
<tr>
<td>Dynamic Cone Drop</td>
<td>EN ISO 13433</td>
<td>11</td>
<td>Mm</td>
</tr>
<tr>
<td>Tensile Strength (min) at max.load</td>
<td>EN ISO 10319</td>
<td>25</td>
<td>kN/M</td>
</tr>
<tr>
<td>Tensile Extension (max) at max. load</td>
<td>EN ISO 10319</td>
<td>50</td>
<td>%</td>
</tr>
<tr>
<td>Protection Efficiency</td>
<td>EN ISO 14575</td>
<td>300</td>
<td>N</td>
</tr>
<tr>
<td>Breakthrough Head</td>
<td>EN ISO 10319</td>
<td>nil</td>
<td>mm</td>
</tr>
<tr>
<td>Coefficient of Permeability</td>
<td>EN ISO 11058</td>
<td>55x10^-3</td>
<td>m/s</td>
</tr>
<tr>
<td>Characteristic opening size</td>
<td>EN ISO 12956</td>
<td>70</td>
<td>microns</td>
</tr>
</tbody>
</table>

Jointing: 300mm overlap
Installation: Remove humps and sharp projections and fill hollows before laying.
Protect from damage due to:
- Exposure to light, except during laying (maximum five hours)
- Contaminants
- Materials listed as potentially deleterious by geotextile manufacturer
- Damage, until fully covered by fill

Wind uplift, by laying not more than 15 m before covering with fill

LINEAR DRAINAGE CHANNEL SYSTEM

Manufacturer: Polypipe Civils
Product reference: Permachannel
Combined surface water collector and silt/oil separator. The Permachannel system complies with the regulations of the treatment train criteria in a SUDS scheme as defined by PPG3.
Discharge shall be from the side of the channel via a weir & baffle component, which shall be capable of separating oils and silt from progressing beyond the channel into the rest of the drainage system.
Refer to Engineer Drawings xxxxxxx
Size: 210 x 150 x 1000mm
Weight: 29kg
Outlet pipe diameter: 40 mm.
Pollution prevention performance:

- Silt retention capacity - 7000ml/m
- Oil retention capacity - 5000ml/m
- Compressive Resistance - 96-104N/mm²
- Bending Strength - 15-22N/mm²
- Water absorption - <5%
- Density - 2300kg/m³
- Modulus of elasticity - 15-30kN/mm²
- Chemical Resistance
  The polymer concrete shall be capillary free, non porous sealed structure and resistant to most chemical

Installation: Designed to be laid flat or max. 1:500
Accessories: Permachannel Universal Connector, Permachannel End Caps, Permachannel Blanking Plugs, Permachannel Deflector Plates.
Joints: Consult with Polypipe Civils for recommendations and details
Cover gratings: Ductile Iron Grid
Fixings: Consult with Permavoid for recommendations and details.
Loading grade to BS EN 1433: D400

OIL AND PETROL SEPARATOR UNITS - PLASTICS

Manufacturer: Polypipe Civils
Product reference: Permaceptor
Material: Recycled plastic
Size: 1062 x 708 x 300mm
Weight: 20kg
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.
Consult with Polypipe Civils for recommendations and details.
Refer to Engineer Drawings xxxxxxx
Pollution prevention performance:

- Silt/ Oil retention capacity - 25 litres

Inlet pipe size: DN 150 (Or less with adaptor)
Outlet pipe size: DN 150
Installation: Consult with Polypipe Civils for recommendations and details.

Manufacturer: Polypipe Civils
Product reference: Permavoid™ BioMat Unit
Material: Recycled plastic
Size: 708mm x 354mm x 150mm
Weight: 3 kg
Storage Volume: 35.71 litres
Permavoid™ BioMat is a high strength sub-base replacement system incorporating interlocking ties to each face and conform to BS7533-13:2009, to create a structural raft.

Hydrocarbon pollutants are removed from the surface water via a buoyant geocomposite located inside a Permavoid geocellular unit. The composite will interact with the free product oil, allow the formation of a biofilm on a solid surface and provide the opportunity for nutrient recycling within an active biofilm development. The system is intended to provide an environment which is ideal for the encouragement of oil degrading micro organisms where moisture, oil and oxygen from the atmosphere are all available in a situation supplied with a large surface area for oil adsorption and biofilm attachment.

Pollution prevention performance: Oil retention capacity - 56g/m2
Consult with Polypipe Civils for recommendations and details.
Refer to Engineer Drawings xxxxxx

Physical Properties of the Geocellular Units:

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<td>l/s</td>
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<td>Flow rate per m width @ 5% gradient</td>
<td>21</td>
<td>l/s</td>
</tr>
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Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.
Installation: Consult with Polypipe Civils for recommendations and details.

- The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage.
- The constructed conduits shall be surrounded with a suitable separation/filtration geotextile prior to carefully backfilling with material approved by The Engineer. Bedding layers and backfills shall be as specified by the Engineer.
- Jointing: each unit shall be connected to adjacent units with purpose made structural interlocking ties to prevent lateral displacement.
- The tie arrangement shall be in accordance with the design drawings
- Workmanship generally: Pre-laying checks: surface acceptability; before laying check that substrate surfaces are compacted and free from ridges and undulations

Accessories: Permavoid Permatie, Permavoid Shear Connector

Medium Duty Permavoid™ with Biomat Treatment Unit
Manufacturer: Polypipe Civils
Product reference: Medium Duty Permavoid™ with Biomat Treatment Unit
Material: Recycled plastic
Size: 1000mm x 500mm x 400mm
Weight: 9 kg
Storage Volume: 190 litres
Hydrocarbon pollutants are removed from the surface water via a buoyant geocomposite located inside a Polystorm geocellular unit. The composite will interact with the free product oil, allow the formation of a biofilm on a solid surface and provide the opportunity for nutrient recycling within an active biofilm development. The system is intended to provide an environment which is ideal for the encouragement of oil degrading micro organisms where moisture, oil and oxygen from the atmosphere are all available in a situation supplied with a large surface area for oil adsorption and biofilm attachment.

Pollution prevention performance: Oil retention capacity - 56g/m2
Consult with Polypipe Civils for recommendations and details.
Refer to Engineer Drawings xxxxxxx

Physical Properties of the Geocellular Units:

- Unconfined Compressive Strength: 650 KN/m2
- Volumetric Void Ratio: 95 %

Inlet Connections: xxx mm
Outlet pipe diameter: xxx mm.
Silt trap: Consult with Polypipe Civils for recommendations and details.

Installation:

- The Geocellular units shall be installed strictly in accordance with the manufacturer’s recommendations and in a manner that will not cause damage. The constructed conduits shall be surrounded with a suitable separation/filtration geotextile prior to carefully backfilling with material approved by The Engineer. Bedding layers and backfills shall be as specified by the Engineer.
- Jointing: each unit shall be connected to adjacent units with purpose made structural interlocking ties to prevent lateral displacement. The tie arrangement shall be in accordance with the design drawings.
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ONE PIECE GULLIES AND COVERS (EXTERNAL)

Standard: BBA Cert. 90/R054,
Manufacturer: Polypipe Civils
Product reference: Ridgigully corrugated polyethylene road gully
Sizes: 480mm
Outlet size: 150mm

COVER
Product reference: xxxxxx
Type: xxxxxxx
Material: xxxxxxx
Size: xxxxxxx
Loading grade: xxxxxxxx
INSTALLING UNDERGROUND STORAGE TANK UNITS

The Installer will provide apparatus for the off-loading and handling of modular pipework and fittings in accordance with manufacturer’s requirements/recommendations and good practice. Any components suffering damage resulting from any means, will be immediately rejected from the site. Making good of damaged components will not be permitted.

CONTACT:

Polypipe Civils
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Loughborough
Leicestershire
LE11 1SP

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Fax: +44 (0) 1509 615215

Email: civilsenquiries@polypipe.com

www.polypipe.com/civils