

Permanent Way



Terram™
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 - PW-NP-1.0 Geotextile | PW2.0 Robust Geotextile
 - PW4.0-LA Reinforcement Composite | PW5.0 Radar Detectable Geotextile
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 - Guidelines for the use of Geosynthetics in Rail Construction

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Concrete Canvas™ Material Data

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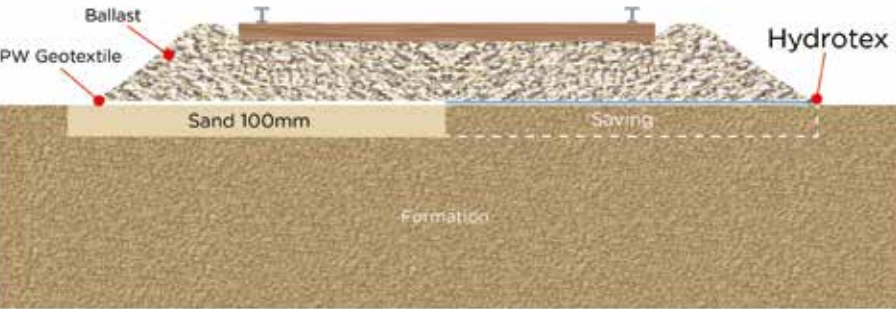
Terram™
Hydrotex 2.0 – Pads No. 057/100401 and 057/100405



HYDROTEX 2.0 product acceptance certificate PA05/05451
Hydrotex provides a permanent way solution for trackbed stability that acts as a filter / separator for fine soils and also removes the need for sandblankets.

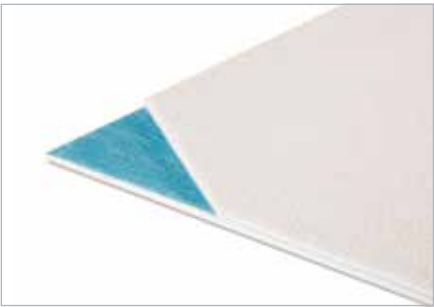
Mechanical Properties (Mean values)			
Wide-width strip tensile - Mean peak strength - Elongation at peak strength	EN ISO 10319	kN/m	95
		%	75
CBR Puncture Resistance - Mean peak strength	EN ISO 12236	kN	18
Cone Drop - Mean hole diameter	EN 13433	mm	0
Filter Properties			
Pore Size – Mean AOS	ASTM F315-03	µm	<1
Permeability - VI ₂₈₀ - 0.28m Head	EN ISO 11058	l/m²s	0.03
Physical Properties (Typical values)			
Weathering - Retained strength at 200MJ/m² exposure	EN 12224	%	>90
Microbiological resistance - Retained strength	EN 12225	%	No loss
Resistance to acids and alkalis - Retained strength	EN 14030	%	No loss
Oxidation - Retained strength at 85 days	EN 12225	%	>90

TERRAM™ Hydrotex is strong but flexible allowing the composite to conform to the excavated formation, so that no voids exist below the filter media for the development of pockets of slurry resulting in an unstable trackbed.



Environmental benefits:

TERRAM™ Hydrotex composite reduces the depth of excavation that would be required with a sand blanket. The result is a decrease in the amount of spoil being taken away for landfill and a reduction of vehicles required to deliver materials.



Features:

- Prevents upwards particle passage smaller than 0.002mm
- Permeable filter, allowing upward and downward water transmission
- Replaces the requirement for a sand blanket
- Quickly and easily installed, no specialist plant is required
- Functions under ballast without any reduction in performance
- Residual slurry becomes desiccated as any pore water is dissipated
- Supplied on standard rolls of 3.9m x 50m (other sizes available on request).

Terram™
PW-NP-1.0 Geotextile | PW2.0 Robust Geotextile



TERRAM™ PW-NP-1.0 is approved by Network Rail – Cat No 57/100776
PW-NP-1.0 – Trackbed filter / separator between ballast and subgrade.

Mechanical Properties (Mean values)			Mean Values	Applied Tolerance
Wide-width strip tensile - Mean peak strength - Elongation at peak strength	EN ISO 10319	kN/m %	22 60	-2.2 ±30
CBR Puncture Resistance - Mean peak strength	EN ISO 12236	kN	3.3	- 0.33
Cone Drop - Mean hole diameter	EN 13433	mm	22	+ 2.2
Hydraulic Properties				
Pore Size – Mean AOS		µm	60	±30%
Permeability - VI _{H50} - 50mm Head	EN ISO 11058	l/m².s	45	-30%
Physical Properties (Typical values)				
Weathering - Retained strength at 200MJ/m² exposure	EN 12224	%	>90	n/a
Microbiological resistance - Retained strength	EN 12225	%	No loss	n/a
Resistance to acids and alkalis - Retained strength	EN 14030	%	No loss	n/a
Oxidation - Retained strength at 85 days	EN 12225	%	>90	n/a

TERRAM™ PW2.0 product acceptance certificate - 57/100777

PW2.0 Geocomposite - a robust separator / filter incorporating a drainage net between two geotextile filter layers.

Composition				
Extruded polyethylene net with a geotextile filter bonded to both sides. The geotextile is manufactured from virgin polypropylene fibres				
Mechanical Properties			Mean Values	Applied Tolerance
Tensile Strength (MD)	EN ISO 10319	kN/m	52.5	-5.25
CBR Puncture Resistance	EN ISO 12236	N	9000	-0.9
Hydraulic Properties – PW2.0				
In-plane Water Flow	EN ISO 12958	l/m.s @20kPa	0.475	-0.05
Hydraulic gradient = 1.0, hard/hard		l/m.s @100kPa	0.390	-0.04
Plattens and measured in the longitudinal		l/m.s @200kPa	0.300	-0.03
Direction		l/m.s @400kPa	0.180	-0.02
Hydraulic Properties – Geotextile				
Opening Size	EN ISO 12956	µm	60	±18
Permeability	EN ISO 11058	l/m².s	45	-9
Physical Properties (Typical values)				
Mass per unit area	EN ISO 9864	g/m²	1160	n/a
Thickness at 2kPa	EN ISO 9863-1	mm	6.3	n/a
Roll Dimensions				
Roll Width		m	4.0	
Roll Length		m	25	
Roll Weight		kg		



Uses:

- Geotextile separator as per NR/SP/TRK/9039.

We also offer radar detectable geotextiles PW5 in rolls 4m x 50m PW Trace in rolls 0.5m x 200m.



Uses:

- A drainage enhancing composite used in wet ground conditions
- Robust separator that prolongs ballast life where poor drainage exists as per NR/SP/TRK/9039 treatment number 2.

Terram™
PW4.0-LA Reinforcement Composite | PW5.0 Radar Detectable Geotextile



TERRAM™ PW4.0-LA product acceptance certificate – 57/000779
PW4.0-LA Geocomposite – comprising SSLA30 Geogrid and a Geotextile filter layer, enabling reinforcement and separation to be laid in one pass.

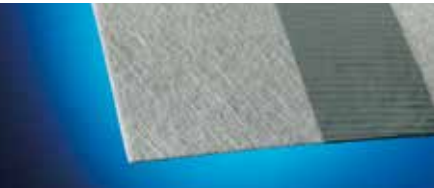
Composition				
Tensar™ SSLA30 geogrid with a geotextile filter bonded to one side. Geotextile is manufactured from virgin polypropylene fibres.				
Mechanical Properties (Mean values)			Mean Values	Applied Tolerance
Wide-width strip tensile - Mean peak strength - Elongation at peak strength	EN ISO 10319	kN/m %	22	-2.2
			60	±30
CBR Puncture Resistance - Mean peak strength	EN ISO 12236	kN	3.3	- 0.33
Cone Drop - Mean hole diameter	EN 13433	mm	22	+ 2.2
Hydraulic Properties				
Pore Size – Mean AOS		µm	60	±30%
Permeability - VI H ₅₀ - 50mm Head	EN ISO 11058	l/m².s	45	-30%
Physical Properties (Typical values)				
Weathering - Retained strength at 200MJ/m² exposure	EN 12224	%	>90	n/a
Microbiological resistance - Retained strength	EN 12225	%	No loss	n/a
Resistance to acids and alkalis - Retained strength	EN 14030	%	No loss	n/a
Oxidation - Retained strength at 85 days	EN 12225	%	>90	n/a
Standard roll dimensions		m	3.8 x 25	1.9 x 25



Uses:
Mechanical stabiliser/separator used in accordance with RT/CE/S/039.

TERRAM™ PW5.0
Geosynthetic composite comprising a robust geotextile filter separator incorporating an electronically conductible radar detectable strip spaced at set intervals.

Mechanical Properties – Geotextile	Test Method	Unit		Mean	Tolerance Value
Tensile Strength		kN/m	MD	22	2.2
			CMD	22	2.2
Tensile Elongation	EN ISO 10319	%	MD	60	±20
			CMD	60	±20
CBR Puncture Resistance	EN ISO 12236	N		33	0.33
Cone Drop	EN ISO 13433	mm			*
Hydraulic Properties – Geotextile					
Pore Size – Mean AOS	EN ISO 11058	µ		75	±20
Permeability – (H ₅₀)		l/m².s		50	-15



Uses:
Terram™ PW5.0 has been specifically engineered for use below track ballast as a filter separator. It has the ability to provide an indication of the level of ballast contamination and movement, allowing for monitoring of trackbed distortion when used in conjunction within ground probing radar systems.

Terram™
PW9 Robust Separator

NEW



1. Description: Nonwoven geotextile manufactured from UV stabilised, high tenacity, virgin polypropylene fibres that have been both mechanically and thermally bonded to provide high strength and excellent abrasion characteristics.

2. Application: Terram PW9 filter/separator is designed to maintain separation between the adjacent sand/sub-grade and ballast layers within the trackbed construction, preventing the upward movement of fine sub-grade particles and the intermixing of ballast with the sub-base.

Terram PW9 is suitable for where sub-grade soils have sufficient strength and good filtration yet have a higher percentage of large particles (>10% by weight >14mm) present.

3. Features: Engineered to provide high strength and high elongation at break to ensure excellent resistance to damage during construction and under the dynamic loading applied within trackbed. Terram PW9 is manufactured to performance properties, not weight, sufficient fibre will be added to achieve these properties.

Manufactured from high tenacity UV stabilised virgin polypropylene fibres which have been heavily drawn to ensure excellent long term durability in all soil types.

Manufactured using a randomly orientated web to provide completely isotropic properties, ensuring that high strength is not limited to a single direction. Excellent uniformity with high permeability and low pore size for soil filtration.

	Test Method	Unit	Mean Value (Applied Tolerance Value ^(a)) PW9
4. Mechanical Properties			
Tensile Strength	EN ISO 10319	kN/m	kN/m 52.5 (-5.25)
Tensile Elongation	EN ISO 10319	%	60 (±20)
CBR Puncture Resistance	EN ISO 12236	kN	9 (-0.9)
Cone Drop	EN ISO 13433	mm	2 (+1)
5. Hydraulic Properties			
Pore Size - Mean AOS	EN ISO 12956	µm	60 (±20)
Permeability – (H ₅₀)	EN ISO 11058	l/m².s	45 (-9)

	Test Method	Unit	Retained Strength ^(b) Terram PW9
6. Properties Relating to Durability			
Weathering 50MJ/m² exposure (1 month EU)	EN 12224	%	>90
Microbiological resistance	EN 12225	%	No loss
Resistance to acids and alkalis	EN 14030	%	No loss
Oxidation at 85 days (100 years)	EN 12226	%	>90

	Test Method	Unit	
7. Physical Properties (nominal)			
Thickness @ 2kPa	EN ISO 9863-1	mm	2.5
8. Material Dimensions			
Standard Roll Length		m	25
Standard Roll Width		m	4.0
Maximum Roll Width		m	6.0
Gross Roll Weight (nominal) ^(c)		kg	130

9. Packaging and Identification: Terram PW9 is supplied on cardboard cores and wrapped in Polyethylene sheeting with identification labels in accordance with ISO 10320.

10. Storage: The rolls of geotextile shall be stored on stable/ level ground and stacked not more than five rolls high and no other materials shall be stacked on top. The rolls can be stored outdoors when packaged, but should be protected from exposure to UV. All materials should be stored in accordance with good health and safety practice and in accordance with local laws. For additional information please refer to Terram Geotextiles MSDS.

11. Notes: a. Reported values are arithmetic mean values unless otherwise stated. A set of test results shall be those results derived from specimens cut from one sample and taken across the full width of the roll. For sampling, EN ISO 9862 should be applied, i.e. samples should be taken not less than 5m from the end of the roll in machine direction and over the whole width in the cross machine direction. The location of the sample should be described exactly. Applied tolerances are based on 95% Confidence limits, this is the value below which not more than 5% of the test results may be expected to fall. This represents the value at 1.645 standard deviations below the mean value. For evaluation of conformance, statistical procedure should be used in line with section 5.2 of CEN/TR 15019: 2004. The tolerance value provided for tensile elongation is based on an absolute value; e.g. 60% ±20% = 40%-80%.

b. Reported values are based on durability testing on the lowest grade product within a family, no loss indicates that there is no notable effect due to exposure, laboratory sample variation may identify a small change in properties.

c. A nominal value indicates that the value is not part of the performance specification and is provided for guidance only.

d. Gross roll weight is based on 4.5m rolls at standard length, information provided is for lifting guidance only and does not for part of quality control.

12. Additional Information: Refer to the Terram Jointing Methods (downloadable from www.terram.com) for when simple overlaps are required for subsequent and adjacent roll lengths. However, pegging, sewing, stapling or gluing can also be used depending upon the application, the sub-grade conditions, the loading, the convenience and the cost. These figures relate to standard product weights and roll sizes. Other weights, sizes and colours may be available on request. For further information please contact Fiberweb Geosynthetics Technical Support.



Product Grades	1000	3000	4000
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Mechanical Properties – Control

Wide width strip tensile	EN ISO 10319				
- Mean peak strength		kN/m	8.0	18.0	22.0
- Elongation at peak strength		kN/m	28	33	33
CBR puncture resistance	EN ISO 12236				
- Mean peak strength		N	1500	3250	4300

Mechanical Properties – Consequential

Wide width strip tensile	EN ISO 10319				
- strength at 5% strain		kN/m	3.4	6.3	7.5

Hydraulic Properties – Consequential

Pore size	EN ISO 12956				
- Mean AOS O90		µm	150	100	85

Permeability

EN ISO 11058					
- VIH50					
- 5cm head 10-3m.s-1 (l/m².s)			100	55	45

Physical Properties – Typical

Mass per unit area	EN 965	g/m²	125	260	335
Roll width		m	4.5	4.5	4.5
Roll length		m	100	100	50
Roll weight		kg	65	125	80
PADS number			57/100704	57/100706	57/100709



Uses:

Geotextile 3000 and 4000 are suitable for drainage and separation applications under RT/CE/S/010.



The use of geogrids/geotextile in railway earthworks is covered by Network Rail Model Clause 52 for Specifying Civil Engineering Works and their product specification needs to comply with the requirements of NR/SP/TRK/010 (formerly RT/CE/S/010).

The following geotextiles listed are selected in accordance to comply with the technical criteria required that is outlined by the above Network Rail document to be used in either a drainage or separation application for use in track construction. All products have Network Rail Approval and are supplied with respective Catalogue numbers.

Drainage specification: < 40 l/m².s permeability, 10kN tensile minimum, between 30 – 180 micron pore size, < 1500N CBR Puncture Resistance. Separator Specification: < 10 l/m².s permeability, 10kN tensile minimum, 30 – 85 micron pore size, < 3000N CBR Puncture Resistance.

Geotextiles Suitable for Drainage Applications under NR/SP/TRK/010:

Terram 2000 – 4.5m x 100m Cat No. 57/100705
Terram 3000 – 4.5m x 100m Cat No. 57/100706
Terram 4000 – 4.5m x 50m Cat No. 57/100709
Terram PW1 – 4m x 50m Cat No. 57/100776

Geosynthetics Suitable for Separator Applications under NR/SP/TRK/010:

Terram 3000 – 4.5m x 100m Cat No. 57/100706
Terram 4000 – 4.5m x 50m Cat No. 57/100709
Terram PW1 – 4m x 50m Cat No. 57/100776

Also for Separation under NR/SP/TRK/9039 (formerly) RT/CE/C/039

Code of Practice: Formation Treatments
Terram PW1 – 4m x 50m Cat No. 57/100776
Terram PW2 – 4m x 25m Cat No. 57/100775 – Robust Separator
Terram PW4LA – 3.8m x 25m Cat No. 57/100779 – Reinforced Separator



All the above products have full Network Rail approval for use in track and drainage applications across the UK network.

Geoweb™

A major problem in the rail industry is unstable soils. A major solution is the Geoweb® cellular confinement system. By significantly reducing vertical and lateral stresses, the Geoweb® system reduces and can even eliminate the cost of dealing with unstable soils. Long-term test results and successful applications worldwide confirm the benefits of the Geoweb® system.

The Stable Solution: Railway engineers worldwide have successfully applied cellular confinement technology to 1) strengthen the track structure over weak soils and 2) stabilise soils on adjacent slope and channel embankments. The engineered system uses a three-dimensional, honeycomb-like structure that confines soil in its cells so the

soil functions and performs as you intend it to. Geoweb® has been successfully engineered to stabilise infill materials for load support, slope and channel protection and earth retention applications.

Benefits in Load Support: In load support applications, the Geoweb® system generates powerful confinement forces and soil-to-cell wall friction creating a load dispersion structure with high flexural strength. The results, significant improvements in the long-term performance of the load support system. The proof, a reduction in the rate of track geometry degradation and measurable lower maintenance costs.

Geoweb® has been successfully used by Network Rail to stabilise the sub-ballast over soft soils and thus reduce sub-soil movement and consequently maintenance costs. The Geoweb® Cellular Confinement System has been successfully applied to strengthen the track structure over weak soils and stabilise soils on adjacent slope and channel embankments.

The engineered system uses a three-dimensional honeycomb-like structure that generates powerful confinement forces and soil to cell friction creating a load dispersion structure with a high flexural strength. This results in the long-term performance of the load support system and so reduces the rate of track geometry degradation and lowers maintenance costs.



ALWAYS SPECIFY THE GENUINE GEOWEB® PRODUCT

Tensar™
TriAx® TX190L Geogrid – Pads No. 57/100470



- General:**
- The geogrid is manufactured in accordance with a management system which complies with the requirements of BS EN ISO 9001:2008
 - The geogrid is manufactured from a punched polypropylene sheet, which is then oriented in three equilateral directions so that the resulting ribs of the triangular apertures have a high degree of molecular orientation which continues through the mass of the integral node.
- The properties contributing to the performance of a mechanically stabilised layer are:**



Geometrical	Longitudinal	Diagonal	Transverse	General
Rib pitch (mm)	60	60		
Mid-rib depth (mm)		1.9	1.6	
Mid-rib width (mm)		1.6	2.5	
Nodal thickness (mm)				5.4
Rib shape				Rectangular
Aperture shape				Triangular
Open area aspect ratio (%)				≥85
Roll size				50m x 3.8m
Mechanical				
Junction efficiency (%)				90
Typical isotropic stiffness ratio				0.60
Mean radial secant modulus at low strain (kN/m @ 0.5% strain)				600±65
Durability				
Resistance of chemical degradation				96%
Resistance to weathering				98%
Resistance to oxidation				90%
Resistance to installation damage				>87%
Roll size				50m x 3.8m

SSLA30 Large aperture Geogrid has been used for many years for undertrack applications under approval 57/100822.

With the advent of Triaxial geogrid technology this has now been replaced by TX190L. Whereas the tensile stiffness of biaxial geogrids is predominantly in two directions, with TriAx® it is now multi-directional. The product has near isotropic tensile properties, through 360°.

Geogrid-based mechanical stabilisation of both sub-ballast and ballast has long been an accepted part of the track engineers’ construction and maintenance techniques. Tensar’s previous biaxial geogrids have been extensively used to improve the bearing capacity of sub-ballast layers and extend ballast tamping cycles to reduce maintenance costs. Indeed, Network Rail engineers estimate more than 10% of all track refurbishment in the UK now includes geogrid stabilisation.

Polypipe
Structured Wall Catchpits – Pads No. PA05/667



Polypipe’s bespoke structured wall catchpits are manufactured to customer’s exact requirements. Because they arrive on site as prefabricated units, they can be quickly installed and connected to your trackside drainage system.

Our catchpits are Parts and Drawing Systems (PADS) approved for their intended application.



- Key benefits:**
- Provides easy access maintenance points for silt collection
 - Bespoke, fully welded and watertight
 - Tough and durable
 - One piece installation
 - Off-site construction – delivered ready to install resulting in reduced installation time and on-site costs
 - Strong, yet lightweight, minimising Health and Safety risks in handling, storage and installation
 - Choice of diameters available 1050mm, 1200mm, 1500mm, 1800mm, 2100mm
 - Fully bespoke options of inlets and outlets
 - Inlets and outlets supplied with integral sockets as standard
 - Catchpits are also available perforated for use as a lightweight soakaway chamber
 - Depth can be tailored
 - Plastic or lockable steel cover
 - Step irons to BS 1247 now replaced by BS EN 13101
 - Ladder option available.

Tailor Made Solutions

As part of the unique fabrications service offered by Polypipe, fully qualified design engineers work in partnership with our customers to create a bespoke solution to match individual specifications and site requirements.

Seamless Integration

Fabricated solutions from Polypipe are designed to integrate into an overall drainage application, with the fabricated element designed specifically to meet the requirements of the scheme. Polypipe offers a value engineered approach to bespoke fabrications and is supported by a technical department that provides sound advice and design experience. Our products can be designed and manufactured to suit any project timeline, without the need for lengthy lead times.

Off-site Construction

Polypipe is unique in its position of being able to offer pre-fabricated, bespoke solutions constructed off-site. This approach to modern methods of construction reduces time and installation costs on-site as well as minimizing health and safety risks in handling, storage and installation. The strong, yet lightweight properties of plastic pipes also enables further reduction in the use of heavy plant on-site.

Cubis™
Cubis Drainage Catch Pits

The Drainage Catch Pit is a Network Rail approved trackside drainage system. Product acceptance certificate PA05/04067.



The CUBIS Drainage Catch Pit utilises the STAKKAbox™ ULTIMA access chamber, a system that is strong, structural and easily meets on-site manual handling requirements. Installation is safe, easy and rapid; two people can lift a complete unit into the excavated position.

The system is approved for Network Rail and London Underground in three different clear opening sizes. It is possible to increase or decrease the depth in increments of 150mm due to the sectional ULTIMA system.

Installation Procedure – remove for:

Chamber Type:	Internal Dimensions		Depth (mm)	Weight	Number of Sections	PADs No.
	L (mm)	W (mm)				
ULTIMA	1160mm	380mm	1050mm	11.4kg	7	057/100698
ULTIMA	1200mm	600mm	1050mm	18.9kg	7	057/100699

Product summary:

- Glass Reinforced Polyester Resin (GRP)
- Rapid installation
- Lightweight and safe
- Matches concrete for strength
- Flexible on site
- Reduced installation costs
- Long life: not affected by frost, acids, alkalis or diesel – all concrete killers
- Compatible with the existing drainage network
- Factory produced to ISO 9001, 14001 and 50001.

STAKKAbox™
Ultima Access Chambers

For telecommunications, signalling and power. Network Rail approved – Various PADS certificates

STAKKAbox™ Ultima access chambers are approved by Network Rail for construction on permanent way projects.

Each chamber is made from 150mm deep stacking sections which interlock to offer flexibility in finished chamber depths. Each section is under 25kg, making it suitable for a single person lift under manual handling guidelines.

Ultima is manufactured in Glass Reinforced Polyester plastic, which possesses excellent

strength to weight properties. Each 150mm section is ribbed vertically and horizontally to provide vertical and sidewall loading performance that is equivalent to concrete.

Duct entries can be created on site using non-specialist tools and the chambers can be retro-fitted around existing infrastructure.

Concrete-Infill and Composite access covers, manufactured by CUBIS Industries, are also approved for use.



	Clear Opening	Depth per section	B125 Concrete Cover	12.5T Composite Cover
ULTIMA	1160mm x 380mm	150mm		•
ULTIMA	1200mm x 600mm	150mm	•	•
ULTIMA	1310mm x 610mm	150mm	•	•

Drainage Catch Pits
Precast Concrete

Precast Concrete Catch Pits

Keyline Rail offer a range of precast concrete catch pit covers and frames including bases, half frames and left / right handed corners.

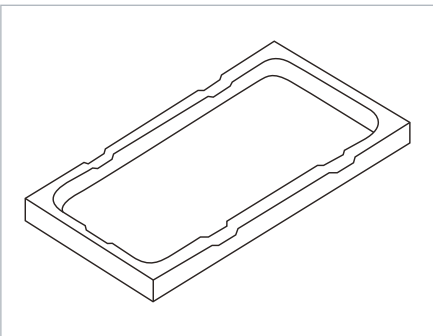
Product Description	Part No.	Weight (kg)	Size (WxHxL)
Standard catch pit cover	4/13508	38	420 x 50 x 335
Standard catch pit frame	4/13501	71	725 x 115 x 1290
Standard catch pit ledge	4/13510	38	199 x 65 x 1270
Standard catch pit base	4/13509	58	425 x 75 x 385
Standard catch pit half frame	4/13502	56	230 x 165 x 1270
Standard catch pit corner LH	4/13506	20	230 x 165 x 385
Standard catch pit corner RH	4/13507	20	230 x 165 x 385



Matisa Catch Pit Cover and Frame System

The Matisa System is a range of smaller concrete catch pits for use in installations where access is extremely limited.

Product Description	Part No.	Weight (kg)	Size (WxHxL)
Matisa catch pit frame	4/104514	54	575 x 115 x 1035
Matisa catch pit fender	4/104513	34	115 x 115 x 1040
Matisa catch pit cover	4/104512	35	520 x 47 x 585
Matisa catch pit base	4/104511	54	520 x 75 x 585



Catch Pit Lids



GRP Catch Pit Lids:

- Lid – non-slip, galvanised, anti-vandal
- Lockable two piece cover and frame – lockable (featuring cam-lock system)
- Lid – grated, galvanised, anti-vandal
- Lid – HDPE plastic suited to applications with live third rail locked via self tapping screws
- Lid – one piece, galvanised
- Additional mesh can be supplied for grated lids to minimise the ingress of track ballast.

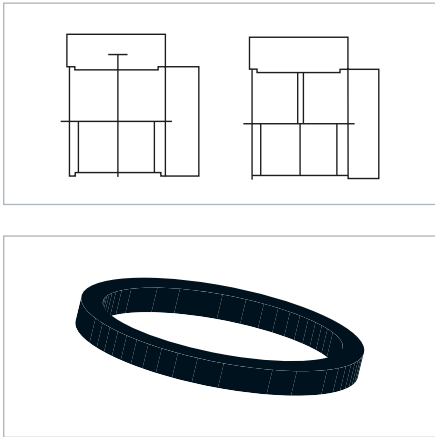
Ridgidrain™
Structured Wall Pipes and Seals

Product acceptance certificate PA05/667 and PA05/05460.

Ridgidrain Plain Ended							
Nominal Size	Product Code	Option	IDmm	OD mm	Length m	Weight kgm ⁻¹	Pack Qty
100	RD100X6PE/1	U	100	118	6	0.8	85
100	RD100X6PEHP/1	H	100	118	6	0.8	85
100	RD100X6PEP/1	P	100	118	6	0.8	85
150	RD150X6PE/1	U	150	178	6	1.6	36
150	RD150X6PEHP/1	H	150	178	6	1.6	36
150	RD150X6PEP/1	P	150	178	6	1.6	36
225	RD225X6PE/1	U	225	267	6	3.6	14
225	RD225X6PEHP/1	H	225	267	6	3.6	14
225	RD225X6PEP/1	P	225	267	6	3.6	14
300	RD300X6PE/1	U	300	355	6	5.4	9
300	RD300X6PEHP/1	H	300	355	6	5.4	9
300	RD300X6PEP/1	P	300	355	6	5.4	9
375	RD375X6PE/1	U	375	435	6	7.4	5
375	RD375X6PEHP/1	H	375	435	6	7.4	5
375	RD375X6PEP/1	P	375	435	6	7.4	5
400	RD400X6PE/1	U	400	458	6	8.0	5
400	RD400X6PEHP/1	H	400	458	6	8.0	5
400	RD400X6PEP/1	P	400	458	6	8.0	5
450	RD450X6PE/1	U	450	523	6	9.0	1
450	RD450X6PEHP/1	H	450	523	6	9.0	1
450	RD450X6PEP/1	P	450	523	6	9.0	1
500	RD500X6PE/1	U	500	576	6	9.2	1
500	RD500X6PEHP/1	H	500	576	6	9.2	1
500	RD500X6PEP/1	P	500	576	6	9.2	1
600	RD600X6PE/1	U	600	700	6	14.0	1
600	RD600X6PEHP/1	H	600	700	6	14.0	1
600	RD600X6PEP/1	P	600	700	6	14.0	1

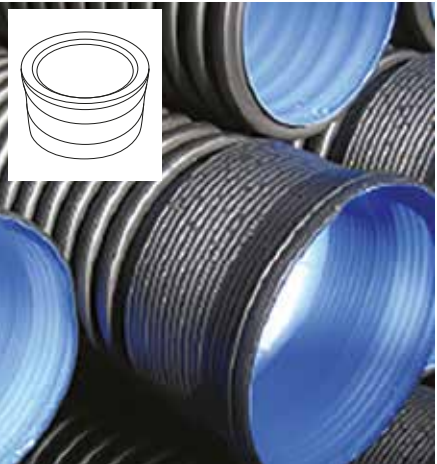
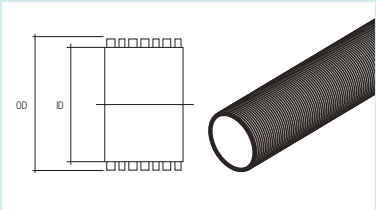
Sizes 750mm and above are available as Ridgistorm-XL.
U = Unperforated H = Half perforated P = Fully perforated

Ridgidrain Seal		
Nominal Size	Product Code	Pack Qty
100	SRD100	170
150	SRD150	36
225	SRD225	14
300	SRD300	8
375	SRD375	10
400	SRD400/1	2
450	SRD450/1	2
500	SRD500/1	2
600	SRD600/1	2



Ridgidrain Plain Ended

Order seals separately if required,
1 coupler, 2 seals per length.



Sealing Rings

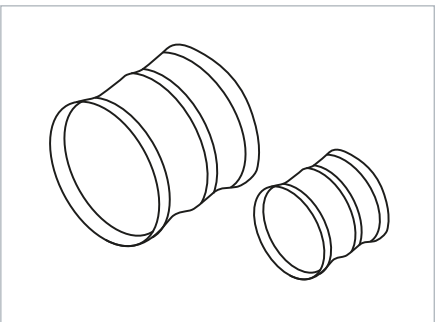
EPDM seals to BS EN 681:
Part 1 as standard.
Optional nitrile seals are available,
but may be subject to order quantities
and lead times.



Ridgidrain™
Couplings

Ridgidrain Double Socket Couplings				
Nominal Size	Product Code	A mm	B mm	Pack Qty
100	CRD100	140	133	43
150	CRD150	185	186	18
225	CRD225	260	289	7
300	CRD300	280	379	3
375	CRD375	335	460	1
400	CRD400DS/1	400	475	1
450	CRD450DS/1	435	540	1
500	CRD500DS/1	489	589	1
600	CRD600DS/1	560	719	1

Slip couplers available on request.



Double socket couplings

Order seals separately if required,
2 per coupler.

Weholite™
Structured-Wall Pipe

Weholite™ is a high quality structured-wall pipe with smooth internal and external surfaces.
Weholite™ pipe is manufactured by spiral welding PE- or PP- profiles.

The Weholite™ product range is a complete pipework system for conveying liquids or air,
underground, under water or above ground. Weholite™ is manufactured in sizes ranging from 300 to
3500mm internal diameter, and can be supplied in ring stiffness classes up to 8kN/m².



Weholite™ provides all the technical advantages of equivalent PE solid wall pipes but with substantial savings in weight combining greater ease of installation with increased cost effectiveness.

Installation is quick and reliable, with the pipes easily transported to the job-site, even in poor ground conditions. Weholite™ pipes have a natural ability to “flex”, which enables them to adjust to different loading conditions, vibrations, stress and soil movements without causing damage to the pipe.



Heavy Duty Solid Wall PE Pipe

Pads No. PA05/02084

TerraDrain Perforated Pipe

TerraDrain is a heavy-duty polyethylene drainage pipe used where heavy loads are to be expected, typically for under track applications. Manufactured from PE80, an extremely tough, high-strength, material well-proven to resist static and shock loading, it can be installed using traditional trenching or slip lining methods. Under track drainage systems for 4ft, 6ft and 10ft drains.

Rehabilitation of under track drainage culverts

Standard perforation, which appears over the top half of the pipe, has a minimum open area of 1% thus providing much higher drainage performance than other similar products on the market. Other perforations and open areas are available on request.



- Lightweight, simple, quick and cost effective to install
- As specified by London Underground for covered ways and open track
- Minimum open area 1%
- Flush push fit, threaded or coupling joints
- Low coefficient of friction
- Smooth internal bore suitable for CCTV inspection and jetting
- Can be used in combination with TerraLine
- Available from 63 to 630mm OD

TerraLine Carrier Pipe

TerraLine is a heavy-duty polyethylene pipe used as a carrier drain for railway line-side and under track drainage.

- Simple, quick and cost effective to install
- Provides type II structural lining
- Low coefficient of friction
- Well established renovation technique
- Wide range of lengths and diameters
- Lightweight for easy handling
- Excellent chemical resistance
- Available in diameters 63-630mm

Polyvault Chambers™

Network Rail approved – PA05/00635

Polyvault access chambers are approved by Network Rail for building access chambers to construct under track crossings.

Polyvault is manufactured in HDPE plastic which possesses excellent strength-to-weight properties. Structural ribs on the outside of the chamber provide further resistance to vertical and sidewall loadings.

The chambers arrive on site complete; all that remains for the installer is to excavate, drop in the chamber, and backfill with suitable materials. Polyvault can be supplied with MULTIduct™ spigots pre-fitted at production in order to further improve installation times.

Access chambers can be supplied as Concrete-infill, Composite, Recessed, Ductile Iron or HDPE.



MULTIduct™ for UTX/URX Systems

Network Rail approved – PA05/00635

MULTIduct™ is a multiple duct system, manufactured by CUBIS Industries, used for constructing under track or road crossings (UTX/URX), bridge crossings and linear routes.

Duct banks are built by connecting nominal 1 metre long sections, either by a steel clip or a push-fit system. There is also a range of accessories that offer flexibility in construction.

MULTIduct™ is manufactured from nitrogen foamed high density polyethylene, which offers high strength-to-weight properties, resulting in a product that has high crush resistance but can be lifted by a single person (all parts are below 25kg).

MULTIduct™ has held long-standing approvals from national rail operators and has been installed in other applications across the world for more than 30 years.

CUBIS manufactures **MULTIduct™** alongside our **STAKKAbOX™** access chamber range. Our customer base includes national highways agencies, water utilities, power utilities and telecommunications operators, rail network operators, Government bodies worldwide.

The MULTIduct™ System

4, 6 or 9 way options.

Each duct space is equivalent to 110mm single duct (160mm option available in 4 way).

Each section is 1120mm long (lay length is 1070mm).

Units have socket (female) and spigot (male) joints and are connected by clip-fix or push-fit.

Accessories to manage common bends, duct configurations and for interfaces with traditional single ducts and access chambers.

Applications:

- Under track crossings
- Under road crossings
- Buried cable routes
- Linear routes
- Bridge crossing
- Tunnels
- Station renewals.



Why MULTIduct™

Strong

- High crush strength
- Can be buried much shallower than conventional duct
- More robust – no breakages.

Environmental

- HDPE material consists of 70% recycled content
- Completely recyclable.

Superior

- Manufactured to ISO 9001 and ISO 14001.

Light Weight

- All parts under 25kg
- Reduced health and safety issues
- Easier to transport on site.

Fast

- Rapid installation for every application
- More work completed during track possessions or road closures.

Flexible

- Full range of accessories to overcome bends, break out of runs and interface with standard duct
- Easily cut on site for termination.

Economical

- Less excavation due to shallower burial
- No special plant required for lifting
- No concrete surround, specialist backfill or spacers required.

RAILduct™



- Uses:
- A lightweight (under 25 kgs) alternative to traditional concrete troughing
 - Strong structural design vertically and laterally
 - Installed 4-5 times faster than concrete
 - Covers hinge to both sides and lock down when closed
 - Internal divider available
 - Unique twist and lock together system for joining each length with its neighbour
 - Compatible with existing concrete troughing
 - Combines perfectly with our POLYvault™ and STAKKAbOX™ chamber systems
 - Approved by a number of European rail operators.

RAILduct™ is the modern, lightweight alternative to concrete cable troughing. Each 1m length unit weights just 14kg yet the installed trough is capable of taking loadings imparted by vehicular traffic.

The unique Twist and Lock hook jointing design on each trough section allows them to be joined securely to each other and provides a small amount of movement, which allows the trough line to follow any gentle curves in the track. These features combine to provide an installation time 4 to 5 times faster than traditional concrete. Lids are hinged to either side of the channel and are very simply removed, either in individual 1m lengths or in a long section for cable placement. When shut the lids are locked into place and therefore are not susceptible to lifting when trains pass by. An extra security lock is available for areas where vandalism is a possibility. Inside the channel it is possible to insert a vertical divider, which splits the trough into two separate usable spaces.



GRP™ Cable Troughing and Trays

GRP™ troughing is designed to outperform conventional glass reinforced concrete systems



We understand the stresses and strains that rail installation products need to endure. That's why all of our products are manufactured to the highest standards and offer a range of benefits.

Our GRP™ troughing is designed to outperform conventional glass reinforced concrete systems, being lighter in weight, more robust and less prone to accidental damage. That's why our MITA GRP™ products can be safely specified for even the most demanding rail applications and will provide a complete 'fit and forget' solution. All of our GRP™ products are corrosion resistant, fire retardant and UV protected, ensuring they withstand even the most demanding conditions. We can provide products for Section 12 stations, tunnels and other environments. Our GRP™ troughing is available in lengths of up to six metres, reducing the number of supports needed and consequently minimising installation time and overall costs.

We can offer the best advice and support in the marketplace. GRP™ cable troughing, cable trays, trunking and cable ladders are just some of the solutions we offer. Our **Cabsys®** cable tray and ducting systems have Network Rail acceptance and LUL product approval, demonstrating the quality and high standards they deliver. The troughing is available in either solid or slotted-base versions, and we offer a full range of supports and accessories.

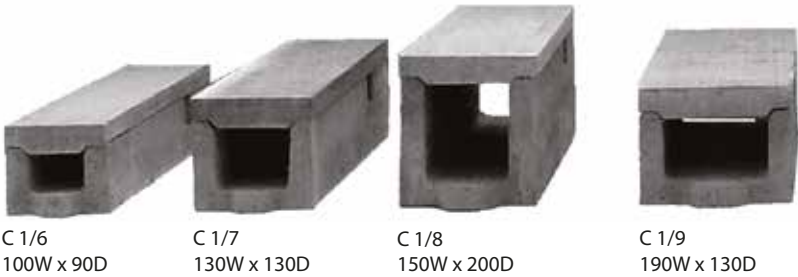
Cable Protection Troughs – Straights



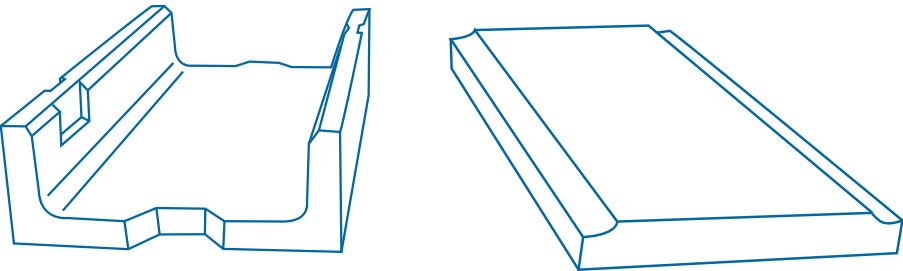
Keyline Rail stock and distribute a wide range of cable protection troughs and lids. Electricity service cables and trunking are completely protected from accidental damage or acts of vandalism whilst allowing for ease of access to maintenance teams.

As well as the standard straight troughs and curves, we supply a range of specials including, tees, transitions and transformer/ location bases, all with Network Rail Approval.

If you require a non-standard item that is not shown in our product range, we offer a bespoke service working to your specification.



Straights



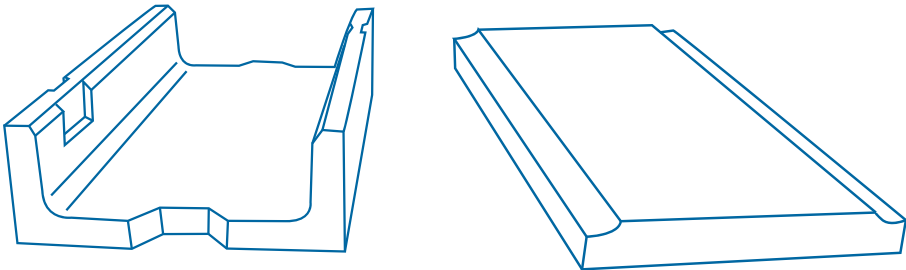
Ref. No.	Type	Trough/Lid	Type	Weight/Unit (kg)	External Dimensions		Units Per Pallet	Units Per Load	No. of Pallets Per Load
					Width	Depth			
C/1/6	Straight	Trough	W100 x D90	37	190	130	36	792	22
C/1/6	Straight	Lid		22	190		48	1056	22
C/1/7	Straight	Trough	W130 x D130	47	220	170	25	550	22
C/1/7	Straight	Lid		27	220		40	880	22
C/1/8	Straight	Trough	W150 x D200	71	250	240	20	360	18
C/1/8	Straight	Lid		29	250		40	800	20
C/1/9	Straight	Trough	W190 x D130	51	280	170	20	440	22
C/1/9	Straight	Lid		33	280		32	704	22
C/1/10	Straight	Trough	W250 x D130	62	340	170	15	330	22
C/1/10	Straight	Lid		42	340		24	528	22
C/1/29	Straight	Trough	W350 x D130	72	440	170	15	270	18
C/1/29	Straight	Lid		66	440		24	432	18
C/1/43	Straight	Trough	W350 x D300	115	440	340	9	162	18
C/1/43	Straight	Lid		66	440		24	432	18
C/1/Uni	Straight	Trough	W65 x D60 x L1500	23					

Cable Protection Troughs – Transitions

‘C Series’ precast concrete troughs installed alongside existing troughing, to carry additional power and communication cables.



Transitions



Ref. No.	Type	Trough/Lid	Type	Weight/Unit (kg)	External Dimensions		Units Per Pallet	Units Per Load	No. of Pallets Per Load
					Width	Depth			
C/1/33	Transition	Trough	C1/10-C1/29	67		130	10	220	22
C/1/33	Transition	Lid		54			16	352	22
C/1/35	Transition	Trough	C1/9-C1/10	58		170	15	330	22
C/1/35	Transition	Lid		58			24	528	22
C/1/36	Transition	Trough	C1/8-C1/10	68		240	8	176	22
C/1/36	Transition	Lid		36			24	528	22
C/1/38	Transition	Trough	C1/7-C1/9	53		170	15	330	22
C/1/38	Transition	Lid		30			24	528	22
C/1/40	Transition	Trough	C1/6-C1/7	43		170	15	330	22
C/1/40	Transition	Lid		25			24	528	22
C/1/44	Transition	Trough	C1/29-C1/43	93		340	4	88	22
C/1/44	Transition	Lid		65			24	352	22
C/1/45	Transition	Trough	C1/8-C1/43	93		340	4	88	22
C/1/45	Transition	Lid		47			16	352	22
C/1/60	Transition	Trough	C1/9-C1/29	65		170	10	220	22
C/1/60	Transition	Lid		53			16	352	22
C/1/Uni	Transition		Unitrough to C/17						

Cable Protection Troughs – Curves

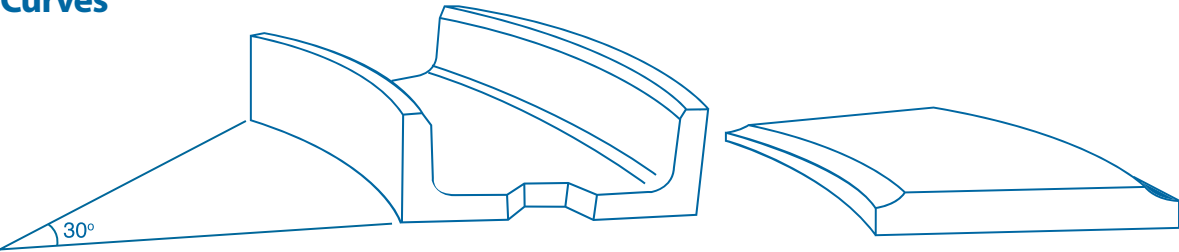


C 1/10
250W x 130D

C 1/29
350W x 130D

C 1/43
350W x 300D

Curves

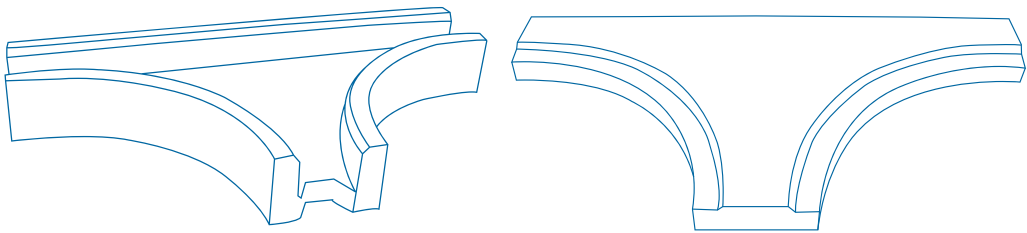


Ref. No.	Type	Trough/Lid	Type	Weight/Unit (kg)	External Dimensions		Units Per Pallet	Units Per Load	No. of Pallets Per Load
					Width	Depth			
C/1/16	Curve	Trough	C/1/6 Curve x 1000R	20	190	130	36	792	22
C/1/16	Curve	Lid		12			64	1408	22
C/1/17	Curve	Trough	C/1/7 Curve x 1000R	25	220	170	25	550	22
C/1/17	Curve	Lid		15			64	1408	22
C/1/18	Curve	Trough	C/1/8 Curve x 1000R	37	250	240	16	352	22
C/1/18	Curve	Lid		15			48	1056	22
C/1/19	Curve	Trough	C/1/9 Curve x 1000R	27	280	170	20	440	22
C/1/19	Curve	Lid		17			32	704	22
C/1/20	Curve	Trough	C/1/10 Curve x 1000R	32	340	170	30	660	22
C/1/20	Curve	Lid		22			32	704	22
C/1/30	Curve	Trough	C/1/29 Curve x 1000R	35	440	170	20	440	22
C/1/30	Curve	Lid		34			32	704	22
C/1/70	Curve	Trough	C/1/43 Curve x 1000R	40	440	340	12	264	22
C/1/70	Curve	Lid		22			32	704	22

Cable Protection Troughs – Tees



Tees



Ref. No.	Type	Trough/Lid	Type	Weight/Unit (kg)	External Dimensions		Units Per Pallet	Units Per Load	No. of Pallets Per Load
					Width	Depth			
C/1/23	Tee	Trough	C/1/8 off C/1/8	99	250	240	8	176	22
C/1/23	Tee	Lid		54			16	352	22
C/1/32	Tee	Trough	C/1/10 Branch off C/1/29	81	440/340	170	8	176	22
C/1/32	Tee	Lid		88			16	352	22
C/1/34	Tee	Trough	C/1/10 off C/1/10	73	340	170	10	220	22
C/1/34	Tee	Lid		60			16	352	22
C/1/37	Tee	Trough	C/1/9 off C/1/9	68	280	170	10	220	22
C/1/37	Tee	Lid		52			16	352	22
C/1/39	Tee	Trough	C/1/7 off C/1/7	70	220	170	10	220	22
C/1/39	Tee	Lid		43			16	352	22
C/1/41	Tee	Trough	C/1/6 off C/1/6	51	190	130	12	264	22
C/1/41	Tee	Lid		39			16	352	22
C/1/42	Tee	Trough	C/1/8 Branch off C/1/6	77	440/250	240/170	8	176	22
C/1/42	Tee	Lid		33			16	352	22
C/1/80	Tee	Trough	C/1/29 off C/1/29	71	440	170	10	220	22
C/1/80	Tee	Lid		65			16	352	22
C/1/81	Tee	Trough	C/1/43 off C/1/43	140	440	340	6	132	22
C/1/81	Tee	Lid		65			16	352	22

Trough-Lite™
Lightweight cable protection troughs



Using lightweight concrete technology, that has been utilised and proven for years when manufacturing concrete fencing products, FP McCann have developed a lightweight

C series troughing system. The lightweight Trough-Lite system has the same dimensions as the company's traditional products, so that two systems are fully compatible. Trough-Lite reduces the concerns associated with manual handling due to a weight reduction of up to 30%, when compared to standard concrete.

Trough-Lite is a cost effective lightweight product that is up to 50% cheaper than alternative lightweight products currently available. This lightweight solution offers additional benefits including:

- Faster installation
- Lower on-site labour costs
- Reduction in transportation costs
- Reduced carbon footprint and increased sustainability, as the concrete mix uses over 50% recycled content.

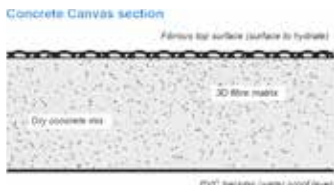
Concrete Canvas™

Concrete Canvas (CC), is a flexible, concrete impregnated fabric that hardens when hydrated to form a thin, durable, waterproof concrete layer. CC allows concrete construction without the need for plant or mixing equipment. Simply position the Canvas and just add water. CC consists of a 3-dimensional fibre matrix containing a specially formulated dry concrete mix. A PVC backing on one surface of the canvas ensures the material is waterproof. The

material can be hydrated either by spraying or by being fully immersed in water. Once set, the fibres reinforce the concrete, preventing crack propagation and providing a safe plastic failure mode.

CC is available in 3 thicknesses: CC5, CC8 and CC13, which are 5, 8 and 13mm thick respectively.

NEW
INNOVATION IN
CONCRETE
JUST ADD WATER!



Concrete Canvas (CC) key facts:

- Rapid Install**
CC can be laid at a rate of 200sqm/hour, up to 10 times faster than conventional concrete solutions
- Easy to Use**
CC is available in man portable rolls for applications with limited access. The concrete is pre-mixed so there is no need for mixing, measuring or compacting. Just add water
- Lower Project Costs**
The speed and ease of installation mean CC is more cost-effective than conventional concrete, with less logistical complexity
- Eco-Friendly**
CC is a low mass, low carbon technology which uses up to 95% less material than conventional concrete for many applications
- Water Proof**
The PVC backing on one surface of the Canvas ensures that the material has excellent impermeability
- Strong**
The fibre reinforcement prevents cracking, absorbs energy from impacts and provides a stable failure mode
- Durable**
CC is chemically resistant, has good weathering performance and will not degrade in UV
- Flexible**
CC has good drape characteristics and will closely follow the profile of any ditch or embankment. The material can negotiate tight bends and fit around existing infrastructure. Unset CC can be cut or tailored using basic hand tools.



Concrete Canvas applications



Ditch Lining



Culverts



Erosion Control



Pipeline Protection

Concrete Canvas™

CC Type	Thickness	Batch Roll Size	Bulk Roll Size	Roll Width	Mass Unset	Density Unset	Set
CC5	5mm	10m²	200m²	1m	7kg/m²	1500kg/m³	+30-35%
CC8	8mm	5m²	125m²	1.1m	12kg/m²	1500kg/m³	+30-35%
CC13	13mm	n/a	80m²	1.1m	19kg/m²	1500kg/m³	+30-35%
SETTING							
Initial Set > 2 hours		Final Set < 24 hours		CC will achieve 80% strength at 24 hours after hydration.			



Concrete Canvas™ Material Data



Post Set CC Properties

Post set data is based on CC hydrated in accordance with the CC Hydration Guide.

Strength

Very high early strength is a fundamental characteristic of CC. Typical strengths and physical characteristics are as follows:

Compressive tests based on ASTM C109 – 02 (initial crack)
– 10 day compressive failure stress (MPa) 40

Bending tests based on BS EN 12467:2004 (initial crack)
– 10 day bending failure stress (MPa) 3.4
– 10 day bending Youngs modulus (MPa) 180

Tensile data (Initial crack)

	Tensile strength (kN/m)	
	Length direction	Width direction
CC5	6.7	3.8
CC8	8.6	6.6
CC13	19.5	12.8

Other

Abrasion Resistance (DIN 52108)
– Similar to twice that of OPC Max 0.10 gm/cm2

Manning's Valve (ASTM D6460)

CBR Puncture Resistance EN ISO 12236: 2007 (CC8 and CC13 only)
– Min. Push-through force 2.69kN
– Max. Deflection at peak 38mm

Standard Test Method for **Impact Resistance of Pipeline Coatings**
ASTM G13 (CC13 only) Passed

Freeze-thaw testing (ASTM C1185) 200 Cycles

Freeze-thaw testing (BS EN 12467:2004 part 5.5.2) Passed

Soak-dry testing (BS EN 12467:2004 part 5.5.5) Passed

Water impermeability (BS EN 12467:2004 part 5.4.4) Passed**

Reaction to Fire

CC has achieved Euroclass B certification:
BS EN 13501-1:2007+A1:2009 B-s1, d0

CC has achieved MSHA approval:
30 CFR, Part 7, Subchapter B, Section 7.24 Passed

CC Patent Information

Patent Protected

Pat Pend/Granted: AE (766/2011), AE (932/2006), ARIPO (AP/P/2011/005842), AU (2010209524), AU (2005254788), BR (PI1005309-3), CA (2655054), CA (2749991), CA (2570532), CL (01809-2011), CN(201080005835.6), CO (11-092824), EP (2027319), EP (2393970), EP (1766162), GB (2455008), HK (12100037.1), ID (W00 2011 028 25), IL (214350), IN (5429/DENLP/2011), IN (20/DENLP/2007), JP (2011-546952), KR (10-2011-7020005), MN (3644), MX (MX/a/2011/007802), MY (PI2011003536), NO (20070245), NZ (594823), OM (OM/P/2011/00162), PH (1-2011-501468), RU (2011134016), RU (2386767), SG (201105143-0), TH (1101001335), US (8287982), US (US-2010-0233417-A1), US (13/146836), US(7721749), US (13/708074), VN (1-2011-02023), ZA (2009/00222), ZA (2011/06289), ZA (2007/0471) and other patents pending.

* Occasionally there will be a Beam Fault (fabric imperfection under 100mm wide running across the width) in a Bulk Roll. This fault is unavoidable due to the manufacturing process and the fault will be clearly marked with a red tag, there will be a maximum of (1) one Beam Fault in any Bulk Roll. A joint may need to be made on site where there is a Beam Fault as the material at a fault will not reach the performance specified in this Data Sheet. The maximum un-useable material due to any Beam Fault will be 100mm. There are no beam faults in standard batched rolls.

* Indicative values

** For containment applications it is recommended to use CC as a protective overlay in combination with an appropriate sealed membrane liner. CC is not recommended as the sole barrier layer where impermeability is critical.

The information contained herein is offered free of charge and is, to the best of our knowledge, accurate. However, since the circumstances and conditions in which such information and the products discussed therein can be used may vary and are beyond our control, we make no warranty, express or implied, of merchantability, fitness or otherwise, or against patent infringement, and we accept no liability, with respect to or arising from use of such information or any such product.

CC Physical Properties*

CC	Thickness (mm)	Batch Roll Size (m²)	Bulk Roll Size (m²)	Roll Width (m)
CC5	5	10	200	1.0
CC8	8	5	125	1.1
CC13	13	N/A	80	1.1

CC	Mass (unset) (kg/m²)	Density (unset) (kg/m³)	Density (set) (kg/m³)
CC5	7	1500	+30-35%
CC8	12	1500	+30-35%
CC13	19	1500	+30-35%

Pre-Set CC Properties

Setting

Working Time: 1-2 hours subject to ambient temperature
CC will achieve 80% strength at 24 hours after hydration.

Method of Hydration

Spray the fibre surface with water until it feels wet to touch for several minutes after spraying.

Re-spray the CC again after 1 hour if:

- Installing CC5
- Installing CC on a steep or vertical surface
- Installing in warm climates.

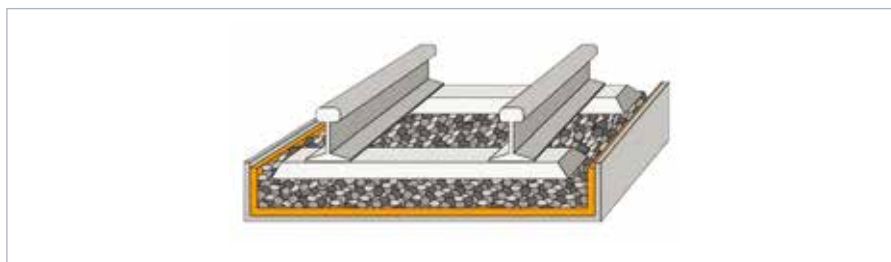
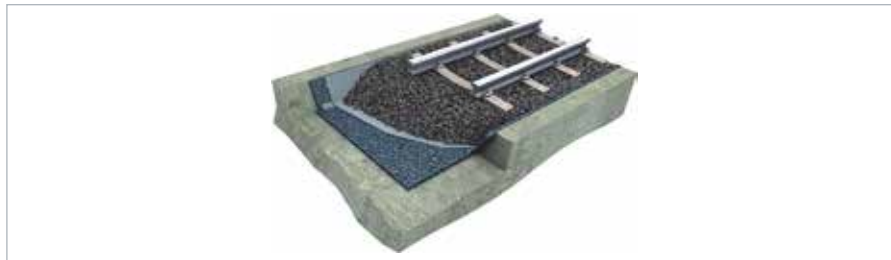
Notes:

- CC cannot be over hydrated and an excess of water is always recommended
- Minimum ratio of water: CC is 1:2 by weight
- Do not jet high pressure water directly onto the CC as this may wash a channel in the material
- CC can be hydrated using saline or non-saline water
- CC will hydrate and set underwater
- CC has a working time of 1-2 hours after hydration. Do not move CC once it has begun to set
- Working time will be reduced in hot climates
- CC will set hard in 24 hours but will continue to gain strength for years
- If CC is not fully saturated, the set may be delayed and strength reduced. If the set is delayed, re-wet with a large excess of water.

Ballast Mats

Allow a high level of track elasticity to be achieved. Sylomer and Sylodyn ballast mats are installed for reduction of secondary airborne noise, vibrations. Also they are installed in areas with very low ballast depth.

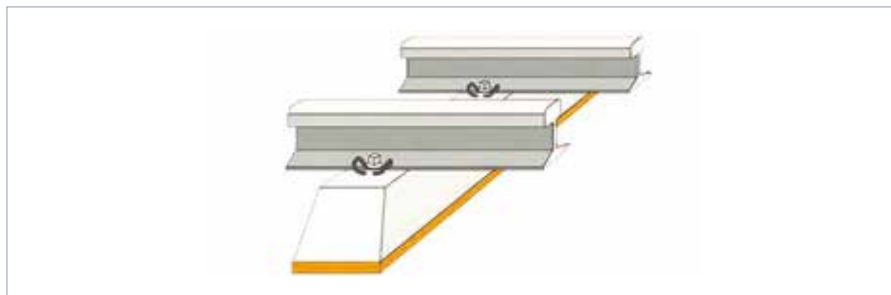
- Reduction of noise and vibrations in ballasted tracks
- Installed in areas with reduced ballast depth to keep ballast in good condition
- Reduction of maintenance costs
- Weather independent installation possible.



Sleeper Pads

Installed in high-speed rail lines and in lines with high axle loads, as well as in standard lines. No additional work at installation site required, as they can be installed on the sleepers during their production in the factory.

- Reduce stresses and wear on the ballast under the concrete sleeper
- Improve track stability
- Quick installation, unaffected by weather conditions
- Reduce noise and vibrations.



Travis Perkins operates some of the leading brands in the industry, 20 businesses from more than 1,800 sites across the UK.

TRAVIS PERKINS | BENCHMARK | WICKES | TILE GIANT | BSS | PTS | CITY PLUMBING SUPPLIES
KEYLINE | RUDRIDGE | CCF | SBS | DHS | CITY HEATING SPARES | TOOLSTATION
SOLFEX | BIRCHWOOD PRICE TOOLS | F & P | CONNECTIONS | PRIMAFLOW

- **Benchmark** - Benchmark Kitchens & Joinery is a strictly trade only company supplying high quality kitchens, joinery and flooring and everything else to complete the job.
- **Birchwood Price Tools** - Birchwood Price Tools (BPT) is a leading wholesaler of power tools, hand tools and site equipment, carrying a distinguished line-up of global brands.
- **City Plumbing Supplies** - One of the UK's largest plumbers' merchants and bathroom retailers, with a dedicated national network of branches and bathroom showrooms.
- **CCF** - leading specialist distributors of ceilings, drywall, screeding, insulation, partitioning and fire protection to the construction industry.

- **City Heating Spares** - City Heating Spares is the new super-fast heating spares brand trading at selected City Plumbing Supplies branches.
- **Direct Heating Spares** - Direct Heating Spares Limited ('DHS') is a leading independent distributor of domestic heating spares in the UK with national coverage.
- **F & P Wholesale** - The independent merchants' choice for heating, plumbing and bathroom products.
- **BSS Industrial** - Pipeline & Heating Solutions - A specialist distributor of pipeline, heating and mechanical services equipment serving customers across all industrial sectors within the UK and Ireland.
- **Plumbing Trade Supplies** - PTS is a leading distributor of plumbing, heating, sanitaryware and renewable energy products to a wide range of customers, both public and private sector, from national house builders to the sole trading plumber.

- **Travis Perkins** - One of the UK's leading builders' merchants supplying more than 100,000 product lines to trade professionals and self-builders.
- **Tile Giant** - Tile Giant is the fastest growing ceramics merchant in the UK.
- **Toolstation** - Toolstation is a rapidly growing direct retailer of tools and hardware.
- **Wickes** - One of the UK's leading DIY and Home Improvement retailers, operating over 200 stores across the country.
- **Connections** - A leading distributor of plumbing fittings from leading brands and manufacturers.
- **Solfex** - One of the largest specialist distributors in the UK of high quality renewable energy systems.