

Road & Highways



www.terram.com

 **TERRAM**
Geosynthetics you can trust



Geosynthetics in Highways and Related Applications

Geosynthetics have been used in civil engineering since the 1970's. One of the earliest applications was in the construction of highways where simple geotextile filters were placed between the sub-base and the subgrade to maintain the integrity of the stone layer.

TERRAM - Products

The ability of a geotextile filter to allow the passage of water yet still prevent intermixing of stone and soil has meant these filter/separators are being used every day around the globe. At one end of the scale it could be a remote unpaved haul road or, at the other, a major highway connecting international business centres.

The uses and products have expanded over the years as technologists and engineers have innovated and exploited the unique properties of the products that have been developed and refined.

Geosynthetics are now being used to control erosion on cut slopes as a result of road widening schemes, for roadside drainage, as part of SUDS projects for infrastructure access and housing/retail/commercial developments, and in the construction of retaining walls, bridge abutments and steep slopes.

TERRAM 1000 has been the most-frequently-specified geotextile in the UK for over 40 years.

TERRAM - The Brand

TERRAM branded products are manufactured by PGI, a leading global innovator and manufacturer of specialty materials, and the largest global manufacturer of nonwovens.

The innovative TERRAM product range includes geotextiles, geocells, geocomposites, cable and pipeline protection and ground reinforcement mesh.

With over 45 years' experience in the geosynthetic market, TERRAM provides value engineered solutions for the construction of highways, railways, landfill, pipelines and landscapes.

Improving Granular Layer Performance

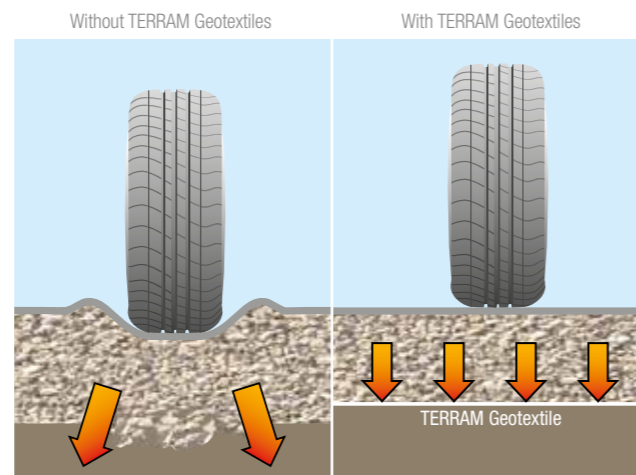


TERRAM Standard Geotextiles prevent intermixing of sub-base and subgrade layers. This intermixing causes a loss in bearing strength, as the stone layer becomes progressively contaminated, resulting in failure in the form of deformation. This can be remedied if it's an unpaved area/road by filling the ruts but even this can be uneconomic or unacceptable if stone has to be imported over long distances at a later date.

If it's a paved road then the intermixing could manifest itself as deformation at the pavement surface e.g. cracking and/or rutting, by which time the damage at the sub-base/subgrade interface cannot be repaired without re-construction and any repairs are cosmetic rather than structural. It is therefore better to pre-empt the problem by including a suitable geotextile.

Site-damage Resistance

The geotextile must first be capable of withstanding the rigours of installation as this is when the textile is most susceptible to damage. If it is not sufficiently robust, and is capable of tearing or being punctured, then the product may be incapable of performing its design function. For example, the filaments of many low-cost, woven textiles can be easily teased apart, even during physical examination. They have little integrity and it is easy to imagine how they will perform when angular stone is placed on them and compacted. A textile filter/seperator must have an apparent pore size which remains unaffected by loading. Any openings which are created or widened, or are caused by tearing/puncture, will allow subgrade particles to be pumped through to the sub-base.



Intermixing of the sub-base and subgrade prevents the full load-bearing capacity of the stone layer being mobilised and leads to failure. A suitable geotextile acts as a filter separator throughout the highway's life and acts to preserve the stone layer's integrity.



Radial Load Requires Isotropic Properties

The loading from a wheel at the sub-base/subgrade interface is radial and this means that the geotextile should have isotropic strength to deal with it. It is not sufficient for the textile to have high strength in one or two directions as with woven geotextiles.

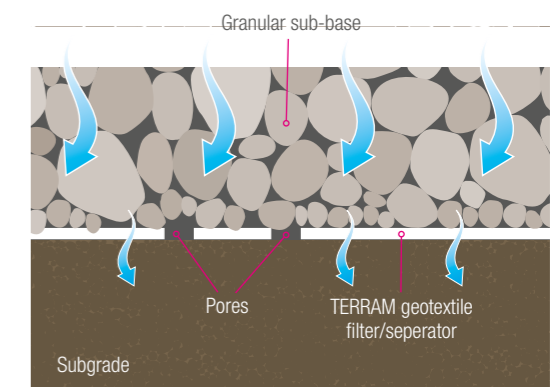
Sustained Filtration

The geotextile must provide sustained filtration whilst also separating the two layers i.e. the textile must allow the free passage of ground water yet limit the passage of soil particles. This involves matching the pore size with the sub-grade's smallest particle size. This does not mean that the geotextile should have a pore size smaller than the smallest soil particle. It has been established that a geotextile helps create filtration by virtue of a natural filter that is formed against the surface of the textile.

The ultimate objective is to maintain the integrity of the granular layer and thus gain the maximum life from the structure. This can be achieved by allowing its maximum bearing strength to be mobilised throughout the road's width and depth, and throughout its life.

Typical paved and unpaved applications where geotextiles are used beneath granular layers include:

- Highways
- Car parks
- Hardstandings
- Access and haul roads
- Cycle ways and footpaths



A natural filter is established adjacent to the geotextile's pores.

Geotextile Selection



The thickness of a sub-base and/or capping layer should be determined using appropriate national design criteria. Other more simplified procedures may be adopted if these do not exist or are inappropriate.

For example, the nomogram shown is for the design of unpaved roads and may be used to check initial layer thicknesses for a paved road, see Fig. 1.

Where information is scarce, the following may prove useful for the selection and installation of the most appropriate TERRAM grade. These guidelines should not be used to replace more rigorous design and the experience of contractors familiar with the installation of geotextiles.

Subgrade Strength and Moisture Content

The selection of the most appropriate TERRAM grade is largely dependent on the strength and moisture content of the subgrade. Site investigation should be used to assess these parameters. Fig. 2 may be used for guidance in the absence of field data.

Grade Selection

The TERRAM grade must be sufficiently robust to resist installation damage. The lower the subgrade strength and the larger the stone, the more robust the grade needs to be.

Installation

The area should be cleared of any large objects, such as stones and tree stumps, before geotextile placement. Ruts and sharp undulations in excess of 100mm should be filled and levelled. Strong perennial weeds, such as thistles, should be treated with weed killer. Other vegetation can be left undisturbed, if this is allowable and not detrimental to the structure. The presence of surface vegetation can actually aid construction with very soft soils i.e. CBR <1% and un-drained shear strengths <10kN/m².

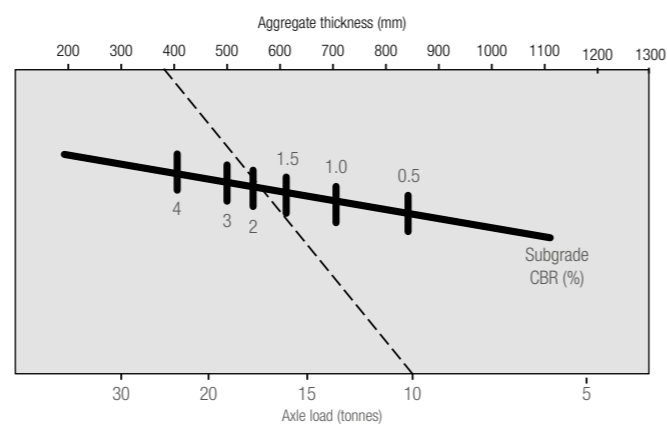


Fig. 1
Example: Subgrade CBR = 2%,
Axle load = 10 tonnes,
Stone thickness required = 350mm

Soil type	Plastic index %	CBR% Depth of water table below formation level	
		>600mm	<600mm
Heavy clay	70	2	1
	60	2	1.5
	50	2.5	2
	40	3	2
Silty clay	30	5	3
Sandy clay	20	6	4
	10	7	5
Silt		2	1
Sand (poorly-graded)	non-plastic	20	10
Sand (well-graded)	non-plastic	40	15
Sandy gravel (well-graded)	non-plastic	60	20

Fig. 2 Some approximate CBR values for soils at their natural moisture content

TERRAM geotextiles can be unrolled directly onto a subgrade with adjacent and subsequent rolls overlapped between 300mm and 1000mm - the softer the subgrade, the greater the overlap. A combination of overlapping and sewing may be more economical where the subgrade strength is particularly low, or in other critical situations (see the 'Joining methods for TERRAM Geotextiles' pdf document downloadable at www.terram.com).

Vehicles and plant must not run directly on exposed textile. Construction traffic should be restricted to areas of textile which have been covered with sub-base and preferably compacted to the minimum required depth.

Sub-base Selection and Placement

The sub-base must be well-graded, compactable and for permanent works, capable of transporting rising water and resistant to long-term degradation. Recommended grading bands for compactable granular materials are shown in Fig. 3.

The sub-base thickness will depend on loading and on the strength of the subgrade. The thickness should take into account the maximum anticipated axle load, both during construction and in service, and should be increased by 10-20% on bends or where a slightly inferior sub-base is used.

Sub-base should be bladed forward over the textile and graded down to the required un-compacted depth. Typical practice with a firm subgrade is to place the sub-base in layers which are compacted to 150mm using a vibro-roller.

With a soft subgrade it is prudent to place at least 300mm of lightly-compacted sub-base in one lift (500mm on an exceptionally soft subgrade) before overlaying this with a thinner layer of better-compacted material.

A very low-CBR subgrade, heavier traffic loadings, or a poorly-graded sub-base may require differing techniques. For example, heavy compaction with a very soft clay subgrade can lead to rutting and heave, and it may be necessary to increase the initial layer thickness and allow time for consolidation of the subgrade before the placement of thinner layers and applying more intense compaction.

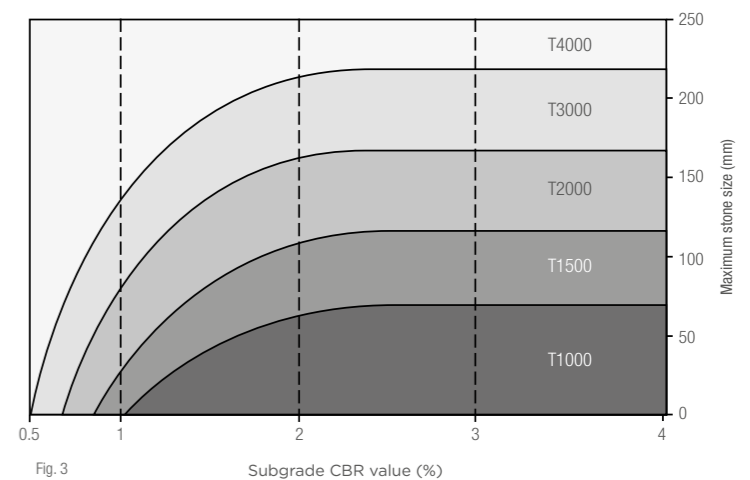


Fig. 3

Drainage



TERRAM Geocomposite Drains are manufactured by bonding a compression-resistant net core between two geotextile filters or between a geotextile and a geomembrane. The grade of net dictates the composite's flow capacity.

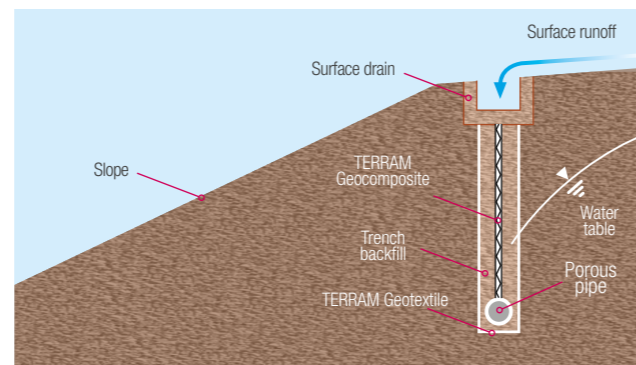
The filter/net/filter composites are used for general area drainage and are easy-to-install, factory-assured replacements for tradition stone installations. The filter/net/membrane composites are used to drain from one side only and provide a barrier to the other – a cut-off drain. Both types can be deployed vertically or horizontally.

TERRAM Geocomposite Drains are preferred to stone as they are less expensive, and much easier to install; particularly against vertical faces such a bridge abutment. They are also lighter and more compact which means lower transportation costs and minimum traffic disruption.

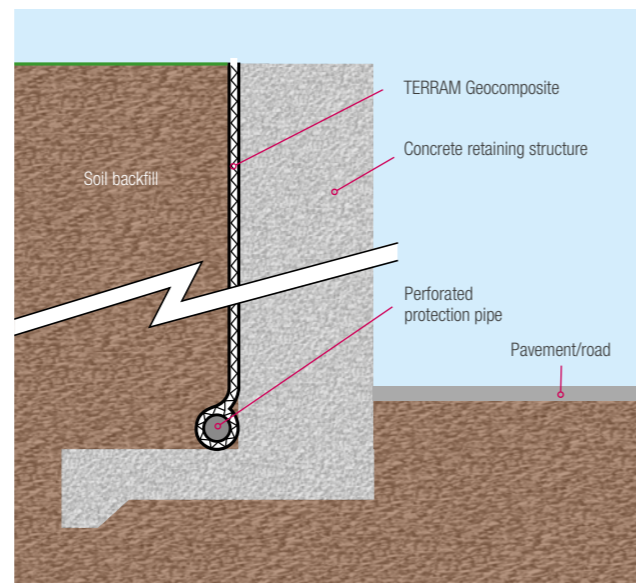
TERRAM Geocomposite Drains have factory-assured properties so there's no issue of stone grading and consistency. As most stone drains rely on a geotextile to prevent the ingress of fines, it's simpler to replace the stone with a drainage core such as a net.

Typical Applications

- Alongside roads
- Within slopes
- Around culverts, basements, reservoirs and other buried structures
- At the rear of retaining walls and abutments
- In the construction of tunnels



Slopes and embankments. The drainage function is a critical element in the design of soil slopes and in slip repairs.



Retaining Structures. To maintain the stability of a retaining structure it is important to provide an efficient drainage system at the rear of a retaining structure to prevent the build up of pore pressure.

Sustainable Urban Drainage Systems (SUDS)

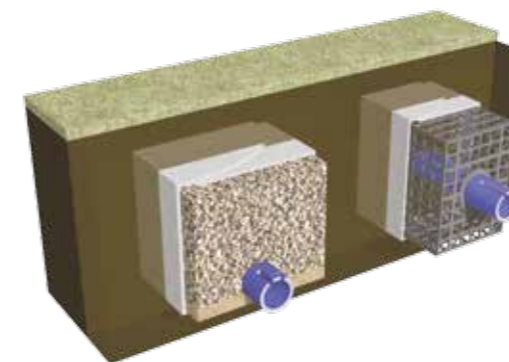
Paved areas and roof gardens require a light and versatile drainage system capable of a high in-plane flow. TERRAM Geocomposite Drains offer high flow rates, high compressive strength and good resistance to creep. Their use reduces manpower and minimizes the need for heavy materials making them ideal solutions for these applications.

Traditional Drainage Applications

TERRAM Standard Geotextiles and TERRAM Geocomposite Drains are used in traditional drainage methods including Fin, Lateral, French and SuDS drains.



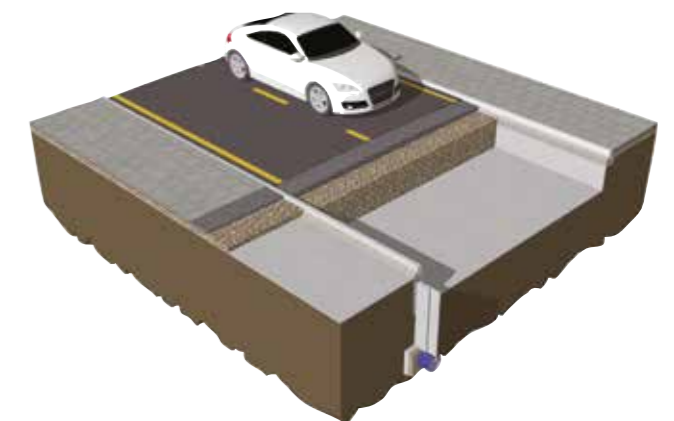
Standard Geotextiles used in a French Drain application.



Standard Geotextile used in a SuDS box drainage system.



Quick, easy to handle, efficient and cost effective drainage systems are necessary in areas of construction such as basements, culverts, car parks, reservoirs and many other structural and subsurface applications.



Vertical edge drains running parallel to a roadway are necessary to intercept the lateral flow of groundwater. A geocomposite fin drain saves on excavation and is quicker to install than a stone alternative.

Controlling Erosion on Highway Slopes



Combat slope erosion and stabilise surfaces using TERRAM GEOCELL.

Using TERRAM GEOCELL to control erosion ensures better resistance to the erosive effects of wind and water run-off. As TERRAM GEOCELL is made from permeable geotextile, it allows water to flow freely between cells encouraging drainage and vegetation.

Typical Applications

- Cut or Fill Embankments
- Dams or Spillways
- Revetments
- Abutment Protection
- Geomembrane Protection
- Soil-nailing Cover
- Landfill Lining

TERRAM GEOCELL is supplied as flat packed panels which are opened to form the honeycomb-like structure. These are positioned and pinned to the ground using fixing pins and filled with a suitable, permeable infill.

TERRAM GEOCELL can be used on slopes up to 1:1 and is flexible enough to be formed around trees and other obstacles. Seeded topsoil is the most suitable fill for less-exposed slopes with small shrubs, offering improved protection, whilst a granular material offers the highest protection.



Load Platforms and Tree Root Protection



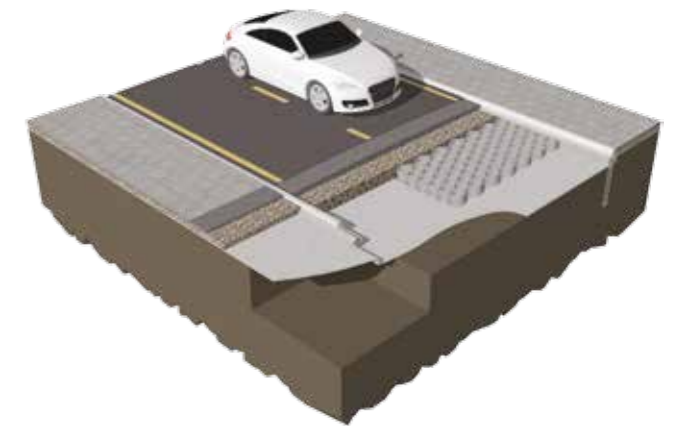
TERRAM Geocell load platforms, once filled with a free-draining granular material, act as a mattress that spreads traffic loads laterally to reduce vertical deflections. The fill is confined within the individual cells by hoop stress.

Load Platforms

TERRAM Geocells are also used to construct semi-rigid platforms over poor soils and over areas where there's a no dig-restriction.

Tree Root Protection

Using TERRAM GEOCELL for tree root protection ensures the roots beneath are protected from vehicle loads by confining the sub-base and stabilising the ground. When the permeable TERRAM GEOCELL is filled with a porous, no fines, free-flowing aggregate the system allows easy passage of air and water providing essential nutrients to the roots. TERRAM GEOCELL is ideal for "No-Dig" situations.



TERRAM Geocell load-platform.



TERRAM Geocell load-platform.



TERRAM Geocell tree-root-protection.

Retaining Walls



Grass and Gravel Surface Stabilisation



Need an earth retention structure? TERRAM GEOCELL can stabilise and retain wall structures.

TERRAM GEOCELL provides a cost-effective alternative to conventional earth retention structures as it eliminates the potential for cracking, spalling, splintering and corrosion commonly seen in concrete, steel and timber systems.

Typical Applications

- Steepened Embankments
- Dams and Flood Defence Bunds
- Retention Bunds
- Green Walls
- Culvert Head Walls
- Sound Barriers

TERRAM GEOCELL is supplied as flat packed panels which are opened to form the honeycomb-like structure. These are positioned and installed in horizontal layers to form a gravity or composite wall.

Composite Wall

TERRAM GEOCELL is installed in layers creating a totally confined facing wall that is directly connected to the backfill using a traditional earth reinforcement system. Typical reinforcement techniques such as geogrids, soil nails, rock bolts and helical anchors are commonly used. When combined with TERRAM GEOCELL they create a mechanically stabilised earth structure.

Gravity Wall

TERRAM GEOCELL is installed in layers creating horizontal terracing on the fascia wall, capable of resisting internal loads and pressures to maintain structural integrity. In some circumstances TERRAM GEOCELL can be utilised to create a vegetated cover for the fascia.

WHY TERRAM GEOCELL?

- Lightweight and easy to handle, reducing installation costs.
- The flexible TERRAM geotextile material allows TERRAM GEOCELL to effectively adapt to any variations in the terrain.
- TERRAM GEOCELLS are easily cut to size without damage, therefore reducing cost.



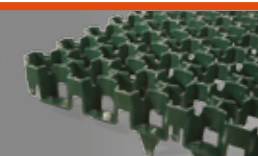
Constructing stable grass and gravel surfaces for trafficking.

There are many products and techniques for increasing the stability of low-load-bearing ground but most have been developed with paved areas in mind. It is only in the last thirty years or so that the demand has grown for unpaved solutions.

It is now possible to construct green roads and car parks which are not only pleasing to the eye but retain their appearance and continue to perform when other non-engineered alternatives are worn and unattractive.

TERRAM solutions, including Grassprotecta, Bodpave 85 and Truckpave, can be used with grass or gravel. All solutions are porous which means they are source-control compliant for SuDS installations.

The products have been developed with different trafficking requirements in mind. The demand can vary from occasional foot traffic to frequent, heavily-loaded vehicles so it's important to deal with a company who can supply the full range of solutions rather than a one-size-fits-all approach.



Demarcation and Warning Layers



Demarcation and warning layers for underlying contaminants and services.

If the filter/separation functions are required for construction over contaminated land then there is an additional benefit that TERRAM products can provide – high visibility so that they also warn operators during excavation at a later date.

TERRAM Hi-Vis is a bright orange geotextile used to mark areas of soil prior to backfilling. Manufactured using orange fibres, it has the same filter/separation benefits of TERRAM Standard Geotextiles but provides a visible separation of clean and contaminated soils. Future excavations will see the visible barrier of the contaminated soils beneath.

TERRAM Indicator Mesh is available in red to protect bridge deck membranes and also act as a depth marker during re-surfacing operations. The mesh is a proven alternative to using red sand and is much easier to install.

TERRAM Detectamesh detectable underground warning tapes, provide two functions when installing highway pipelines, drainage, cables and communication fibre optics: 1; Provides a visible warning to future excavators of the utility service beneath. 2; Contains a traceable element to enable the detection of plastic pipes and un-energised cables using a cable avoidance tool, preventing damage to the services.



Product Pages



TERRAM

Standard Geotextiles



TERRAM Standard Geotextiles enhance the performance and design life of granular layers by providing the filtration and separation functions. Typical uses for TERRAM Standard Geotextiles include ground stabilisation (between the sub-base and subgrade) and around drainage materials.

Preventing intermixing of granular materials and soils

TERRAM Standard Geotextiles provide an effective solution to the problem of constructing a stable granular layer over soft foundation soils. When stone is placed directly on a soft subgrade, the imposed load often causes intermixing of two layers. This results in contamination of the stone layer and a resulting loss in bearing strength, surface rutting and deformation at the sub-base/subgrade interface.

Preventing the ingress of fines into drainage media

Whether it's a granular drain or a geosynthetic alternative such as open geocellular units, TERRAM Standard Geotextiles are ideal for preventing the ingress of fines.

Features

- Engineered to provide high strength and high elongation at break
- Manufactured from high tenacity UV stabilised virgin polypropylene fibres to provide long term durability in all soil types
- Manufactured using a randomly orientated web to provide completely isotropic properties
- Excellent uniformity with high permeability and low pore size for soil filtration

TERRAM filters/separators are used extensively in the construction of

- Paved and unpaved roads
- Railways
- Car parks and hardstandings
- Cycleways and footpaths
- SuDS installations
- Green roofs

Product Grade	T700	T900	T1000	T1300	T1500	T2000	T3000	T4000	T4500
Roll Width (*) m	4.5/6	4.5/6	4.5/6	4.5/6	4.5/6	4.5/6	4.5/6	4.5/6	4.5/6
Roll Length m	150	150	100	100	100	100	100	50	50

* All products can be manufactured up to a maximum width of 6 metres.

TERRAM

Geocomposite Drain



TERRAM Geocomposite Drains are manufactured by bonding together textiles, membranes and nets in different combinations to create easier-to-install replacements for conventional granular layers.

The textile provides the filter function so this allows liquids and gases to pass into the net core but prevents soil particles from washing into and clogging the core. The net collects the liquids and gases which can then be conveyed to collection points. Membranes are used to provide the barrier function and prevent the passage of liquids and the majority of gases.

A Composite Must

- be robust to survive installation and service life.
- be stable under load to resist deformation that could ultimately restrict flow.
- have good chemical resistance.

Its Filter Must

possess an apparent pore size to suit the soil and prevent the ingress of fines provide sustained performance without blocking TERRAM Geocomposite Drains are proven to satisfy these criteria and stand the test of time. The products have established an impressive track record in building and construction projects across the world for over forty years.

Features

- Manufactured using TERRAM T1000LE, a unique geotextile filter developed for its high tensile modulus and ability to prevent soil ingress into the void space of the drainage core
- TERRAM drainage cores are manufactured from HDPE nets which have been engineered to have good flow under high loading

	B1	1B1	1BZ	1C1	1E1
Roll Width m	20/2.0	20/2.0	20/2.0	20/3.8/4.0	20/4.0
Roll Length m	25/100	25/100	25/100	25/50/100	25/100

* All products can be manufactured up to a maximum width of 6 metres.



TERRAM product specifications can be downloaded from www.terram.com



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TERRAM Geocell Retaining Walls



TERRAM Geocell Erosion Control



Need an earth retention structure? TERRAM GEOCELL can stabilise and retain wall structures.

Design Considerations

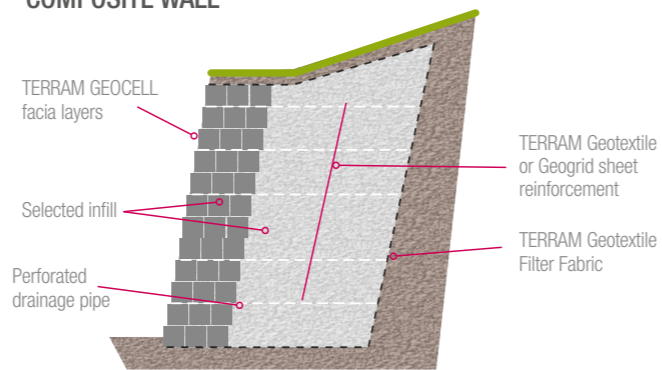
- Wall Height
- Facia Angle
- Surcharge Load on the top of the wall
- Overturning Stability
- Sliding Stability
- Foundation Bearing Capacity

TERRAM works with specialist partners to provide independently validated solutions in accordance with best practice guidelines.

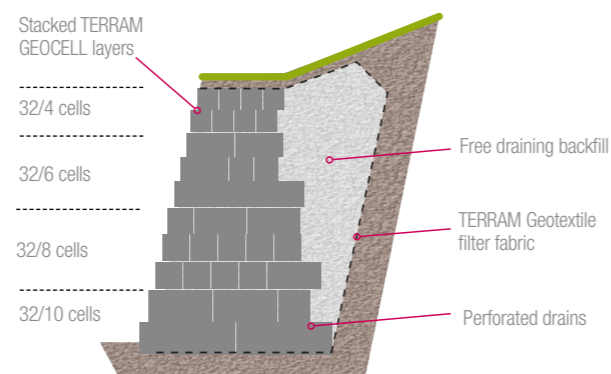
Fixing Pins

Fixing pins available upon request.

COMPOSITE WALL



GRAVITY WALL



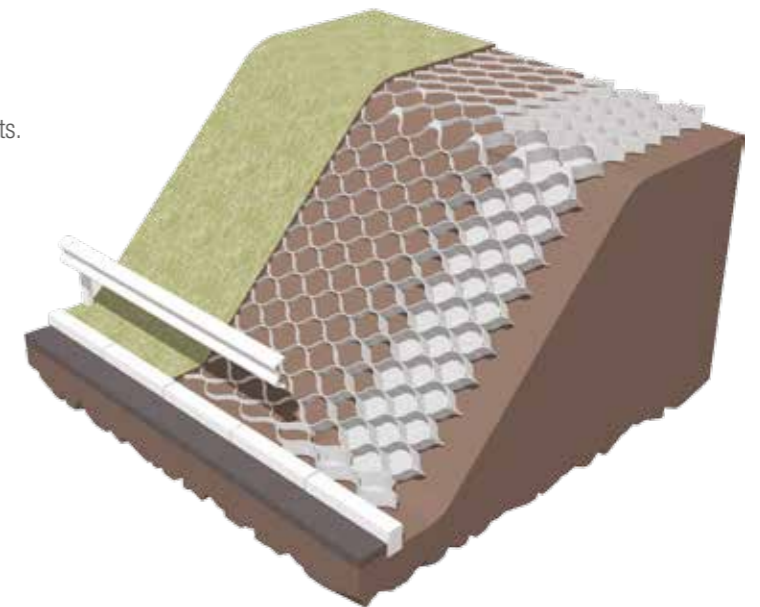
Product Details

PRODUCT	PANEL SIZE (m)	DEPTH & CELL Dia (mm)	PANEL WEIGHT
TERRAM Geocell Wall 330 32/4	10.6 x 1.45	320 x 500 dia	10.43kg
TERRAM Geocell Wall 330 32/6	10.6 x 2.03	320 x 500 dia	14.26kg
TERRAM Geocell Wall 330 32/8	10.6 x 2.61	320 x 500 dia	18.09kg
			21.92kg

Combat slope erosion and stabilise surfaces using TERRAM GEOCELL.

WHY TERRAM GEOCELL?

- Lightweight and easy to handle, reducing installation costs.
- The flexible TERRAM geotextile material allows TERRAM GEOCELL to effectively adapt to any variations in the terrain.
- TERRAM GEOCELLS are easily cut to size without damage, therefore reducing cost.



Fixing Pins

Fixing pins available upon request.

Product Details

PRODUCT	PANEL SIZE (m)	CELL Dia & DEPTH (mm)	PANEL WEIGHT	SLOPE TYPE
GEOCELL 25/10	5 x 7	250 dia x 100	17kg	Large/Medium*
GEOCELL 25/15	5 x 7	250 dia x 150	25kg	Large/Medium*
GEOCELL 35/10	5 x 7	350 dia x 100	11kg	Small*
GEOCELL 35/15	5 x 7	350 dia x 150	17kg	Small*

* These are typical profiles only.



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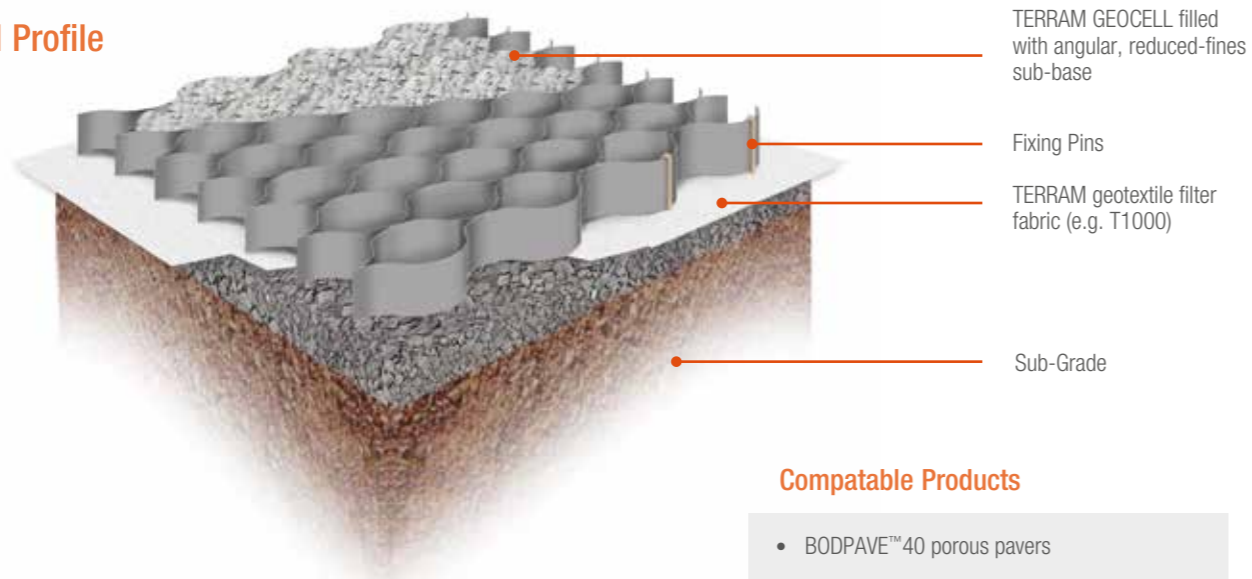


TERRAM Geocell Tree Root



Protect tree roots from vehicle traffic, whilst maintaining water and nutrient absorption using TERRAM GEOCELL.

Typical Profile



Compatible Products

- BODPAVE™ 40 porous pavers
- BODPAVE™ 85 porous pavers
- TRUCKPAVE™
- TERRAM geotextile filter
- Geogrid

Fixing Pins

Fixing pins available upon request.

Product Details

PRODUCT	PANEL SIZE (m)	CELL Dia & DEPTH (mm)	PANEL WEIGHT	TYPICAL LOADING
GEOCELL 25/10	5 x 7	250 dia x 100	17kg	Pedestrian cycle*
GEOCELL 25/15	5 x 7	250 dia x 150	25kg	Light vehicles*
GEOCELL 22/20	6 x 3	220 dia x 200	20kg	Optimum for heavier vehicles or more frequent traffic*

* These are typical profiles only.

TERRAM Truckpave



Manufactured from recycled plastics, TERRAM Truckpave cellular paving is robust, durable and capable of withstanding all levels of traffic up to and including coaches, dustcarts and HGVs.

TERRAM Truckpave's cells can be filled with either grass seed/topsoil or gravel, making them suitable for stabilising areas where a grass or stone surface is desirable. TERRAM Truckpave pavers are the economic, environmentally-friendly and lightweight alternative to grass concrete type pavers.

Applications

- Lorry, coach and car parks
- Fire access roads and HGV service access roads
- Road widening
- Grass verges, incl' where HGV overrun occurs
- Footpaths
- Service yards and other areas where forklift trucks operate including loading areas
- Lay-bys

Benefits

- Comply with the HSE manual-handling limit (concrete units exceed this limit).
- Meet SLW60 load category - vehicles up to 60t gross weight, 10t wheel load.
- Flexible and resistant to cracking.
- Plastic achieves greatly improved volume and quality of grass compared to concrete units.
- Available with anti-skid surface detail for additional traction on gradients.
- Pavers do not transfer heat and dry out soil infill.
- Non-standard colours can be manufactured subject to order quantity.

PRODUCT	TRUCKPAVE 80	TRUCKPAVE 100
Width (mm)	600	600
Length (mm)	400	400
Depth (mm)	80	100
Weight (kg)	9	12
Unit/m ²	4.17	4.17
Colour	Grey	Grey



TERRAM product specifications can be downloaded from www.terram.com



TERRAM product specifications can be downloaded from www.terram.com



TERRAM Bodpave™ 85



TERRAM Bodpave 85 is an interlocking cellular porous paving system for ground reinforcement which can be installed with either a grass or gravel filled surface.

The design of TERRAM Bodpave 85 pavers allows them to positively interlock with each other and resist shear. Once filled, they provide a high level of load-bearing performance. They are laid on a free-draining base and can be filled with either gravel for immediate frequent/intensive use, or with a seeded sand/soil to establish a grassed surface for occasional consecutive use. Both options mean that the resulting pavement is porous and in sympathy with the environment. Note: a grassed surface may not be suitable for every application.

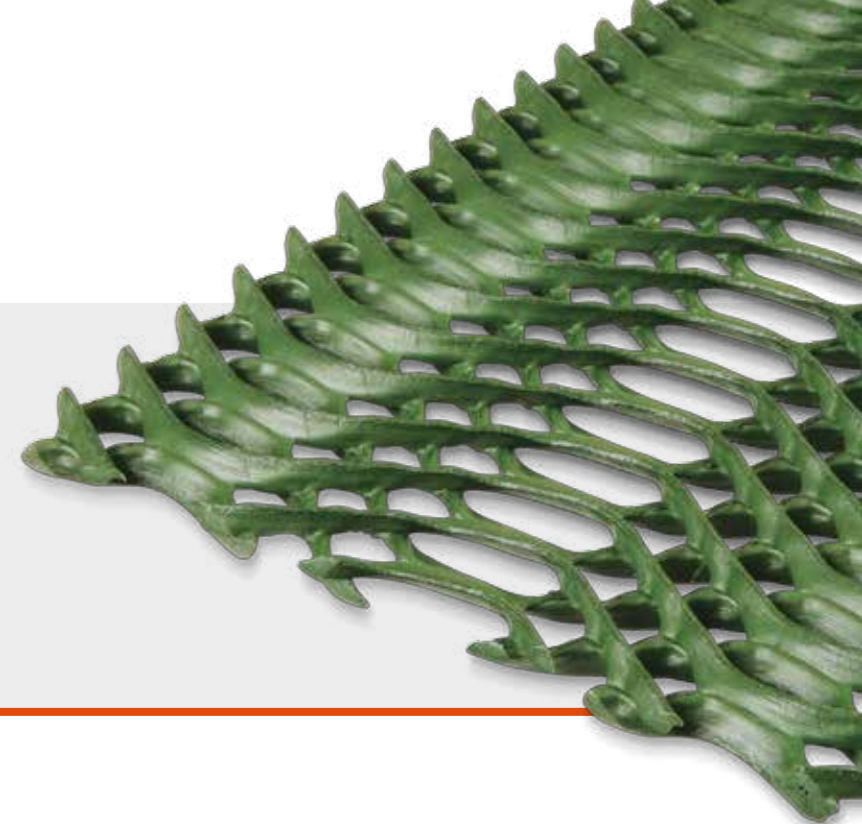
The unique TERRAM Bodpave 85 design resists lateral movement whilst accommodating expansion and contraction, promotes surface traction and stability and encourages grass growth by protecting the roots.

Typical Applications

- Car / coach parks
- Emergency / HGV service access routes
- Aircraft taxiways & helipads
- Walkways and disabled access
- Golf buggy paths
- Driveways & residential parking
- SuDS source control
- TERRAM Bodpave 85 is suitable for grassed surfaces, gravel retention and SUDS source control applications.

PRODUCT	BLACK / GREEN
Connection & locking type	Overlapping edge loop & cell connection with integral self-locking, snap-fit clips
Basal support & anti shear	Integral 35mm long ground spikes (18/paver) with cross & T section
Dimensions	500 x 500mm x 50mm deep (plus 35mm long ground spike)
Cell wall thickness	2.5mm - 4.4mm
Nominal internal cell dimensions	67mm (cruciform) & 46mm (round)
Quantity per m ²	4 pavers
Weight	1.56kg (6.24kg/m ²)

TERRAM Grassprotecta™



TERRAM Grassprotecta heavy-duty polyethylene mesh reinforces grassed surfaces prone to wear and smearing e.g. permanent car parking and heavily-used pedestrian areas. The oscillated mesh structure provides traction and slip resistance.

TERRAM Grassprotecta mesh is available in two thicknesses: 14mm and 11mm. It is simple to install by fixing to the existing grass surface. The sward grows through the mesh apertures and knits with the filaments to create a strong, discreetly reinforced surface which is capable of withstanding vehicle loads, limiting damage and helping to reduce compaction by reducing direct contact with the soil surface. The grass can be mown, rolled and fertilised as normal during this period and the mesh soon becomes unobtrusive.

It is strongly advised that newly-installed areas remain untrafficked until the sward and the mesh have knitted - normally after a few weeks during the growing season, increasing to a few months out of season. Immediate use may restrict growth and limit the effectiveness of the installation.

The Standard (11mm) grade is suitable for

- Light-usage, overflow car parks
- Wheelchair (DDA) access routes
- Golf-buggy paths
- Heavily-pedestrianised paths

The Heavy (14mm) grade is suitable for

- Overflow car parks
- Light-aircraft taxiways
- Caravan sites and amenity areas
- Some equestrian surfaces
- Verge stabilisation

NOMINAL DIMENSIONS	STANDARD (1.2kg)		HEAVY (2kg)	
	1	1	1	2
Width (m)	1	1	1	2
Length (m)	1	1	10	20
Thickness (mm)	11		14.5	
Weight/m ²	1.2		2	
Weight/linear m (kg)	1.2	2.4	2	4
Roll weight (kg)	12	48	20	80



TERRAM product specifications can be downloaded from www.terram.com



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Hi Vis Geotextile



TERRAM Hi Vis is a non-woven orange geotextile used for separating contaminated/uncontaminated soils.

TERRAM Hi Vis geotextiles have a dual effect: its vivid colour warns of potential danger at the point of any future excavations and it can also prevent the upward movement of contaminated soil particles.

Preventing intermixing of granular materials and soils

TERRAM Hi Vis geotextiles provide an effective solution to the problem of constructing a stable granular layer over soft foundation soils. When stone is placed directly on a soft subgrade, the imposed load often causes intermixing of two layers. This results in contamination of the stone layer and a resulting loss in bearing strength, surface rutting and deformation at the sub-base/subgrade interface.

Preventing the ingress of fines into drainage media

Whether it's a granular drain or a geosynthetic alternative such as open geocellular units, TERRAM Hi Vis geotextiles are ideal for preventing the ingress of fines.

TERRAM filters/separators are used extensively in the construction of

- Paved and unpaved roads
- Railways
- Car parks and hardstandings
- Cycleways and footpaths
- SuDS installations
- Green roofs

Features

- Engineered to provide high strength and high elongation at break
- Manufactured from high tenacity UV stabilised virgin polypropylene fibres to provide long term durability in all soil types
- Manufactured using a randomly orientated web to provide completely isotropic properties
- Excellent uniformity with high permeability and low pore size for soil filtration

PRODUCT GRADE	T1000 Orange Geotextile
Roll Width (*) m	4.5/6
Roll Length (m)	100

TERRAM

Indicator Mesh



Indicator Mesh is a highly visible plastic mesh used on bridge decks to indicate and protect the waterproof membrane.

TERRAM Indicator Mesh is laid over a layer of sand asphalt or a fine binder course which has been laid over the waterproof membrane on the bridge deck. A binder course is laid above the indicator mesh, before the bridge surface course is laid.

TERRAM Indicator Mesh is a great alternative to other depth indicator techniques such as red sand asphalt. The TERRAM Indicator Mesh ensures that future resurfacing contractors undertaking subsequent planing or repairs to the bridge surface and binder course are given clear warning that the waterproof membrane is below.

TERRAM Indicator Mesh is available up to 1.5m wide and in red, yellow or orange:

- Highly visible indication mesh
- Manufactured from high density polyethylene
- Rot resistant and chemically inert
- Installation of Indicator mesh netting for a bridge deck construction to protect the waterproof membrane
- TERRAM Indicator Mesh can also be used to indicate membranes on roads, or can be used to indicate areas of soil contamination

ROLL WIDTH	ROLL LENGTH	COLOUR	MESH THICKNESS
1.5m	50m	Red	3mm



TERRAM product specifications can be downloaded from www.terram.com



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Terram Rootguard™



Root control barrier to protect buildings, walls, paths, access roads, drainage pipes and underground cables from root damage.

TERRAM ROOTGUARD and TERRAM ROOTGUARD PLUS are used to protect buildings, walls, paths, drainage pipes, cables and lawns from potential damage caused by root development. Tree roots grow very close to the surface and are the cause of considerable damage. Structures with shallow foundations can be undermined. Damaged pipes, or pipes with faulty joints can become blocked by roots. Root growth is also known to cause desiccation of soils to the extent that soil shrinkage can result in parts of the foundation no longer being supported. When this occurs structures may subside and crack, and in these circumstances expensive underpinning may be the only solution. The choice of TERRAM ROOTGUARD product will depend upon the application, specifically whether water needs to pass through the product.

TERRAM ROOTGUARD - Permeable Solution

In some instances it may be necessary to have a water-permeable solution e.g. surrounding land drains. Although some permeable barriers may not provide the highest level of protection (see TERRAM ROOTGUARD PLUS), they still provide excellent resistance.

TERRAM ROOTGUARD is a geotextile manufactured from polypropylene/polyethylene fibres. It provides excellent resistance to root development; confirmed in numerous trials and commercial projects.

TERRAM ROOTGUARD has high tensile strength, high puncture resistance and is capable of withstanding the differential forces that can develop in clay soils.



TERRAM ROOTGUARD PLUS - Impermeable Solution

Research has demonstrated that high-density polyethylene (HDPE) can withstand penetration by even the most vigorous of tree roots. TERRAM ROOTGUARD PLUS - a composite of TERRAM ROOTGUARD and an HDPE membrane is the choice when there is no requirement for water to pass through the barrier. This product will provide the greatest degree of protection. Both products are chemically inert to natural soil conditions and resistant to biodegradation.

Terram rootguard product details

PRODUCT	ROLL SIZE (m)	WEIGHT	CBR PUNCTURE RESISTANCE	COLOUR	MATERIAL
TERRAM Rootguard	2.25 x 25	260g/m ²	3250N	Black	Non-Woven PP/PE
TERRAM Rootguard Plus	2 x 25	275g/m ²	2550N	Black	Non-Woven PE/HDPE coated



TERRAM product specifications can be downloaded from www.terram.com



Further market specific literature available:

- Railways
- Ground Reinforcement Solutions
- Pipelines / Utilities
- Forestry & Landscaping
- Fruit & Viticulture

www.tubex.com

Application specific literature, product data sheets, case studies and installation guides are available on request or can be freely downloaded from **www.terram.com**

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PGI excels in the innovative application of technology to create versatile, high-performance materials which are unique, cost-efficient and deliver significant added value.

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