Technical Data Sheet

BODPAVE™ 85

FLP Flexible Lining Products

Ponds, Ecology and Bioengineering

Bodpave™ is an interlocking cellular porous plastic paving grid system for ground surface stabilisation.

Applications

- Car and light vehicle parking
- Pedestrian walkways
- Golf buggy paths
- Cycle paths
- Driveways
- Residential parking
- Sustainable Drainage Systems (SuDS)

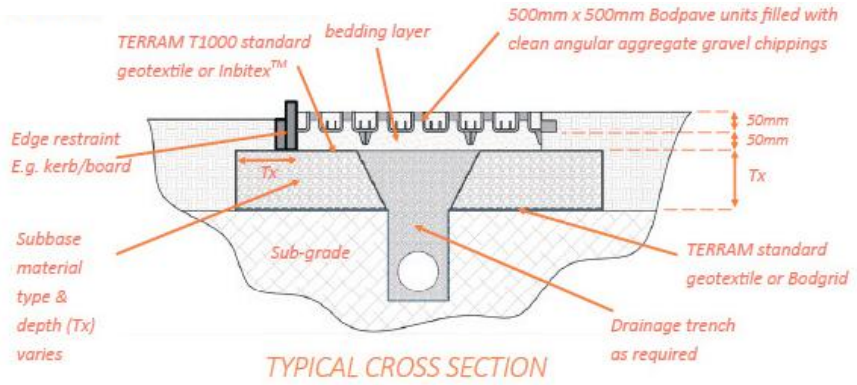
Design

Most Bodpave™ installations will require a new sub-base (pavement foundation layer) to be constructed. The thickness and type of granular material used to form the sub-base will generally depend on the following factors;

- Strength of the underlying ground (sub-grade) measured in CBR* %
- Water permeability of the underlying ground (sub-grade) k measured in m/s
- Type of underlying ground (sub-grade) e.g. clay/silt/sand/gravel/rock
- Type of vehicle traffic (HGV/LGV/car/cycles/pedestrian)
- Frequency of traffic (occasional/regular)

*California Bearing Ratio Test

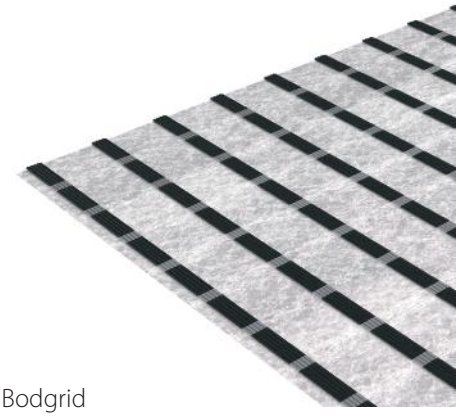
A comprehensive ground investigation survey with suitable testing is highly recommended to ensure the sub-base for a Bodpave™ surface is suitably strong and sufficiently durable for the anticipated use. **This design guide can be used for estimating ground conditions and producing preliminary pavement designs but it is not a substitute for site specific ground investigation works and a detailed pavement design by a suitably qualified civil engineer.**



TYPICAL CROSS SECTION

Table 1 - Minimum Sub-base Thickness (Tx) with Bodgrid

Sub Grade	Cars/Light Vehicles (#)		Coaches/Heavy Goods/ Emergency Vehicles		Overlap
CBR* %	Thickness (mm)	Bodgrid	Thickness (mm)	Bodgrid	(mm)
1	300	GC30	400	GC30	600
2	150	GC30	250	GC30	500
3	125	GC30	175	GC30	450
4	125	GC30	150	GC30	400
5+	100	GC30	125	GC30	300



Bodgrid

Table 2 - Minimum Sub-base Thickness (Tx) without Bodgrid

Sub Grade	Cars/Light Vehicles (#)		Coaches/Heavy Goods/ Emergency Vehicles		Overlap
CBR* %	Thickness (mm)	Standard Geotextile	Thickness (mm)	Standard Geotextile	(mm)
1	450	T2000	600	T2000	600
2	225	T1500	375	T1500	500
3	200	T1000	300	T1000	450
4	200	T1000	225	T1000	400
5+	150	T1000	200	T1000	300

*California Bearing Ratio Test

Standard geotextile

Regular tight turning of vehicles and "dry" steering may cause damage to the Bodpave™ units and/or displace gravel infill; vehicle manoeuvring should be carefully considered at specification/design stage. Gravel filled units may require some maintenance when subjected to regular channelised and turning traffic loadings. Terram Bodpave™ 85 and Truckpave™ paviours are generally recommended for occasional overrun or regular HGV traffic respectively. If construction traffic axle load exceeds 60kN (6 tonnes), minimum sub-base thickness over Terram Bodgrid should be 200mm.

Table 3 - Field Guidance for Estimating Sub-grade Strength

Consistency	Indicator		Mechanical (test) SPT	Strength	
	Tactile	Observation		CBR %	Cu Kn/SQM
Very Soft	Sample squeezes through fingers	Person standing will sink >75mm	<2	<1	<25
Soft	Easily moulded by finger pressure	Person walking sinks 50-70mm	2-4	~1	~25
Medium	Moulded moderate finger pressure	Person walking sinks 25mm	4-8	1-2	25-40
Firm	Moulded by strong finger pressure	Utility truck ruts 50-70mm	8-15	2-4	40-75
Stiff	Can be indented by thumb	Loaded construction vehicle ruts by 25mm	15-30	4-6	75-150

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Table 4 - Typical Soil Types and Properties

Soil Type	Plasticity	CBR% Depth of Water Table Below Formation Level		Typical Range for Coefficient of Permeability K (m/s)	Infiltration
Heavy Clay	70 60 50 40	2 2 2.5 3	1 1.5 2 2	10^{-10} to 10^{-8}	No
Silty Clay	30	5	3	10^{-9} to 10^{-8}	No
Sandy Clay	20 10	6 7	4 5	10^{-9} to 10^{-6}	Partial
Silt	Non-plastic	2	1	10^{-8} to 10^{-6}	Partial
Poorly Graded Sand	Non-plastic	20	10	10^{-7} to 10^{-6}	Partial
Well Graded Sand	Non-plastic	40	15	10^{-6} to 10^{-4}	Total
Well Graded Sandy Gravel	Non-plastic	60	20	10^{-5} to 10^{-3}	Total

This field guide is provided as an aid to assessing the mechanical stabilisation requirements in commonly encountered site conditions.

1. Minimum sub-base thickness (Tx) can be selected from table 1 or 2 with ground strength and permeability estimated from tables 3 or 4 in the absence of any site specific ground investigation report.
2. If the Bodgrid layer is omitted, then the total sub-base layer thickness (Tx) must be increased by 50%. A standard geotextile separation layer should be specified with lower sub-grade strength (CBR value) requiring a more robust grade in accordance with BS8661:2019 (see table 2).
3. Bodpave™ units are an ideal surface for source control porous pavings SuDS with a permeable sub-base; DoT Type 3 (Type 1x) porous/open graded granular material as described in Specification for Highways Works clause 805. If a higher water storage (attenuation) capacity (void ratio) is required a hard crushed angular "clean stone" such as a course graded aggregate (CGA) type 4/20 (4mm minimum and 20mm maximum particle size) can be used. The type of SuDS design (attenuation, total or partial infiltration) will depend upon the underlying ground conditions and not all sites are suitable for infiltration. Weak and low-permeability cohesive sub-grades are generally unsuitable for infiltration (permeability coefficient k $<10^{-6}$ m/s). Clays with a low plasticity index (<20%) will reduce in strength when saturated; a full attenuation system with an impermeable membrane directly on top of the sub-grade is recommended (see table 4). Specific advice on suitable drainage and construction over very weak ground (CBR <1%) is available.
4. Alternatively traditional 'DoT Type 1' well graded granular material may be used for the sub-base provided that an adequate drainage system is installed. Typical drainage details; 100mm diameter perforated pipe drain laid at minimum gradient 1:100, bedded on gravel in trench backfilled with SHW Clause 505 'Type A' drainage aggregate (or CGA type 4/20), covered or wrapped with Terram T1000 standard non-woven geotextile and leading to a suitable outfall or soakaway. Drains placed down the centre

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or along the edge of access routes up to 5m wide. Wider areas may require additional drainings at 5m - 10m centres.

5. The sub-base must be covered with a lyer of Terram T1000 standard or InbitexTM non-woven geotextile to prevent settlemen due to mixing of the bedding and sub-base layers and to provide filtration and pollution control.
6. Bedding layer material should be either free-draining clean angular hard aggregate gravel chippings or course grit sand. Bodpave units should be filled with free-draining clean angular hard aggregate gravel chippings. **Rounded pea shingle is not suitable.** See table 6 for more details.
7. The final pavement and drainage design should be undertaken by a suitably qualified civil engineer and based on specific site conditions.
8. Maximum advised gradient for traffic applications is 12% (1:8) 7^0, Bodpave units have specific fixing points for **steel u-pins** if required for steep slope applications.

Table 5 - Products

Bodpave™ 85	
Dimensions	500mm x 500mm x 50mm + 35mm ground spike
Compressive Strength	<400 tonnes (400kN)/SQM (gravel filled)
Connection Strength	7kN/Lm
Material	100% recycled plastic
Coverage	4 units/SQM

Bodpave™ 85

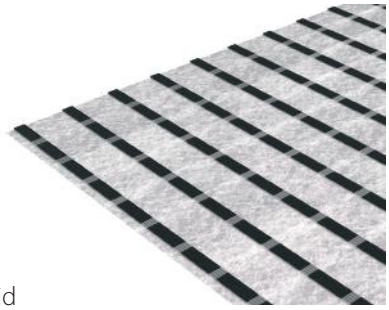
Inbitex™ Non-woven Geotextile	
Standard Roll Dimensions	4.5m wide x 100m long
Tensile Strength kN/m	8.5
Elongation	30%
CBR Puncture Resistance kN	1.6
Oil Absorption and Removal	<400g/SQM year

Inbitex

Non-woven Standard Geotextile	
Standard Roll Dimensions	4.5m x 100m long
Grades	T1000/T1500/T2000
BS8661 Classification	1/2/3
Tensile Strength kN/m	8.0/12.5/14.5
Elongation	60%
CBR Puncture Resistance kN	1.5/2.25/2.75

Standard geotextile

Bodgrid GC30	
Standard Roll Dimensions	4.8m wide x 50m long
Tensile Strength kN	30
Tensile Elongation	7%
Functions	Separation, filtration, stabilisation



Bodgrid

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Table 6 - Fill Materials

Bodpave Surface Fill

Description	Clean angular hard aggregate gravel chippings
Aggregate Size	6 to 10mm
Typical Source Quarried Rocks	Granite, Basalt, Hard Limestone
Grading to BS EN 13242	GC 80/20 6/10
Comments	Rounded Pea Shingle is not suitable

Bedding Layer (2 options)

Description	Option 1 - clean hard angular aggregate gravel chippings
Aggregate Size	6 to 10mm
Typical Source Quarried Rocks	Granite, Basalt, Hard Limestone
Grading to BS EN 13242 or 12620	GC 80/20 6/10
Comments	Rounded Pea Shingle is not suitable
Description	Option 2 - course grit (sharp) sand
Aggregate Size	0 to 4mm
Grading to BS EN 13242 or 12620	GC 85 0/4 Site Category II <1/5% fines (0.063mm)

Sub-base (3 options)

Description	Option 1 - well graded granular DoT Type 1 (with filter drains)
Aggregate Size	0 < 63mm
Grading to BS EN 13242 or 12620	GC 75/32 1/31.5 (SHW Clause 803)
Description	Opt 2 - permeable open graded granular DoT Type 3 (Type 1x)
Aggregate Size	0 to 40mm
Grading to BS EN 13242 or 12620	GC 80/25 1/40 (SHW Clause 805)
Description	Opt 3 - clean stone, course graded aggregate type 4/20
Aggregate Size	4 to 20mm
Grading to BS EN 13242 or 12620	GC 90/15 4/20

UNCOMPACTED COMPACTED


Angular Gravel Chippings


~~Pea Shingle~~


Course grit sand


Type 1


Type 3 (1x) - permeable


CGA Type 4/20 (clean stone) - permeable

UNCOMPACTED COMPACTED

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Installation

1. Excavate ground to the required formation level.

2. Unroll Bodgrid geocomposite (white geotextile below, black geogrid above) or standard geotextile onto prepared sub-grade with a minimum of 300mm overlap at the joints.

3. Place and compact type 3 (*) open graded granular material on top of the layer to the required compacted thickness determind by the designer (minimum 100mm) to form a strong permeable sub-base layer.

* Type 3 is an open graded granular material as described in Specification for Highways Works clause 805. If a higher water storage (attenuation) capacity (void ratio) is required, a hard crushed angular "clean stone" such as a course graded aggregate (CGA) type 4/20 (4mm minimum and 20mm maximum particle size) can be used. Traditional well graded type 1 aggregate (with suitable drainage) may be used to form the sub-base layer as determind by the designer.

4. Install edge restriants as specified; traditional precast concrete kerbs, steel, plastic or treated timber boards/sleepers.

5. Install a second later of Terram standard geotextile on top of the sub-base with a minimum of 300mm overlap at the joints.

6. Place, compact and screed granular bedding material (angular gravel or grit sand) to a minimum uniform thickness of 50mm. See material specification section for more guidance on suitable bedding materials. The use of rounded pea shingle/ gravel is not recommended.

7. Start in the corner of the longest straight edge (kerb) leaving a 25mm expansion gap around the perimeter.

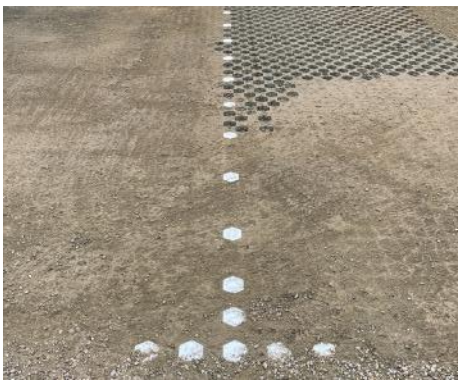
8. Place pre-connected set of four Bodpave units (1m x 1m) with the loop connectors facing outwards as a "leading edge" towards the remainder of the prepared bedding layer. Apply firm pressure so taht the ground spikes are pressed fully into the bedding and the base of the units sit flat on the bedding layer surface.

9. Connect adjacent Bodpave units together by slotting the edge half cells down into the edge loops. Progress in rows (LOOPS ALWAYS LEAD) locking units in place with firm pressure over the snap-fit clips. If separation is required, clips can be dislocated using careful, firm hand or screwdriver pressure or by gently twisting the pavers.

10. Cut pavers to fit around obstructions and at the end of rows using a fine toothed hand or circular power saw. Partial units should be fixed using snap-fit clips and additional UV resistant nylon cable ties.

11. Install snap-fit markers as required before filling Bodpave units.

12. Once all Bodpave units have been installed, fill pavers with aggregate level with the top of the units. Use a light vibrating plate compactor to consolidate the pavers. Top up as required after settlement.



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Maintenance

A gravel filled Bodpave 85 porous surface should last for many years with very little maintenance. The long-term performance of Bodpave is dependant upon many factors including the frequency and intensity of traffic loading, adjacent or overhanging vegetation and the initial sub-base construction. The following maintenance should be considered:

1. Debris - fallen leaves, sticks and other debris should be removed from the surface as needed.
2. Weeds - ideally removed by hand or using a biodegradable weed killer once or twice a year.
3. Gravel spread and settlement - regularly inspect areas of Bodpave porous surfacing subject to regular turning and channelised traffic. Rake or brush the gravel back into the Bodpave units or top up with fresh clean angular aggregate gravel chippings are required. Failure to top up regularly trafficked Bodpave units with gravel may result in lateral movement, lifting and ultimately failure of the system.
4. Speed, weight and height restrictions should be placed on all vehicles trafficking a Bodpave porous surface. Heavy vehicles, excessive braking, turning and accelerating may cause damage.
5. If Bodpave units are damaged, contact us for advice on repair.

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