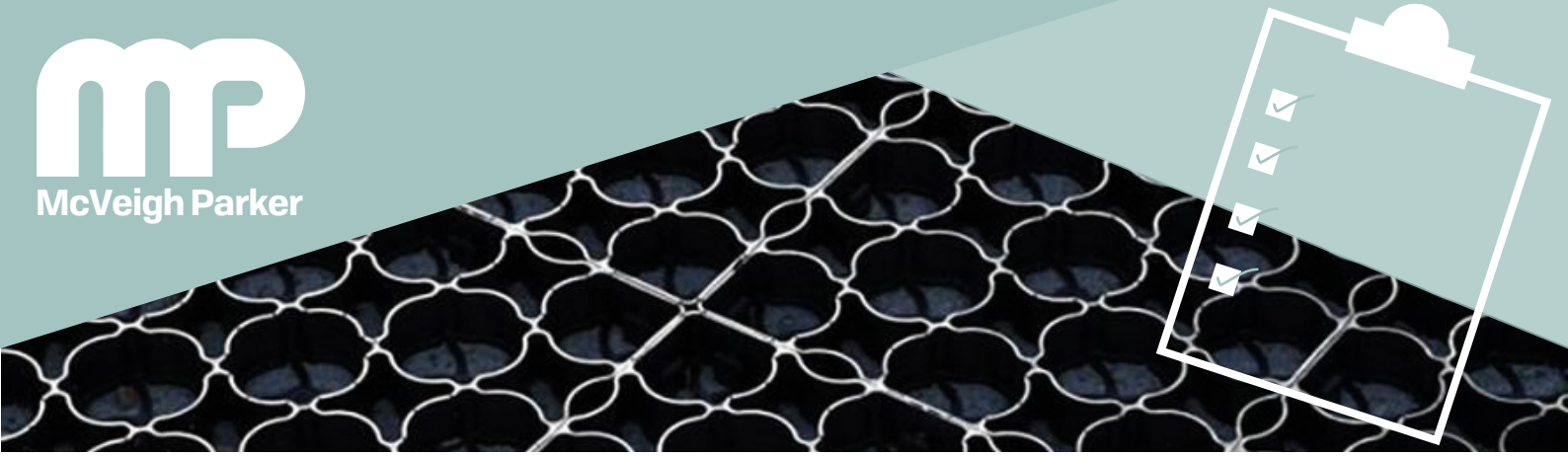


HANPAVE POROUS PAVING SYSTEM

SPECIFICATION SHEET

Hanpave™ porous paving is a high performance, durable and low maintenance plastic grid used as a surface solution for grass and gravel in a SUDS (Sustainable Drainage Systems) compliant permeable paving system.

Hanpave™ porous paving blocks are connected by an interlocking structure and installed on a porous base course. Their role is to transfer loads from the surface to the engineered course base below.

The purposes of SUDS (Sustainable Drainage Systems) are to minimise water runoff quantity, improve water quality and provide amenity and biodiversity. Both BREEAM and the Code for Sustainable Homes address the benefits of permeable paving as a SUDS technique and award credits accordingly. SUDS already form part of government planning policy. Hanpave™ porous paving with a grass or gravel finish can be effective in:

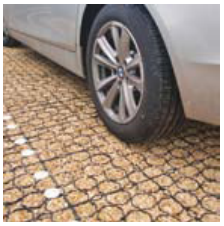
- **Minimising water runoff quantity**
- **Improving water quality**
- **Providing clean water for amenity and biodiversity**

Product Benefits

- SUDS compliant. Hanpave™ porous paving with grass or gravel can improve project ratings in accordance with BREEAM & the Code for Sustainable Homes.
- When laid, Hanpave™ offers excellent water permeation through the surface. It reduces the potential for clogging compared to an in-situ concrete paving system.
- Durable, non-rotting and weather resistant. Over 10 year expected product life.
- The lightweight interlocking profile design enables ease and speed of installation.
- Load bearing capability at 250 - 350 tonnes/m2, on a correctly specified and compacted sub-base.
- Low maintenance & cost-effective throughout the product life.
- NBS Specification support in accordance with Q23 for gravel surfacing or Q30 for seeding/turfing.
- Hanpave™ conforms to Part M of the Building Regulations and is Disability Discrimination Act compliant when it is correctly laid and maintained.
- Made from 100% plastic waste which might otherwise go to landfill. Hanpave™ reduces the carbon footprint of a project. It's fully recyclable at the end of its product life.

Applications

- Permanent and overspill car parks
- Emergency vehicle access roads, HGV service access routes
- Driveways, cycle routes & pathways



Product Specification

- **Material:** 100% recycled polyethylene & polypropylene
- **Production process:** The polymer is blended and fed under high pressure into moulds
- **Load bearing:** 250 - 350 tonnes/m2 on a correctly specified and compacted sub-base
- **Block dimensions:** 330 x 330 x 40 mm - 9 blocks per m2

- **Cell profile:** 63 x 63 mm internal. Approx. 85% open cells/m2
- **Weight:** 4.14kg/m2
- **Connection type:** T slugs and slots
- **Colour:** Black
- **Delineators:** White circular inserts. Can be used to mark up areas such as parking bays and routes. 6 per continuous linear metre
- **Surface finish:** Gravel or Grass

Delineators
Simply push fit into the Hanpave™ blocks, before filling to create white lines, shapes and even words.

Diameter	Height	Colour

HANPAVE™ PERMEABLE PAVING SPECIFICATION & INSTALLATION GUIDE

The following are intended as a general guide in accordance with BS7533. For further details on permeable paving design refer to BS7533 Part 13 for installation refer to BS7533 Part 3. The design for pavements should satisfy two parts - to support the traffic load and to manage the surface water effectively.

Subgrade Assessment

The strength of a subgrade is measured by California Bearing Ratio (CBR). The design CBR should be obtained either by testing or by measurement of the plasticity index of the subgrade material. In the case of CBR testing, the method described in BS1377-4:1990+A2:2002, Clause 7 should be used. The table below gives typical values for the subgrade strengths (the CBR).

The surface of the subgrade material should be prepared according to the Highways Agency's Specification for Highway Works, Clause 616. Detailed preparation of the subgrade should be in accordance with the recommendations in BS7533-3. An acceptable subgrade level should be free of any soft spots, reasonably parallel to the plane of construction. A capping layer may be required if the ground is structurally weak, likely to be subjected to exceptional loads or is significantly below the specified ideal formation level.

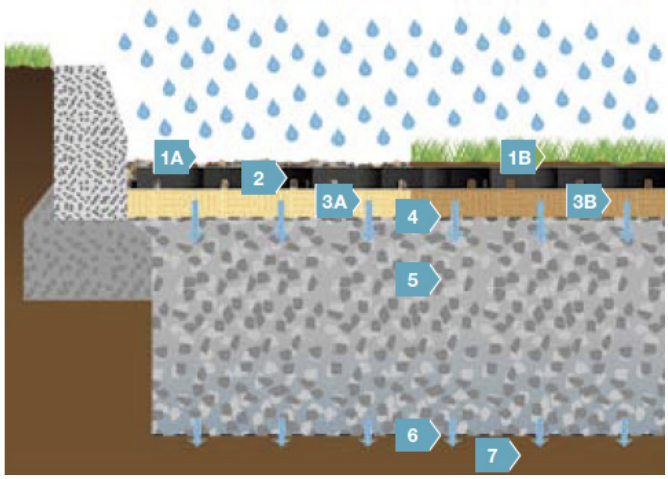
Soil Classification	Typical range for coefficient of permeability, k (m/s)	Typical range of CBR values when read in conjunction with Table 2	Plasticity index
Heavy clay	*10^{-10} to 10^{-8}*	*2 to 5*	*40 to 70*
Silty clay	*10^{-9} to 10^{-8}*	*3 to 6*	*30*
Sandy clay	*10^{-9} to 10^{-6}*	*5 to 20*	*10 to 20*
Poorly graded sand	*5×10^{-7} to 5×10^{-6}*	*10 to 40*	-
Well graded sand	*5×10^{-6} to 10^{-4}*	*10 to 40*	-
Well graded sandy gravel	*10^{-5} to 10^{-3}*	*30 to 80*	-

Permeable Paving Systems

A permeable pavement is required to absorb 180 litres /second/hectare. Permeable paving with Hanpave™ can be an effective means of providing a structural pavement suitable for pedestrians and vehicular traffic whilst allowing water to pass straight through the surface into the pavement construction for temporary storage, storm attenuation and dispersal to the ground or collection. Generally, there are three permeable paving systems:

A. Full Infiltration System

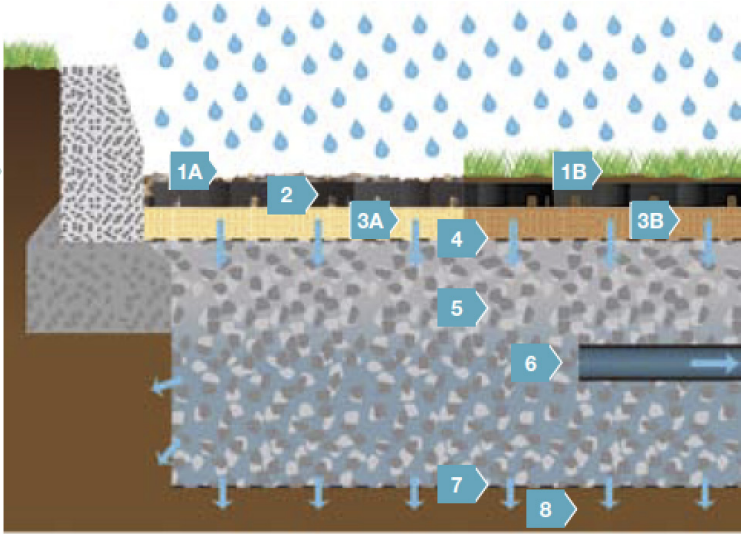
Suitable for existing subgrade with good permeability. The system allows all the water falling onto the pavement to infiltrate down through the constructed layers below and eventually into the subgrade. Some retention of the water will occur temporarily in the permeable sub-base layer allowing for initial storage before it eventually passes through. No water is discharged into conventional drainage systems, completely eliminating the need for pipes and gulleys, and making it a particularly economical solution.



1A	Gravel
1B	Grass
2	Hanpave™
3A	Laying course
3B	Root zone
4	Upper geotextile
5	Permable sub-base
6	Lower geotextile
7	Subgrade

B. Partial Infiltration System

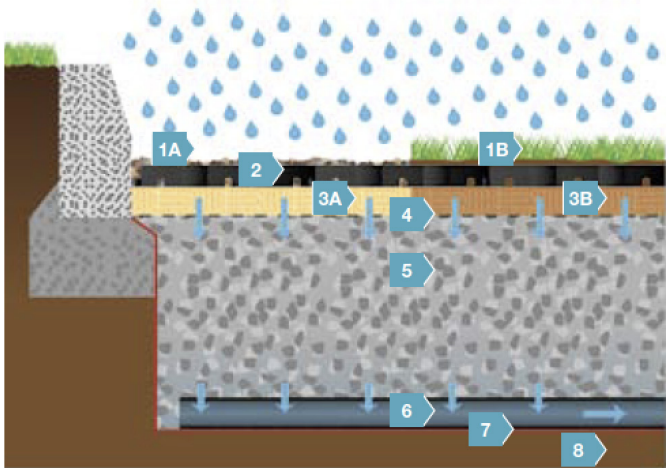
Used where the existing subgrade may not be capable of absorbing all the water. A fixed amount of water is allowed to infiltrate – which, in practice, often represents a large percentage of the rainfall. Outlet pipes are connected to the permeable sub-base and allow the excess water to be drained to other drainage devices, such as swales, watercourses or sewers.



1A	Gravel
1B	Grass
2	Hanpave™
3A	Laying course
3B	Root zone
4	Upper geotextile
5	Permable sub-base
6	Drainpipe
7	Lower geotextile
8	Subgrade

C. No Infiltration System

Where the existing subgrade permeability is poor or contains pollutants, this system allows for the complete capture of the water. It uses an impermeable, flexible membrane placed on top of the subgrade level and up the sides of the permeable sub-base to effectively form a storage tank. Outlet pipes are constructed on top of the impermeable membrane to transmit the water to watercourses, sewers or other treatment systems.The system is particularly suitable for contaminated sites, as it prevents pollutants from being washed further down into the subgrade where they could reach groundwater.



1A	Gravel
1B	Grass
2	Hanpave™
3A	Laying course
3B	Root zone
4	Upper geotextile
5	Permable sub-base
6	Drainpipe
7	Impermeable flexible membrane
8	Subgrade

System Selection

Table 2 below recommends appropriate pavement systems for a range of sub-grade conditions. Please read in conjunction with Table 1 for soil classification. For System A and System B, the highest recorded groundwater level should be greater than 1000mm below the bottom of the sub-base. This is to allow filtration of pollutants in the soil below the pavement and also to prevent groundwater rising and reducing the available storage in the sub-base.

Table 2. Guidance on selection of a permeable paving system

		System A - total infiltration	System B - partial infiltration	System C - no nfiltration
Permeability of subgrade defined by coefficient of permeability, k (m/s)	*10^{-10} to 10^{-3}*	✓	✓	✓
	10^{-8} to 10^{-6}	X	✓	✓
	10^{-10} to 10^{-8}	X	X	✓
Highest recorded water table within 1000mm of formation level		x	x	✓
Pollutants present in subgrade		x	x	✓

Sub-base Thickness

The design of the pavement is approached by considering the sub-base thickness required to meet both the hydraulic factors and the loading factors. The greater sub-base thickness identified for either of these factors is adopted.

- **Hydraulic factors -** The design should take into account the water storage volume in the sub-base and the rate of infiltration/ restricted outflow rate. The thickness of the sub-base required to provide sufficient water storage capacity can be obtained using Table 3.

Table 3. Sub-base thicknesses to provide sufficient water storage capacity for Systems A, B & C

Rainfall Data	r [A]	Required sub base thickness (mm)					
		1 in 30 year event		1 in 100 year event		1 in 100 year event plus 20% cimate change	
		Systems A & B	Systems C	Systems A & B	Systems C	Systems A & B	Systems C
M60 [B] =20mm	0.4	120	120	160	160	210	210
	0.3	140	140	190	190	240	240
	0.2	180	180	250	250	310	310
M60= 17mm	0.4	100	100	140	140	180	190
	0.3	110	120	160	160	210	210
	0.2	150	150	210	210	270	270
M60= 14mm	0.4	-	-	-	-	-	-
	0.3	90	90	130	130	170	170
	0.2	110	120	170	160	220	220

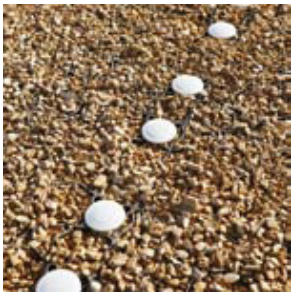
A) Ratio of a 60 minute storm rainfall depth to the depth of the 2-day maximum rainfall depth.
B) 60 minute storm recurring every 5 years.

- **Load Categories -** The design has to take into account the cumulative amount of traffic which the pavement has to carry, measured either in terms of the number of commercial vehicles per day (cv/d), or alternatively, the number of standard axles. Table 4 below gives indication on the loading categories of some typical applications.

Table 4. Loading categories

Category	No. of standard axles	Traffic guide	Typical applications
Domestic	*0*	*No large HGV*	*- Patios* *- Private drives* *- Decorative features* *- Enclosed playgrounds* *- Footways with zero overruns*
Car Parking	*100*	*Emergency vehicles only*	*- Car parking bays and aisles* *- External car showrooms* *- Sports stadium pedestrian routes* *- Footways with occasion overruns* *- Footway crossovers*
Lightly trafficked roads	*15000*	*1 large HGV/week*	*- Nursery access* *- Parking areas to residential developments* *- Garden centre external displays* *- Cemetery/crematoriums* *- Airport car parks (no bus pick-up)* *- Sports centres*



Tables below show the pavement course thickness and material type suitable for subgrades with a CBR ≥ 15%.

Table 5. Systems A & B – selection of pavement course material and thickness

Category /application	Hanpave™ block/laying course (mm)	Hydraulically bound base (mm)	Coarse graded material (mm)
Domestic	*40 / 40-50*	*-*	*250*
Car parking	*40 / 40-50*	*-*	*350*
Lightly trafficked roads	*40 / 40-50*	*125*	*150*

Table 6. System C – selection of pavement course material and thickness

Category /application	Hanpave™ block/laying course (mm)	Hydraulically bound base (mm)	Coarse graded material (mm)	Capping layer (mm)
Domestic	*40 / 40-50*	*-*	*250*	*150*
Car parking	*40 / 40-50*	*-*	*350*	*150*
Lightly trafficked roads	*40 / 40-50*	*125*	*150*	*150*

The additional thickness to be provided in the case of low CBR can be taken from Table 7 for Systems A and B and Table 8 for System C. The use of geotextile / grid reinforcement products can enhance the load bearing capability of the subgrade. Further advice should be sought from the relevant manufacturers.

Table 7. Additional thickness of coarse graded material for Systems A and B

CBR of subgrade (%)	Adjustment of coarse graded material (mm)
1	*300* [A) B)]
2	*175* [B)]
3	*125* [B)]
4	*100* [B)]
5	*Use table 5 for thickness*
8	*Use table 5 for thickness*
10	*Use table 5 for thickness*
15	*Use table 5 for thickness*

Table 8. Total thickness of capping material for System C

CBR of subgrade (%)	Adjustment of coarse capping layer (mm)
1	*600* [A)]
2	*350*
3	*250*
4	*200*
5	*Use table 6 for thickness*
8	*Use table 6 for thickness*
10	*Use table 6 for thickness*
15	*Use table 6 for thickness*

A) Expert guidance should be sought.

Material Selection

In a permeable pavement system, there is a requirement for stiffness but the base aggregate also needs to be permeable to allow water to flow through it and to have sufficient void space for water storage. Conventional DTp Type 1 sub-base is not recommended.

Sand and gravel with rounded particles should not be used in permeable pavement sub-base construction. Two gradings of sub-base material for permeable paving are given in Table 9 below, conforming to BS EN12620:2002 GC 90/15 4/40 and 4/20 coarse aggregates.

Table 9. Sub-base material gradings for permeable paving

Sieve size (mm)	Percentage passing	
	Coarse aggregate, 4/40	Coarse aggregate, 4/20
80	*100*	*-*
63	*98-100*	*-*
40	*90-99*	*100*
31.5	*-*	*98-100*
20	*25-70*	*90-99*
10	*-*	*25-70*
4	*0-15*	*0-15*
2	*0-5*	*0-5*
1	*0*	*0*

Table 10. Laying coarse material gradings for permeable paving

BS Sieve size (BS EN993-1) (mm)	Percentage passing
14	*100*
10	*98-100*
6.3	*80-99*
2.0	*0-20*
1.0	*0-5*

Note: Necessary measures should be taken to prevent migration of the laying course material into the sub-base, e.g. by using a geotextile or by using compatible gradings of laying course and sub-base materials.

Installation Notes

- The preparation of the subgrade, the construction of the sub-base and the construction and type of roadbase (if present) should generally be in accordance with relevant current practice as described in the Highways Agency's Specification for Highway Works.
- It is essential that the sub-base compaction is thorough, using a vibrating plate compactor or vibrating roller.
- The thickness of the laying course after final compaction of the surface course should be 40 - 50mm, within an accepted surface level tolerance. All areas of prepared laying course material should be protected and not left exposed overnight.
- The laying course may be placed and screeded using a mechanical device.

It is necessary to include a substantial edge restraint when constructing Hanpave™ permeable paving with grass/gravel finishes. Edge restraints need to be sufficiently robust to withstand override by any anticipated traffic, to withstand thermal expansion and to prevent loss of laying course material. Typical examples of edge restraints are kerbs, channels, established structures, and rigid abutments such as securely fixed paving units.

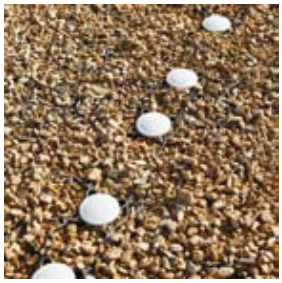
Laying Hanpave Blocks

- Place the blocks onto the prepared sub-base and laying course. The leading edge of the blocks should have the fixing lugs exposed for quick installation. No pegging is required. Always protect the outer edge with edging strips. Stand on laid blocks when laying the next row.
- An expansion gap at 0.1mm per metre per °C should be incorporated along the edges.
- Connect the blocks using lugs and slots, progressing over the area in rows.
- Blocks can be cut to fit around obstructions and contours. Any that need to be cut should be measured and cut prior to installation where possible leaving full, complete cells along the outer edge. Cut pieces less than half of the original size should be avoided where possible.
- Hanpave™ delineators can be inserted into the porous paving blocks before filling, to create lines, shapes and even words.

Surface Finish

Gravel

- Fill the porous paving blocks to the top of the cells with gravel in accordance with NBS section Q23 for gravel surfacing. The use of 6 - 10mm angular aggregate is recommended to acheive the best result.
- A light vibrating plate can be used to consolidate the blocks and to settle the gravel. Top up the cells as required after settlement. Do not overfill.
- The surface may be trafficked immediately.
- Over time top up gravel as necessary.



Grass

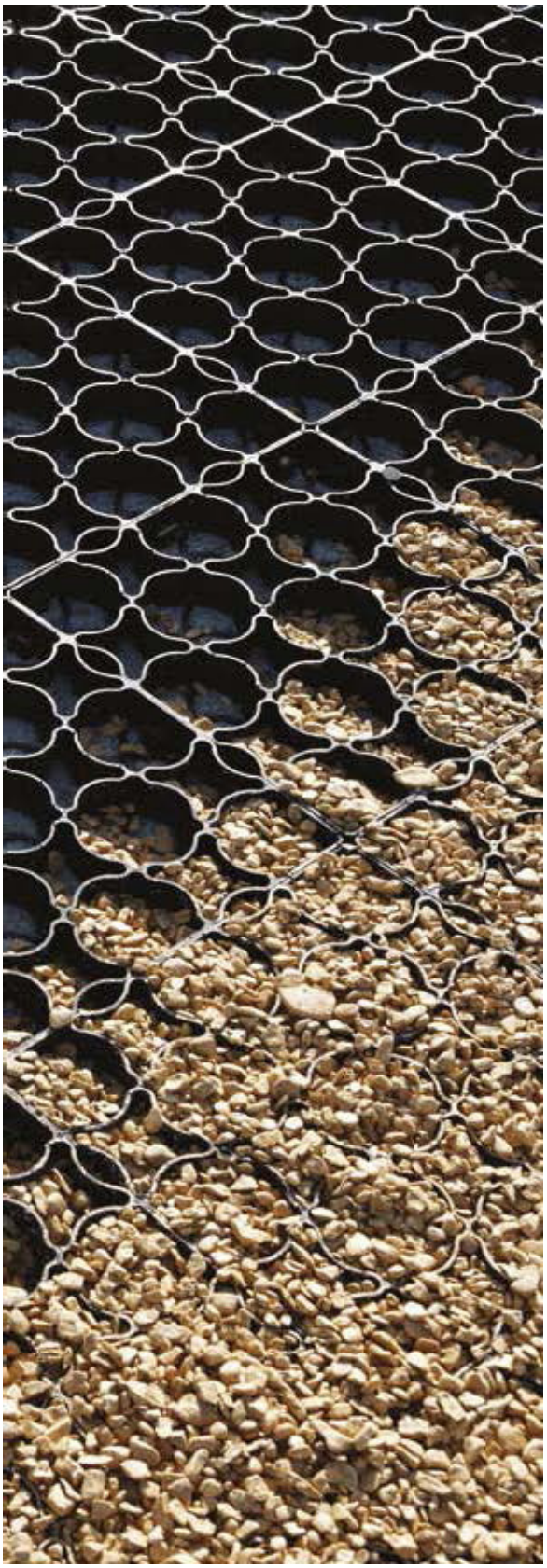
- An optional weed suppressant membrane can be used on top of the sub-base before applying the sharp sand. This will prevent weed growth but will allow for natural drainage of rain water to the ground below.
- Carry out seeding in accordance with NBS section Q30 for seeding or turfing.
- Use a 70/30 or 60/40 root zone mixture. Initially fill to 7 - 10 mm below the top surface of each grid as this will protect the grass in its early growing phase.
- A light vibrating plate can be used to consolidate the blocks and to settle the root zone infill.
- The whole area can then be seeded and watered. A very light top dressing may be applied to just cover the seed and to provide adequate germination conditions. Do not overfill.
- The surface should not be trafficked immediately. Allow the grass to fully establish prior to use, typically 8 weeks.

Notes:

1. Maximum advised gradient for traffic applications without pegging: 5%

2. During the design stage, consideration should be given to the potential for extraordinary use of the surface. The incorporation of bays and edges in design layout and/or the setting of a speed limit of 10 - 15 miles / hour or other calming methods to avoid heavy braking is advised if there is a possibility of abusive use.

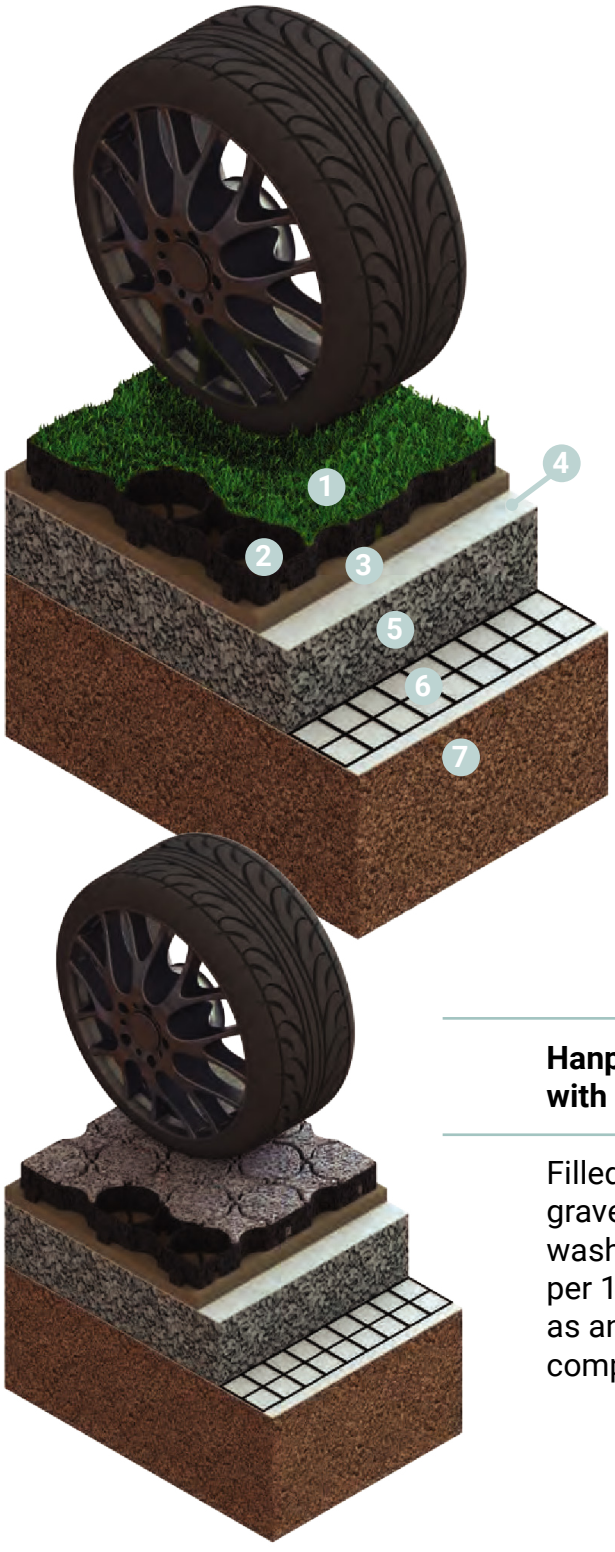
Call us today on
03330 050115
for more information on
Hanpave porous paving blocks.
Alternatively email us on
sales@mcveighparker.co.uk
or visit our website
www.mcveighparker.com



References

- BS7533-3:2005 + A1:2009
- BS7533-7:2010
- BS7533-13:2009
- BS EN13242:2002 + A1:2007
- The Highways Agency: Specification for Highway Works
- The Environment Agency: Guidance on the permeable surfacing of front gardens
- Building Regulations 2010 Approved Document M1 Access and Use

Typical Installation Examples



1. **Seeded or turf finish**
2. **Hanpave units**
   Filled with good quality 60:40 root-zone (allow 3.8m³ / 6t of topsoil per 100m²).
3. **Sharp sand**
   Compacted to 30mm depth with topsoil (2:1) bedding.
4. **Geotextile filtration layer**
   Non-Woven needle-punched.
5. **Free draining sub-base**
   Typically min. 100mm layer of DoT Type 3 or modified Type 1. NB. Standard Type 1 sub-base is not suitable for infiltration SuDs.
6. **Geotextile separation layer**
   Non-woven needle-punched c/w optional geogrid.
7. **Sub soil**
   Typically min. CBR 5%. For weaker sub-soil use a geogrid at base of sub-base.

Hanpave infiltration with gravel	Hanpave attenuation with gravel
Filled with 10mm angular gravel-**not** rounded or river washed (allowed 3.8m ³ / 9t per 100m ²). Grit can be used as an alternative bedding to compacted sharp sand.	A sealed geomembrane layer should be installed between the geotextile and the sub grade to prevent infiltration. Surface water should be directed to a suitable outlet.

INSTALLATION INSTRUCTIONS

The subgrade and sub-base should be prepared and installed according to Highways England's Specification for Highway Works (MCHW).

Before laying **Hanpave,** install an edge restraint that can withstand vehicle overrun and prevent bedding migration.

Install and compact a free-draining DoT Type 3 sub-base (depth according to traffic loading). Cover the sub-base with a non-woven needle-punched geotextile layer (with 150 mm overlaps) to prevent the bedding course migrating into the sub-base. Install, compact and level a 30 mm sharp sand (or grit) bedding layer.

LAYING HANPAVE™

Starting from a straight edge, lay **Hanpave** grids onto the bedding layer with the T-shaped interlocking tabs facing outwards. The paved area can then be extended by simply clicking further grids into place. **Hanpave** comes pre-assembled in 1 m² sections that can be lifted off the delivery pallet, laid on the bedding layer and clicked together. Large areas can be laid quickly and easily in this way. NB. Always stand on the installed grids when laying the next row.

Laying rates: Hanpave units are supplied pre-assembled in 1 m² squares (3 x 3 grids) for fast and easy installation. With a three-person team, up to 300–400 m² can be laid in a day.

Expansion gaps and cuts

Allow a 25 mm gap (filled with gravel or topsoil) between **Hanpave** and a kerb or hard edge. **Hanpave** can absorb up to 1.5 mm of movement per grid so further expansion joints throughout the paved area are not needed.

Hanpave grids can be cut to fit around obstacles. Make cuts before installation and leave full, complete cells along the outer edge. Avoid cutting grids to less than half size.

Installation on slopes

Hanpave can be installed on slopes of up to 15° without additional staking. For steeper slopes, drive a 300 mm ground stake into the centre of the grid and hook over the base reinforcement at 1 m centres.

Parking markers

Hanpave parking markers can create parking spaces and bays. NB. Insert markers into the grids before filling.

SURFACE FINISH

Gravel

Fill **Hanpave** grids to the top with 5–15 mm angular gravel (crushed stone). This allows the gravel to compact within the cells. Rounded or river washed gravel will not compact.

Top up the gravel once the filling has settled. A light vibrating plate can be used to settle the gravel to the top of the cells but be careful not to overfill. After installation, top up the gravel (if required) as part of normal maintenance.

Allow 3.8 m3 (9 tonnes) of gravel per 100 m2 of surface.

Grass

The non-woven needle-punched geotextile layer below the bedding layer lets rain water drain through naturally but suppresses weed growth.

For the bedding layer, mix one part good quality root-zone to two parts sharp sand. Fill the **Hanpave** cells with a high quality free-draining sandy loam (60:40 root-zone) and scrape off any excess (typically 1 t = 25 m² of **Hanpave**). Do not use 'as dug' material.

Before seeding, allow a week for the topsoil to settle naturally or use a light vibrating plate. This should create a 6 mm space between the soil and top of the **Hanpave** cell that protects a newly seeded area from vehicle use.

Allow 3.8 m3 (6 tonnes) of topsoil per 100 m2 of surface.

Seeding: Apply a suitable grass seed mix (30–35 g/m²) with a light fertiliser top dressing. Water the area regularly for six weeks before vehicle use. See the next page for seeding mixes.

Turfing: For an 'instant' grass finish for Hanpave, allow the topsoil to settle and top up with additional root-zone and a quality fertiliser. Be sure to choose a wear-resistant turf and install to the supplier's recommendations. Water the area regularly for three weeks before vehicle use.

Note: A 10–15 mph speed limit and/or traffic calming can minimise heavy braking and abuse of the area.

Hanit®
HEAVY DUTY GROUND GRID

With connection system
Our heavy duty ground grids are considerably lighter than equivalents. This makes transport and installation much easier. And with a stabilising interlocking system, our grids are just the job for car parks, lay-bys, farmyards or warehouses.

Material:
hanit® Recycled Plastic

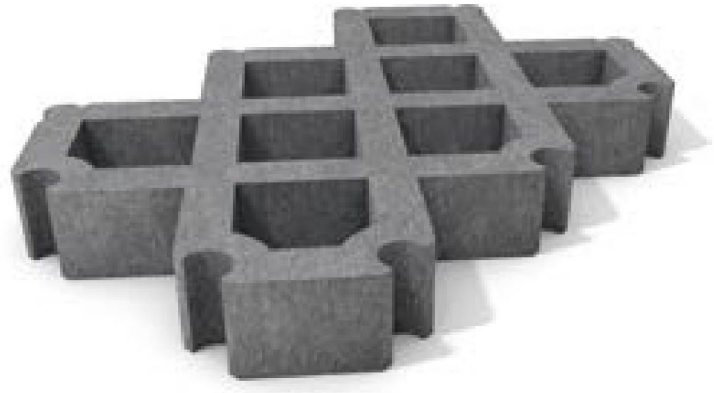
Dimensions:
60 x 40 x 8 cm

Requirement / m²:
Approx. 4.17 stones

Model:
Web thickness approx. 4 cm
With connecting system

Advantages:
- Quick installation thanks to connecting system
- Stable and permeable surface reinforcement
- Transport cost savings – load up to 600 m² per truck
- Frost- and UV-resistant
- Highly resilient
- Perfect for installation on green spaces
- Suitable for load class SLW 60 according to DIN 1072

Please note:
This product consists of recycled plastic. Deviations in surface structure can not always be avoided. Please consider temperature-caused length variations (up to +/- 1.5%) when installing the product.



This product (*Heavy Duty Ground Grid*) has a minimum order quantity requirement as is **Not a stock item.**