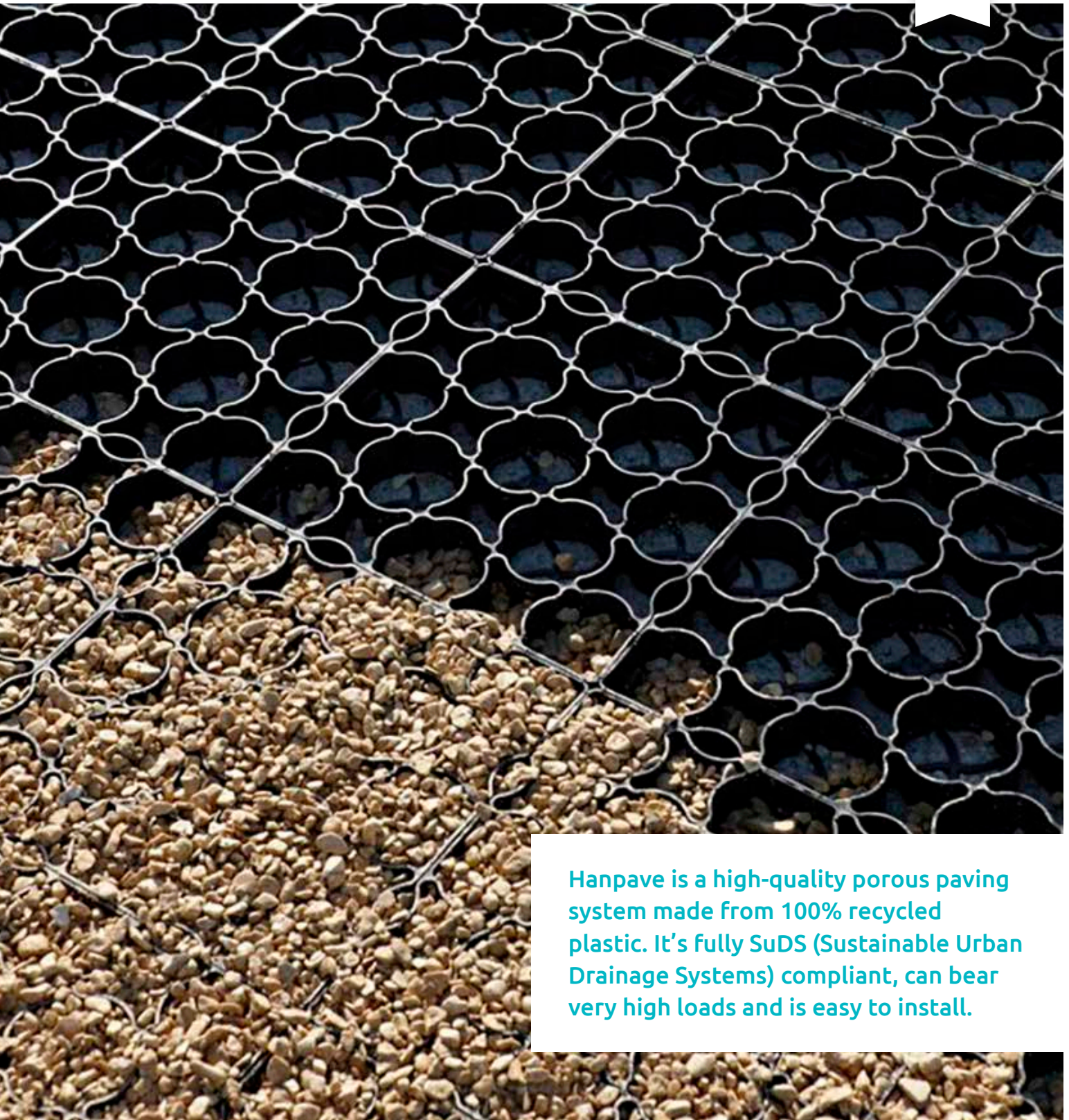


Uniclass L815
CI/SfB (90.49)

TECHNICAL GUIDE

HANPAVE®



Hanpave is a high-quality porous paving system made from 100% recycled plastic. It's fully SuDS (Sustainable Urban Drainage Systems) compliant, can bear very high loads and is easy to install.

For fast installation, Hanpave comes pre-assembled in 1 m² sections. These are then placed onto a porous bedding and clicked together with the simple interlocking system. With a grass or gravel finish, the paved area allows rainfall to drain through easily and is stable enough for vehicle use. Hanpave will:

- » Minimise surface water run-off
- » Reduce flood risk
- » Improve water quality
- » Encourage biodiversity

OVERVIEW

Material	100% recycled polyolefins
Nominal size	333 mm x 333 mm x 40 mm
Unit weight	0.46 kg (4.14 kg per 1 m ² panel)
Coverage	9 units/m²
Compressive strength	2,465 kN/m², 250 t/m² (empty) 3,990 kN/m², 400 t/m² (topsoil)
*max. load/unit	5,990 kN/m², 600 t/m² (gravel)
Connection type	Integral T connector and slots
Colour	Black or green
Parking markers	White circular inserts
Surface finish	Gravel or grass
Infiltration rate	5,000 mm/hr
Pallet size	1 m x 1 m x 2.4 m (56 layers of 1 m ²)
Pallet details	504 units, 256 kg (26 pallets/load)
Compliant with	Part M (Building Regs) Equality Act (DDA) NBS Q23 (gravel) & Q30 (grass)

TRIED & TESTED

Some porous paving systems only quote maximum load capacities of 200 or 300 tonnes per square metre, but this is only half the story. A paving system needs strength and flexibility to withstand repeated vehicle use. Strength without flexibility leads to cracks, breakages and ultimately product failure.

Hanpave has been tested in accordance with DIN EN 124 to maximum capacity and achieves 400–600 tonnes/m² dependent on the filling of either topsoil or gravel (see overview).

Hanpave has been tested to rigorous Copro PTV 828 standards that were specially developed for paving grids. Here are some of the things that PTV 828 test for:

» Strength and flexibility

This is done in accordance with DIN EN 124 and the strength is measured at 15% deformation. Grids must be strong enough to bear a direct load of at least 1019 kN/m² (104 t/m²) for general use and emergency fire trucks when applied through a 250 mm loading plate. For heavy duty use, this increases to a minimum of 1528 kN/m² (156 t/m²). The flexibility of the system under load requires a minimum deformation of 2% when measured at 815 kN/m² (83 t/m²).

✓ **Hanpave surpassed these values.**

» Strength of the interlocking system

Vehicle movement is not a static force. Cars and trucks put grids under considerable vertical and horizontal pressure, particularly when using power steering. The interlocking system must be tough enough to withstand this pressure and the PTV 828 standard specifies a minimum strength of 3 kN/m length to ensure a secure connection.

✓ **Hanpave surpassed these values.**

HANPAVE & SUSTAINABILITY

SUSTAINABLE URBAN DRAINAGE SYSTEMS (SuDS)

Sustainable drainage systems are designed to keep on-site drainage levels similar to those that occurred naturally before the site was developed. SuDS help to minimise water run-off, reduce flood risk, improve water quality, encourage biodiversity and are already part of UK planning policy.

Both BREEAM and the Code for Sustainable Homes recognise the benefits of SuDS and award credits to sites, schemes and projects that use them (see below for details).

The SuDS Management Train begins with minimising impermeable areas and treating rainfall 'at source'. For example, a car park is usually impermeable with rainwater being directed into drains and away from the site. If the car park is made using a porous paving system like **Hanpave** water flows through the sub base to the ground below. This minimises run-off, reduces flood risk, removes pollutants, improves water quality and encourages biodiversity.

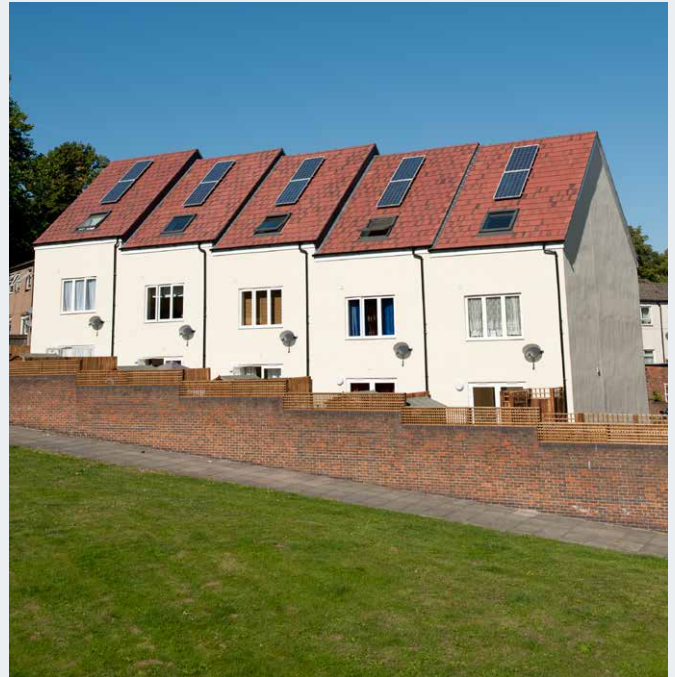
BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

Launched by the Building Research Establishment in 1990, BREEAM is the world's leading method of assessing and certifying the sustainability of buildings according to environmental, social and economic standards. Their Home Quality Mark (HQM) sets specific standards for new and residential construction.

The BREEAM HQM gives credits in nine categories.

» Flood risk	up to 19 credits
» Managing rainfall Impacts	up to 19 credits
» Responsible sourcing	up to 25 credits
» Environmental impact of materials	up to 25 credits
» Durability	up to 7 credits
» Responsible construction practices	up to 5 credits

Credits count towards a rating of up to five stars. Similar schemes cover non-residential developments to achieve an overall BREEAM benchmark.



CODE FOR SUSTAINABLE HOMES (CfSH)

CfSH is a technical guide that sets out the sustainability requirements for new developments. The code is similar to BREEAM and also split into nine categories with mandatory and voluntary elements and credits awarded for each.

The following CfSH categories relate to surface water and where **Hanpave** can help to gain credits:

» Category 2: Water

Up to five credits available for the use of water control devices such as low flush toilets and rainwater harvesting. One credit available for the use of water butts.

» Category 4: Surface water run-off (mandatory)

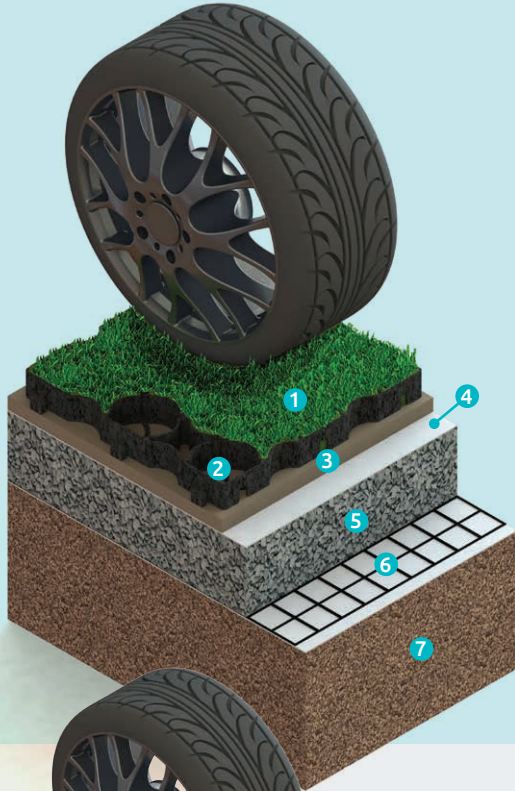
Up to two credits available for the management of run-off using SuDS. Up to two credits available for developments in Zone 1 (areas with low risk of annual flooding).

» Category 8: Management

Up to two credits available to go beyond requirements of the Considerate Constructors Scheme.

TYPICAL INSTALLATION EXAMPLES

Hanpave infiltration with grass



- 1 **Seeded or turf finish**
- 2 **Hanpave units**
Filled with good quality 60:40 root-zone (allow 3.8 m³ / 6 t of topsoil per 100 m²).
- 3 **Sharp sand**
Compacted to 30 mm depth with topsoil (2:1) bedding.
- 4 **Geotextile filtration layer**
Non-woven needle-punched
- 5 **Free draining sub-base**
Typically min. 100 mm 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

Filled with 10 mm angular gravel – **not** rounded or river washed (allow 3.8 m³ / 9 t per 100 m²). Grit can be used as an alternative bedding to compacted sharp sand.

Hanpave attenuation with gravel

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.

» 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.

» 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 vertically into the centre of the grid and hook over the base reinforcement or cell wall at 1 m centres.

MORE EXAMPLES

Example installations, parking space layouts, disability parking demarcations and standard specifications can be downloaded from www.hahnplastics.com

SUBGRADES & SOIL TYPES

Depending on the porosity of the subgrade, **Hanpave** can be used as an infiltration or attenuation system. In most cases, the requirement is for a free-draining surface that can bear the load of vehicle use. However, if there is very low porosity, or the subgrade is contaminated, a sealed geomembrane between the sub-base and subgrade can be used to direct water to an outlet point.

Subgrade strength is measured by its Californian Bearing Ratio (CBR) as defined within BS1377 Part 9. The table below shows subgrade strengths/CBRs of some typical soils.

The table shows which soils are suitable for SuDS infiltration schemes utilising a DoT Type 3 porous sub-base. The soils shown as not suitable for SuDS can still be used for non-infiltration schemes using sealed geomembrane to direct surface water to an outlet. The commonly specified DoT Type 1 sub-base is **not** suitable for SuDS due to high fines content which makes infiltration impossible. DoT Type 3 sub-base is very similar to a DoT Type 1x but lower fines content helps infiltration.

Soil classification	Coefficient of permeability (m/s)	Relative permeability	Typical CBR	SuDS infiltration suitability
Well graded gravels	10^{-5} to 10^{-3}	Pervious	30 to 80	Yes
Poorly graded gravels	5×10^{-5} to 10^{-3}	Pervious	20 to 60	Yes
Well graded sand	5×10^{-6} to 10^{-4}	Pervious	10 to 40	Yes
Poorly graded sand	5×10^{-7} to 10^{-6}	Semi pervious	10 to 40	Yes
Sandy clay	10^{-9} to 10^{-6}	Impervious	5 to 20	No
Silty clay	10^{-9} to 10^{-8}	Impervious	3 to 6	No
Heavy clay	10^{-10} to 10^{-8}	Impervious	2 to 5	No

EXPANSION

Hanpave is designed to absorb up to 1.5 mm of movement/expansion per unit. To compliment this, a 25 mm gap (filled with gravel or topsoil) should be left between **Hanpave** and any kerb or hard edging.

Hanpave expands by 0.00012 mm per °C of temperature change. For example, a 20 m length would expand by 60 mm with a temperature change of 25°C. This same 20 m length is made up of 60 individual **Hanpave** units, all absorbing up to 1.5 mm each. This gives up to 90 mm of thermal movement within the laid area and removes the need for additional expansion joints.



SUB-BASE DESIGN

When the CBR of a subgrade is known and the permeability assessed, the depth of DoT Type 3 sub-base can be calculated. The use of a suitable geogrid between the subgrade and the sub-base allows for a reduction in the overall depth of sub-base as indicated below.

For SuDS schemes that require attenuated storage within the sub-base, contact HAHN for technical support.

The majority of **Hanpave** installations are designed for car use with occasional HGV/truck such as refuse collection vehicles or emergency services. If regular HGV/truck, bus and coach use is intended, HAHN'S HDGG (Heavy Duty Ground Grid) system should be used.

The following guidance is suitable for vehicular use with occasional HGVs/trucks.

Typical use	CBR (%) of subgrade	DoT Type 3 depth (mm)		Use of geogrid
		inc. geogrid	exc. geogrid	
<ul style="list-style-type: none"> Domestic parking areas Pedestrian access Wheelchair access Bridleways Cycle routes Golf buggy paths 	Not normally measured	100	100	n/a
<ul style="list-style-type: none"> Car parks Park & rides Caravan parks Car showrooms Stables Helicopter pads Airport car parks Sports centres 	>6	100	100	n/a
	4-6	150	225	30/30
	2-4	225	335	30/30
	1-2	260	390	30/30
<ul style="list-style-type: none"> Fire paths Occasional HGVs/trucks Emergency vehicle access 	>6	150	150	n/a
	4-6	175	260	30/30
	2-4	275	412	30/30
	1-2	475	710	30/30
<ul style="list-style-type: none"> Verge reinforcement (estate roads) <p>N.B. For verge reinforcement adjacent to a carriageway subject to regular HGVs/trucks – use the HAHN HDGG (Heavy Duty Ground Grid) system</p>	>6	150	150	n/a
	4-6	200	300	n/a
	2-4	300	450	30/30
	1-2	450	675	30/30

Note: If no Geogrid is utilised the sub base thickness's indicated above should be increased by 50%.

GROUNDWORK & SURFACING PRODUCTS BY HAHN

Paddock Slab



Heavy Duty Ground Grid



EcoSlab



Decking

