Tobermore
Hard landscaping. **Made easy.**

Guidelines for the installation of Tobermore **Hydropave Permeable Paving**

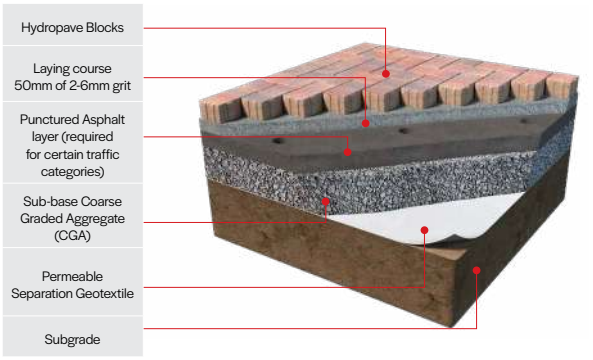
How permeable paving works

There are three system types which can be specified.

System types:

Full infiltration permeable paving system (Type A)

Best suited to sites with permeable subgrades



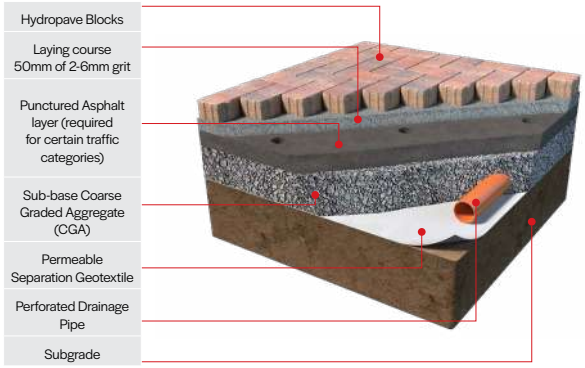
This is specified when the subgrade has been tested and shows sufficient permeability to allow water to drain through at the required rate.

The water falls on the surface and drains through the joints between the blocks. From there, it filters through the laying course of grit and into the coarse graded aggregate sub-base. Finally, it drains through a permeable geotextile and infiltrates directly into the ground.

Water is not sent to drains so there is no need for drainage pipes or gullies, making Type A the simplest and, typically, most economical permeable paving option.

Partial infiltration permeable paving system (Type B)

Used where partial infiltration is achievable



This is specified when the ground is permeable enough to receive some water but not to a level sufficient for Type A to be used.

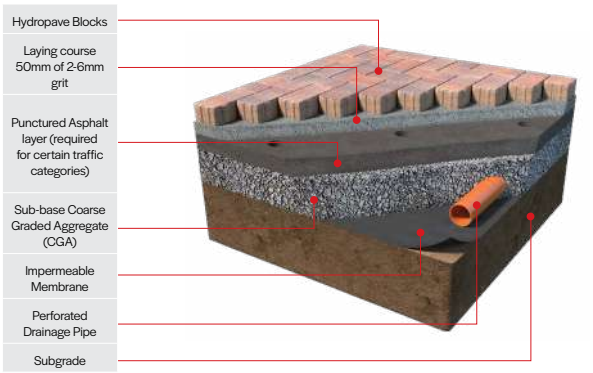
This system can be used in situations where the subgrade may be capable of absorbing some water without losing its stability. Outlet pipes are used in the sub-base to take excess water away to be collected and eventually discharged through a different part of the drainage system.

The rate of discharge will be controlled in line with regulatory guidance to meet local water management requirements.

Tanked (no infiltration) permeable paving system (Type C)

Specified where infiltration is not possible

This is specified when the subgrade has been tested and shown not to have sufficient permeability, or where introducing water into the subgrade would make it become unstable. It can also be utilised where the water is required to be redirected for re-use or irrigation.



An impermeable membrane lines the sub-base and is wrapped up the sides to enable the complete capture of the water and effectively form a storage tank. Outlet pipes are constructed through the impermeable membrane at suitable locations to direct the water to secondary drainage systems such as watercourses, ponds, or treatment systems. The diameter of the outflow pipe is site specific, so should be determined by the project engineer according to the requirements.

System C is also in areas with high water tables, preventing them from entering the sub-base where they would compromise its ability to drain away surface water.

Materials

Capping layer (if required)

On sites where the CBR (California Bearing Ratio) of the ground is lower than 5%, a capping layer will be required to improve the bearing capacity. The capping layer material is installed below the sub-base. The type and depth of material will be dependent upon the CBR and the system type being specified. The capping materials should meet the requirements of 6F5 from Table 6/5 of Highways Agency Specification for Highways Works – Series 600 – Earthworks.

Sub-base aggregate specification

The sub-base material provides both structural integrity and storage of runoff water, meaning the material must provide sufficient porosity. The sub-base material should be in accordance with BS7533-103:2026 Pavements constructed with clay, concrete or natural stone paving units - Design and installation of modular permeable pavements.

The recommended material is 4/20mm Coarse Graded Aggregate (CGA). The grading of this aggregate is shown in **Table 1** and should provide a porosity of between 30%- 32% within the aggregate voids. Aggregates with this porosity provide approximately 1m3 of water storage for every 3m3 of sub-base aggregate.

The strength of the CGA should be sufficient to accommodate the loads which will be applied to it under trafficking. The flakiness index, shell content and mechanical properties should be in accordance with BS EN13242: 2002+A1:2007 Coarse graded crushed rock or gravel. The recommended physical properties for the CGA can be found in **Table 2.**

Important

The material should be categorised as LA30, FI20 and MDE20 according to table A.3 within BS 7533:13:2009.



Table 1 Grading recommendations for sub-base material

Sieve size (mm)	Percentage passing
40	100
31.5	98-100
20	90-99
10	25-70
4	0-15
2	0-5

Grading requirements	
Recommended BS EN 12620 aggregate (mm)	4/30
Recommended BS EN 1262 grading/tolerance category	Gc80/20 GTc20/15

Table 2 Physical property recommendation for CGA

Properties	Category to BS EN 13242 or BS 12620
Grading	4/20 (preferred) or 4/40, Gc 85-15, GTc 20/17.5
Fines Content	14
Shape	FI20
Resistance to Fragmentation	LA_{30}
Durability: Water absorption to BS EN 1097 6:2000 + A1:2005, Clause 7 - for WA > 2% -Magnesium sulfate soundness	$WA_{24}2$ MS_{18}
Resistance to Wear	$M_{de}20$
Acid-soluable sulfate content:| - Aggregates other than air-cooled blast furnace slag and - Air-cooled blast-furnace	$AS_{0.2}$ $AS_{1.0}$
Total sulfur: Aggregates other than sir-cooled blast-furnace slag Air-cooled blast-furnace slag	< 1% by mass < 2% by mass
Volume stability of blast-fumede and steel slags: air-coced blast furnace sig - Steel slag	Free from dicalcium silicate and iron disintegration in accordance with BS EN 13242:2002+A1:2007, 6.4.2.2V_5
Leaching of contaminants	Blast-furnace slag and other recycled materials should meet the requirements of the Environment Agency "Waste Acceptance Criteria) for inert waste when tested in accordance with BS EN 12457-3.

Laying course and jointing aggregate specification

A laying course material is required to provide an even layer on which the blocks can be installed. The grading of this material should be in accordance with **Table 3** and provide maximum infiltration to allow water to easily pass through the joints and laying course. An angular crushed aggregate will ensure maximum interlock between the blocks to provide structural integrity to the paved surface.

Table 3 Grading details & requirements

Grading details	
Sieve size (mm)	**Percentage by mass passing ISO 565 sieve**
31.5	
20	
14	100
10	98-100
6.3	80-99
4	
2	0-20
1	0-5
0.063	0-2

Grading requirements	
Recommended BS EN 12620 aggregate grading (mm)	2/6.3
Recommended BS EN 1262 grading/tolerance category	Gc80/20

Important

As testing the physical properties of the 2-6.3mm material is not possible, the source material should have the same physical properties as the sub-base aggregate (CGA.)



Important

A permeable paving system relies heavily on using the correct aggregates. Prior to installation, we would ask you to test both the 4/20mm coarse graded aggregate and also the 6.3-2mm bedding and jointing grit as per the relevant British Standard specification (BS EN 13242:2002). In particular, the material should be categorised as LA20 according to Table 9, SZ18 according to Table 10 and MDE15 according to Table 11 within this standard. The grit should be insoluble in dilute hydrochloric acid and should be naturally occurring material. In our experience, incorrect use of aggregates is one of the most common reasons for failure of a permeable paving system.

You must ensure the grit and coarse graded aggregate are compatible. For example, if you use a finer grit it may percolate into the sub-base and may destabilise the pavement. Please refer to the following source of information – BS7533-103:2026 Pavements constructed with clay, concrete or natural stone paving units - Design and installation of modular permeable pavements.

Impermeable membrane for System Type C

An impermeable membrane will be required in System Type C permeable paved surfaces. For the majority of projects, a 2000 Gauge Polythene membrane (500 mu) is suitable. The membrane should be overlapped by 300mm and the joints taped with Visqueen jointing tape.

However, when there is a requirement for a high level of water tightness a membrane with welded joints must be used and specialist advice sought.

An effective seal around outfall pipes can be achieved with the use of top hat seals.



Top hat seal



Impermeable membrane



Visqueen jointing tape

Geotextile for infiltration in system Types A & B (installed between the sub-base and subgrade)

Installing a geotextile provides two benefits. (1) It acts as a separation layer between the sub-base and subgrade, preventing migration of aggregates. (2) It also increases the water cleansing effectiveness of the system. It should be installed directly above the subgrade in System Type A (infiltration) and System Type B (partial infiltration).



Edge restraints

All paved areas will require edge restraints. These can be walls, buildings or precast concrete kerbs. All edge restraints should have sufficient strength to prevent lateral movement of the paving caused by traffic.

When installing precast concrete kerbs, ensure that the concrete haunching is smooth. If an intermediate restraint is required, the haunching for this can be installed directly onto the coarse graded aggregate (CGA).

Installation

We strongly advise that this overview is read in conjunction with the relevant parts of the BS 7533 series of standards and a full in-depth detailed design is carried out by a qualified professional.

The longevity, durability and performance of a paved surface relies not only on the quality and characteristics of the chosen surfacing material, it also relies on the bedding, jointing and sub-base materials being specified and installed correctly.

Materials used for permeable paving laying courses and sub-bases differs from the traditional materials used in conventional impermeable pavements. The main difference is the lack of fines; therefore, there is potential for separation during transporting and installation. The grading of the materials also differs depending on where it has been sourced from. Best practice is to undertake site trials of the materials to establish a suitable construction procedure.

Care must be taken to ensure that the permeable sub-base materials and joints do not become contaminated during installation. The use of silt fences and temporary drainage swales to divert runoff should be given consideration.

Special care must be taken when soft landscaping works are being carried out to prevent soil or mud from entering the joints. It is good practice to cover areas of permeable paving during the installation of soft landscaping.

Construction traffic

On certain sites, a partially completed permeable paved road will need to be used as an access route during the construction phase. Construction traffic will cause rutting to the sub-base material and introduce dirt and mud which can cause the sub-base to become clogged. The solution to this is to install a protective layer of AC (asphalt concrete) over the sub-base aggregate. The AC layer can be used by construction traffic and prior to the installation of the laying course material and paving blocks, the AC is perforated with 75mm diameter holes to allow the infiltration of water to the sub-base layer beneath.

Capping

When installing a System Type C then an impermeable capping material can be used. E.g. MOT Type 1. For Type A or B systems, the capping layer should be the same as the 4/20mm sub-base material. Compact the material in layers not exceeding 150mm in thickness. Conventional rollers can be used for compaction, but these should not be vibrating.

Draining impermeable areas onto permeable areas

When the project layout requires runoff water to be drained from impermeable surfaces, including roofs, the ratio of impermeable area to permeable paving should be 2:1.

There may be a need to increase the depth of aggregate in the permeable construction where there is insufficient hydraulic storage capacity.

Guidance for installation

For infiltration systems A & B

Lay the geotextile onto the subgrade layer or capping (if present), ensuring there are no wrinkles and bring it up the sides of the kerbs prior to installing the sub-base material. Overlap the joints by 300mm.



For non-infiltration system C

The capping/subgrade should be free from sharp objects or protrusions before installing the membrane. The joints in the membrane should be overlapped by 300mm and taped with polythene jointing tape. The membrane should be brought up to the top of kerb and trimmed off. For the majority of applications, taped joints are sufficient. However, sites which require a high level of water tightness or where the water table is high or areas over basements, the membrane should have welded joints and specialist advice should be sought.

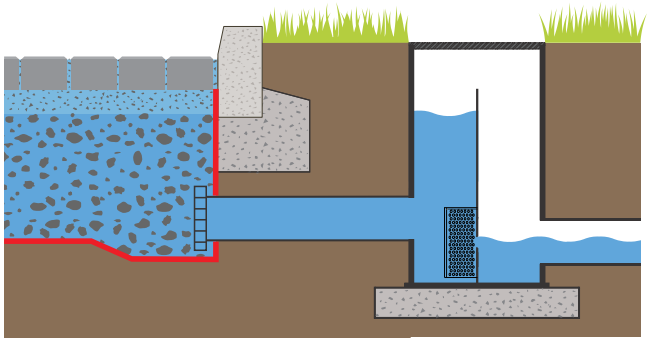


Non-infiltration system

Outfall pipes should be installed at the low point of the sub-base.

Controlling flow at outlets

The use of outlet flow control chambers with orifices which accurately limit flows are now common. They can be specified as part of the SuDS design approval process and are accessible for observation and adjustment if required.



Sloping sites/Gradients

Although impermeable paving requires surface falls for drainage, the surface of permeable can be completely flat, thus avoiding any surface water ponding.

In System B and System C, the sub-base can have a gradient of approximately 0.5% towards the outlets. For sloping sites where the subgrade gradient exceeds 5%, extra design methods will need to be introduced.

Without design input on steeply sloping sites, the water will flow to the low end of the paving construction and reduce the volume of available storage. (See figure B)

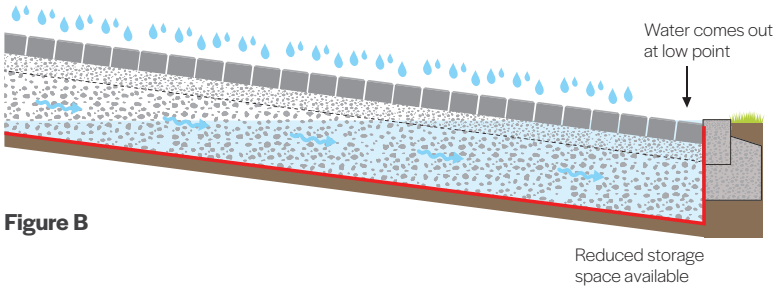


Figure B

On these sites it will be necessary to check the hydraulic storage capacity and, if required, the sub-base thickness increased or check dams or terracing introduced.

Installation of check dams (baffles) within the sub-base to delay water, either for infiltration or with flow controls to the drainage network, thus avoiding water discharging through the paving surface. (See figure C)

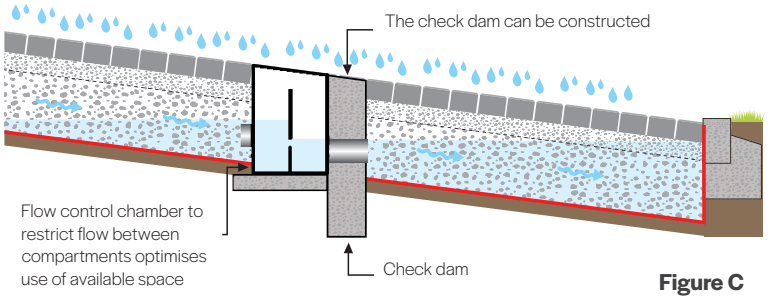


Figure C

Introduction of terraces to create flat areas of permeable paving will separate storage compartments. (See figure C1)

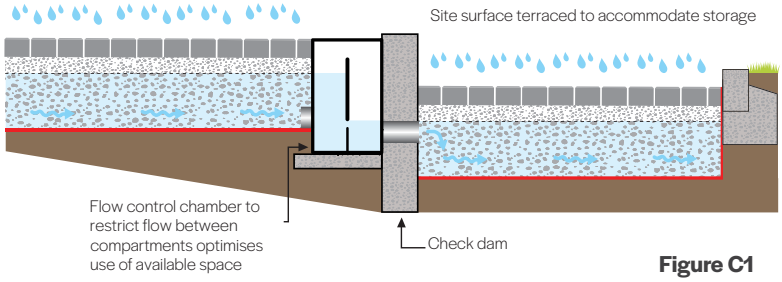


Figure C1

Sub-base material: 4/20mm sub-base aggregate

The open graded 4/20mm sub-base material (in accordance with Table 1) is installed in layers no greater than 150mm using a non-vibrating roller or plate compactor. This ensures that the void ratio of the material remains at 32% and avoids over-compaction of the material.

As materials can differ, it is good practice to carry out a compaction trial. Aim for a tolerance of +/- 20mm from the level specified.



Asphalt concrete (AC) layer

When the loading category requires additional structural support or where temporary site access during construction is required, an asphalt concrete layer is installed over the sub-base.

Using a mini tracked paving machine makes it easier to install the asphalt concrete over the CGA. Rutting in the CGA can be kept to a minimum by ensuring the paving machine keeps to one laying track. Any rutting of the 4/20mm CGA can be corrected by hand raking.

The material should be a 0/32mm size dense base as given in BS4987:2015 +A1:2017 Coated macadam (asphalt concrete) for roads and other paved areas – Part 1: Specification for constituent materials and for mixtures (clause 5.2). The binder will typically be 50 pen in accordance with clause 4.7. However, it may vary dependent on the specific loading conditions.

Once set, 75mm diameter cores are drilled through the AC layer at 750mm centres and filled with the bedding/jointing material. This allows water to permeate into the sub-base beneath, see figure 1. If the cored holes are not being filled immediately, they should be covered to prevent any contamination entering which may clog the system.



Figure I

Laying course

Spread and screed the 6.3-2mm laying course material (Table 3) to a depth of 50mm (+/- 20mm) over the 4/20mm CGA to provide an even surface for the blocks to be installed on.

The laying course materials will have different properties to traditional sand and does not compact in the same manner. It is good practice to complete a trial area to gain an understanding of the material characteristics.



Installing the Hydropave blocks

Blocks should be installed in the specified laying pattern to achieve a level surface within the permitted tolerances. To maintain the laying pattern, string lines should be used. Factors such as the manufacturing tolerances and frequency of string lines will have an impact on the straightness of lines achievable.

Blocks should be installed ensuring the nibs interlock with neighbouring blocks. Where it is necessary to maintain straight lines or to maintain bonding, joint widths can be varied slightly.

When the circumstances allow, complete one area of paving by using products taken from the same batch. This is achieved by checking the batch code label displayed on the packs.

Always select blocks from a minimum of three packs to ensure the correct colour blending is achieved. Where products are supplied in packs with vertical slices, always take them “vertically, slice by slice.” This ensures that colours are distributed evenly.

When the circumstances do not allow the use of products from the same batch, it is extremely important to minimise possible colour banding/shading by always thoroughly mixing products from a minimum of three packs concurrently, with some overlap between deliveries/ batches.

Where products from different batches are being installed in the same area of paving, it is the installers responsibility to carry out a colour match check by comparing colours from each batch. If a noticeable variance in colour/shade or texture is visible, do not proceed with the installation and contact your supplier for further guidance.





Mixing thoroughly from a minimum of three packs is of particular importance when installing single colours such as Natural, Charcoal, Graphite, Silver, Mid-Grey, Oat etc.

During installation the installer must make regular visual checks to ensure the blending of colours is consistent. We would always recommend that when purchasing products, especially in larger quantities, they are all ordered at the same time and a delivery schedule provided.

On slopes or gradients, commence laying from the bottom and work upwards.

Cutting in

Once all full size units have been installed, cut blocks will be required to fill any gaps around the perimeter or obstacles. Small cut pieces can break or become loose. To prevent cut units becoming loose or breaking, no unit should be cut to less than one quarter of its original size. The use of inboard cutting should be used to avoid small cut pieces. Units should be measured and cut to maintain the permeable joint width in the range of 3-6mm. On curves, the maximum joint with should not exceed 6mm.



Jointing and final compaction

Before final compaction of the paving commences, brush any loose debris from the paving surface. Leaving excess material on the surface can lead to scratches or scuffs on the blocks. Brush the 6.3-2mm jointing material into the joints. Brush off any excess and compact using a vibrating plate with a rubber protective mat.

You will need approximately 1 ton of grit for every 100m^2 of 80mm paving.



! Important

Ensure that the grit is brushed off prior to compaction to avoid scratching the paving. Repeat this process 2-3 times until the joints are filled to the top. Any joints that are not completely filled can lead to movement of the paving during trafficking and subsequently blocks can chip and become loose. Tobermore recommends that after a few weeks of use, the joints should be checked and topped up if necessary.

! Warning

Permeable paving joints **MUST NOT** be filled with kiln dried jointing sand.

Joint sealing

If sealing the joints is required, special permeable joint sealers are now available. These sealers bind the jointing aggregate whilst allowing the infiltration of surface water. Only sealers which are suitable for permeable paving should be used. Advice should always be sought from the sealant supplier. Never use conventional block pavement sealants on permeable paving.

Instructions & warnings

Stay informed: Scan for important guidance.

To ensure the best results when using Tobermore products, we've made our latest installation guidelines, care instructions and product warnings easily accessible online.

Always up to date

Get the latest product and installation information.

Expert advice

Best practices for achieving a high-quality finish.

Care & maintenance

Tips to keep your products in top condition.

Troubleshooting

Guidance on common issues and how to resolve them.

Simply scan the QR code below to access everything you need for a smooth installation and long-lasting results.