



Permeable Paving

Recent decades have seen increases in instances of severe flooding and greater pressure on infrastructure such as drainage systems and effluent treatment works. A combination of more and more building on natural flood-planes, over abstraction from natural aquifers and the effects of climate change is thought responsible.

This has resulted in a rethinking of how we manage rainwater runoff in a more sustainable way whilst at the same time relieving the burden on infrastructure and natural watercourses. The Sustainable Urban Drainage System/Scheme (SUDS) was introduced to devise ways to manage rainwater runoff, be it through pervious or permeable systems, soakaways or more engineered SUDS rainwater collection and soakaway systems. Furthermore, hard non-pervious surfaces tend to collect polluting substances (oil, fuel, brake dust etc.) which will be washed off into drains and find their way into rivers and streams during heavy rain events.

What is Permeable Paving?

Traditional paving methods divert the rainwater quickly towards the edges and then to the local drains.

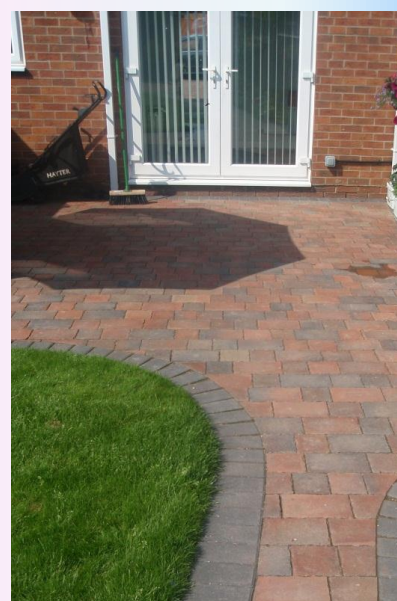
A permeable paving driveway deliberately diverts the water into the paving structure which allows for a controlled release of rainwater into the environment.

Therefore the paving blocks, jointing, laying course and bedding materials used for permeable paving differs from conventional block paving, the details of which are given below.

From the 1st October 2008, legislation was introduced which require householders to gain planning permission to pave their front gardens using traditional impermeable driveways which allow uncontrolled runoff of rainwater to roadways, sewers and local watercourses.

Therefore systems have been devised which will comply with regulations, permit the laying of driveways without the need for planning permission and yet offer the same aesthetic properties of traditional methods.

One such system is Thomas Armstrong's Permeable Paving system.



We must clarify some terminology to avoid confusion between the various systems devised to comply with regulations.....

SUDS (Sustainable Urban Drainage System/Scheme)

This is the overall scheme under which permeable paving is one solution to comply with SUDS. SUDS schemes are all designed to attenuate rainwater and release it back into the natural environment in a controlled manner, ideally replicating a natural cycle.

This helps control pollution, replenish natural aquifers and groundwater courses and reduce ongoing costs of maintenance of drainage infrastructure. SUDS compliant schemes include:

Permeable Paving

Porous / Pervious Paving

Ponds, Wetlands and Swales

Infiltration, collection, distribution Systems

Porous /Pervious Paving

This is very different to Permeable Paving because this system allows water to soak through the paving block itself. We do not supply such products

Permeable Paving

The water flows into the gaps between the paving blocks and into the layers beneath where it is slowly released in a controlled manner. The blocks themselves do not allow water through them.

Types of Permeable Paving Systems

There are 3 types of Permeable Paving design (as defined in 'The SUDS Manual' by CIRIA) all of which are suitable for use with Thomas Armstrong's Permeable Paving blocks. These are:

System A - Full Infiltration:

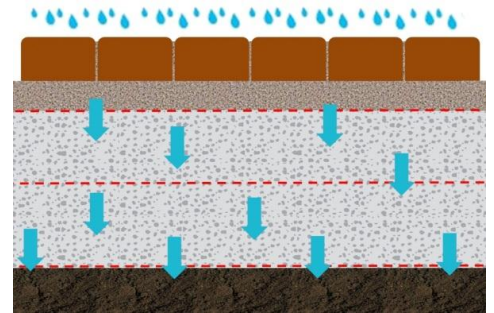
Where all of the rainwater soaks into the sub base and eventually into the ground which is gradually released into the natural environment. The water is not sent to drains so there is no need for drainage pipes or gulleys making this the simplest and most economical system available.

System B - Partial Infiltration:

Used where the ground may not be capable of absorbing water very well and the rainwater soaked into the sub-base is diverted via outlet pipes to other drainage systems such as swales, ponds and sewers.

System C - No Infiltration:

Suitable for contaminated land in particular where all of the rainwater is captured in the sub-base and diverted away via outlet pipes to other drainage systems such as swales, ponds and sewers. An impermeable, flexible membrane is placed beneath the sub-base and up the vertical sides effectively forming a storage tank for the rainwater soaked through the paving layer. This prevents contaminants in the ground from being washed into watercourses.



The schematic diagram above shows the make-up of the layers of a Type A system the details of which is described below in "How to Install Thomas Armstrong Permeable Paving".

Thomas Armstrong Permeable Paving Blocks

- Our Permeable Paving blocks are materially the same as traditional paving blocks offering the same durability, strength and range of styles and colours as traditional paving.
- They are manufactured to BS EN 1338:2003 and have a permeability exceeding the minimum required flow rate of 1800 litres / second / hectare, provided that the sub-base below the blocks is correctly specified and has similar flow-rate capabilities.
- They are available in 60mm and 80mm thicknesses, with a range of colours and styles including rectangular and beamish cobbles. We are continually adding to our Permeable Paving range so please contact us for further up to date details.



Our Permeable Paving blocks include 4.5mm vertical 'nibs' on their sides so that when they are laid, the correct width void is immediately formed between the blocks which is then filled with a suitable permeable material grit resulting in an aesthetically pleasing permeable surface.

This surface complies with flow rates carried out by the British Research Establishment (BRE) and where surfaces are in excess of 200m² it is recommended that additional back-up drainage is incorporated into the design (see the Interpave website www.paving.org.uk).

How to Install Thomas Armstrong Permeable Paving

Block laying should be carried out in accordance with BS 7533 - Part 3:2005. The details here describe a 'Type A - Full Infiltration' system which is the simplest and most economical of the 3 recognised types (see above) but the same basic method and materials apply to all 3 types.

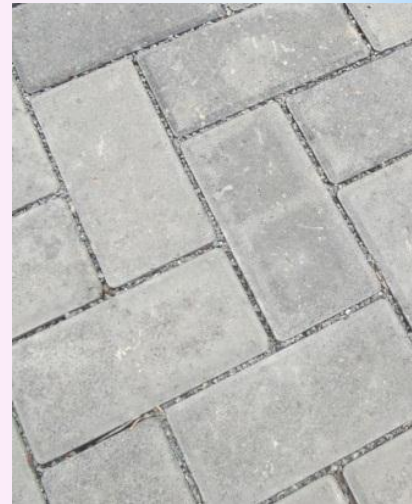
General Site Practice:

- Sub base materials lack fines and are prone to segregation during transport and during construction should be avoided.
- Soil and mud must be prevented from mixing into the sub-base material during construction which will lessen its ability to store rainwater until it soaks away.
- Keep muddy equipment away from the area when laying the sub base and laying base.
- If necessary, create temporary drainage swales to divert away from the area run-off from surrounding areas, contaminants and mud during the construction phase.
- The aggregates must be kept clean and contaminant-free during construction.

The Sub-Base and Laying Base:

- For 60mm Permeable Paving, use 200mm deep sub-base, for 80mm Permeable Paving, use 275mm deep sub-base.
- The sub-base is 10 - 20mm angular clean Type 3 material.
- A 50mm layer of Type 3 6mm open graded (no fines) gravel is used as the laying surface for the blocks.
- The Permeable Paving blocks are then laid in situ and an angular 2 - 4mm grit is then brushed across the surface and into the voids between the blocks. As with conventional paving, the jointing used between the individual blocks is critical to the stability and strength of the driveway as a whole.
- Do not use dry kiln sand in between the blocks as this will severely restrict the rainwater flow into the sub-base. Consequently, a course of 2 - 4mm angular no-fines aggregate is used as a jointing medium which is supplied by Thomas Armstrong Limited.

It is absolutely essential that the correct materials as specified above are used in order to provide the correct permeable surfaces between the blocks and beneath the blocks!





Maintaining Permeable Paving

Permeable Paving systems will require minimal ongoing maintenance as long as the above rules for avoiding contamination during construction have been followed.

Nevertheless, the only significant difference between conventional paving and permeable paving surfaces is the need to prevent the permeable filled gaps between the blocks becoming 'blinded' by soil and other fine material.

Therefore it is recommended that permeable surfaces be kept as free of mud, soil and other materials as far as possible and regularly swept clean. By doing so, the effectiveness and life of the system will be maintained.

Weeds should be removed by hand or any other method which avoids the use of weed killer and subsequent contamination of the permeable layers beneath the paving.

The joint is only required to have a permeability of 1800 ltrs/sec/hectare.

Our permeable paving blocks substantially exceed this required flow-rate.

The figures here were originally derived from research carried out by the British Research Establishment BRE.

Flow Rates of Thomas Armstrong Permeable Paving

60mm Permeable Paving

Derbyshire Agg Top Grit: $\frac{20}{60} \times \frac{10,000}{0.31 \times 0.31} = 34,686$ ltrs/sec/hectare

Francis Flower Agg Top Grit: $\frac{20}{60} \times \frac{10,000}{0.40 \times 0.40} = 20,833$ ltrs/sec/hectare

80mm Permeable Paving

Derbyshire Agg Top Grit: $\frac{20}{80} \times \frac{10,000}{0.31 \times 0.31} = 26,014$ ltrs/sec/hectare

Francis Flower Agg Top Grit: $\frac{20}{80} \times \frac{10,000}{0.40 \times 0.40} = 15,625$ ltrs/sec/hectare

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