

Infiltration paving systems using **Permi.8 concrete block paving** are a supremely effective drainage system used in conjunction with permeable sub-bases and sub-grades. The individual permeable concrete blocks employ larger and non-conventional spacer nibs on the sides of individual blocks so that the surface water infiltrates through to the layers below.

Method Two

Permeable Block Paving and Total Infiltration



JOINTING MATERIAL
2mm-6mm crushed angular gravel/rock

Plaspave Permi-8
60mm or 80mm Block Paving

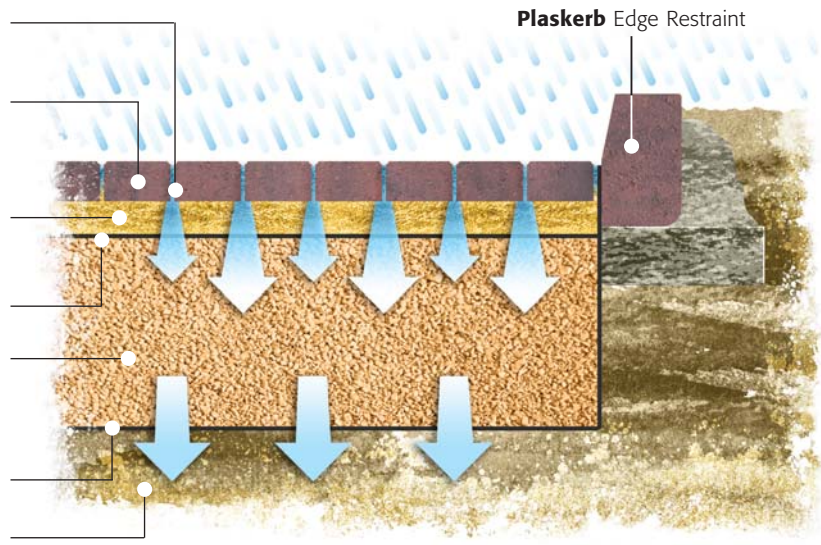
50mm AGGREGATE BEDDING COURSE
2mm-6mm crushed angular gravel/rock

UPPER GEOTEXTILE

PERMEABLE COURSE
4mm-20mm crushed course graded aggregate depth determined by design

LOWER GEOTEXTILE

PERMEABLE SUBGRADE



The open, graded sub-base materials and geotextile layers must still be compacted in the same way as an impermeable paving sub-base to provide a firm foundation for the paving system to be trafficked, but will have voids between the pieces of stone. This system allows all rainwater falling onto the paved area to infiltrate down through the joints or voids between the blocks, passing through the constructed layers below and eventually into the sub grade. The temporary reservoir created by the 33% void ratio of the sub-base may store some of the water before it eventually infiltrates the sub-grade.

This 'Zero Drainage' system requires no discharge into traditional drainage systems, removing the need for pipes and gulleys resulting in cost savings.

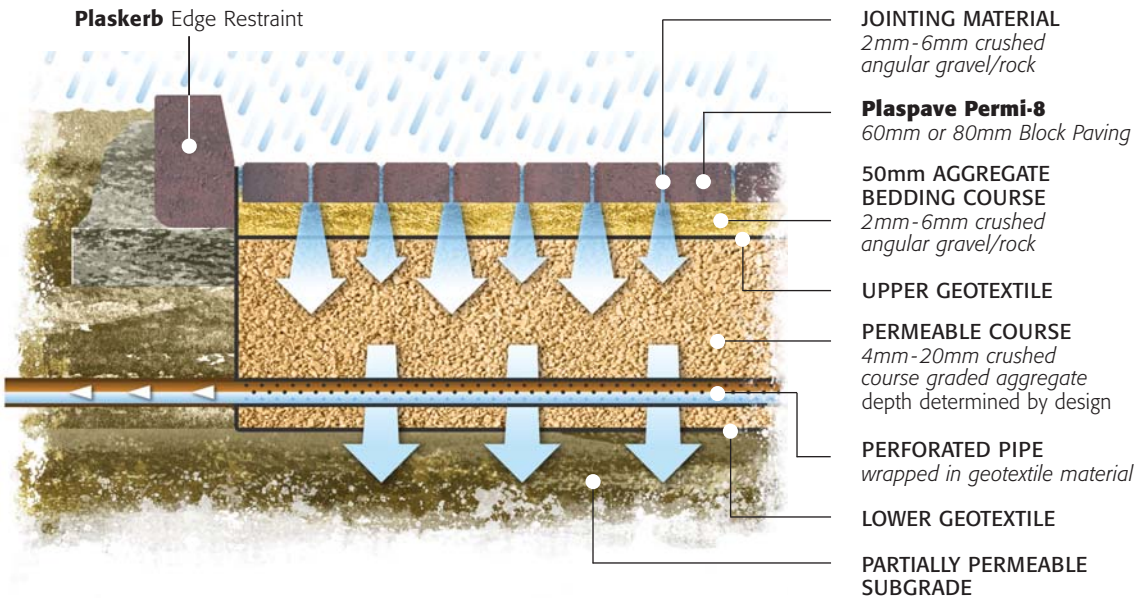


GEOTEXTILE is a permeable fabric which filters the water passing through and stops any migration of the bedding course into the sub-base. In the 'tanked' system **GEOMEMBRANE** is used underground to minimise the loss of water.



Method Three

Permeable Block Paving and Partial Infiltration



Similar to Method Two, partial infiltration systems may be used in situations where the existing sub-grade may not be capable of absorbing all the water. This system can, therefore, prevent the sub-grade from becoming water logged and losing its stability. In this system Permi.8 paving sits on top of a permeable sub-base which surrounds a perforated outlet pipe which allows the excess water to be drained to other drainage outlets such as sewers, swales or watercourses.

Whilst a high proportion of the rainfall is allowed to infiltrate through the system into the sub-grade, the excess is discharged with a peak discharge rate that is agreed with the Local Authority or Environmental Agency.

The Non Infiltration/Tanked paving system is employed in situations where the existing subgrade has low permeability such as a heavy clay soil where there is little opportunity for infiltration. It is also used where the subgrade is of low strength and liable to damage by the introduction of additional water. This system allows for the complete capture of all the water falling on the paved area. This is achieved by placing an impermeable flexible geomembrane on top of the subgrade and up the sides of the permeable sub-base to effectively create an underground tanked reservoir.

Method Four

Permeable Block Paving and Non Infiltration or Tanked Systems



JOINTING MATERIAL
2mm-6mm crushed angular gravel/rock

Plaspave Permi-8
60mm or 80mm Block Paving

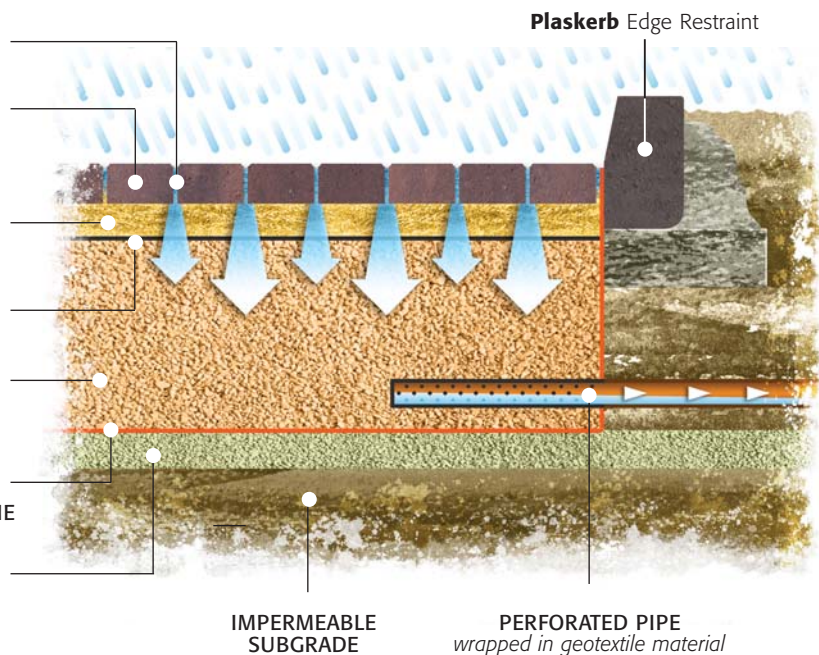
50mm AGGREGATE BEDDING COURSE
2mm-6mm crushed angular gravel/rock

GEOTEXTILE

PERMEABLE COURSE
4mm-20mm crushed coarse graded aggregate depth determined by design

IMPERMEABLE FLEXIBLE GEOMEMBRANE

SUBGRADE CAPPING
to protect impermeable flexible geomembrane



Non-Infiltration/Tanked paving systems are particularly suitable for contaminated sites as it prevents pollutants from infiltrating the subgrade from where they are eventually washed into the groundwater. The stored water can also be re-used for not-potable purposes such as irrigation, car washing or toilet flushing. (See Method Six - Rainwater Harvesting).

Pipe Outlets and Outflow

Pipe outlets from Non-Infiltration/Tanked paving systems penetrate the impermeable flexible membrane. To ensure watertight connection, proprietary ‘top-hat’ seal systems should be employed.

Non-Infiltration/Tanked paving system design assumes that the system outflow rate is restricted to the accepted ‘Greenfield’ run off rate of 5 -7 Litres/sec/hectare. This minimises the impact on drainage networks and water courses during storm events. This discharge rate can be accommodated using a 100mm diameter pipe with the flow restricted by proprietary flow control systems. The spacing and location of outlet pipes will be dictated by site layout and available points of discharge.

Outlet to the urban drainage system may need permission from the Local Authority/ Environment Agency.

Capping Layer

For Non-Infiltration/Tanked paving systems, it is necessary to lay a layer of capping material below the impermeable flexible geomembrane to provide a firm working platform for the overlying construction layers. Two types of capping material are recommended for use in the Specification for Highway Works (2007), 6F1 (finer material) and 6F2 (coarser material). If 6F2 material is used it will be necessary to blind the surface with fine material to prevent puncturing the impermeable geomembrane.

Distinctive Finishing Touches

COMO COBBLESTONES are an ideal way of adding extra texture and detail to the edging on driveways and paths.

PLASKERB edge restraints help to support traffic loads, contain lateral movement and are available in large and small kerbs and as a Weathered Kerb shown here.



In situations where increased water storage capacity or shallower sub-bases are demanded, permeable sub-base replacement systems can be incorporated into permeable paving systems. These proprietary sub-base systems consist of geocellular boxes made of lattice plastic crate-like structures which are connected together to form a rigid raft structure that replaces some or all of the permeable sub-base depending on traffic loading.

Method Five

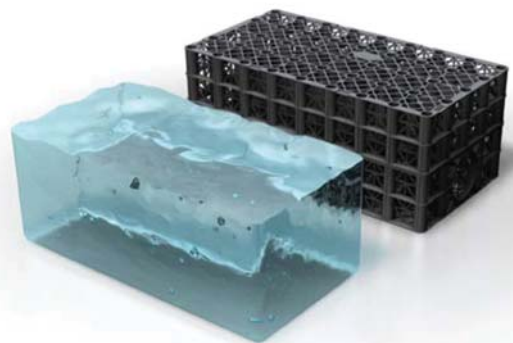
Permeable Block Paving and Permeable Sub-base Replacement Systems



Polystorm cellular units supplied by Polypipe

The water storage capacity is higher than with conventional granular aggregate sub-bases, with some void ratios of up to 90%. Consequently the overall depth of construction can be reduced resulting in shallower excavation and reduced material disposal to landfill.

This type of system typically incorporates a Rainwater Harvesting facility.



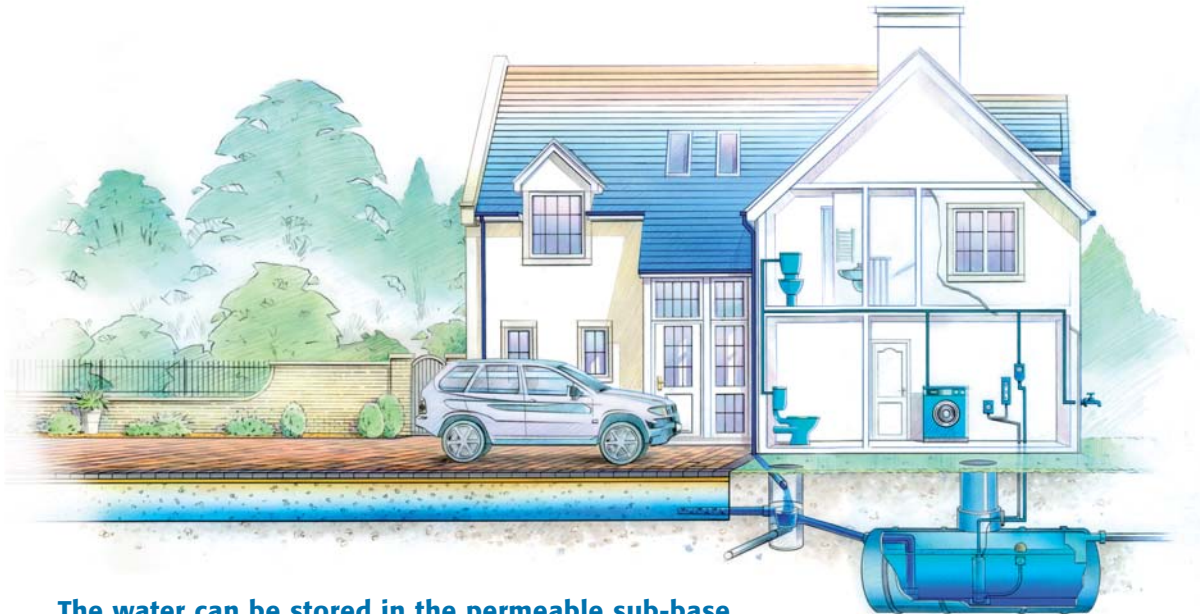
Specialist design advice is available from the manufacturers of the cellular units.

Rainwater harvesting is the collecting of rainwater from roofs and the underground tanked systems of permeable paving to use in or around buildings for non potable purposes such as watering the garden, car washing or toilet flushing. The run off water used for harvesting needs to be of reasonable quality and should be free of debris and sediments. Permeable paving systems will provide the filtration to achieve this.



Method Six

Permeable Block Paving and Rainwater Harvesting



The water can be stored in the permeable sub-base of a permeable paving system. It is however very important to note that the storage volume for re-use is normally separate to that for rainfall attenuation. This is because the two types of storage have different requirements.

- **Rainwater re-use - must be full for as much of the time as possible so that water is available for use.**
- **Stormwater attenuation - must be empty most of the time so that it can temporarily store water from rainfall events.**

Rainwater Harvesting systems will usually have an overflow or pipe outlet to a soak away or to the urban drainage system. The outlet principles for Non-Infiltration/ Tanked systems shall apply. Rainwater Harvesting will not only reduce rainwater run off into the drainage system but will also reduce the amount of mains water used. This contributes to water efficiency and provides savings on water bills if using metered water.

Advice is available from the UK Rainwater Harvesting Association - www.ukrha.org