



Uni-Ecolok[®]

Permeable Interlocking Concrete Paving (PICP)

Uni-Ecolok[®] pavers are used on paved surfaces which advance rather than retard water infiltration. The prime purpose of Uni-Ecolok[®] paving systems is to alleviate over-burdened stormwater systems, but they also offer other benefits such as pollution control and water harvesting. Used in what is known as Permeable Interlocking Concrete Paving (PICP) systems, Uni-Ecolok[®] pavers combine excellent load-bearing capacity with permeability rates of up to 1 800 litres/sec/hectare.

World-class concrete products for eco-friendly and sustainable development

Product features

As urban and industrial areas throughout the country have continued to expand, the total area of impermeable surfaces such as roofs, roads, pavements and car parks has increased. These surfaces prevent the natural infiltration of rainwater into the ground and place an additional burden on drainage systems, many of which are no longer able to cope with the increased levels of water run-off. The consequences are flash-flooding and increased levels of pollution.

During periods of dry weather, heavy metals, hydrocarbons, oil, rubber and other pollutants are deposited on impermeable surfaces. When it rains these pollutants are washed into drainage systems and end up in rivers where they pose a threat to local communities and wildlife.

Local authorities realise that urbanisation increases the risk of flooding and pollution and many are now specifying systems which attenuate stormwater and improve water quality.

One such system is Permeable Interlocking Concrete Paving (PICP) which has been successfully used in Europe and the Americas since the mid 1980s, and in Australia for the past 12 years. PICP is proven in applications as diverse as pedestrian walkways, commercial car parks, major road and ultra-heavy industrial applications.

Uni-Ecolok® PICP allows for the on-site retention of rain water and its controlled discharge into municipal drainage systems. It also reduces pollution and/or sedimentation levels. It is particularly effective when existing stormwater drainage systems are operating near or at capacity.

Uni-Ecolok® PICP can:

- Deal with run-off close to where it falls
- Manage potential flooding at its source
- Allow new development in areas where existing drainage systems are at full capacity, thereby enabling new development within existing areas
- Protect water resources from accidental spills and pollution
- Protect or enhance water quality
- Encourage natural groundwater recharge
- Blend in with the environmental setting and assist the needs of the local community
- Provide a habitat for wildlife in urban areas.

The inclusion of Uni-Ecolok® PICP as part of a drainage system will not only increase the likelihood of planning proposals being approved but may also offer the developer considerable cost savings over traditional methods (detention ponds, pipes, manholes etc) due to a significant reduction in stormwater management costs.

Four elements of permeable paving

There are four elements which make up permeable paving:

- 1 Permeability
- 2 Detention of stormwater
- 3 Pollution control
- 4 Structure.



Permeability

Uni-Ecolok® PICP systems have permeability rates of up to 1 800 litres/sec/hectare, providing a significant performance improvement over what is normally regarded as the required permeability rate of 180 litres/sec/hectare.

Detention

The **sub-base** thickness should be designed to detain rain falling over a 24 hour period and must provide voids of at least 30%. A 4,75/19,0mm coarse open graded crushed rock to SANS 1083:2006 should be used. If the designer opts to specify alternative materials, a site trial must be undertaken to ensure that the laying course material does not invade the sub-base material.

The laying course and jointing material must be 6,7/2,36mm grit to SANS 1083:2006. Tests have shown that this grading has a superior permeability rate and will not invade the 4,75/19,0mm sub-base material. Under conditions in which water cannot infiltrate the subgrade, an impermeable membrane must be laid between the subgrade and sub-base and up the sides of the PICP installation for water retention.



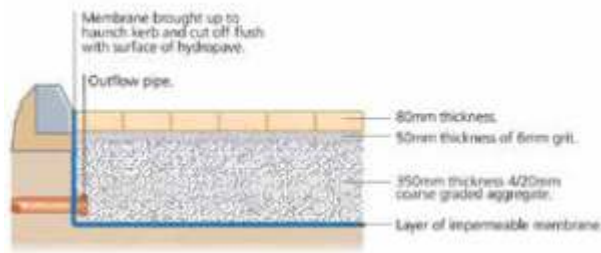
Uni-Ecolok®



Product features

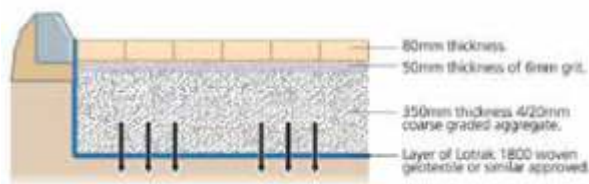
There are two common types of permeable paving systems, Attenuation and Infiltration.

Typical Attenuation System



The Attenuation system temporarily stores the water in the crushed stone beneath the paving before being gradually released back into the drainage systems. This reduces the peak downstream flow during heavy rainfall.

Typical Infiltration System



The Infiltration system allows the water to flow slowly through the crushed stone beneath the paving before being slowly released back into the ground through a geotextile membrane.

Pollution

As water flows slowly into the sub-base it deposits pollutants on the large surface area of the aggregates. The pollutants are then broken down by natural microbial action. Alternatively, they eventually come to rest at the bottom of the system.

Structure

The specification of a permeable paving structure depends upon hydraulic and traffic-loading characteristics as well as the properties of the subgrade.

Many pavements will be required to have a water detention capability rather than infiltration because of the subgrade types and under these conditions, the permeable paving system should be designed to retain a 24 hour rainfall and to release it slowly back into the drainage system.

Some Words of Caution

Although PICP is in its infancy in South Africa, over 25 years experience in Europe and the Americas have shown that failures of PICP have largely been due to:

- Incorrect grading of the sub-base and/or bedding layer and/or jointing material.
- The use of sand as a jointing and/or bedding material. It has been shown that there is about a 50% reduction in the permeability of PICP when sand is used in the jointing and/or bedding, resulting in slow infiltration, ponding, clogging and excessive run-off.
- The use and subsequent clogging of an inappropriate upper geotextile between the sub-base and bedding layer instead of using compatible materials which meet conventional soil-filter course-laying criteria.
- Adding fines to the laying and subgrade layers for better compaction.
- The under-estimation of the impermeable surface which drains onto the permeable paving surface.
- The specification and/or use of a paving block that is not specifically designed for use in permeable paving. A standard ICP surface installed with conventional joints will not provide sufficient permeability for a permeable pavement to function as designed.
- Run-off, which includes mud and other debris due to soft landscaping or construction work, clogging the paving.
- Heavy silt loads from the in-service function of the paved area, e.g. recycling centers, wood chip stock piles etc.