

# Permeable Paving and its role in Sustainable Drainage in Urban Areas



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*Permeable Paving has the advantage over other SuDS techniques in that it facilitates vehicle and pedestrian traffic as well as recreational activities.*

## Introduction

Permeable paving has become a very important element in sustainable urban drainage systems (SuDS) and with increased development of urban areas and significant climate changes, it is likely to become one of the key techniques in the fight to reduce flooding in our towns and cities and pollution and damage to our rivers, streams and water courses.

Permeable paving was first introduced about 20 years ago and has become very popular throughout the world in recent years as a result of new legislation introduced by governments to help manage flood risk. Permeable paving offers some major advantages over other sustainable drainage techniques, primarily the ability to use the surface for other purposes such as vehicle and pedestrian traffic as well as leisure and recreational activities.

## The Problem

As “green fields” are developed and the top soil and vegetation is sealed over by new buildings, car parks, roads, footpaths, houses, driveways, patios etc, the percentage of open ground is reduced.

In this open ground rainfall is naturally absorbed in the top soil and is slowed down or “attenuated” before it finds its way into the groundwater and into streams, ditches and rivers.

The topsoil, vegetation and sub grade material removes much of the pollution that may have existed and the water that reaches the rivers and watercourses will be rendered harmless.

The sealing of this open ground stops aquifers being replenished and the problem has been exacerbated in recent years through increased traffic on our roads and an increase in the number of heavy rainfall events (see appendix attached).

The traditional method of dealing with storm water run off is to collect it in drains and gullies and to direct it into sewerage systems or into rivers and watercourses. If it enters the sewers the pollution must be removed by expensive water treatment plants. If it is taken into our rivers there is the potential for serious damage to our flora and fauna.

## **Flooding**

It has become apparent in recent years that the traditional storm water drainage in many urban areas is incapable of dealing with the increased storm water run off that occurs during very heavy rainfall events. The devastation caused to homes and commercial buildings has forced governments to take action.

## **Pollution**

During heavy rainfall much of the dirt and pollution which builds up on roads, pavements, roof tops, car parks etc is “stripped off” and flushed into the drainage system.



*Permeable paving could prevent the erosion of streams and rivers and the subsequent destruction of natural habitats for wildlife.*



*Urban flooding is on the increase as our traditional drainage systems become incapable of handling heavy rainfall in built up urban areas where open ground has been sealed over*



*If polluted water is discharged directly into our streams and rivers it poses a significant threat to the environment.*

If this water is discharged into our rivers or streams, there is a very real threat of serious damage to the natural environment. Fish, animals, insects and plants will all be threatened.

It is hardly surprising that Scotland, with its huge dependence on its rivers and lakes for attracting tourists, was one of the first countries to enact legislation that made a SUDS statement and policy an integral part of any planning application.

The Scottish Environmental Protection Agency (SEPA) goal is to be an excellent environmental regulator and an influential authority on the environment.

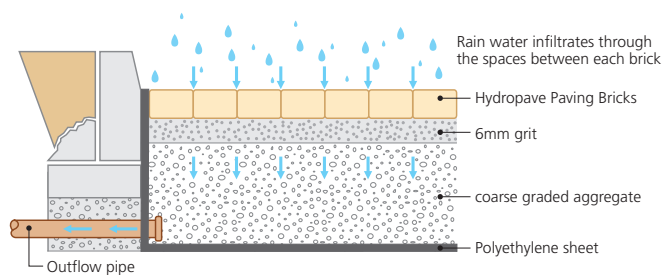
## **Thermal Heating**

In hot climates when rain falls on roofs, pavements, car parks etc it is heated rapidly and if it enters the drainage system and is discharged into nearby streams the sudden change in temperature can destroy insect larvae and fish fry which are very sensitive to sudden thermal heating.

# The Solution

Permeable paving offers a solution to the problems that we have outlined above. It replicates nature and subsequently slows down water run off and significantly reduces the pollution levels in the water that reaches our rivers and streams.

The storm water is absorbed by the paving through joints, which are filled with grit instead of the sand that is used in conventional paving, and stored in a special sub base beneath the paving.



This acts like a huge tank and the aggregate that is used for the sub base filters out most of the pollution that may have been washed off the roads, roofs etc.

The water is then slowly released into nearby streams or the drainage system through pipes. As well as removing pollution, the system reduces the temperature of the water and eliminates the threat to wildlife in the eco system mentioned earlier.

## New legislation

Other countries in the UK have followed Scotland's lead and enacted Flood Management legislation and the only country that does not have legislation in place or pending is N.Ireland.

Pressure is being put on the N.Ireland Assembly to fall into line with other parts of UK and the Republic of Ireland and it is anticipated that legislation will be introduced in the near future which will prevent development proceeding in Flood Risk areas without suitable SuDS provision.

## Rainey Endowed School

Our school was the first school in N. Ireland to use permeable paving in the school playground/car park and this has already attracted considerable media interest, including television coverage.

The research that will be done over the coming months will determine just how effective the system is in slowing down storm water run off and removing harmful pollution from the water.

We also hope to determine if such a system could provide a viable source of geo-thermal heating by trapping the heat that is taken from the water as it moves through the stone sub base. If this can be done it could provide a substitute form of heating to conventional fossil fuel methods, with the associated benefits to our environment

## The Future

Sustainable construction is the way of the future and sustainable drainage as discussed in this essay offers huge benefits.

In Germany and other European countries at least 10% of all paving is permeable. This equates to nearly 10million m<sup>2</sup> per annum.

This trend is likely to continue and the 9th International Conference on Concrete Block Paving October to be held in Buenas Aires from 18th-21st 2009 entitled Concrete Block Paving as a Sustainable Tool for a Comprehensive Development will focus heavily on the role that permeable paving has to play in improving our environment.

We would like to present the findings of our research to the Conference. It will give Rainey more PR and hopefully help develop interest and awareness of the benefits of Sustainable Drainage and the role of permeable paving.