EUPAVE
EUROPEAN CONCRETE PAVING ASSOCIATION

FACT SHEET
Sustainable Water Management

Concrete contributes to more ecological water cycle management

© Ebema

Water is a scarce resource that we must handle with care, in an integrated manner throughout the water chain. This is even truer now that climate change is leading to wetter winters, drier summers and more extreme weather phenomena. Only through an integrated approach to water management can we win this challenge.

In addition to heat waves, floods and forest fires, climate change is also causing increasingly long periods of drought. During such periods, water shortages may occur, not only because of a lack of precipitation but also because of insufficient water reserves in the subsoil due to falling groundwater levels. This, in turn, has to do, among other things, with the large proportion of paved and built-up areas in our living environment. This problem is exacerbated by demographic developments: the increase in the world's population and its concentration in large cities.

What can we do in practice? First of all, it is important to be aware of the amount of water consumed and, in some cases, wasted. Responsible water use is the start of good water management.

There are many possible solutions for maintaining the water balance, such as:

- infiltration pits or ditches;
- rainwater tanks and larger rainwater harvesting basins to capture and store water in wet periods;
- green roofs, with vegetation, which limit the run-off of rainwater;
- water-permeable pavements, which can store the water in the road structure and provide deferred evacuation or allow it to infiltrate into the subsoil.

Many of these solutions can be made in concrete. After all, concrete is extremely suitable for water purification facilities and for the storage and distribution of drinking water, rainwater and wastewater. And concrete certainly occupies a prominent place in water-permeable road surfacing, for which the general principle is to collect rainwater as close as possible to where it falls and, if possible, to allow it to infiltrate into the subsoil.

PERVIOUS CONCRETE PAVEMENTS

Various solutions are available for water-permeable concrete pavements, both with in-situ cast draining concrete and with pre-cast concrete products. The area of application of pervious pavements is roads with low traffic volume, car parks, bicycle and walking paths and squares. The design of these pavement structures must take into account the bearing capacity to support traffic loads together with surface water management, i.e. infiltration and sufficient storage. The draining character of these pavements can also be easily combined with a decorative aspect through special shapes and colours.

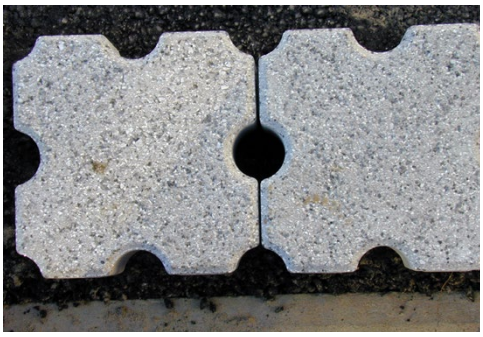
The benefits of permeable pavements in urban environments – sometimes referred to as a 'sponge city' – are:

- flood prevention;
- a cooling effect, thus reducing the "urban heat island effect" and providing better thermal comfort in the environment and the buildings;
- a financial gain due to the redundancy of a sewage system;
- beautifying the surroundings with aesthetic paving.

PERMEABLE SOLUTIONS IN PRECAST CONCRETE ("CONCRETE BLOCK PERMEABLE PAVING")

Generally, permeable/pervious precast concrete paving blocks can be categorised in four different types:

- **impervious concrete paving blocks with widened joints**, which are created by spacers at the sides of the blocks. The *joint surface/total surface* ratio needs to be sufficient to evacuate the run-off water and may be specified in the technical specifications in some countries, e.g. a minimum of 10%. Obviously, the joint filling material must be water permeable.
- **impervious concrete paving blocks with drainage openings**. Due to their specific design, these concrete pavers are designed to allow water to infiltrate through the openings created after laying. For this type of stone, it is in fact sufficient to save an opening on one or more sides or centrally in the stone. In this case, too, the proportion of openings determines the pavement's drainage capacity.



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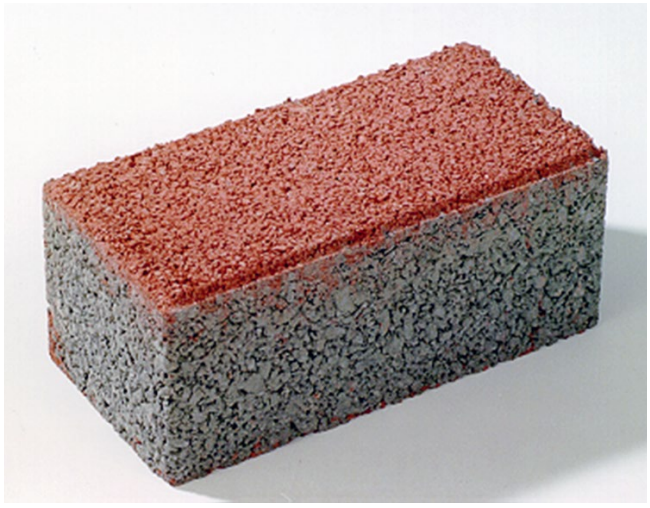
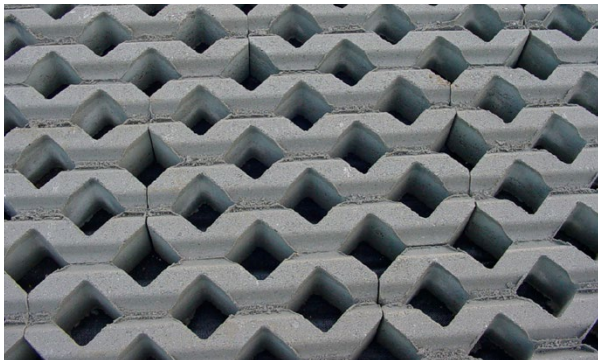


- **porous concrete paving blocks**. In this case, the typical dense concrete mix is replaced with a porous one. The water can percolate through the open-graded structure. In this case, the water permeability of the paver itself is prescribed and tested.

- **grass concrete tiles**: in this type of paving block the openings can be filled either with grass or with a permeable fine aggregate. Today, the old types have been complemented by new, modern and decorative designs with customised sizes, shapes and colours.

© Stradus



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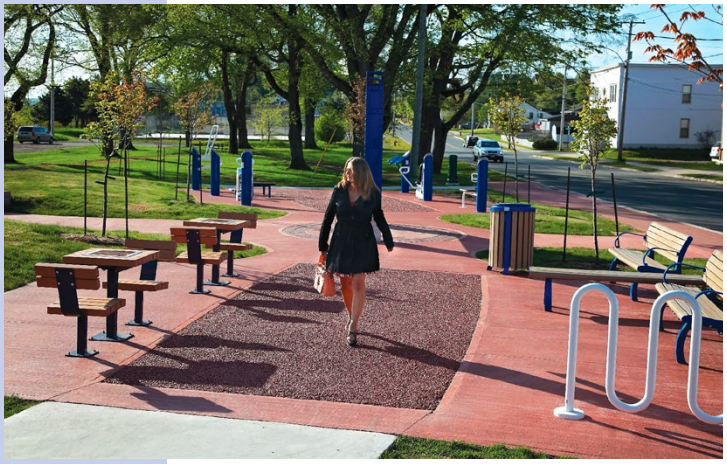


Decorative draining concrete for public spaces © Holcim

Car park with a pervious concrete pavement, Dreux (France) © CIMbéton

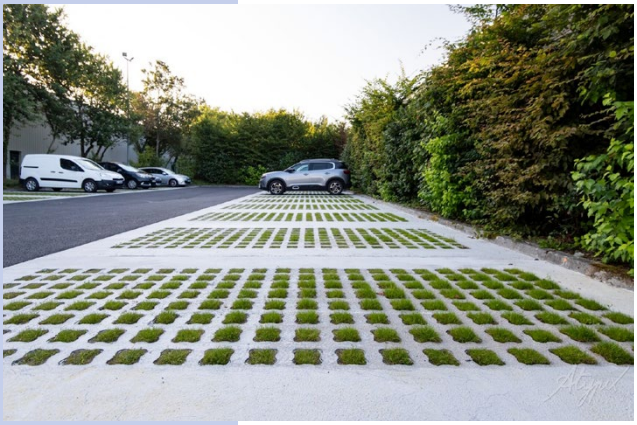
PERVIOUS SOLUTIONS IN IN-SITU CAST CONCRETE

- **in-situ cast porous concrete**. This is a pervious type of concrete thanks to its open structure, due to the absence of sand in the concrete mixture. The coarse aggregates are glued to each other by the cement paste. The percentage of connected voids in the concrete will determine the water permeability but also the concrete's strength. Indeed, this type of concrete is characterised by a lower strength compared to conventional concrete. Therefore, the field of application is limited to pavements with no or limited heavy traffic.

A special application, developed in the Netherlands, is called "Bermcrete". It consists of slipforming longitudinal strips in porous concrete along the edges of rural roads in order to widen them and make them safer.

Construction of 'Bermcrete' in the Netherlands © Heijmans

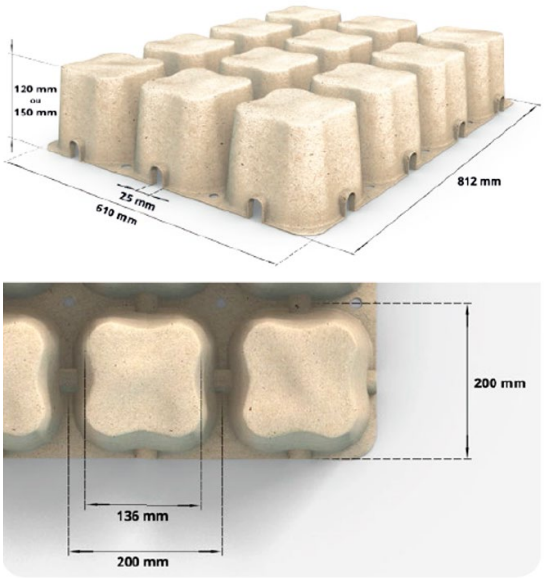
- **in-situ cast cellular reinforced concrete:** this monolithic system, based upon a proprietary design, is obtained with biodegradable formwork surrounded by cast-in-place concrete to form pervious alveolar slabs filled with grass or aggregates. A conventional concrete mix is used, making higher strengths



Applications of cellular reinforced concrete for a parking lot and a tramway © Viaverde

possible. This solution, like most of the other permeable pavements, is mainly used for car parks but also for tramway platforms, walking paths, private access, etc.

It is important to deal with rainwater properly, both in public spaces and on private properties. First, it should be collected and used if possible. Secondly, it should infiltrate the soil. When pavements are needed, permeable solutions must be considered. Concrete offers a wide range of water-permeable pavements, both in-situ cast and with precast concrete paving blocks. In this way, the sewage system is relieved, the soil can absorb new water reserves and the risk of flooding is reduced.



Biodegradable formwork © Viaverde

More environmental benefits from concrete roads can be found on EUPAVE's infographic "Concrete Pavements Make Roads More Sustainable" (2019), https://www.eupave.eu/resources-files/infographic

References

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