

DPS

DRY PAVING SYSTEM

FOR
SUSTAINABLE
WATER
MANAGEMENT



85% of our cities' surface
is impermeable

NEW PROBLEMS IN THE SUSTAINABLE DEVELOPMENT OF CITIES



The traditional growth and development of cities involves the covering of their ground with **impermeable materials** such as asphalt and concrete, which significantly alters the natural water cycles.

The lack of natural infiltration of rainwater into the ground produces important disturbances in ecosystems, as well as the reduction of aquifers.

On the other hand, as experts warn, climate change means an increase in the propensity, intensity and frequency of extreme weather events, such as torrential rains, which cause **flooding and damage to river ecosystems and more rapid soil erosion**.

Of particular concern is the fact that current infrastructures for the management of polluted water are

affected in these cases, with the result that some of this water is forced to be discharged into rivers without prior treatment.

Likewise, the lack of humidity on the surface of the urban soil limits the natural cooling produced by water evaporation, something that, currently, is only associated with parks and green areas.

In addition, the materials with which the city is normally paved accumulate heat during the day, becoming sources of emission during the night, a phenomenon known as **"heat island"**, increasing the temperature of the air and forcing greater energy consumption for cooling.

| SUDS (Sustainable Urban | Drainage Systems)

Sustainable drainage is the ideal alternative for the adaptation of cities to climate change, not only to mitigate the effect of floods, but also to properly manage the quantity and quality of the urban runoff water.

Sustainable Urban Drainage Systems (SUDS) enable water infiltration near the origin and prevents the formation of surface

runoff, constituting an advanced technical solution for the **correct management of rainwater**. In addition to flood mitigation and the prevention of water pollution, SUDS improve urban landscapes, optimizing their value and minimizing the economic costs of rainwater management.

Permeable paving over an
underground structure
of geocells with a high
infiltration capacity

DPS (Dry Paving System)

WHAT IS IT?

DPS (Dry Paving System) Sustainable Urban Drainage System

The **Dry Paving System (DPS)** is a Sustainable Urban Drainage System that offers an excellent solution for efficient rainwater management. DPS integrates a permeable pavement and an underground structure formed by polymeric geocells with a high capacity of infiltration and retention of rainwater under its surface.

The **ecoDraining** concrete slabs, whose composition and porosity guarantee water permeability -both by mass and by joint- forms the upper layer of the system. Their side spacers guarantee the formation of uniform joints through which water can be evacuated

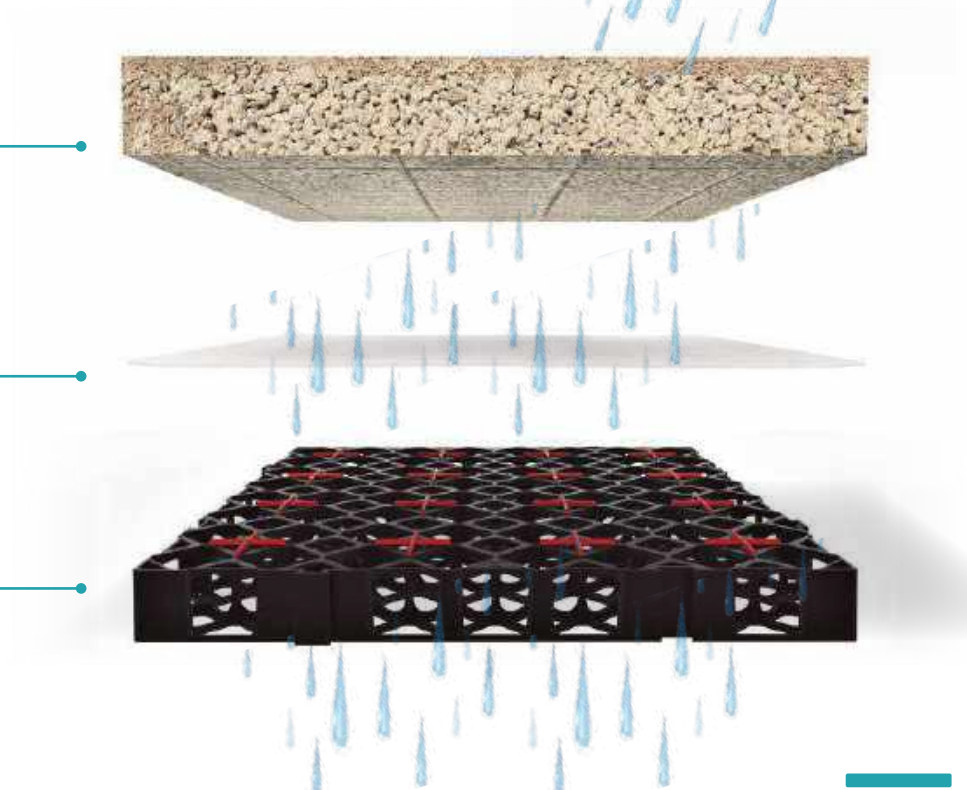
The **Hidrocell** polymeric geocell framework supports the ecoDraining pavement. They are set by a framework of crosses and slots specially designed to assure their adjustment. Between the ecoDraining pieces and the Hidrocell geocells, a thin layer of geotextile facilitates the infiltration of water and prevents the passage of particles, allowing a perfect anchorage between the geocells and the concrete paving.



ecoDraining
Pavement of
permeable
concrete

Geotextile

Hidrocell
Geocell



ADVANTAGES

HIGH PERMEABILITY

DPS is specially designed to evacuate water flows that are hundreds of times higher than those collected during episodes of torrential rain, since filtration occurs through the mass of the concrete pavement, and through the joints between the pieces responding simultaneously to the vertical flow of rain and the horizontal flow of runoff.

HIGH CAPACITY FOR WATER COLLECTION, ACCUMULATION AND INFILTRATION

The void volume provided by the **Hidrocell** polymer cell network gives **DPS** a water retention capacity under its surface of 50 l/m², which can be multiplied by the superposition of additional cells.

ANTI-SILTATION DESIGN

Due to their two-layer design, **ecoDraining** concrete slabs have an anti-siltation function, with their upper layer acting as a sieve to prevent the lower layer from saturating. The geotextile performs similarly with respect to the siltation that could occur through the joints.

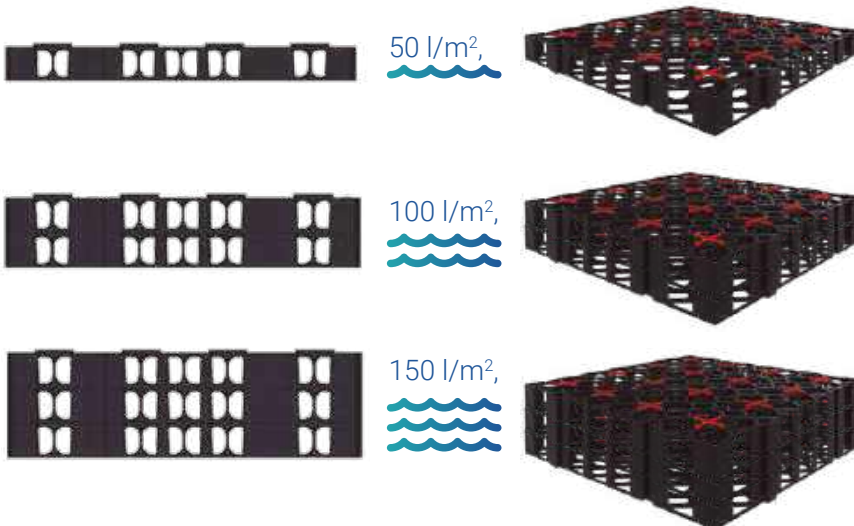
ANTI-POLLUTION TOOL

ecoDraining also has the capacity to eliminate atmospheric pollutants such as nitrogen oxides (NOx) volatile organic compounds (VOCs) and particulate matter (PM), being class 3 according to UNE 127197-1 2013, certified by APPLUS. Therefore, the system purifies and filters the water that infiltrates to the soil.

CLICK-UP SYSTEM (CLIPPING CONNECTION)

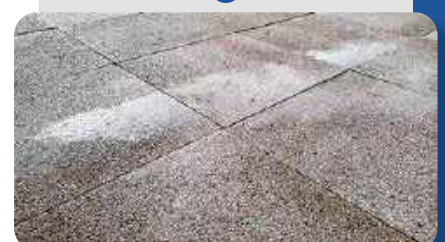
The perfect fit between all its elements, both vertically and horizontally, makes **DPS** work as a single entity, with a cohesion and mechanical characteristics far superior to those of each part separately.

ACCUMULATION ALTERNATIVES:



INFILTRATION TEST

0:00:00"00



0:00:05"07

ADVANTAGES



SECURITY

DPS guarantees a high level of safety for pedestrians by creating continuous paved spaces without architectural discontinuities -such as drains, grids or slopes- and by keeping them permanently dry. Moreover, the pavement offers special anti-slip features.



Investment, not expense

The use of DPS is an investment as it is highly reusable. Thus, if new networks or ducts need to be laid under the pavement, the DPS system can be dismantled and re-assembled to allow the introduction of new infrastructures.



FAST AND SUSTAINABLE INSTALLATION

DPS design makes installation quick and easy, without the need for any civil work or the use of mortar. The reduction of materials, energy and waste makes DPS more sustainable than any other type of paving.



Reduction of the heat island effect

The use of DPS favours soil's oxygenation and the reduction of air temperature, providing a sensation of coolness similar to that of areas with vegetation.



High architectural performance

In addition to the functionality of DPS, there is a wide range of architectural and aesthetic possibilities, with various formats and finishes that allow both pedestrian and mixed pedestrian/occasional traffic uses.



HIGH RESISTANCE TO ICING

As it is a highly permeable material that does not retain water, it has no contraindications with respect to the effects of ice.



SUSTAINABLE MATERIALS

Both the concrete parts and the polymer geocells that make up DPS are made of sustainable materials. The ecoDraining slabs incorporate up to 30% of material from Construction and Demolition Waste (C&DW), while the Hidrocell cells are manufactured with recycled polymers.



EASY MAINTENANCE AND CLEANING

DPS needs hardly any care since weather's inclemencies, such as rain and wind, act directly. The absence of ponding prevents the accumulation of dirt and the development of microorganisms. Only sporadically will sweeping be necessary to guarantee an optimal aesthetic appearance.



25 YEAR WARRANTY

The nature and structure of its components provides DPS with a high resistance that allows it to keep its functions and aesthetics for over 25 years.

BENEFITS

Rainwater management at source

DPS reduces large water floods and avoids the waterlogging of paved areas, guaranteeing the progressive retention and lamination of water to the subsoil, or its controlled conduction. The natural maintenance of aquifers allows the normal development of ecosystems and the growth of urban vegetation. On the other hand, an adequate rainwater harvesting system allows water to be recovered and stored for use in irrigation and street cleaning, reducing water consumption from the general water supply network.

Integration of rainwater in the urban landscape

Due to its high drainage capacity, the areas paved with **DPS**, such as streets, parks and squares, do not flood, allowing its immediate use by citizens after a rainfall.

Reduction of infrastructure costs

The simplicity of **DPS** enables the reduction of costs of water disposal systems at the same time that increases the landscape value of the surroundings.

Improvement of air quality

Thanks to the technology incorporated in the **ecoDraining** concrete slabs, **DPS** reduces environmental air pollution.

Improvement of water quality

The water that is filtered through **DPS** experiences a reduction of its pollutants, thus protecting the natural aquifers. At the same time, by retaining part of the rainwater, saturation in the treatment plants is avoided.

WATER MANAGEMENT

Water management is done through 3 phases:

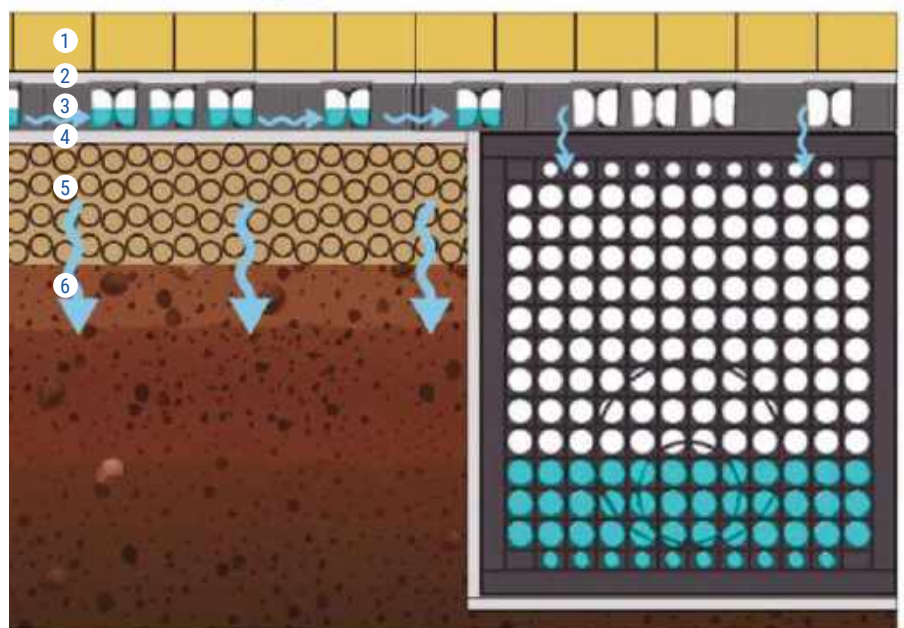
CAPTURE – rain or runoff water quickly permeates the pavement’s surface, being momentarily retained between the polymer cells.

Infiltration – the stored water gradually infiltrates into the subsoil according to its degree of permeability.

Transportation – depending on the slope of the ground and the type of base, water can be transported in a controlled manner to an accumulation tank to be used for garden irrigation or street cleaning, infiltrating the ground gradually. The excess can be diverted to a spillway or the nearest rainwater collector.



- 1 / ecoDraining pavement
- 2 / Permeable Geotextile
- 3 / Hidrocell cells
- 4 / Permeable Geotextile
- 5 / 25 cms. thick Graded-aggregate
- 6 / Ground



COMPONENTS

ecoDraining CONCRETE PAVEMENT

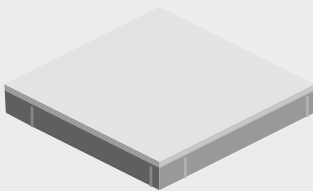
Modular concrete pavement with high drainage capacity of more than 100 l/m²/min. Manufactured with high-strength siliceous, granitic or basalt aggregates, it incorporates recycled materials (WCD). Its exposed face has the capacity to decontaminate the air of NO_x and other contaminants, being class 3 according to UNE 127197-1 2013.



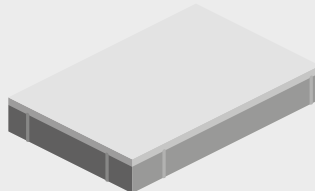
TECHNICAL SPECIFICATIONS

Material	Concrete with siliceous, granitic or basaltic aggregates
Dimensions	Variety of formats
Drainage capacity	More than 100 l/m ² /min
Flexural strength	According to UNE-EN 1339
Weight per m ²	Approx. 115 kg/m ²

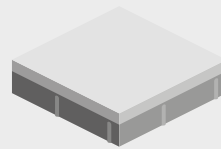
FORMATS



50x50x5 cm.



50x25x5 cm.



25x25x5 cm.

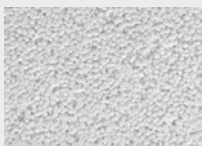


25x12,5x5 cm.

COLORS



Steel



White



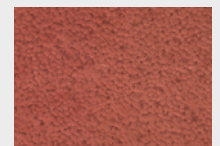
Green



Travertine



Yellow



Red

GEOTEXTILE

Non-woven geotextile with high mechanical performance and very resistant to weather, chemical and biological processes. It allows the passage of water and retains fine particles.



Hidrocell GEOCELL

Highly resistant plastic geostructure that allows the capture, accumulation and underground transport of rainwater. Manufactured with black polypropylene reinforced with mineral charges, it is a 100% recycled and recyclable material. It can be configured in different thicknesses, achieving a greater capacity to retain water under its surface.



TECHNICAL SPECIFICATIONS

material	Black PP reinforced with mineral charges
Dimensions	500x500x50 mm
Total volume	12,5 litres
Useful volume	11,5 litres
Weight	5 kg/m ²
Breaking load	50 ton/m ²

DPS TECHNICAL PRESCRIPTION

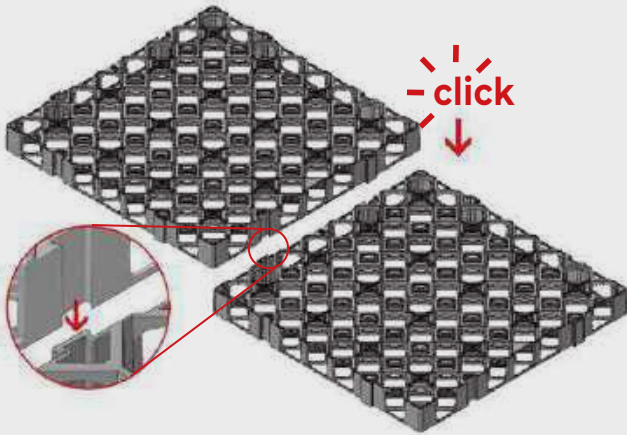
M² supply, installation and performance testing of sustainable drainage system with a permeability of more than 100 l/m²/min, accumulation capacity of at least 50 l/m², decontaminant and certifiable, **Dry Paving System (DPS)** or Equivalent type.

Formed by pieces of customised **ecoDraining** permeable concrete, class 3 according to the UNE 127197/1-2013 standard, anchored with a clipping connection to **Hidrocell** geocells including a geotextile. Size and colour can be chosen by the Project management.

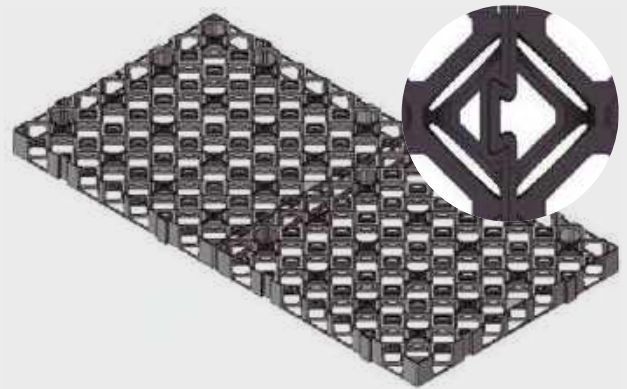


LAYING

- 1** Fix each Hidrocell geocell with the clipping system on the surface to be paved.
(See pages 13 and 14)



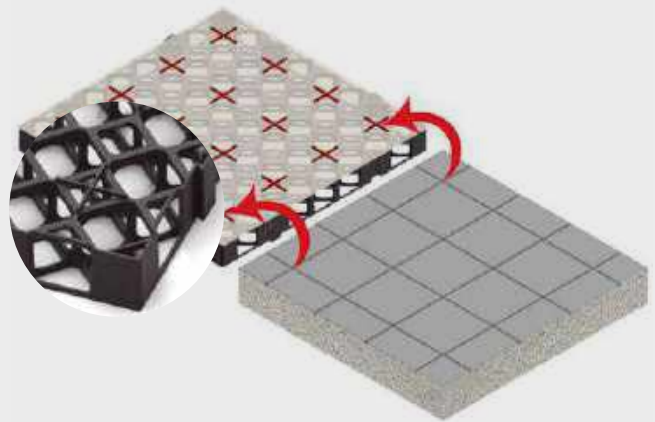
- 2** Cover the desired surface with the Hidrocell geocells assembled with the jumpers strut up



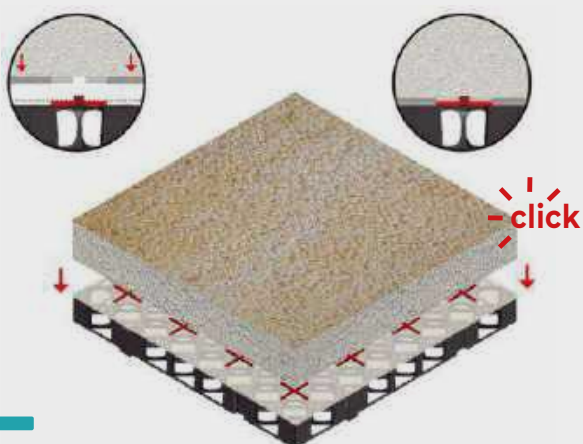
- 3** Place the geotextil on the Hidrocell geocells.



- 4** Install the ecoDrainig concrete pieces on the geotextile layer.



- 5** Anchor the ecoDrainig slabs with the crossheads of the Hidrocell geocells for its complete fixation.



LAYING POSSIBILITIES

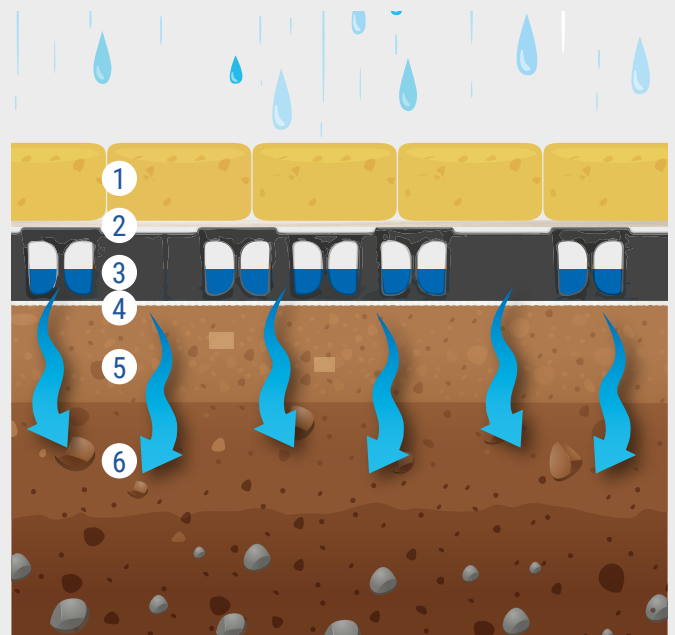
The DPS system is specially designed to fulfil two different functions: the infiltration of water into the ground, or its transport and subsequent reuse. Each of them requires a different type of installation on a different base.

FLEXIBLE BASE

INSTALLATION ON FLEXIBLE PERMEABLE BASE

Capture and infiltration: the rainwater that falls on the concrete pavement, filters through it and falls into the polymeric piece, which retains the water until it infiltrates completely into the ground.

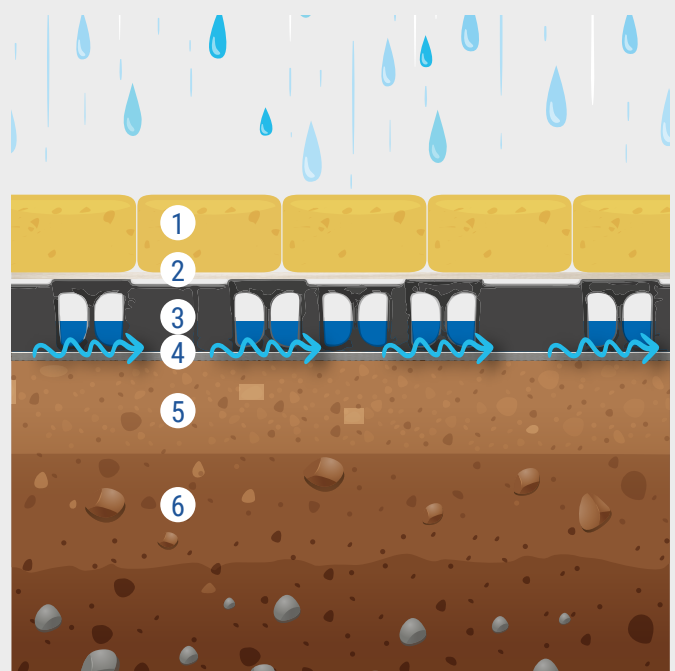
- 1 / ecoDraining pavement
- 2 / Permeable Geotextile
- 3 / Hidrocell cells
- 4 / Permeable Geotextile
- 5 / 25 cms. thick artificial Graded-aggregate
- 6 / Ground



INSTALLATION ON Flexible Impermeable Base

Collection and transport: the rainwater filters through the concrete pavement and drops into the polymeric pieces. Then it is transported thanks to a waterproof geomembrane, which is placed on the ground.

- 1 / ecoDraining pavement
- 2 / Permeable Geotextile
- 3 / Cellules Hidrocell
- 4 / Waterproof Geomembrane
- 5 / 25 cms. thick artificial Graded-aggregate. Compacted (98% of M.P).
- 6 / Ground



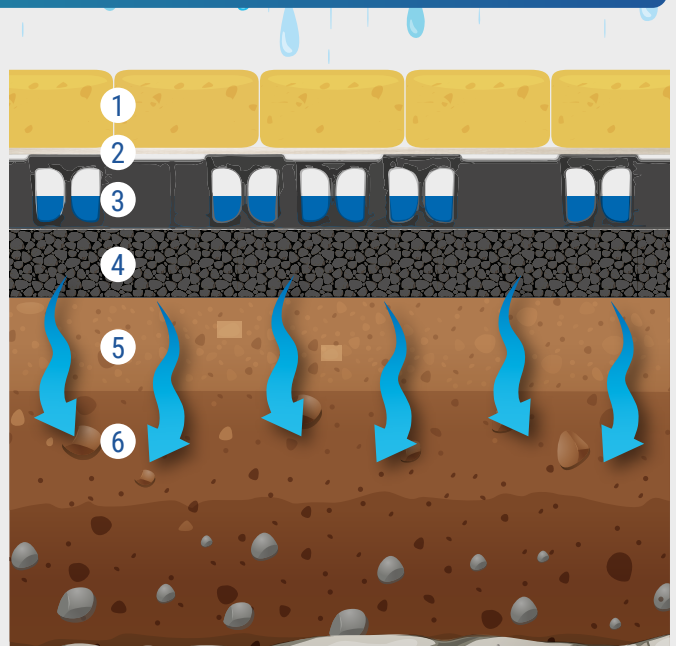


RIGID BASE

INSTALLATION ON RIGID PERMEABLE BASE

Capture and infiltration: the rainwater that drops on the concrete pavement filters towards the polymer piece, which retains the water until it completely infiltrates into terrain, or through the permeable/perforated concrete.

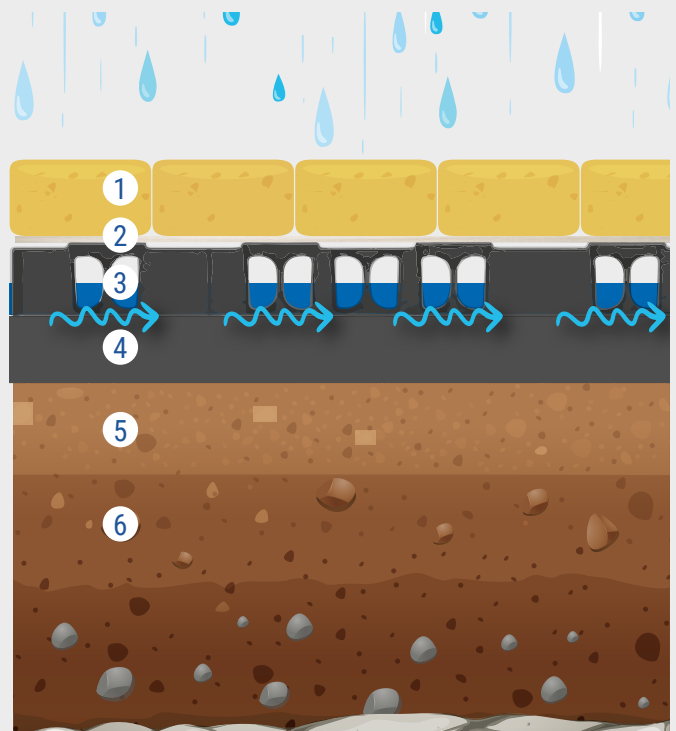
- 1 / ecoDraining pavement
- 2 / Permeable Geotextile
- 3 / Hidrocell cells
- 4 / 10 cms. thick Perforated concrete thickness
- 5 / 25 cms. thick Graded- aggregate.
- 6 / Ground



INSTALLATION ON rigid impermeable base

Collection and transport: the rainwater that drops on the concrete pavement filters towards the polymer piece and is transported thanks to the lower concrete layer. All this water is driven in a controlled way.

- 1 / ecoDraining pavement
- 2 / Permeable Geotextile
- 3 / Hidrocell cells
- 4 / Concrete thickness 10cms.
- 5 / 25 cms. thick artificial Graded-aggregate. Compacted (98% of M.P.)
- 6 / Ground



APPLICATIONS

PUBLIC PROJECTS



APPLICATIONS

BUILDINGS



Recommendations

We recommend you to carefully read these installation recommendations before the installation of the DPS system.

DPS (Dry Paving System)

Sustainable Urban

Drainage System



GEOTECHNICAL STUDY OF THE SOIL

To achieve the best result, it is advisable to carry out a geotechnical study of the terrain, paying special attention to the slopes of the surrounding areas and the soil permeability coefficient (K).

STUDY OF THE AREA PRECIPITATIONS

Depending on the annual rainfall of the project's geographical area, a specific type of installation may be recommended.

KNOWLEDGE OF MUNICIPAL OR REGIONAL REGULATIONS

It is essential to know the rainwater management regulations that apply in the area of action, since they determine the use of the water collected. Normally, water management infrastructures are sized for a specific flow, so if it is exceeded, it will be necessary to use complementary infrastructures such as spillways and storm tanks.

DEFINITION OF THE DIMENSIONS WHERE THE SYSTEM IS TO BE INSTALLED

DPS is modulated in 0.50x0.50m. units. It is recommended to carry out a study of the area to be paved in order to optimize the use of the system and obtain the best finish. DPS has an excellent team of engineers and designers trained to perform this task.

FLATNESS OF THE SUPPORTING SURFACE

To achieve the best architectural finish, it is necessary that the base, rigid or flexible, provides a support surface with the least possible roughness.

CHOICE OF RIGID OR FLEXIBLE / PERMEABLE OR IMPERMEABLE BASE

The conditions of the ground, local regulations and the intended use of the paving determine the type of water drainage, and consequently, the use of a rigid or flexible, and of permeable or impermeable base.

INSTALLATION OF THE GEOCELLS

To ensure a correct adjustment between the elements of the system, it is essential to place all the geocells with the crossarms upwards. Likewise, the first piece will be placed at one of the corners of the area to be paved and, once placed, the rest will be assembled by means of dovetailed lateral joints. Our design and engineering teams are capable of providing solutions for complex areas.

PLACEMENT OF GEOTEXTILE AND CONCRETE PAVEMENTS

The entire geocell structure must be covered with the specific geotextile supplied. The formation of wrinkles should be avoided, making sure that the geotextile is as flat as possible. The **ecoDraining** pieces are placed by adjusting the groove on their reverse side to the crossings of the polymer cells, touch-sensitive adjustable under the geotextile.

THE JOINTS BETWEEN THE CONCRETE PIECES MUST BE COMPLETELY CLEAR.



DPS

DRY PAVING SYSTEM

System developed by:
PVT, HIDROSTANK et AH ASOCIADOS

For more information



www.pvt.es



www.hidrostantank.com



www.ahasociados.com

www.dps-system.com