SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Technical solutions for rainwater management in urbanized environments

HIDROSTANK

Sistema de Gestión ISO 9001:2015

www.hidrostank.com

HIDROSTANK was born in 1996 as the result of a bet in providing innovative solutions that improve the performance of civil construction, with two business lines:

- **Channeling**: manholes, covers, manhole steps...
- **Hydraulic**: hydraulic equipment for storm tanks, spillways...

Accordingly to this double experience, HIDROSTANK's latest commitment to offer **solutions for a more sustainable drainage** was born. This initiative is based on the conviction that the solution to the problems caused by the urbanization boom will be a mixed one:

- by conventional channeling of part of the water to the corresponding wastewater treatment plants,
- combined with the infiltration of rainwater at source using sustainable urban drainage systems (SUDS), which will improve water quality, prevent flooding, and allow aquifer recharge and urban development in areas with saturated collectors.

During these 26 years, HIDROSTANK has been collaborating closely, both nationally and internationally, with local administration, utilities, engineering, contractors, installers, EPC... who rely on our products for their different projects:

- Infrastructure: roads, highways, airports, railways, metro...
- Real Estate Developments, industrial estates
- Photovoltaic & wind
- Drainage and stormwater networks

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Channeling

Hydraulic

SUSTAINABLE DRAINAGE
RAINWATER MANAGEMENT SOLUTIONS

Conventional drainage systems, based on pipe networks, aim to move downstream the stormwater runoff collected in urbanized areas.

Their abuse can cause serious flooding problems, but also pollution on the natural channels because of the discharge of water that carries high concentrations of diffuse pollution (heavy metals, oils, etc.).

The **sustainable urban drainage systems (SUDS)** are a set of advanced technical solutions for stormwater management, contributing to a more sustainable urban development, as they consider not only the problem of the quantity of water, but also its quality and amenity issues (biodiversity, landscape potential, enabling natural habitats, reuse of water for other uses).

Flooding

Pollution

Natural water cycle

A sustainable solution

These systems are more sustainable than traditional drainage methods because they:

- Manage runoff volumes and flow rates (reducing the impact of urbanization on flooding)
- Protect or enhance water quality, natural flow regimes in watercourses, natural groundwater recharge, underground rivers…Enable the evapotranspiration from vegetation and surface water
- Generate social and landscape value, create better places to live, work and play
- Provide a habitat for wildlife in urban watercourses
- Enable the use of rainwater for other uses (irrigation, street cleaning ...)
- SUDS also allow new developments in areas where existing sewerage systems are close to full capacity

It is recommended a **runoff control at origin**: by dealing with runoff at source the volume of water and the potential amount of contamination is less and allow infiltration of the surface water to the ground.

Only if the water cannot be managed on site (too much runoff or bad quality to infiltrate) should be slowly conveyed elsewhere. As last option, runoff could be conveyed through pipes and discharged to a wetland or detention.

Types of SUDS

- Source control: green roofs, Permeable paving
- Filtration: Filter strips, Filter trenches, Bioretention area…
- Swales & conveyance channels
- Infiltration: Soakaways, Infiltration trenches, Infiltration basins
- Retention / detention: Detention basins, Retention ponds, Geocellular drainage
- Wetlands





RAINWATER HARVESTING SUDS
DRAIN MANHOLE WITH BASKET

SUDS: Rainwater Harvesting

There are two ways of harvesting rainwater: the first consists of collecting it through the ground by means of **permeable pavements**, and the second is to collect the water through **drain manholes**, which lead it to the infiltration tank.

Although the most natural way is through the ground, there are times when this is not possible, and it is necessary do it by to conventional harvesting. Either because the site is already built and it is difficult to change the entire pavement, or because there is a contamination that it is necessary to remove from the rainwater before infiltration.

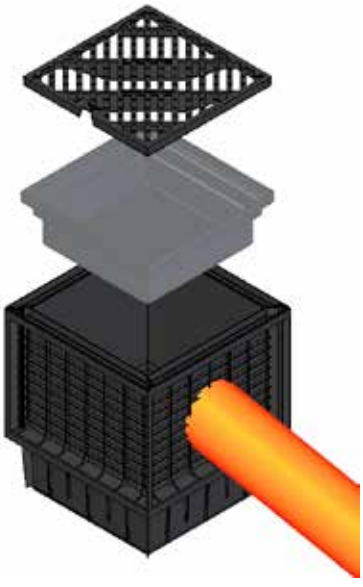
The removal of floating debris, suspended solids, hydrocarbons, or metals can be done in the same drains or through hydrodynamic separators or hydrocyclones.

Permeable pavements

Drain manhole with basket

The collection by means of drain manholes involves the transport of pollution found on the surface of the streets (cigarette butts, papers, plastics...).

Therefore, it is necessary to make a pretreatment. Hidrostank provides this solution consisting of a polypropylene manhole with a sandbox, on which a cast iron grate is placed. This grate is connected to the pit through a levelable frame, on which a basket is placed to retain the mentioned pollutants.



PRETREATMENT
DRAINAGE SYSTEMS
HYDRODYNAMIC SEPARATOR

When the harvesting is not done by infiltration of rainwater through permeable pavements, but through drain manholes, it is necessary to treat the rainwater to remove floating debris, suspended solids, or hydrocarbons.

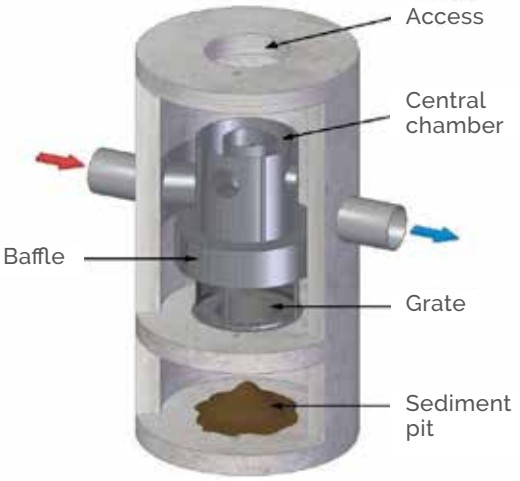
Drainage System

It consists of a folding cast iron grate, connected through a galvanized steel leveling frame to a modular polypropylene drain manhole, coupled to a system of HIDROCRATE/HIDROBOX infiltration boxes. These attenuation crates allow the infiltration of the water collected in the ground, and/or the necessary storage (depending on the permeability).

The folding grate is connected to the manhole by means of an integration frame, which allows it to be leveled. On this frame rests a perforated galvanized steel basket that acts as **a prefilter to retain leaves, cigarette butts, papers, plastics...** carried by the runoff, for future extraction.

At the bottom of the drain manhole lies the filter that **removes the impurities carried by the rainwater**. This filter medium is contained in a geotextile, which also performs its corresponding filtering of rainwater before it passes to the HIDROCRATE/HIDROBOX attenuation crates, which are wrapped in another geotextile that prevents the clogging by gravel or fines.

This system provides a sustainable treatment of rainwater and makes it easy to remove the pollutants retained in the basket and to replace the filters.



Hydrodynamic Separator

The hydrodynamic separator is a rainwater treatment device, which, thanks to its "continuous deflective separation", together with indirect screening, separates and traps residues, sediments, oils and grease associated with runoff.

As a result, **it neutralizes 100% of floating debris larger than 5 mm.**

A widespread practice for the removal of suspended solids from water is the well-known "direct screening", which has the disadvantage that the screens are quickly clogged. This causes an increase in upstream pressure, which can lead to flooding.

The design of the hydrodynamic separator grid has managed to solve this problem thanks to the effect known as "continuous deflective separation". Rainwater enters the unit creating a rotational flow that drives the flow into the separation chamber. Here, thanks to the vortex force generated and the deflection force of the self-cleaning screen, 100% of the floating debris larger than 5 mm is channeled to the waste storage tank.

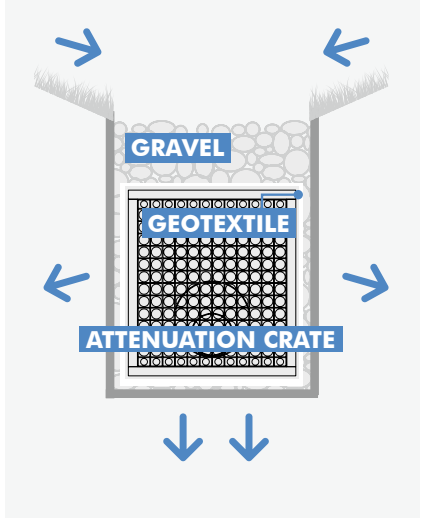
Model	DN	Q 110 microns	Q 5 mm	Q by pass	Ditch Volume
SH 1200	1200	22 l/sg	90 l/sg	102 l/sg	0,69 m^3
SH 1800	1800	106 l/sg	240 l/sg	309 l/sg	1,55 m^3
SH 2500	2500	235 l/sg	446 l/sg	515 l/sg	4,42 m^3
SH 3000	3000	725 l/sg	780 l/sg	1023 l/sg	6,36 m^3
SH 3600	3600	1205 l/sg	1425 l/sg	1751 l/sg	11,20 m^3

INFILTRATION / RETENTION
HIDROCRATE - HIDROBOX – HIDROCELL - DPS

The geostructures, or **geocellular modular systems,** allow the infiltration, lamination, filtering... of rainwater in a simple way and with a high integrability in today's high building density urbanism. They can be used at the source, or the runoff can be transported to the infiltration/retention area by means of a pipe or drainage channel.

Both the **HIDROCRATE** and **HIDROBOX** are highly resistant plastic attenuation crates that allow a modular and simple construction of rainwater harvesting, accumulation, and underground conveyance elements:

- Infiltration / detention tanks
- Filtering trenches / soakaways



APPLICATIONS

Infiltration

Infiltration at source is becoming a necessity in rainwater management. With the use of our infiltration boxes in new urban developments, or in existing ones, we achieve the **infiltration of rainwater into the underground layers,** simulating the hydrological cycle prior to urbanization.

The system is wrapped in a **permeable geotextile.** Water can enter it through the **HIDROCELL** or through pipes. If the water enters through pipes, it is necessary to place at least one manhole to allow ventilation. Likewise, when the collection is done through drain manholes, it is necessary to pretreat the rainwater by means of a pretreatment basket and/or hydrodynamic separators.

Retention

The retention of rainwater allows the water to be **managed or retained for later reuse.** For this purpose, an impermeable **geomembrane is placed to guarantee the watertightness of the tank,** protected by two sheets (inner and outer) of permeable geotextile.

IMPORTANT: It is necessary to emphasize the importance of the correct execution of the installation due to the great influence it has on the good operation of the system, maintenance, and useful life, especially in the retention tanks that must guarantee watertightness.

The SUDS will be installed as late as possible, protecting the percolation surfaces to avoid their clogging during the work.

Ask for the assembly and installation recommendations so that the SUDS are properly installed and a correct maintenance can be performed.

CHARACTERISTICS

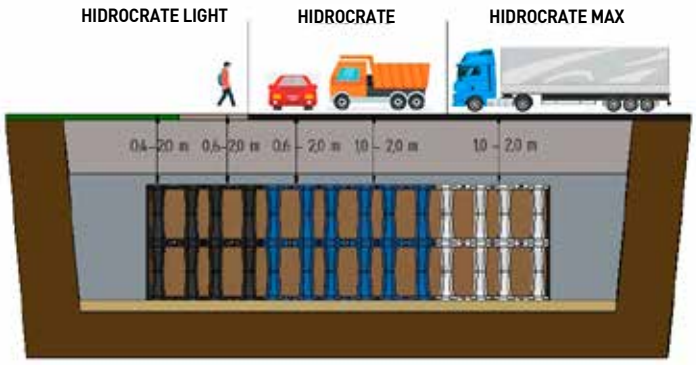
- Large volume per box (95% void ratio versus 25% of gravel)
- High resistance to compression
- Quick and easy installation: manual handling, without machinery.
- Modularity: allows a bespoke dimensioning for each project
- Ecological: 100% recycled and recyclable
- Easy transport and storage, as the system is shipped disassembled
- Easy maintenance thanks to filtration before the cell. CCTV Inspectable
- Economics: minimizing excavation, labor, machinery ...

HIDROCRATE

The **HIDROCRATE** system is a highly resistant plastic geo-structure that allows the collection, infiltration, accumulation, and underground transport of rainwater in a modular and simple way. With a very simple manual assembly, the product **allows configurations of different heights** and simplifies the assembly of previous models, **thanks to its innovative interior design based on columns.**

The **HIDROCRATE** is composed of a base piece that, when joined with another piece of the same type, forms a block with the following **characteristics**:

TECHNICAL CHARACTERISTICS	
Material	Polypropylene reinforced with mineral charges
Dimension	500 x 500 x 500 mm
Surface by unit	0,250 m^2
N° of pieces per ml	4 (2x2)
N° of pieces per m^2	8 (4x2)
No of pieces per m^3	16 (8x2)
Total capacity	125 l
Useful capacity	118 l
Void ratio	94%



SHORT TERM VERTICAL COMPRESSIVE STRENGTH

Mod. **LIGHT** - 35 ton/m^2 Mod . **STANDARD** - 43 ton/m^2 Mod. **MAX** - 51 ton/m^2

By adding more blocks, the surface area and, consequently, the retention volume can be increased. The junction between boxes is made by means of connectors. When we want to increase the height of the tank, the screed and block connectors are used. Once the assembly of the inner structure of the tank has been completed, the top and side covers, and the connectors are placed.

HIDROBOX

The **HIDROBOX** attenuation crate is a highly resistant plastic geostructure that allows the construction of elements for the collection, infiltration, accumulation, and underground transport of rainwater in a modular and simple way.

With an interior design based on partition walls, very simple manual assembly, the **HIDROBOX** infiltration box can be configured in various ways depending on the required resistance (green areas, pedestrian areas, traffic).

Its modularity offers great flexibility during the project design since it allows the installation of any configuration depending on the available area.

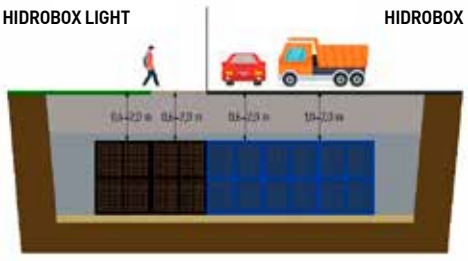
							Total Volume		Retention Volume		
HIDROBOX	HI001	HI002	L (m)	A (m)	H (m)	Weight (kg)	V/crate (m^3)	Crates/m^3	V/crate (m^3)	Crates/m^3	Void ratio
1.1	4	3	0,728	0,445	0,495	11,85	0,1604	6,24	0,1509	6,63	94%
2.1	7	6	0,728	0,445	0,966	21,63	0,3129	3,2	0,2956	3,38	94%
3.1	10	9	0,728	0,445	1,437	31,41	0,4655	2,15	0,4404	2,27	95%
4.1	13	12	0,728	0,445	1,908	41,19	0,6181	1,62	0,5852	1,71	95%
5.1	16	15	0,728	0,445	2,379	50,97	0,7707	1,3	0,7299	1,37	95%

SHORT TERM VERTICAL COMPRESSIVE STRENGTH

Mod. **LIGHT**
30 ton/m^2

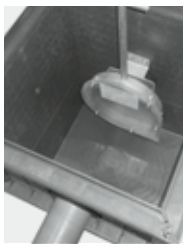
Mod . **STANDARD**
40 ton/m^2

HIDROBOX LIGHT **HIDROBOX**



ACCESORIES HIDROCRATE - HIDROBOX

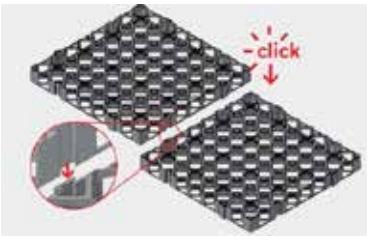
- Inspection / ventilation chamber
- Pipe inlet couplers
- CCTV inspectable channels
- Flow regulator chambers (vortex)
- Hydrodynamic Separator



HIDROCELL

The **HIDROCELL** system is a highly resistant plastic geo-structure that allows the execution of rainwater collection, accumulation, and subway transport elements in a modular and simple way.

With a very simple manual assembly, the product allows configurations of different heights.



Regardless of the permeability of the soil, which will condition infiltration, the **HIDROCELL** allows to provide the subsoil with an additional retention volume in addition to channeling water horizontally in search of the most permeable areas.

SHORT TERM VERTICAL COMPRESSIVE STRENGTH

Modelo **LIGHT** _____ 60 ton/m^2

Modelo **STANDARD** ____ 90 ton/m^2

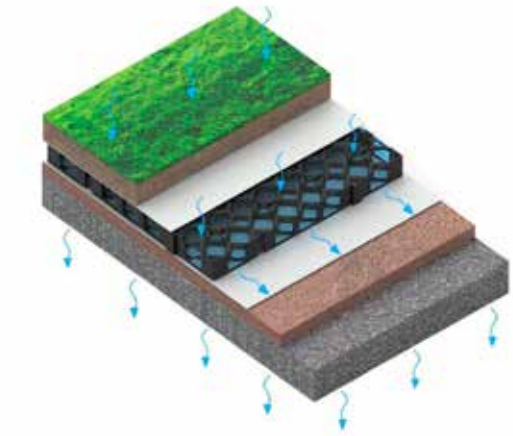
Modelo **MAX** _____ 125 ton/m^2

DPS

The **DRY PAVING SYSTEM (DPS)** is a system that integrates a **permeable paving with an underground structure composed by HIDROCELL geocells,** guaranteeing a rainwater **high infiltration and retention capacity** under its surface.

The ecoDraining concrete elements, whose composition and porosity guarantee water permeability, both by mass and by joint, are placed on the upper part of the system. Their lateral spacers ensure the formation of uniform joints through which water can enter.

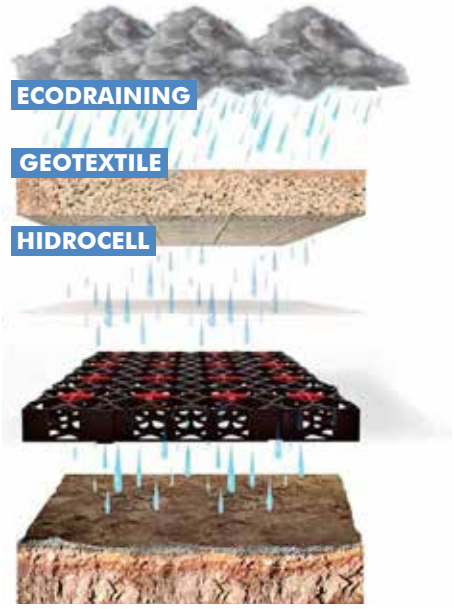
The **HIDROCELL** polymeric geocell grid supports the ecoDraining pavement with which it is connected by means of a system of crosspieces and grooves specially designed to ensure a tight fit. Between the ecoDraining pieces and the **HIDROCELL** geocells, a thin layer of geotextile facilitates water infiltration and prevents the passage of particles, allowing a perfect anchorage between the geocells and the pavement.



INSTALLATION AREAS

- Green surfaces
- Cobblestone surfaces
- Bituminous surfacess

It is necessary to emphasize the importance of the correct execution of the installation due to its great influence on the proper operation, maintenance, and service life of the system.



WATER FLOW REGULATION
VORTEX

VORTEX valves regulate small flow rates with a large passage section, minimizing the risk of clogging.

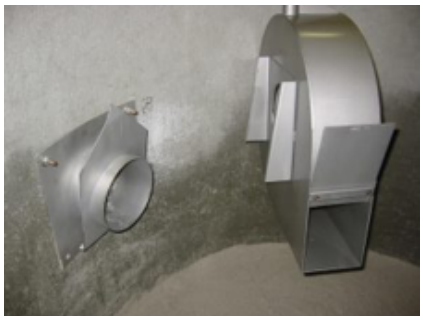
The absence of moving parts, as well as the fact that they do not require energy supply, help **reducing their maintenance.**

Manufactured in AISI 316 stainless steel, they guarantee **maximum durability** under all operating conditions.

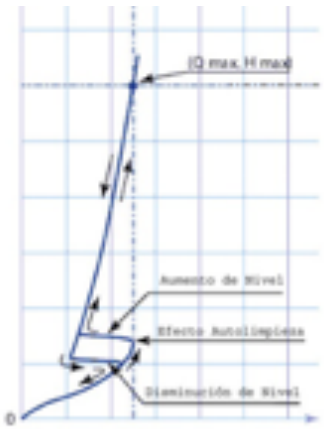
The **VORTEX** regulates the flow rate according to the height of the water. In the separating systems, there is no water flow in dry weather. When it starts to rain and the water reaches the regulator, it passes through the regulator without difficulty. If the water height increases, air is trapped in the upper part of the regulator chamber and a vortex is created.

At this point, the characteristic curve becomes parabolic, reducing the flow rate. The potential energy of the water is lost in the rotation, the cross-section is reduced by the air core, thus limiting the discharge. As the inflow to the spillway decreases, the head of the water decreases, and the characteristic curve continues to be parabolic until air enters the regulator.

This air entry destroys the vortex and creates a sudden increase in discharge, which facilitates cleaning upstream.



VORTEX installation after a infiltration / detention tank.



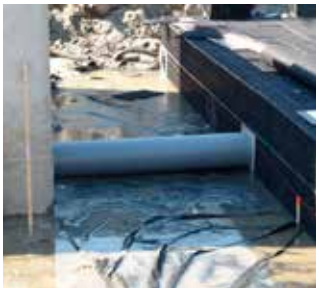
TECHNICAL OFFICE

Hidrostank has a technical office that can advise you on the dimensioning, assembly, and installation of the SUDS, taking into account:

- Soil type: sands, gravels, clays... (infiltration test)
- Pluviometry of the area (rainfall for a return period of X years)
- Area and runoff coefficient

INSTALLATIONS















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