

Hydrain®

High-performance solutions for every drainage requirement

HUESKER

Ideen. Ingenieure. Innovationen.

The Problem

If water is not drained

Wherever water can penetrate structures or accumulate within a building, it must be reliably collected and drained. If it remains in the structure, standing water and pore water pressure may develop. Possible consequences include erosion, frost damage, and deformation, which can impair the structure's function and stability. Drainage requirements vary depending on the construction method, load, and installation conditions. However, the goal remains the same: to drain water in a controlled manner and provide long-term protection for the structure.

Inadequate drainage
Water cannot be adequately absorbed and drained within the structure.

Erosion and material removal
Uncontrolled water flow can cause the erosion and loss of mineral layers.

Damage to the superstructure
Erosion and deformation can impair the function of the structure.

Controlled drainageis necessary,
to reliably drain water and provide long-term protection for the structure.

AI-generated visualization

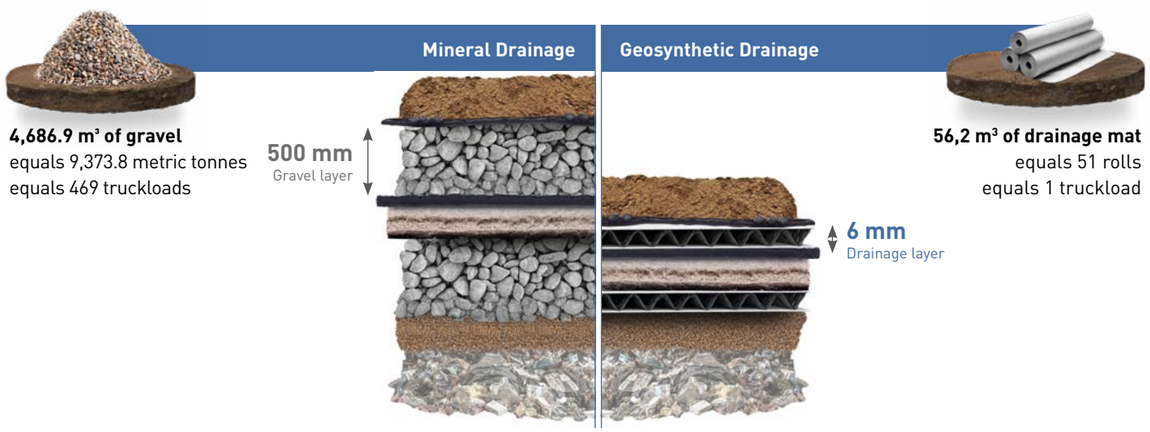
Geosynthetic Drainage

A compact alternative to mineral drainage

Mineral drainage layers made of gravel or crushed stone have proven effective for draining water. However, the required layer structure involves large quantities of material and significant costs for transportation and installation.

Geosynthetic drainage systems can offer a compact alternative for this purpose. The low installation height and the fact that it is delivered in rolls reduce material requirements as well as the effort involved in transportation and handling. This makes it possible to replace mineral drainage layers in many applications in a cost-effective and resource-efficient manner.

Same function—significantly less effort



	Mineral		Geosynthetic
Transportation Costs 20 metric tonnes payload per trip *Total distance in each case including the outbound and return trips	**469** Trips of 50 km each*	⟷	**1** 600 km per trip*
Tyre wear	**39.9** kg	⟷	**0.72** kg
CO_2 emissions	**21,800** kg	⟷	**557** kg

Use of Geosynthetic Drainage
Reduction in transportation-related CO_2 emissions of up to **97%**

Basis for Calculation

The calculation example is based on a reference area of 9,373.8 m². The comparison is between a 0.5m thick mineral drainage layer made of gravel or crushed stone and a geosynthetic drainage solution, Hydrain C06-350 FCF100, which serves the same function in the reference case. For the mineral based variant, a material density of 2 t/m³ and a payload of 20 t per truck trip were assumed. The figures for tyre wear and CO_2 emissions apply exclusively to transportation. The required sizing must be verified on a project-by-project basis.

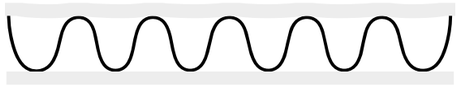
Click here for the calculation basis

Evaluating drainage

A Comparison of the Systems

Geosynthetic drainage mats differ in the design and structure of their drainage core. Their performance is determined not only by their thickness or area density, but also by how water is effectively drained under actual installation conditions.

Overview of Core Structures
Drainage cores can be constructed in various ways. The 3D monofilament, dimpled, and geonet structures shown here each create the necessary flow space in different ways.



3D monofilament structure
Individual plastic filaments are woven together to form an open, three-dimensional structure.



Dimpled strucutre
A profiled plastic sheet creates spaces for water drainage through its raised bumps.



Geonet structure
Overlapping, intersecting plastic ribs form a mesh-like structure with open spaces between them.

The Decisive Factors

01
Creating flow space
Provide a cavity for water drainage

02
Use the flow space
Drain water with as little resistance as possible

03
Maintain flow space
Secure the hydraulically active cross-section under load

04
Achieving Performance Efficiently
High discharge capacity with optimised use of materials

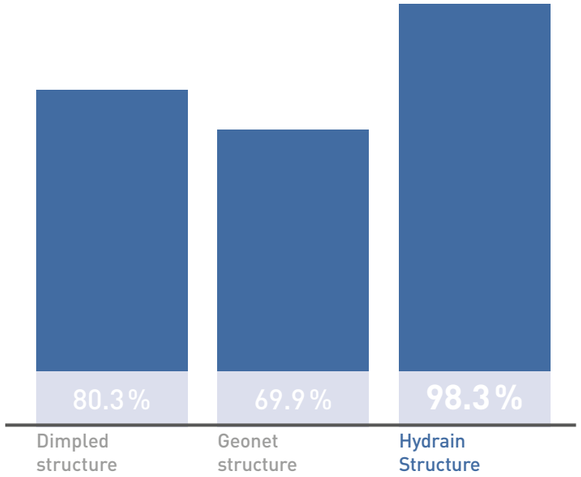
The key factor is the drainage capacity under load.

Create Space for Flow

A cavity as the basis for water drainage

To ensure that water can be successfully drained within a drainage mat, there must be sufficient free space. The void fraction describes the proportion of the drainage core's volume that is available for this purpose and is not occupied by the plastic structure. The less of this space that is taken up by the structure itself, the greater the potential for open flow paths.

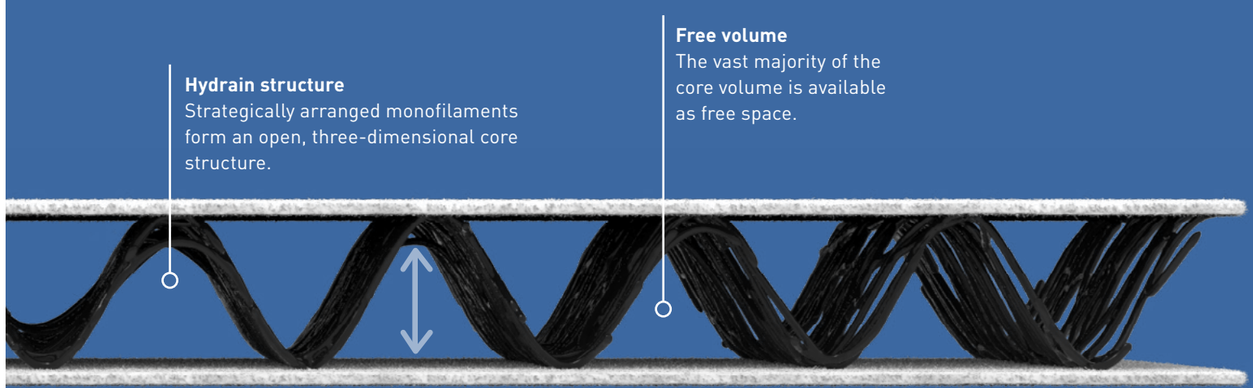
Free volume fraction of various drainage structures
The comparison examines the proportion of free volume in three different drainage cores in the same model height.



Geometric comparison of three simulation models with a height normalised to 6 mm. Porosity is shown as the ratio of free volume to total volume. The model geometries are idealised representations of the core structures investigated. Source: Internal modeling and analysis, HUESKER.

More space for water drainage
In the model comparison, the Hydrain core structure has the highest free volume fraction, at 98.3 %. Compared to the modeled dimpled and geonet structures, the core structure itself occupies less space. This provides more open space for water drainage.

Why is there so much empty space?



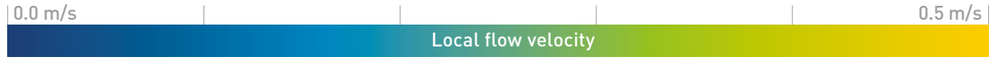
The open Hydrain structure forms the basis for the high porosity.

Use the flow space

Uninterrupted flow paths for efficient water drainage

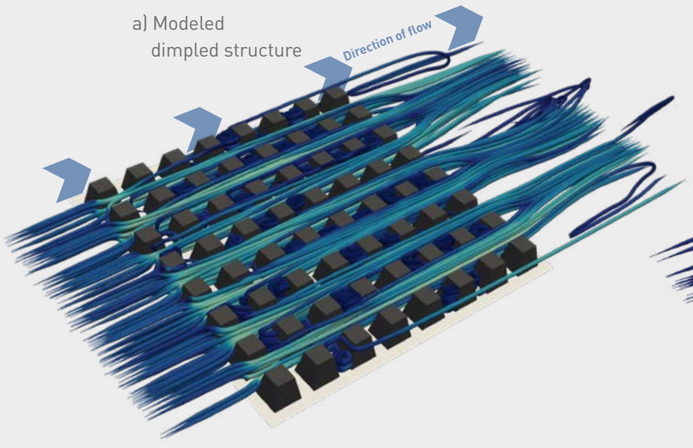
A high porosity creates the conditions necessary for water drainage. How efficiently this space is used depends largely on the geometry of the drainage core. Unobstructed, continuous flow paths allow for efficient water drainage, while bends and narrow sections impede water flow.

Comparison of local flow velocities

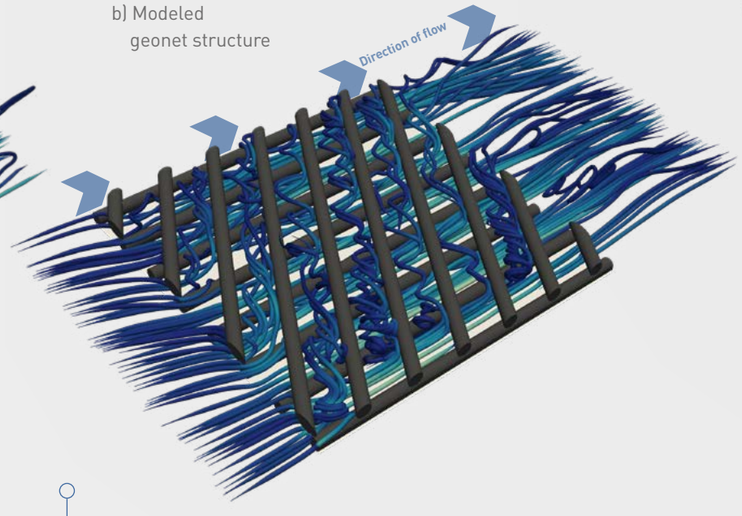


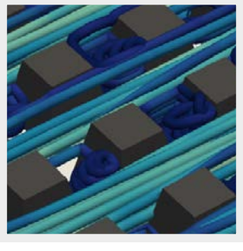
The figure shows the local flow velocity in the flow simulation

a) Modeled dimpled structure

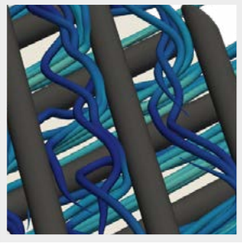


b) Modeled geonet structure





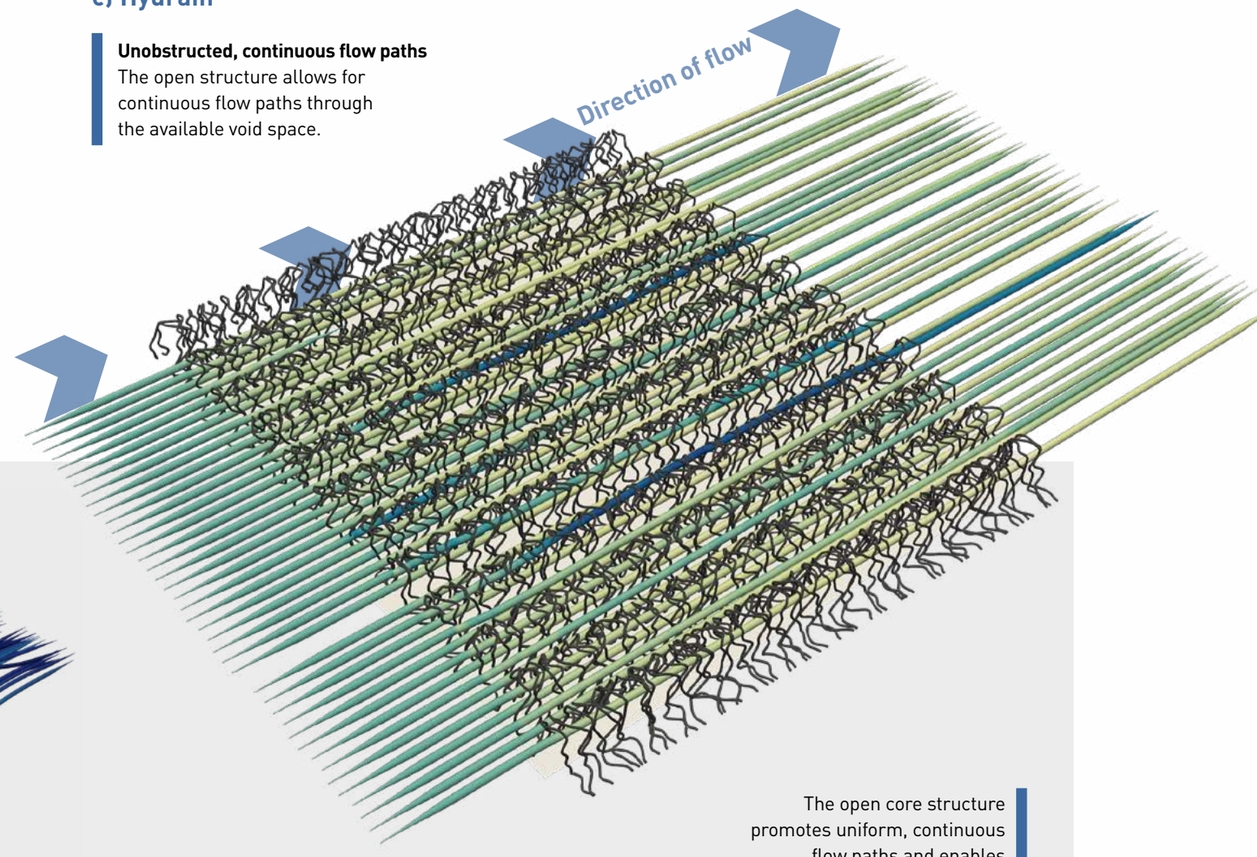
Repeated redirects
The examined nubby geometry leads to repeated changes in direction in the flow pattern.



Limited flow paths
The rib structure under investigation restricts the available flow paths and creates regions with lower flow velocity.

c) Hydrain

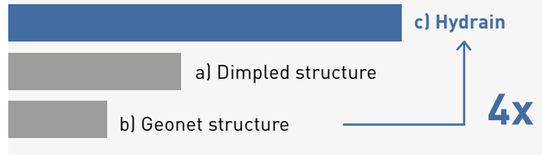
Unobstructed, continuous flow paths
The open structure allows for continuous flow paths through the available void space.



The open core structure promotes uniform, continuous flow paths and enables efficient water drainage.

4 Up to -fold relative water drainage capacity

Relative Water Repellency



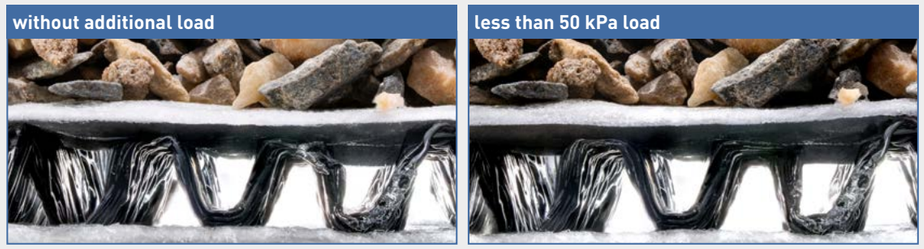
CFD-based comparison for a hydraulic gradient of i = 0.1. The study examined idealised, unloaded core geometries; the influence of the filter fabric and its potential subsidence under load was not included in the simulation. The original geometries, including their structural dimensions, were uniformly scaled to a height of 6 mm; the filament diameter in the Hydrain model is 0.3 mm. The same hydraulic gradient was specified, not the same inflow velocity. Boundary conditions based on DIN EN ISO 12958. Source: internal HUESKER flow simulation.

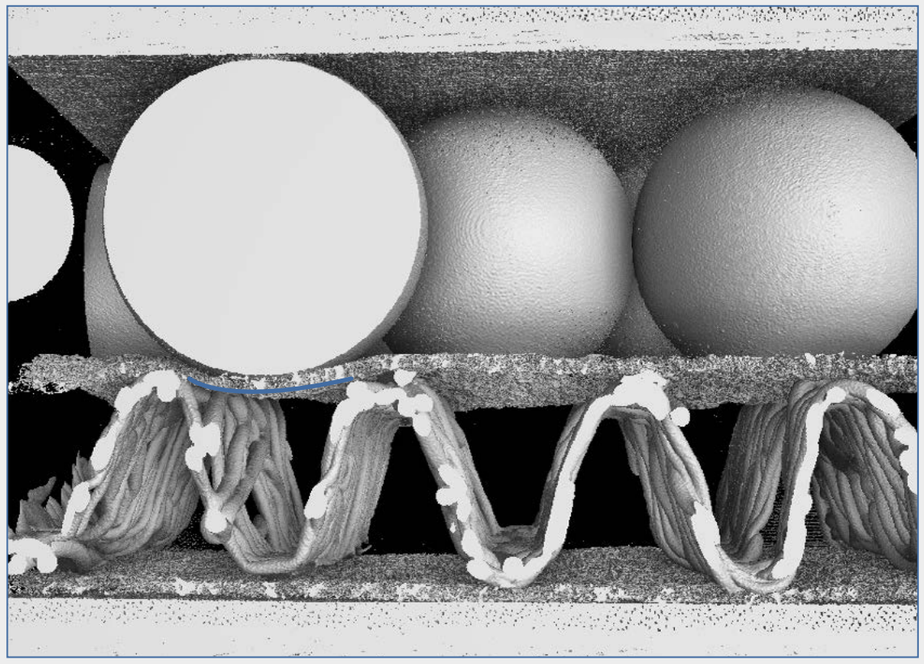
Maintain flow space

Unobstructed flow paths under load

A drainage mat must effectively drain water even under load. It is therefore crucial that the cavity created and the unobstructed flow paths remain intact as much as possible under load. A key factor in this is the support provided to the filter fleece by the drainage core. The filter fleece allows water to enter the core while limiting the movement of soil particles. If it sinks into the drainage core between the support points, the flow space available for water drainage is reduced.

Hydrain Channel





Calculated Filter geotextile intrusion
Sinking of the filter fabric into the drainage core: 9.8 %

9.8 %

Under a load of less than 50 kPa, the calculated geotextile intrusion between the support elements is 9.8%. Under the conditions studied, the flow space available for water drainage is thus largely preserved.

A comparison of three reference products

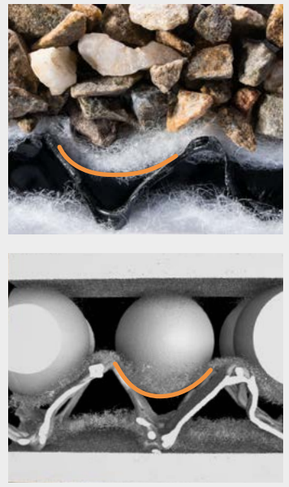
Macro and CT images show how differently Hydrain Channel and the three reference products examined support the filter fleece under a 50 kPa load.

Internal comparative study of Hydrain Channel and three selected commercially available reference products under standardised test conditions. Macro and CT images illustrate the compression of the filter fleece under load. The geotextile intrusion was determined based on CT scans taken without loading and at pressures below 50 kPa at five measurement points between each pair of support points of the drainage core. The percentages describe the relative deflection compared to the unloaded state. The results apply exclusively to the products and test conditions. Source: HUESKER.

3D- Monofilament Structure

Reference Product

less than 50 kPa load



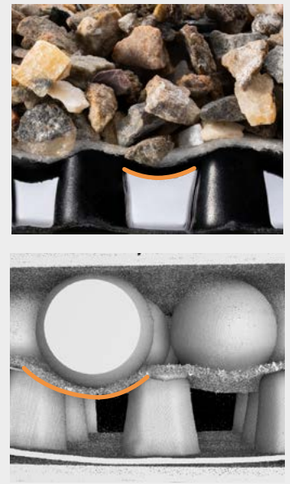
In this reference product, the filter fleece penetrates deep into the core structure. This narrows the available flow space and reduces the potential for water drainage.

Calculated Filter geotextile intrusion
53.2 %

Dimpled structure

Reference Product

less than 50 kPa load



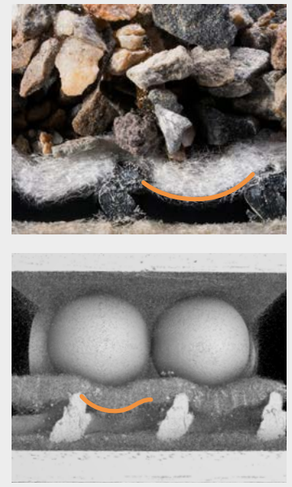
The nubs provide localised support for the filter fleece. Between the support points, it sinks into the drainage core. As a result, there is less flow space and a smaller cross-sectional area available for water drainage.

Calculated Filter geotextile intrusion
14.2 %

Geonet structure

Reference Product

less than 50 kPa load



Between the intersecting ribs, the filter fleece protrudes into the mesh. This reduces the cross-sectional area available for water drainage in that specific area.

Calculated Filter geotextile intrusion
12.7 %

Efficient Performance

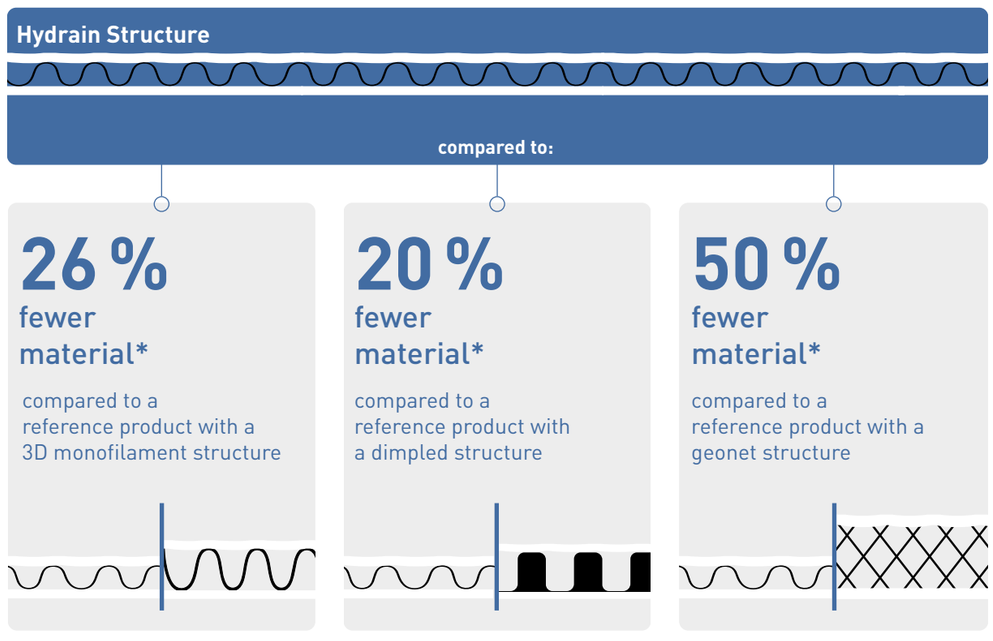
Resource efficiency through intelligent geometry

An effective drainage system reliably drains water under load. In addition to hydraulic performance, the amount of material required is also an important evaluation criterion. An efficient core geometry enables the required water drainage while reducing material usage.

Up to 50 % less material*

with at least the same water drainage capacity

Hydrain compared to selected reference products



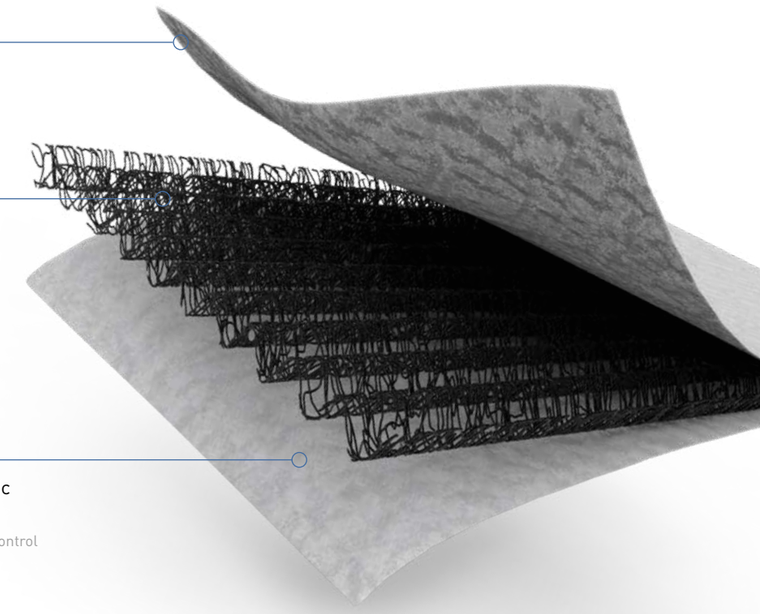
*The percentages were calculated based on the area weights of selected Hydrain variants and standard reference products available on the market, as listed in the respective technical data sheets. The comparison was based on the amount of material used per square metre, assuming at least the same water drainage performance under identical specified test conditions. The benchmark is the respective reference product.
Source: manufacturers' technical data sheets; Calculation: HUESKER.

Hydrain Drainage Systems

Less material, more impact

With Hydrain, HUESKER offers high-performance geosynthetic drainage systems designed to meet a wide range of requirements for reliable water drainage. The 3D monofilament core creates open flow space, supports the filter media under load, and enables reliable water drainage while making efficient use of materials. Depending on their configuration, specially designed geotextiles perform filtration, separation, and protection functions. As a protective layer, they can reduce local mechanical stress on adjacent waterproofing membranes. When combined with optional diaphragms, this creates a functional unit suitable for a variety of operating conditions. With the Channel and Bubble core geometries, drainage capacity, load-bearing capacity, flow direction, and installation height can be specifically tailored to the requirements of each project.

Hydrain Channel in System Construction



Hydrain Channel at a Glance

Create Space for Flow
Open 3D structure for a high porosity

Use the flow space
Unobstructed flow paths for uninterrupted water drainage

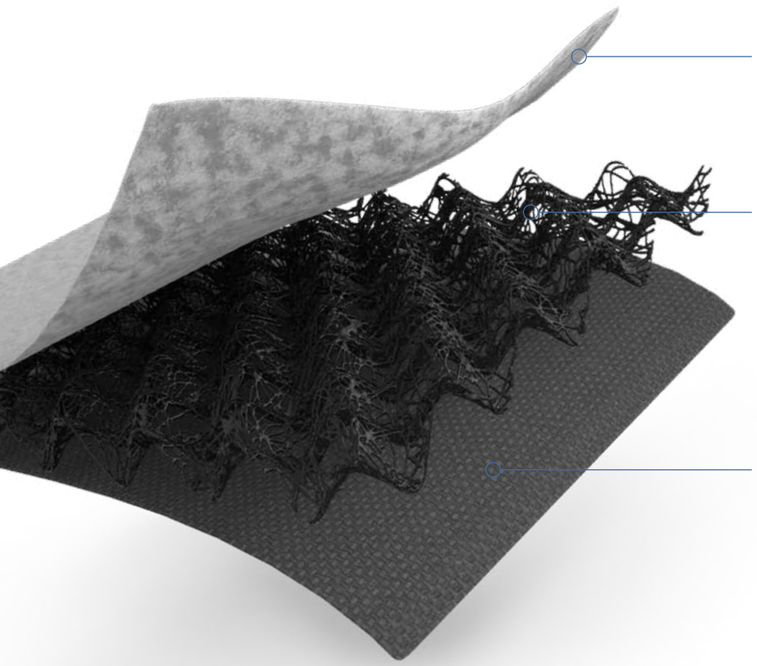
Maintain Flow Space
Supporting the filter fleece for open flow paths under load

Achieving Performance Efficiently
High water drainage with efficient use of materials

Hydrain Bubble

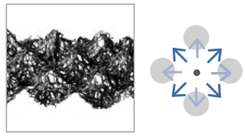
For multidirectional water drainage

In cases of large-scale water inflow or changing flow directions, open flow paths and a correspondingly large hydraulic cross-section are required. Hydrain Bubble combines a profiled 3D monofilament core with functional layers tailored to the application, such as geotextiles or membranes. The open core geometry allows for multidirectional water drainage and provides a large hydraulic cross-sectional area for this purpose.



Coordinated Top Layer
for filtration, separation, and application-specific protection
Optional membrane can be integrated for precise water control

3D monofilament core
for high flow capacity, multidirectional water drainage, and dimensional stability



System-Compatible Underlay
for protection, filtration, and application-specific system design
Optional membrane can be integrated for precise water control

Technical Specifications for Hydrain Drainage Systems*	
Structure	3D geocomposite consisting of a monofilament core, thermally bonded to geotextile filters / membranes
Material	PP, PA
Function(s)	Water and Gas Drainage, Filtration, Separation, Protection
Water drainage capacity	Discharge capacity up to 7 l/(m·s)
Installation Height	up to 22 mm
Service Area	Withstands pressure loads of up to 200 kPa
Roll width	up to 3.2 m

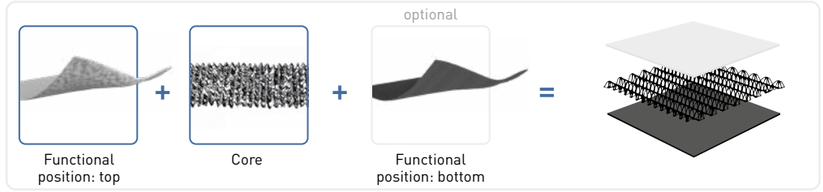
*Materials, features, and performance specifications vary depending on the product model. The maximum values listed may apply to different product variants and test conditions. The current technical data sheets are authoritative for project-specific sizing.
Source: HUESKER.

Custom System Solutions

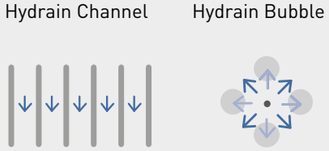
Components that adapt to your project

Hydrain can be configured to meet the specific requirements of each project. Hydrain Channel is particularly well-suited for defined flow directions, high loads, and applications with limited installation height. Hydrain Bubble allows for multidirectional water drainage and provides a large hydraulic cross-sectional area even when flow directions change. Depending on the required water drainage, the dead load, and the available installation height, the core geometry, core height, and the upper and lower functional layers are combined. This results in a system solution tailored to the specific project requirements.

The Hydrain Building Set



Select a drainage core



Add Functional Layers



Select the appropriate configuration

Drainage core	High load	Limited installation height	Defined flow direction	Multiple flow directions	Large hydraulic cross-sectional area
Hydrain Channel	✓	✓	✓	—	✓
Hydrain Bubble	(✓)	—	—	✓	✓

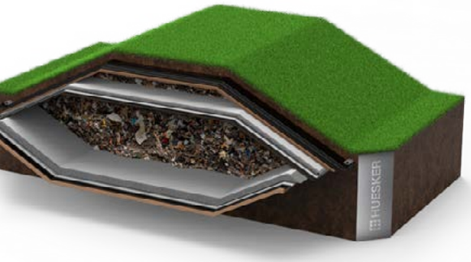
Functional Positions	Filter	Separate	Water-resistant	Gas-permeable
Separation and Filter Fabric	✓	✓	—	✓
Water-impermeable membrane	—	✓	✓	—
Gas-permeable membrane	—	✓	✓	✓

✓ Suitable (✓) depending on the product version and load case — not provided for

Areas of Application

Drainage Solutions for a Wide Range of Applications

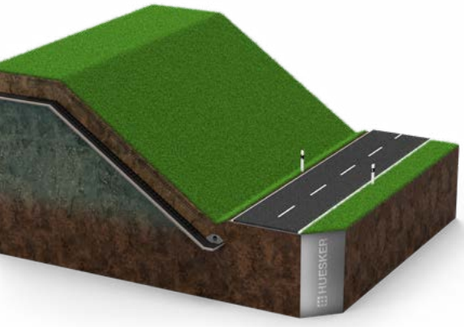
The requirements for a drainage mat vary depending on the construction method, load, and water inflow. With Hydrain Channel and Bubble, the drainage solution can be tailored to the specific flow direction and installation conditions. This is how high-performance solutions are developed for a wide range of applications in earthworks and civil engineering.



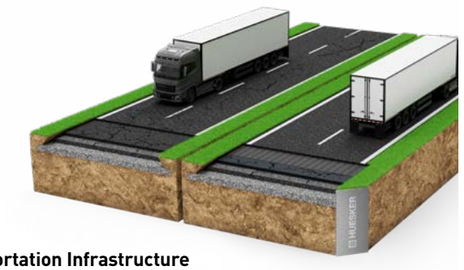
Landfill Construction
For the drainage of seepage water and rainwater, as well as for certain product models, landfill gas.



Tunnels and Structures
To reduce water and moisture exposure to structural components in contact with the ground.



Slope and Landscape Construction
To reduce waterlogging and water-related instability.



Transportation Infrastructure Construction
To reduce waterlogging and frost damage in the subgrade.

Your Benefits at a Glance

High drainage capacity
The 3D monofilament core supports the filter fleece and prevents it from sinking into the drainage core. This ensures that a large portion of the river channel remains available for water flow.

CO_2 reduction potential
This material-efficient design can reduce material and transportation requirements and thus offers the potential to lower transportation-related CO_2 emissions. EPDs are available for select product versions.

Cost-Effective Logistics
Optimised roll sizes and widths allow for maximum loading per truck and quick installation on site.

Configurable
Modular cores allow for project-specific high flow capacity or a higher allowable load.

Project Examples

High Performance in Practice





Site drainage for new traffic areas
Brazil | During the construction of the Brasporto business park in Jacareí, soil that was highly susceptible to settlement had to be prepared for the planned roads. Hydrain* replaced the originally planned drainage layer of sand over an area of approximately 40,000 m². When used in combination with vertical drains, it accelerates settlement and shortens the wait time before road construction can begin. The lightweight, flexible material was quick and easy to install. A test site set up in advance confirmed the suitability of the solution, which was being used in Brazil for the first time. Settlement measurements and pore water pressure measurements were conducted throughout the preloading phase, allowing for monitoring of the soil's behaviour.





Safe drainage in mining
North Macedonia | To expand the tailings storage facility at the SASA mine, a multi-layer sealing and drainage system was constructed on top of existing mining tailings. Two Hydrain* drainage mats ensure controlled water drainage above and below a geosynthetic clay liner. The lower drainage mat counteracts an increase in pore water pressure in the subsoil. The upper one collects any water that accumulates and drains it through drainage pipes. Two different product versions tailor the drainage capacity to the respective hydraulic requirements while also reducing the load on the waterproofing system.

* The projects shown were implemented using products that have been marketed under the name Hydrain since October 29, 2026. The original product names may differ.

Hydrain® is a registered trademark of HUESKER Synthetic GmbH.
HUESKER Synthetic is certified to ISO 9001, ISO 14001, and ISO 50001.

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