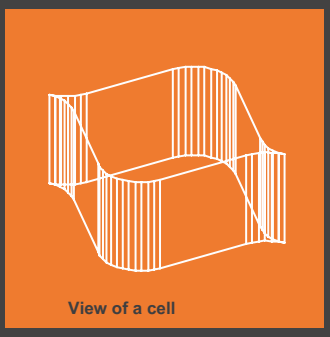
cell geogrid

What is it ?

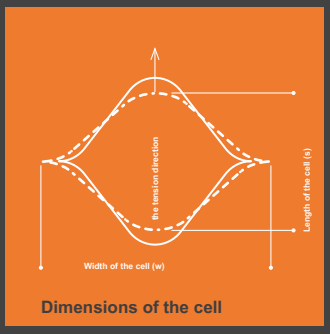
The con finely cellular system was designed in the 70s of the twentieth century as part of a scienti fi Presto Product Co. cooperation with the Corps of the US Army Corps of Engineers. On a large scale, it was used during the "Desert Storm" operation during the Gulf War, where it was transported quickly and e ffi ciently heavy military equipment.

How does this work?

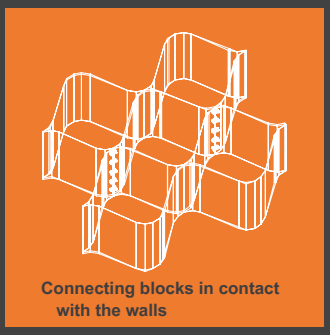
The cell geogrid system has an e ff ect on the beneficial properties of non-compact materials, such as gravel or sand. The imprisonment of these materials within the geosynthetic cells increases the resistance of these materials to shear following compaction until they reach adequate values according to Proctor. The main element of the system is a cellular geogrid which form a spatial block, filled with diff erent materials. Such improved filling eliminates the most expensive and complex elements or expensive techniques. Cell geogrid is an optimal solution in low capacity of the soil load and reduces the costs of its



View of a cell



Dimensions of the cell



Connecting blocks in contact with the walls

This material or the final product is not hazardous to health. As it is not soluble in water and is characterized by high resistance to the action of chemical factors (including those found in the soil), it does not cause danger to the natural environment.

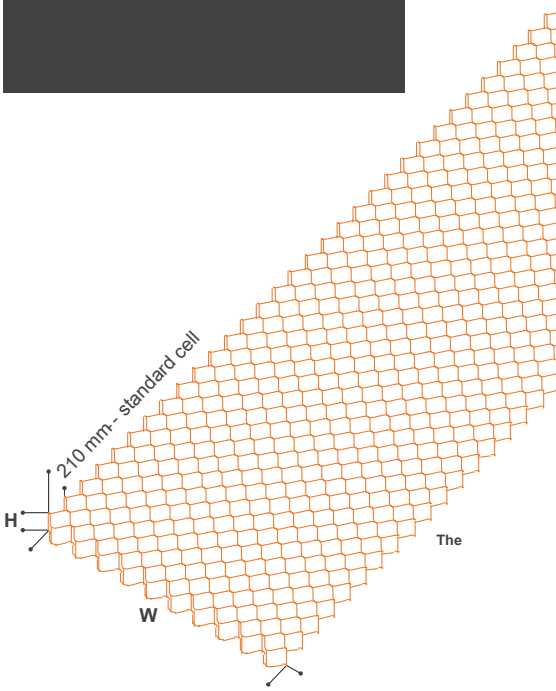
enhancement.

Tensar known on the Polish market under the name of "geocell" or "geogrid" are made with polyester or modified with polyethylene. Polyethylene is stable dansuneplagedes temperatures of -50 ° C to + 80 ° C

and it becomes deformable at a temperature of + 125 ° C to + 132 ° C.

More detailed information about the di ff erence between the materials found in the prospectus devoted to cell geogrid made with polyester modified, namely Nanoweb.

The completeness of the system and versatility result from a number of parameters, obtained with a minimum fi nancial cost, which currently requires earthworks and hydraulic structures, such as: building, filtration, separation, drainage, protection. The simplicity of this solution and at the same time, e ffi ciency of the system results from the possibility of using a low-quality aggregate as filler. The aggregate enclosed in the di ff erent cells of the cell geogrid and compacted to the defined compression settings, increases several times the soil load capacity. The use of geogrid eliminates complicated and methods tools that increase the price of technology, so the final cost.



Blocks in the extended position

Geogrid cell manufactured in 2 versions

☑ in textured strips without perforations, reference (**TN).**

☑ in textured strips, perforated, reference (**TP).**

The depth of the cells which form the cellular geogrid may be 50 mm, 75 mm, 100 mm, 150 mm, 200 mm, 300 mm. The depth indicated cells corresponds to the height of a block. The range of cellular geogrids is determined by the size of a cell, indicated by the distance between the welds on the strip:

- **small cell** 330 mm ± 2% - Reference **GWS 330**
  356 mm ± 2% - Reference **GWS 356**
- **medium cells** 462 mm ± 2% - Reference **GWM 462**
  462 mm ± 2% - oznaczenie **GWM 462**
- **large cell** 660 mm ± 2% - Reference **GWL 660**
  712 mm ± 2% - Reference **GWL 712**
  750 mm ± 2% - Reference **GWL 750**

In most cases, we adopt the following principle: the more charge is important or more the soil is, the more the cells must be profound. Over the cell is high (deep) and the cell is small, plus the ability to transmit loads is better.

E ff ects the use of a cell geogrid

☑ Reducing the thickness of the pavement structure elements with respect to conventional solutions by eliminating the replacement of the earth in depth,

☑ Increase in the resistance of materials that fulfill the cellular geogrid shear following their confinement and compaction within the cells.

☑ Reduction of a ff aissement caused by a natural compaction and reducing lateral movement of the aggregate that fills the cell geogrid.

☑ Reduced stresses transmitted on the substructure in natural soil by commercial loads acting on the coating due to the distribution of concentrated loads between adjacent cells of the cell geogrid, that is to say over a much larger area than in for conventional solutions.

☑ fi ltration possibility of rainwater through the layers of the seat using powdery materials.

☑ Stabilization and surface protection of slopes against erosion.

☑ Reinforcement and soil stabilization in road embankments or on the football field, for example.

Types of fillings

Depending on the project requirements and geotechnical ground conditions, it is possible various fillings:

☑ ground with suitable vegetation

☑ various inorganic materials, starting with sand or gravel to the bigger aggregate or stones,

☑ Concrete diff erent resistors or fi nition surface

☑ local materials available near the site

☑ several above materials together - depending on the project.

Advantages of perforation

☑ Punching and rhomboidal surface texture of the walls of a geogrid further increase the internal friction angle between the granular infill and the wall by allowing a better immobilization of the filling and an improved resistance of the aggregate shear , compared to non-perforated geogrids about 20%.

☑ A suitable number of holes in the walls of cells, defined by the percentage of the required perforation, selected by the designer depending on the requirements, provides a horizontal drainage and rapid ion Venting of phréat ic water and superficial, which reduces the eff ects negative traffic of vehicles on wet coating.

Laying geogrid

Individual geogrids (blocks) are provided bent in the shape of a light beam. The unfolding of a block is simple, rapid, non-complicated. The cells can be filled manually (with simple tools) or a building material. The installation of cell geogrid 'E ff ectue with rectangular mounting frames that are intended to extend the blocks, often cut and prepared already at the stage of manufacture of the blocks. **Installation requires mounting frames to obtain a required geometry of the blocks. These frameworks, multi-purpose, are only used for filling the cells.**

Connecting diff erent blocks of the geogrid is fast, using universal clamps, staples or anchors. If works more demanding, we also use other accessories, like the wires of tension or anchor blocks, etc. Blocks geogrid prepared are transported to the site on pallets in the form of folded rollers connected and surrounded by stretch film. The blocks are wound so that they stretch and easy installation on site.

Flexible solutions designed

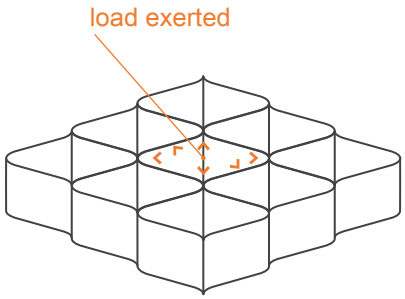
Geogrids cell structures can be easily adapted to many project requirements and site conditions. The versatility of the system results from its fl exibility natural, capacity to withstand unusual loads and possibi ity ut it ize a variety of fillings.

Natural colors

The blocks of the grid blend well with the natural environment **through the use of green, of brown and black.** On request it is possible to manufacture them in other colors, meeting the most audacious requirements. **The UV stabilized polyethylene is resistant to sunlight, it is characterized by improved mechanical strength and a quality that matches the engineering standards applied.**

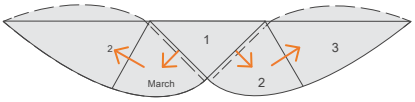
Resistance = result of con finely

The resistance of construction fills in the Govern Cell Con fi system due to the increase of the shear strength and increased rigidity. Improving the resistance is related to the peripheral resistance of the walls of a cell, a passive resistance of adjacent cells and the interaction of the friction forces between the fill material and the cell walls.



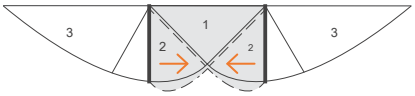
Distribution of con finely forces

Under load, the system generates strong reactions, performed by the lateral forces and the soil friction on the walls of a cell. These mechanisms create the structure of a high-strength bridge flexure and high rigidity. The bridge structure improves the reaction of the simple fillers to loads and deformations of long and can significantly reduce the thickness of the components of a coating.



Without cell geogrid system, the ground deforms when the wedge moves 1 Zones 2 and 3

The benefits of con finely cellular system (ie d. Cellular geogrids) in building single layer, as the seat of roads, tank farms or floors, consist of reducing the cost of earthworks and the cost of filling materials. With the con finely cellular system (ie d. Cellular geogrids), it is possible to use local materials instead granular materials delivered from afar. Since the load is distributed or transmitted by a bridge structure above the lower floor, the thickness and weight of the building elements can be reduced by 50% or more in comparison to traditional methods of load transmission.

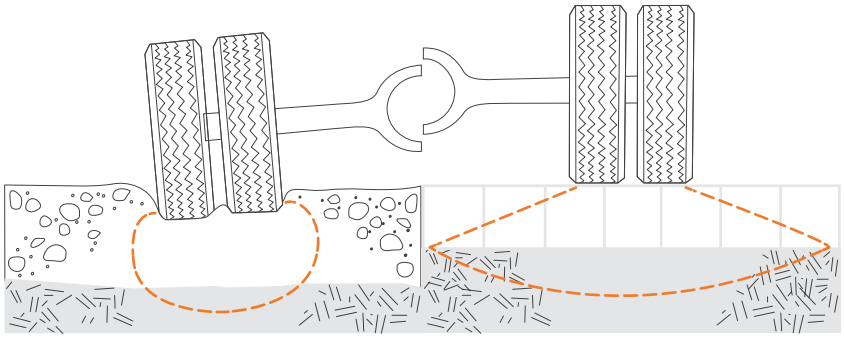


The geogrid system prevents the deformation of the ground limits the area 2 so as to make possible its movement under the action of the load.

1 con finely forces resulting from the action of frictional forces between the filling and the cell walls

2 con finely forces resulting from passive resistance neighboring cells

3 The forces of con finely resulting in peripheral resistance of the cell walls



ruts appearance without finely con system

Load distribution in a geocell system

load transfer

Stabilization seating floor

Cell geogrids blocks form seating carrier high bending strength. This system functions as a semi-rigid panel by reducing to a great extent, and by distributing the vertical loads focused in horizontal components, which allows to reduce the stresses in contact, in the soil.

The deformation and a ff aissement are minimal.

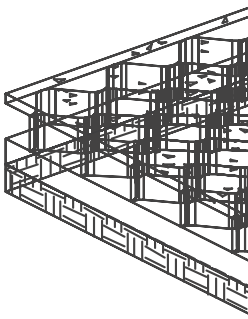
Compared to traditional methods that require certain thicknesses, it is possible to reduce the thickness of the seat gravel and crushed stone of 50% and more. Using a cellular geogrids system allows the use of sand

low quality for temporary or permanent road construction, even in the presence of a

very soft subsoil.

Stockyard

Using a cell retention system improves the characteristics of the distribution of loads in areas covered with hard surfaces and in areas without hard coating. The constraints of the seat in contact, generated by static or dynamic loads, are distributed by a three-dimensional network of cells of the system. This reduces the deformation of coatings, reducing rutting and reduce the cost of repairs.



Ballast railways

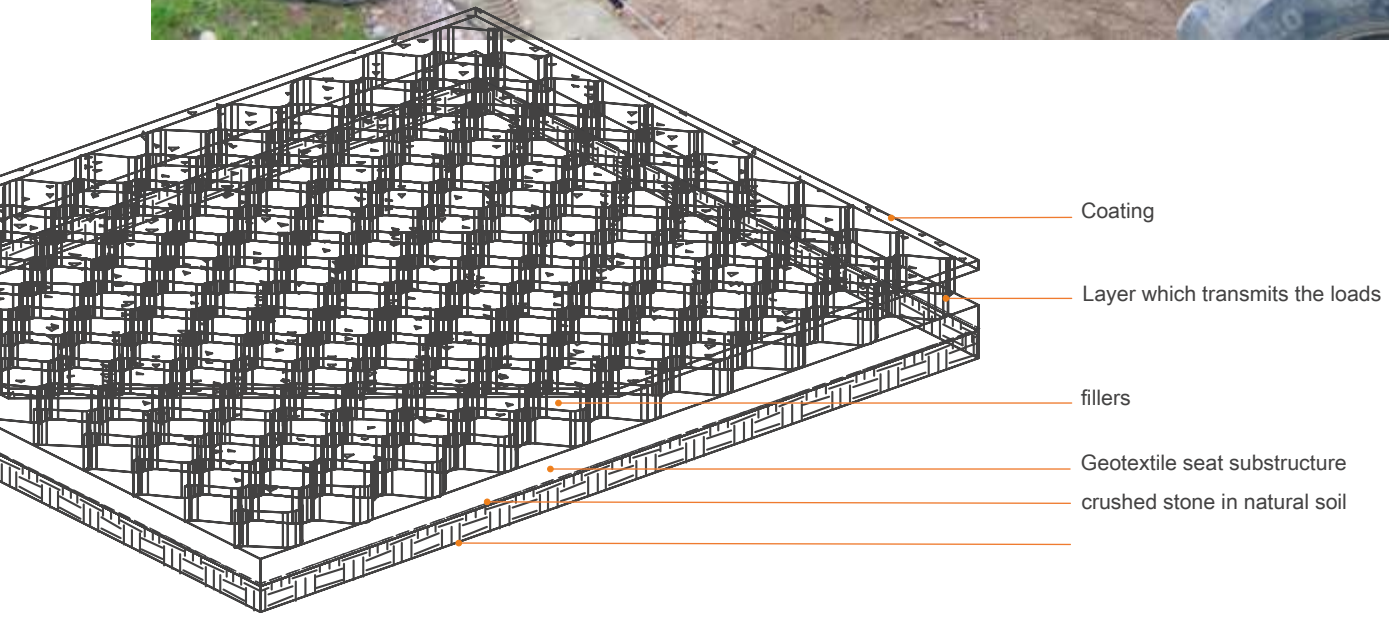
Blocks of cell retention system prevent lateral movement of the layer of crushed stone and its seat, accompanied by non-woven geotextile, needle punched, as a separating layer. This configuration improves the rigidity of the body of the railway, increases load capacity and stability of the railway. The a ff aissement heterogeneous aggregate of ballast, even on a seat low resistance is substantially reduced.

Cell geogrids ensure long resistance in places intense traf fi c, such as level crossings, needles and branches.

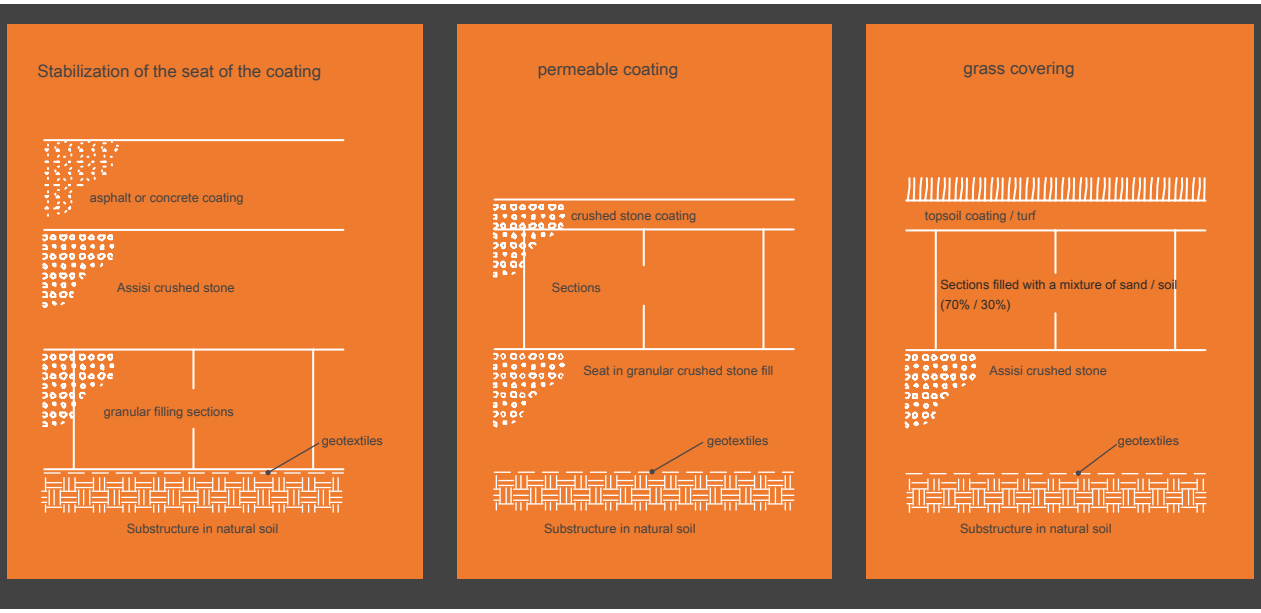
Typical applications

- ☑ permanent and temporary access roads permeable coatings resistant
- ☑ substructure foundation loads and protect loading dock lines in ports
- ☑ and terminals cycling and sidewalks channels road shoulders
- ☑
- ☑
- ☑
- ☑ base of asphalt pavements and paved transport fleet and
- ☑ tank farm parks in ports, substructure transhipment
- ☑ machinery

- ☑ transport terminals and container



TYPE CONSTRUCTION FOR THE TRANSFER OF CHARGES



shoulders

Stable shoulder part with good road conditions, the main factors that influence the traffic safety. In many countries of Europe, is working on this problem for years by allocating resources to improve road safety. **According to statistics compiled by the German ADAC there has been**

56,800 road accidents in 2005, with 2,350 deaths, caused by unstable shoulders. In 20 months in 2006 and 2007, Germany has made 150 building projects and modernization of shoulders in cell geogrid technology. The state shoulders in Poland is poor and, no doubt, this is one of the areas where the use of cellular geogrids can increase security, but also to achieve tangible technical and economic gains.

The use of cellular geogrids allow facilitate and simplify the renovation, strengthening and regeneration of existing earthen berms on county roads,

Cantonal and municipal (by preventing the washing of the shoulder along the rim of the asphalt pavement), as is done in other countries of the European Union.

Reinforced shoulders also improve safety for pedestrians and cyclists. The e ff ects economic regardless of reducing the risk of accidents with a coating resistant to rutting and controlled geometry, are generated with this technology through:

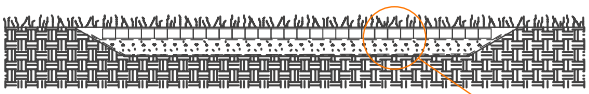
- ☑ the possibility of using locally available materials, compactable, the absence of a
- ☑ traditional seat,
- ☑ the small dimensions of synthetic materials during transport, the use of simple technical
- ☑ means (compactors single plate) the speed of installation (eg 3 people facing more than
- ☑ 200 ml per relay).

Description of the building - convenient solution

The solution proposed for strengthening and regeneration of the shoulder can be used both in deserted areas than in built-up areas. It ensures the safety of the construction with axle loads of 115 kN.

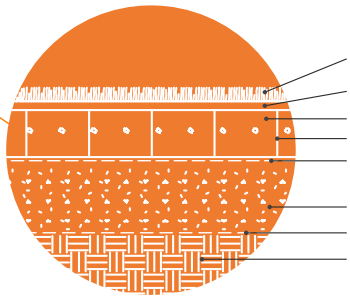
It offers two shoulder widths, namely 1.0 and 1.5 m and these are the widths of the most common earth berm on the roads in Poland. The width of the blocks is adapted geogrid are:

- ☑ final width of the shoulder = 1.0 m: a block contains five cells each 20.3 cm width of the shoulder
- ☑ final = 1.5 m: a block contains 7 cells 20.3 cm each

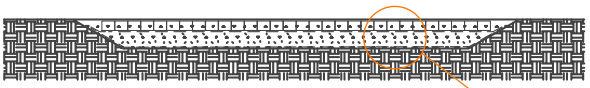


Road grassy coating

Coating grassy kind

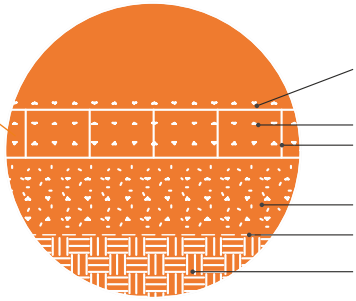


Coating grassy turf or topsoil mixture sand (70%) / land (30%) geogrid blocks
Geotextiles lower seat Geotextiles layer (if needed) Substructure natural ground



Road with a granular coating (crushed stone, eg)

Permeable coating Type



crushed stone coating

crushed stone fill blocks geogrid

lower layer of geotextile seat (if needed) in natural soil substructure

Benefits of geocell

☑ They distribute horizontally loads and reduce the vertical deformations and pressure contact, exerted on the substructure in natural soil, which minimizes the lasting deformations and a ff aissement.

☑ They substantially captivate the formation of ruts (eliminate deep rutting). Cell geogrids multiply the soil loading capacity, which ☑reduces the structure layer of 50% or more.

☑ The geocell limit the shear and lateral movements of the filling permeable coarse. They form a natural retention layer - finely ☑temporary con fi and restrict the flow of storm water in the case of filling open mineral materials.

☑ They avoid deep soil replacement, which greatly limits the cost. easy assembly, even in conditions di ffi cult.

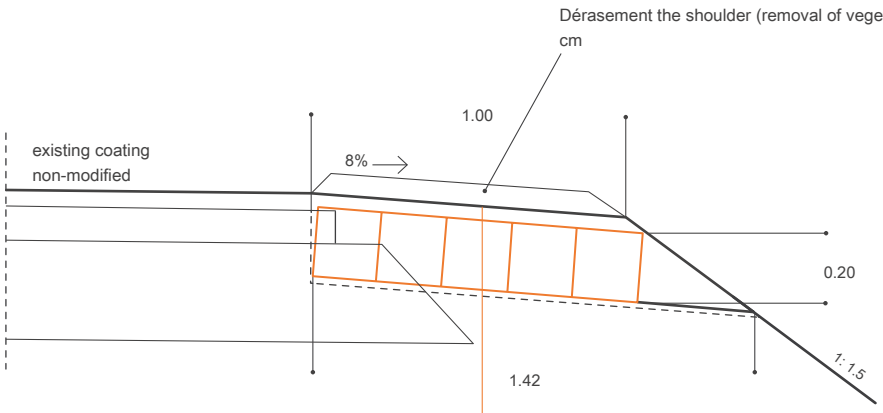
☑

☑ The installation does not require heavy equipment and small jigs during transport limit the cost of it.

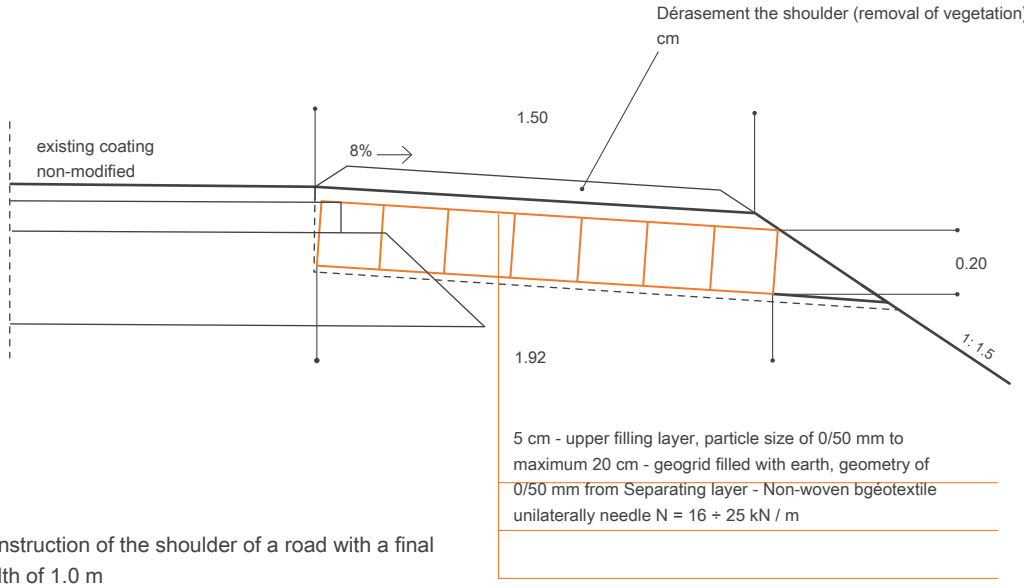
☑ The pressure on the substructure in natural soil is reduced through the distribution of vertical loads in horizontal loads.

☑ This system reduces the horizontal fl ection by limiting the pumping of fine particles of low substructure to the layers of the seat.

☑ They limit ff has a total aissement irregular and even in a substructure low resistance. The perforated cell walls form a natural ☑drainage ensuring resistance to heave by freezing.



Construction of the shoulder of a road with a final width of 1.0 m



Construction of the shoulder of a road with a final width of 1.0 m

Main work to strengthen the shoulder

- ☑ Dérasement a layer of soil with grass, with evacuation of the site.
- ☑ Preparing a bed 25 cm deep, with removal of the extracted material (resistant ground frost by lifting) next to the excavation.

- ☑ Cutting the edge of the paved floor.
- ☑ Laying of geotextile (non woven, needled unilaterally, with tensile strength N = 16 ÷ 25 kN / m). Laying the cell geogrid.
- ☑
- ☑ Filling the cells of the geogrid and compaction of the filling material. The thickness of the compacted top layer is 25 cm (compaction rate Is ≥ 0.98).

The building is the most economical when it is possible **to use the land that is in the shoulder.**
This land should be resistant uplift gel. The cells of the geogrid to be filled to 25 cm in height (value obtained after compaction) with the extracted soil during the construction of the bed (filling of the cells of the geogrid of 20 cm and 5 cm upper layer) .

If the Client has the milled bitumen (obtained after milling of bituminous surface layers), it can be used as a surface layer of 5 cm thickness. Such a layer will prevent excessive enherbage earthen shoulder. The cells of the geogrid are then filled to 20 cm (value obtained after compaction) with the extracted soil during the construction of the bed The size of the largest aggregate of seeds should not exceed 50 mm. In case of larger seeds, remove them before compacting and filling the holes with filler.

If the material extracted from the shoulder is not resistant uplift gel, increase its granulometry with crushed stone or blast furnace slag. When improving the particle size is not economically justified ed, evacuate all the extracted soil and replace it with a material resistant to heave gel. The size of the larger aggregate particles, used for fill the cells of the geogrid, must not exceed 50 mm.

In order to improve the quality of the surface of the shoulder (limit weed limit in dry weather dust) was sprayed in a single application, a cationic bitumen emulsion to average out speed, then sprinkle with crushed stone 0/5 mm.

EARTH ROADS

Any and custom

dirt roads

(Forest, eg)

The problems with the maintenance of roads in fair condition relating to roads with a hard coating, but also local roads, forest roads, fire roads or access roads to agricultural fields. They result from an inadequate foundation of such roads which causes the appearance of ruts of potholes, gaps, leaching and a ff aissement uncured coatings.

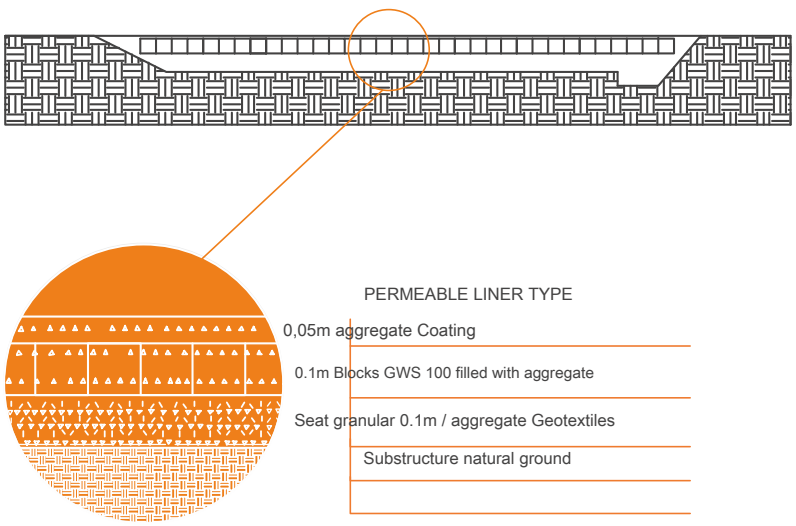
The cellular system con finely (cell geogrid) is a modern solution that facilitates the maintenance, repair and construction of roads, especially on impermeable soils with low natural resistance.

This system allows for significant gains, technical and economic, through the reduction of deep soil replacement, the ability to use lower-quality aggregates (recycled aggregate), the creation of a drainage very e ffi cient and lasts considerably longer than in the case of traditional solutions.

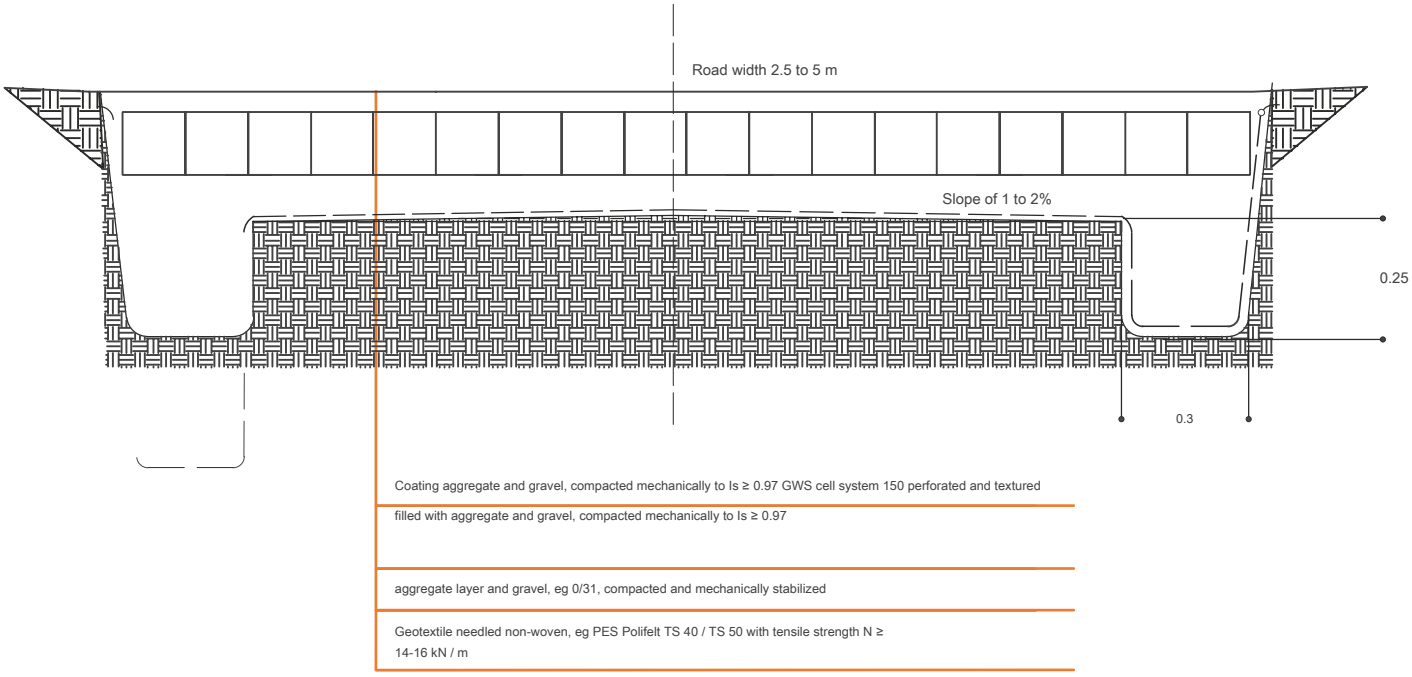
The cellular system stabilizes the seat material of the floor. It works as a semi-rigid panel which distributes vertical loads in lateral stress, reduces the contact pressure in the ground, minimizes the deformations and a ff aissement.

This system can be used to build permanent or temporary dirt roads. It provides high capacity load paths covered with granular coating, permeable, used by heavy equipment, and it allows to minimize costs. It reduces the super fi cial flow and replenishes dirt roads. The coatings for traffic or parking can be covered in plants, which is particularly advantageous in protected areas.

ROADS WITH A COATING MATERIALS GRANULAR



Project a local or forest path on a low natural soil



Project of a forest road and bottom reinforcement of a ravine in the loess

forest roads

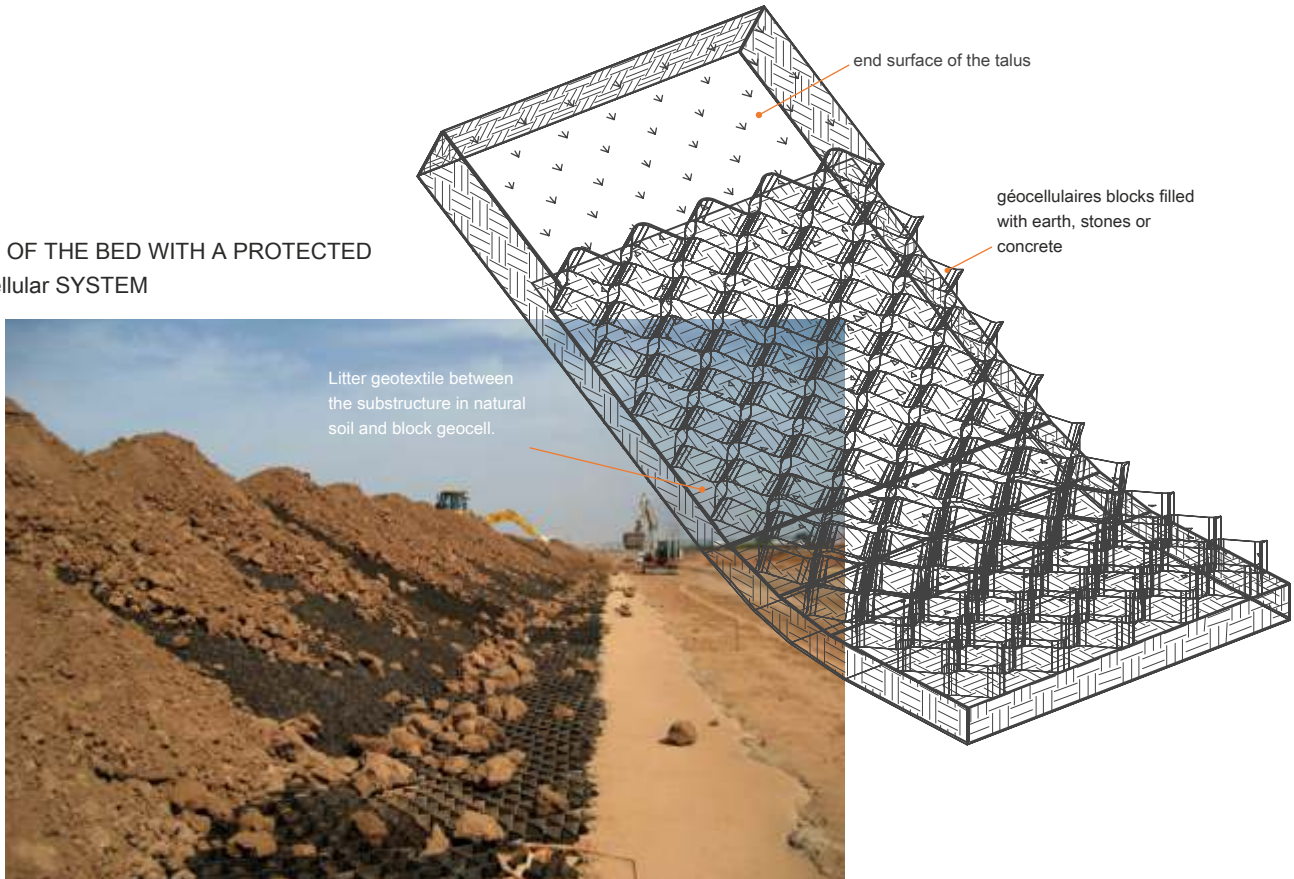
A cheap and quick method of stabilization of forest roads is based on a cellular geogrids system. It prevents leaching and lateral movement of the slope by rain water and ground water by no impact on the natural environment. This system ensures proper growth and protection of tree roots which then do not destroy the structure of the road, nor his seat.

Canals and water reservoirs

The cell geogrid system allows full use of the unique properties of hydraulic structures. This is possible by, among others, filling the cells with various materials, such as soil, aggregate, or concrete, in order to adapt the type and weight of filling the hydraulic conditions, construction and conditions geotechnical expected. Cell geogrids o ff er a number of flexible protections provided for open waterways and hydraulic structures. This system ensures the stability and protection of channels exposed to the action of erosion forces.

Protection channels
The use of cell containment system builds a protection for ruggedness and stability defined. It creates protection systems in one or more layers that meet a broad spectrum of requirements for the construction and hydraulics. A grassy slope is perfect on land where the flows are punctual, in muddy valleys and slopes of the mountain channels. Concrete is recommended in areas with constant flow or high flow rate.

plant protection
The con fi ment cell significantly increases the natural resistance as it envelops and protects the root system in the sward. It integrates and strengthens the turf at a significant flow of water by directing the flow rather above this layer and through the turf.



PART OF THE BED WITH A PROTECTED geocellular SYSTEM

Concrete Protection

Cell geogrids filled with concrete corage form a deformable and act as a series of expansion joints. Such a system is flexible, unlike the system filled with aggregate that remains semi-rigid. Cells fl ect and adapt to the ground displacement, protect against unwanted fi cracks of concrete. The cellular system of containment is a perfect solution to protect the slope exposed to high erosion forces and to protect the channel fl ows permanent.

Benefits of geocell

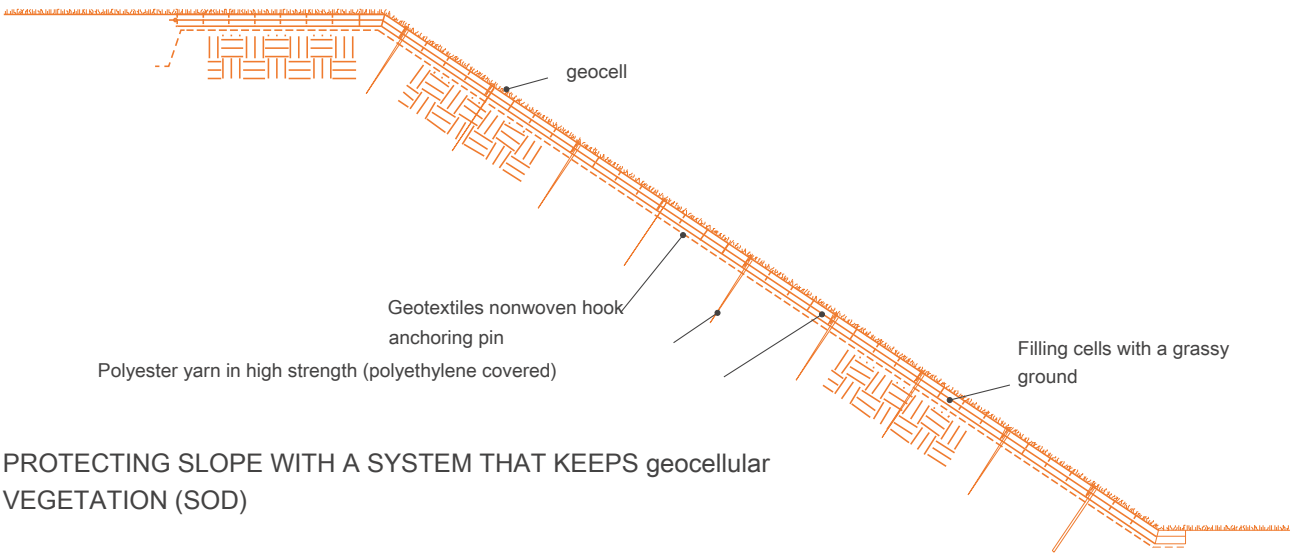
☑ The system allows to meet the requirements relating to drainage below the surface and the control of potential distortions within the structure.

☑ Projects are tailored to local conditions specific, taking into account the protection of the environment, ecology and aesthetics.

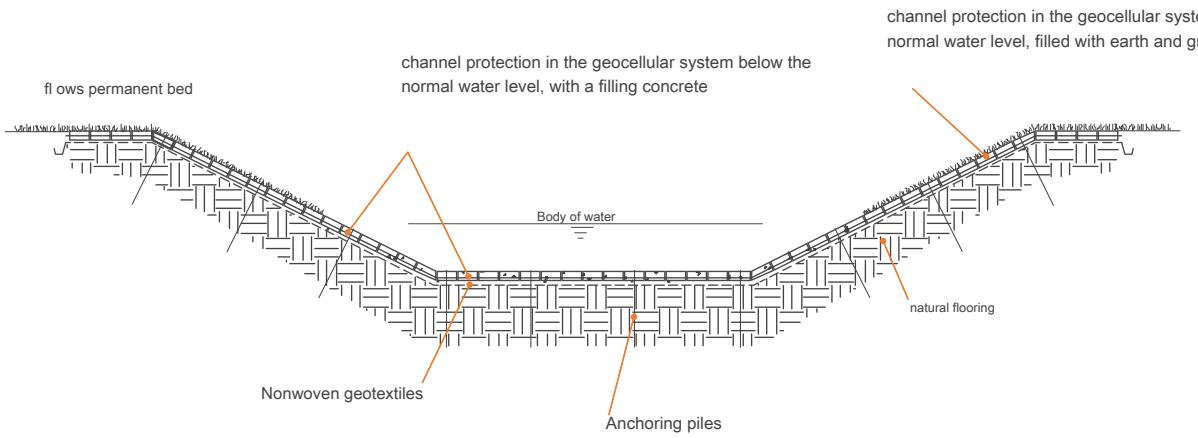
☑ It creates a concrete panel to arm channels. It maintains the filling materials by ☑ improving their properties.

Typical applications

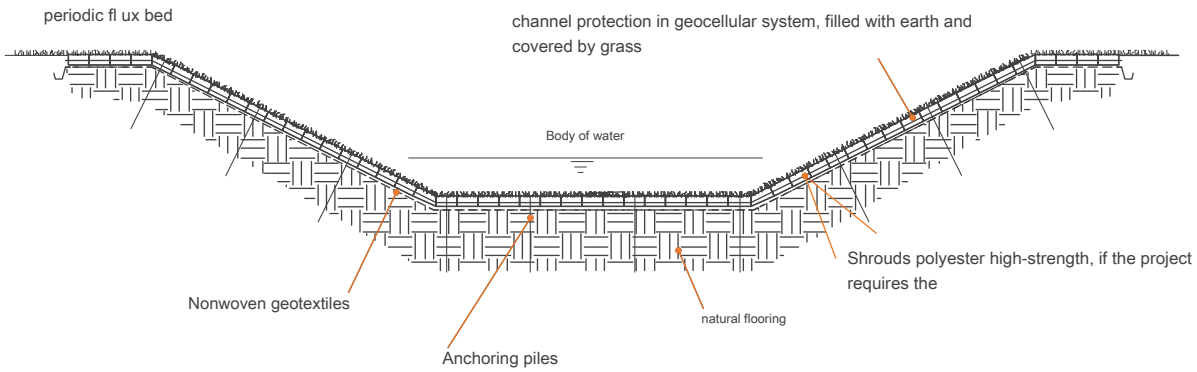
☑ Emissaries of storm water tanks and prepaid channels
☑ technological waters dryness Channels
☑
☑ Channel fl periodic or continuous flow Dykes
☑ unsinkable
☑ Retention basins for storm water tanks fire
☑
☑ Canals near sports facilities



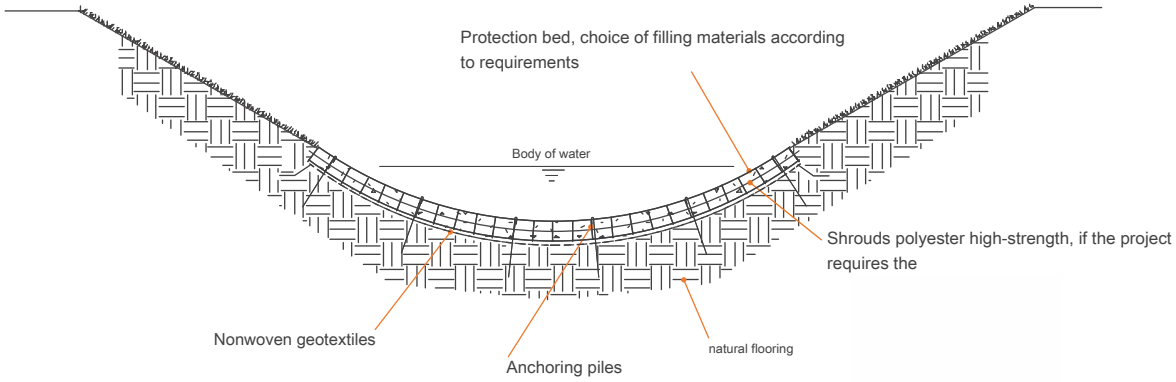
PROTECTING SLOPE WITH A SYSTEM THAT KEEPS geocellular VEGETATION (SOD)



PROTECTION OF CONCRETE BED WITH SYSTEM geocellular



BIOLOGICAL PROTECTION OF THE BED WITH SYSTEM geocellular



PROTECTING DITCH (LIT)

Protection against superficial erosion

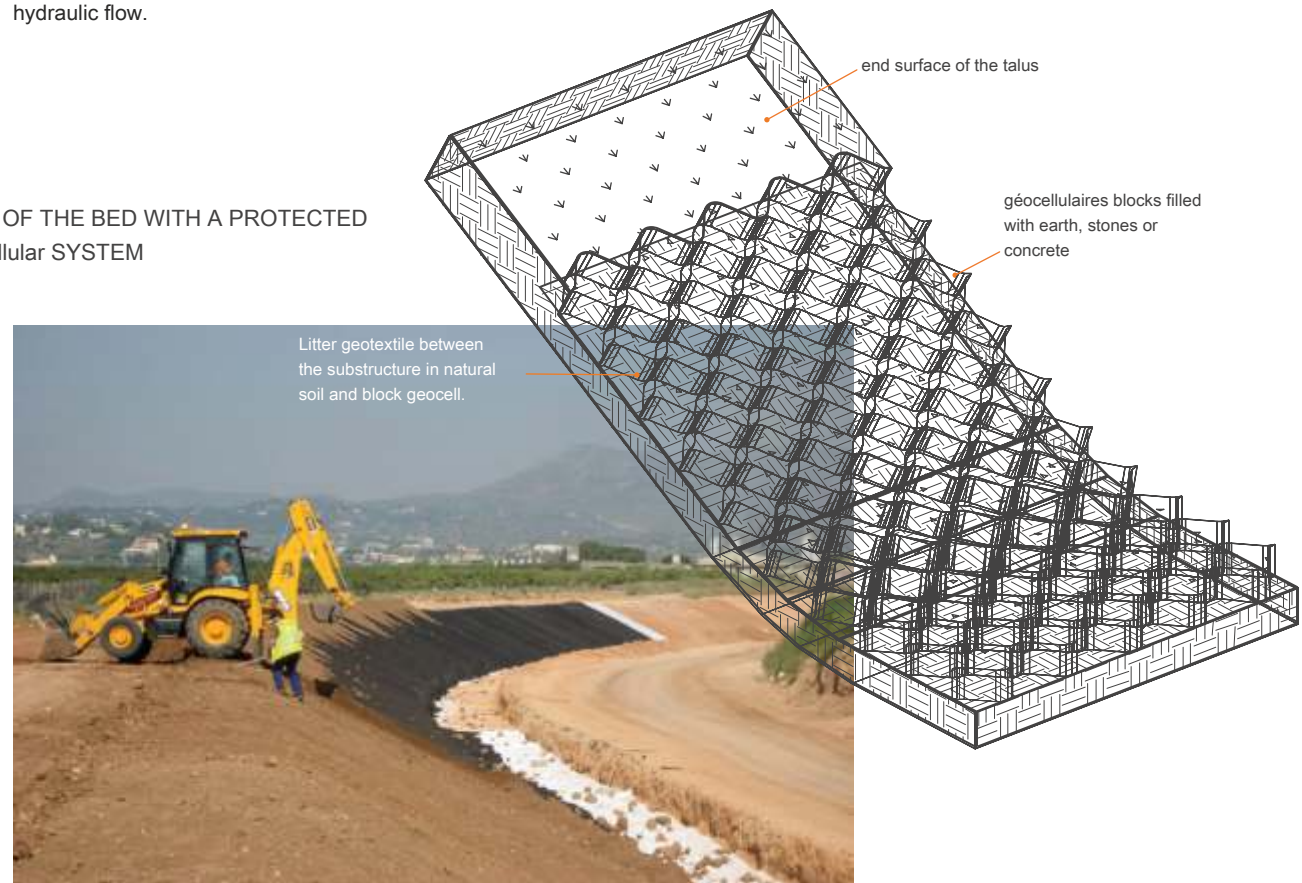
In the case covers flat single layer, on slopes and hillsides, soil that fills the cells is maintained by the cell walls that form barriers mini-series. These protect the filling against the sliding due to the increase of the resistance to washing, while ensuring favorable conditions for the growth and maintenance of plants. Thus, we get strong and durable covers, even on slopes and steep slopes.

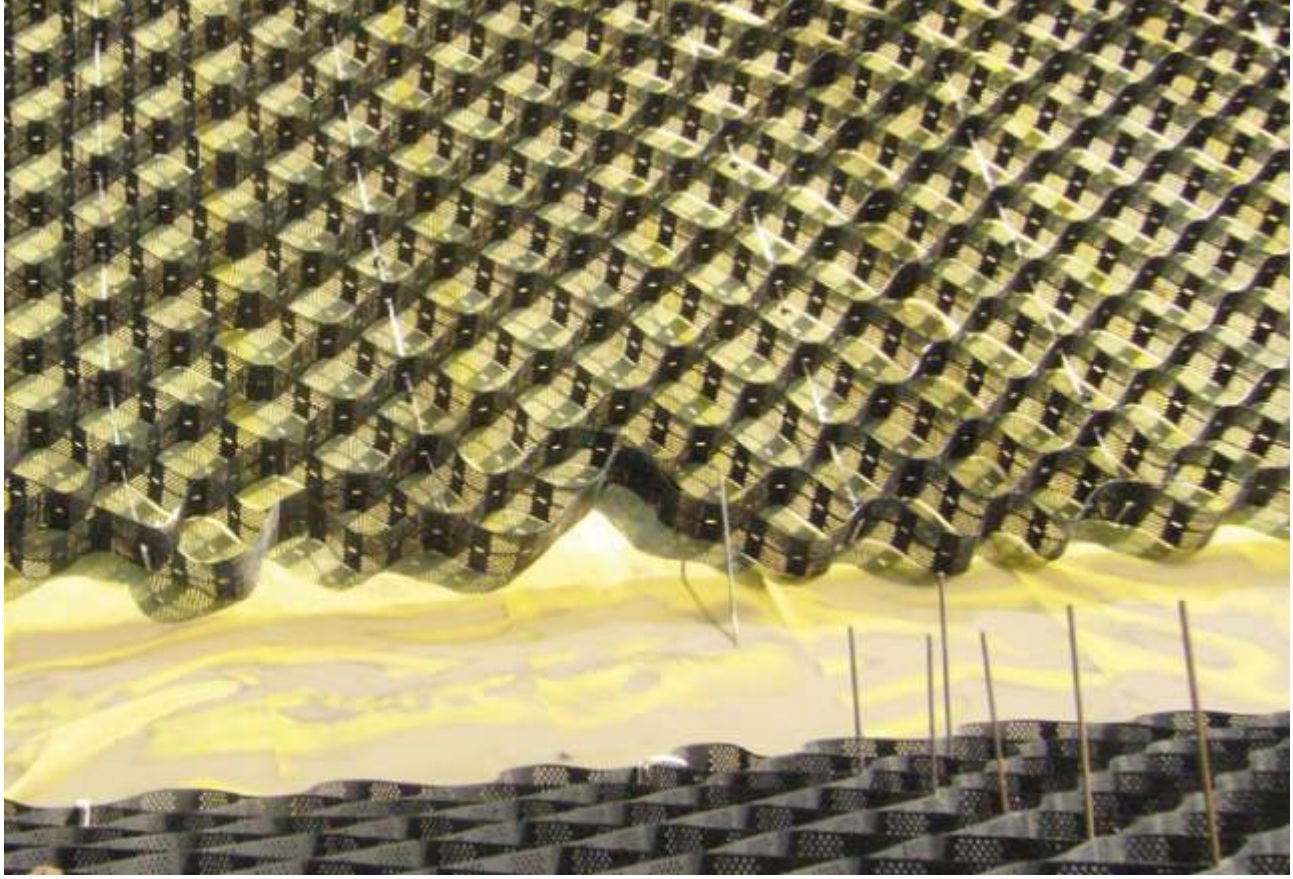
The earthworks army (retaining walls) built with our technology perform the same functions as other traditional support structures, but the cost is significantly reduced compared to traditional solutions. At the same time, all the geotechnical requirements are met and the installation time is relatively short.

covered slope vegetation
The blocks of cellular geogrids reinforce and enclose a vegetable layer. The cells increase natural plant resistance against erosion and protect the roots against the sliding of the soil particles. This works especially well on steep slopes and in areas with low flow or moderate.

Talus without vegetation
Cell geogrids blocks improve resistance of granular materials to erosion. Hydro power is dispersed and soil individual particles do not move down the slope as they are protected against the destructive forces of gravity and against the drive down caused by the hydraulic flow.

PART OF THE BED WITH A PROTECTED
geocellular SYSTEM





Talus armed with concrete

Cell geogrids blocks eliminate the need to use expensive and complex structural elements that require long installation. The geocell filled with concrete function as a corage and as a continuous expansion system. The geocell fl ect and adapt to the movement of soil by reducing cracks.

Géogrillages cell large cell

Blocks of cellular geogrids large cell surround and protect the roots of the turf. Shrubs and small trees can be easily planted inside cells. The large cells are perfect on moderate slope vegetation covered slope and hydraulic fl ow minimum.

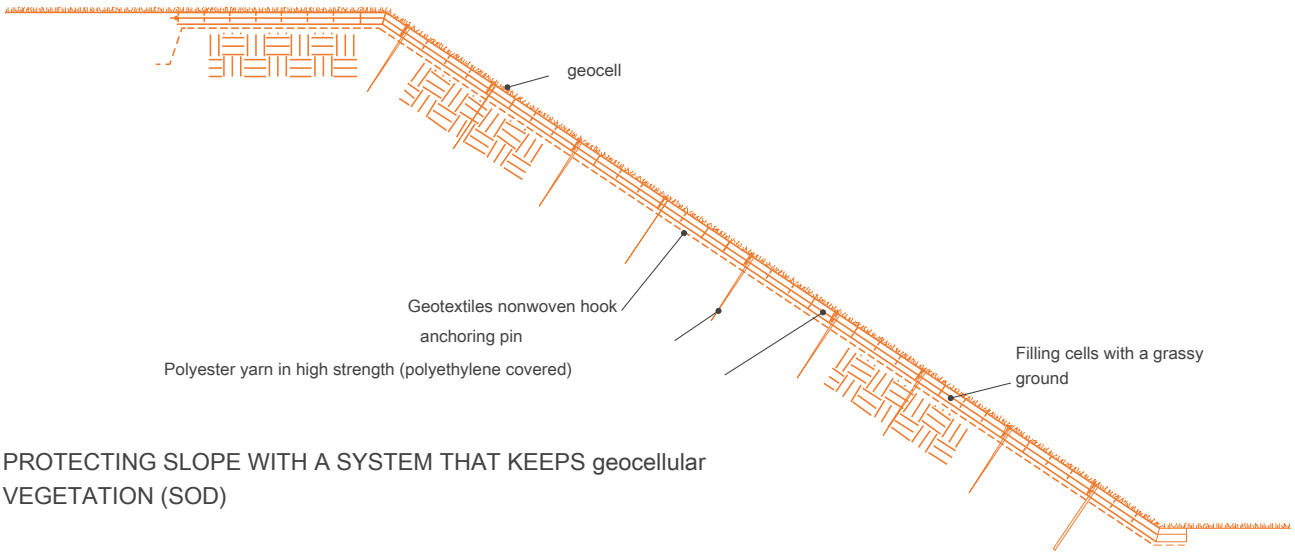
Benefits of geocell

☑ The cells filled with concrete form a flexible concrete mat with built expansion structure.

☑ They protect ecacement slopes and maintain the filled structure of granular materials (sand, gravel, other building materials).

☑ Speed of strengthening of embankments and durability of construction. Reducing

☑ the use of heavy equipment.



PROTECTING SLOPE WITH A SYSTEM THAT KEEPS geocellular VEGETATION (SOD)

uses Type

- ☑ steep slopes and edges
- ☑ Slope protection on the abutments of bridges and tunnels protection of
- ☑ slopes, waste dumps cover protection of geomembranes Retaining walls
- ☑ on Slope erosion dikes banks motorway
- ☑
- ☑
- ☑

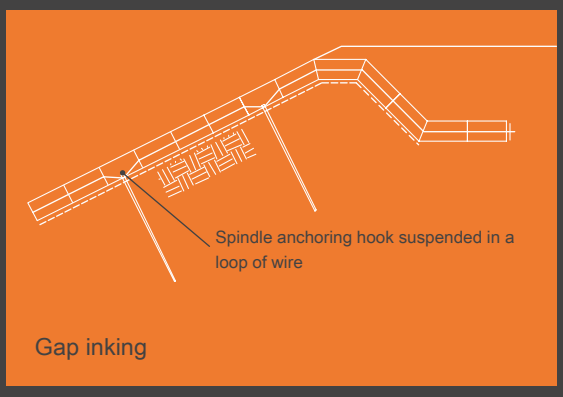
Before



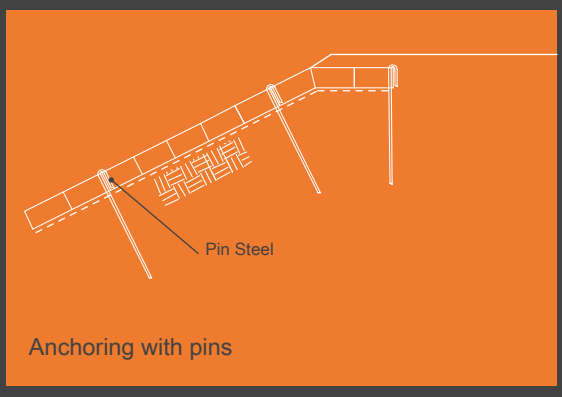
Apr th s



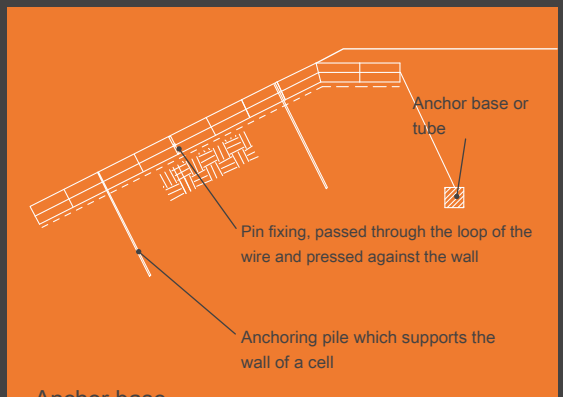
EXAMPLES OF AN ANCHOR geocellular BLOCK ON THE RIDGE SLOPE



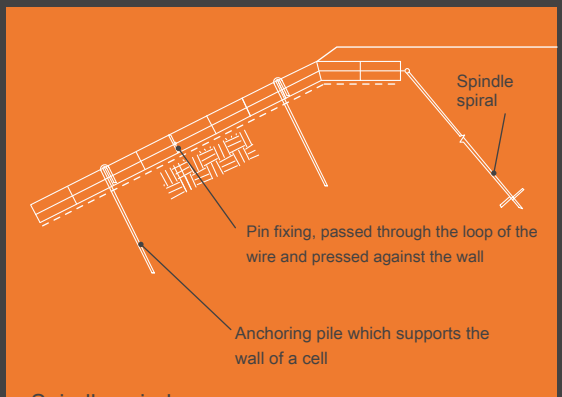
Gap inking



Anchoring with pins



Anchor base



Spindle spiral

Retaining walls

The cellular geogrids, placed in layers, often with other geosynthetics, such as geotextiles nonwoven needled, form a retaining sustainable construction meeting all structural requirements of the project.

Cell geogrids retaining structures o ff er ic at a Esthet tense and bene fi ts for the environment as the steep front surfaces that are covered with a layer of plants. Their stability corresponds to that of traditional retaining walls.

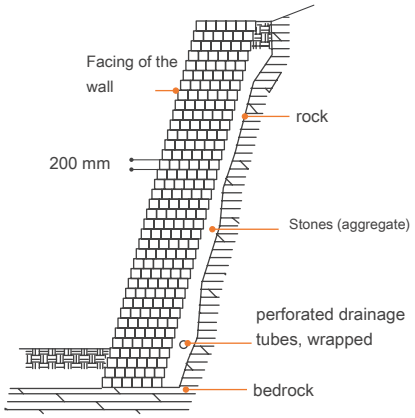
These are economic solutions which are much less expensive than conventional solutions that do not require deep foundations.

With geogrids, slender structures are adapting with flexibility to the building sector needs. They can cope with the challenges s compressibility of the soil or the di ffi culty to access the work area.

Retaining walls
The use of the cellular system of containment in multilayer constructions used to build walls conform to utility requirements. Conventional stability methods can be used in this system. There is software that address a wide range of soil parameters, the embankment and loads on the outside. The external fi nition (siding) of the surface of the walls can be made with items that are not part of the building itself or bene fi t the natural characteristics of soil and revegetated. The use of simple construction techniques and e ffi cient for using this containment system to distant places and di ffi cult to reach.

heavy retaining walls
Blocks of con finely cellular system retain and enhance the granular fill which forms the body of the book. The latter transfers lateral shoot soil and constitutes a supporting structure due to the significant frictional forces between the layers. possible ground deformations do not lead to the loss of the building load capacity. Cell geogrids can support fi nition of the facing surfaces that are not part of the supporting structure or they can be covered with natural turf.

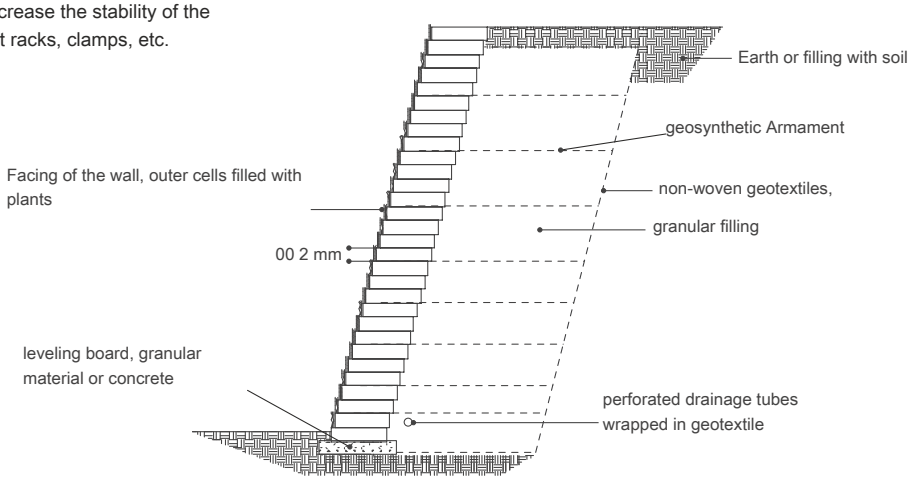
Composite Retaining Walls
The con fi ment cell in geogrid system eliminates the need to use expensive siding panels that are part of the construction. This system forms the facing surfaces of the walls completely discoveries. These surfaces can be connected to the upper part with various anchoring systems. The outer cells can be filled with soil to maintain natural turf.



Protection of rocks - facing wall (facade)
steep surfaces - facing wall (facade). Cell geogrids are laid in layers and do not require additional reinforcement where the stable structure of the ground requires just a simple surface protection.

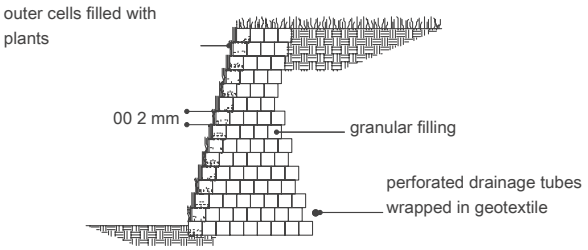
Wall Geocomposites

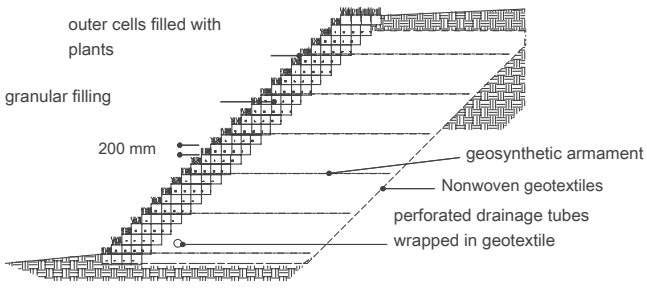
complex structure retaining wall construction - geocomposites wall. This book is built on the basic materials f i i your géocompos with additional cement STRENGTHENING surface slope. In this solution, the dierent elements are interconnected in order to increase the stability of the construction. Components: geotextiles, flat racks, clamps, etc.



gravity wall

A retaining construction that inhibits the action of universal gravitation - gravitational wall. This system works well in places where it is impossible to use the land because of the very limited available space. The dierent layers of the construction are designed so as to retain the strength of the universal gravitation. This structure inhibits lateral support and keeps full even on a distorted ground.





PROTECTING SLOPE - FACING WALL

Benefits of geocell

☑ They keep the stability of the structure with respect to external loads.

☑ E ll es are fac ly adaptabl there are the many requirements of the project and the configuration of the terrain.

☑ They are not subject to corrosion or destruction which are exposed concrete, steel and building systems based on wood or metal wire.

☑ The use of the aggregate reduces hydrostatic forces.

☑ They facilitate the construction and transportation to sites di ffi cult to access or remote.

☑ The geocell can be installed in the fast flowing channel - the system can be filled with coarse aggregate or cement mortar.

☑ This solution is advantageous for aesthetic and the natural environment for vegetation can grow uniformly over the entire surface of the wall.

typical use

The structure of the book on several levels can be used to build several types of walls.

☑ Protecting the facing layer on steep surfaces.

☑ complex structure retaining wall construction with an additional reinforcement geosynthetic the surface of the slope.

☑ Walls resistant r the action of universal gravitation, built in places where it is impossible to use large areas of land.

☑ Multi-layered protection channels.

☑ earth walls landscape improvements. walls covered with
☑ vegetation. unsinkable steep shores and dams. Protection
☑ regularization reservoirs, dams, dikes.
☑

☑ front walls scuppers. Siding vegetated
☑ channels. baffles in the ground.
☑

Environmental Benefits

The layers overlapping create horizontal terraces. These provide a natural environment for specially selected plants. Rainwater then drops on green roofs avoiding washing ground. The waterproof system of retaining walls control the evaporation of ground water and this together creates a favorable environment for plant development. Thanks to its vertical construction, the system prevents the degradation of the land and reduces the excessive exploitation of ground.

Choosing Wall

o ff retaining works rent a number of solutions for the construction of the walls, while respecting the requirements of the project. The decision to build a wall depends on the natural ground, the space available, the ability to deliver the filling materials, budget and aesthetic appearance of the finished structure.

Advantages

This system is already frequently used to build retaining walls to strengthen the embankments. filling materials, ground water and all other expenses relating to exercised parameters can be subject to analysis stability of the classic methods. The use of simple construction techniques and e ffi cient for using this containment system to distant places and di ffi cult to reach.

multi-channel protection

Blocks of geogrid that cover the canal banks are filled with plants and form a natural surface that provides stability and protection of channels exposed to erosion by water.
The multilayer structure resists a ff aissement uneven ground, it does not disintegrate and retains a steep area without the need for a large space.

In areas exposed to strong river currents, geogrids blocks can be protected with coconut fi ber in order to avoid washing the ground during plant development. It is also possible to fill geogrids of coarse aggregate or cement mortar.

RAILROADS

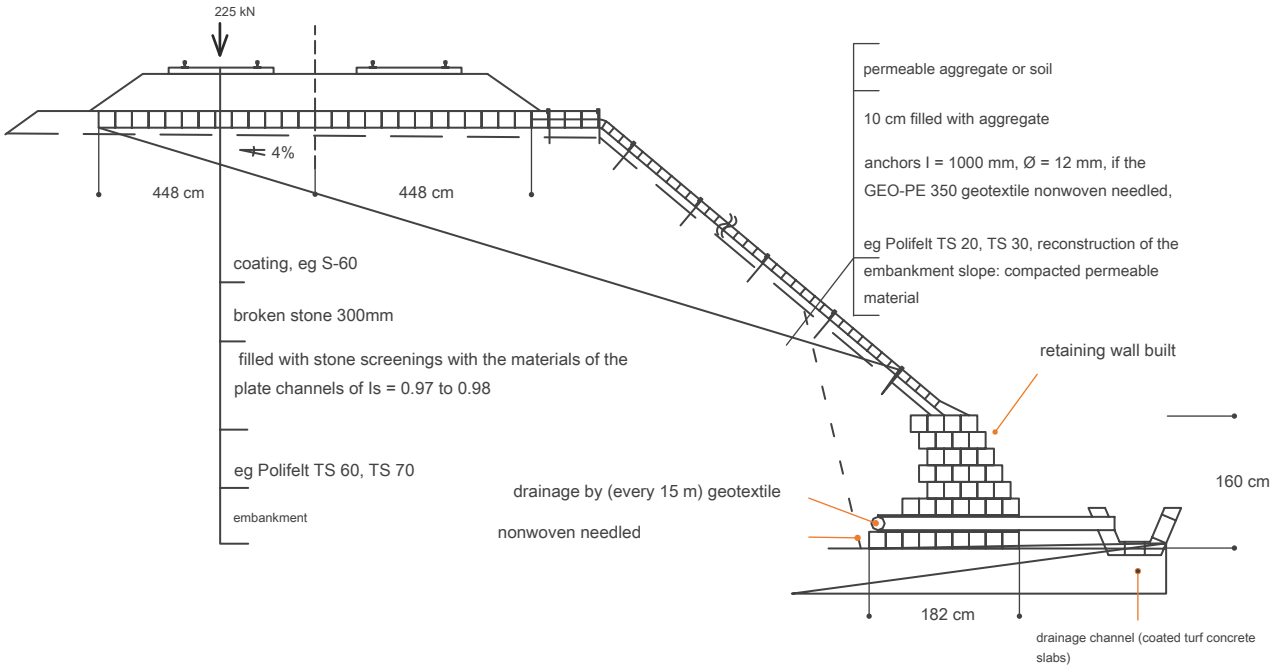
Any and custom

Whatever the observed phenomenon, all operations must carry out technical interventions that would eliminate eects and causes the deterioration of the stability of the ground. The use of cellular geogrids significantly reduces the time and cost of work compared to traditional solutions. This aspect has already been pointed out in previous chapters, but in an emergency it is very important.

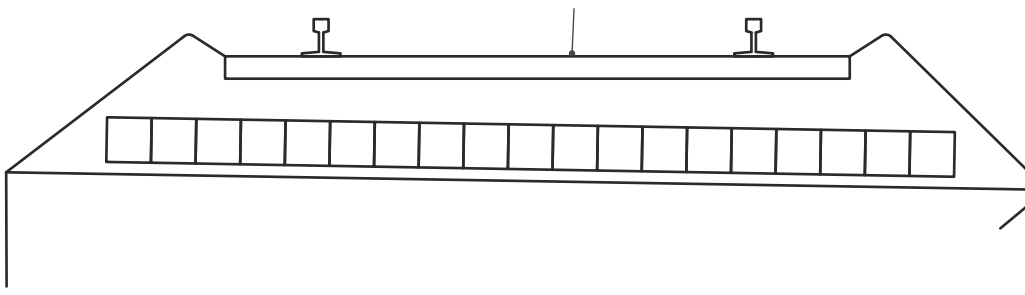
In the rail sector, the geogrid system cell is used since 1984 in many countries, such as England, the United States, Canada, Japan, South Africa and Spain. The research and field trials in the United States and Japan have confirmed the usefulness of this system for the railways characterized by

a large axle load and high vitesse.essieu and at high speed.

The compressible soils with low resistance, and railway embankments and trim degraded pathways pose great problems and cause dicultés in the maintenance of railway traf fi c. In general, reduce the speed of traffic. In extreme cases, the closure of some railroad tracks is required. The danger also comes from unstable slopes in excavations crossed by railroad tracks, slopes exposed to erosion and landslides in the compound of the tracks. In the final, all these phenomena generate significant economic losses.



Stabilization of the track platform from the railroad



The technology-based Cellular System solves the following technical and economic problems:

☑ stabilize and strengthen the base paths on furniture and soft floors (important when using sleepers and turnout sleepers claimed in concrete and welded rail)

☑ build crossings stable and sustainable levels eliminate faded
☑ places
☑ reuse the broken stones for track renewal limit the deep soil

☑ replacement
☑ limiting the spread of oscillations and vibrations, vertical and horizontal, the seat of the tracks (protection of historic listed buildings)

☑ prevent the occurrence of stray currents, increase the life of rails and track equipment
☑ build lasting and stable connections in locations where the trim paths through bridges or viaducts
☑ use any coverings throughout and within the plate tracks, environmentally friendly, according to the aesthetic requirements of the landscape

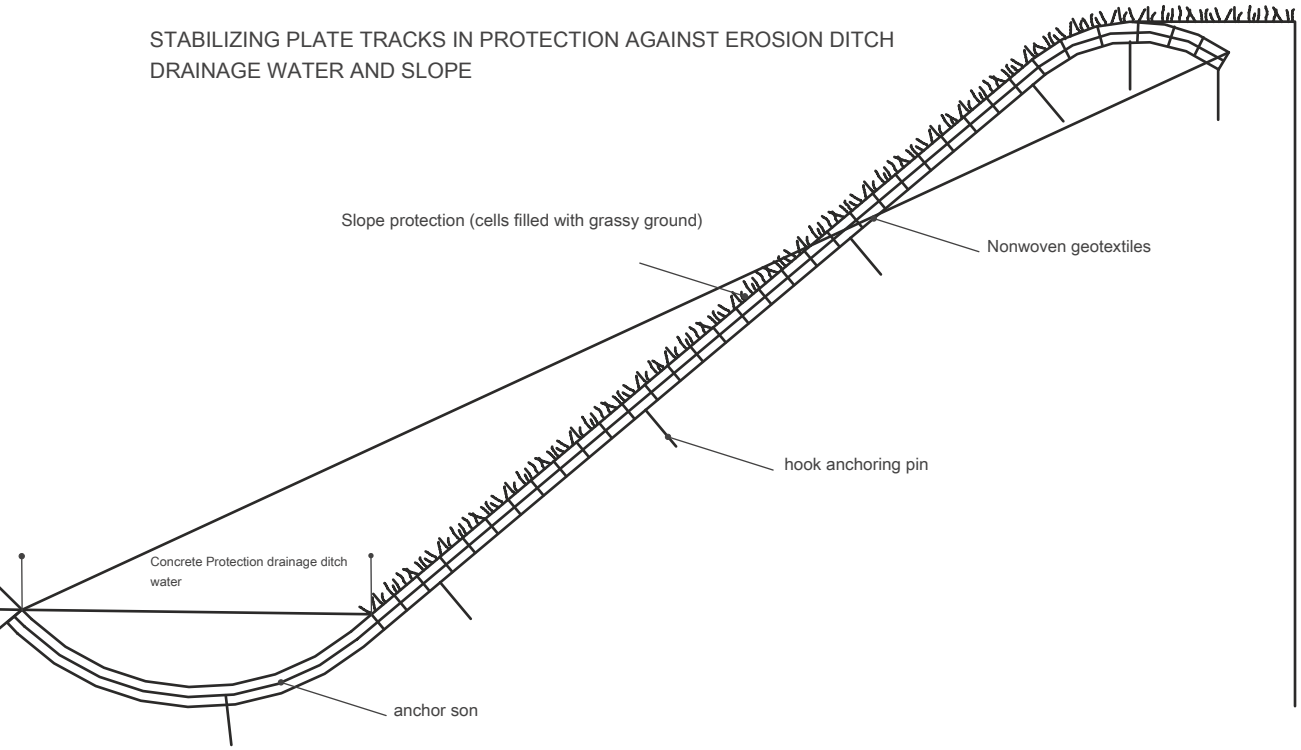
☑ repair or rapidly modernizing crossing / railway crossing on weak soils

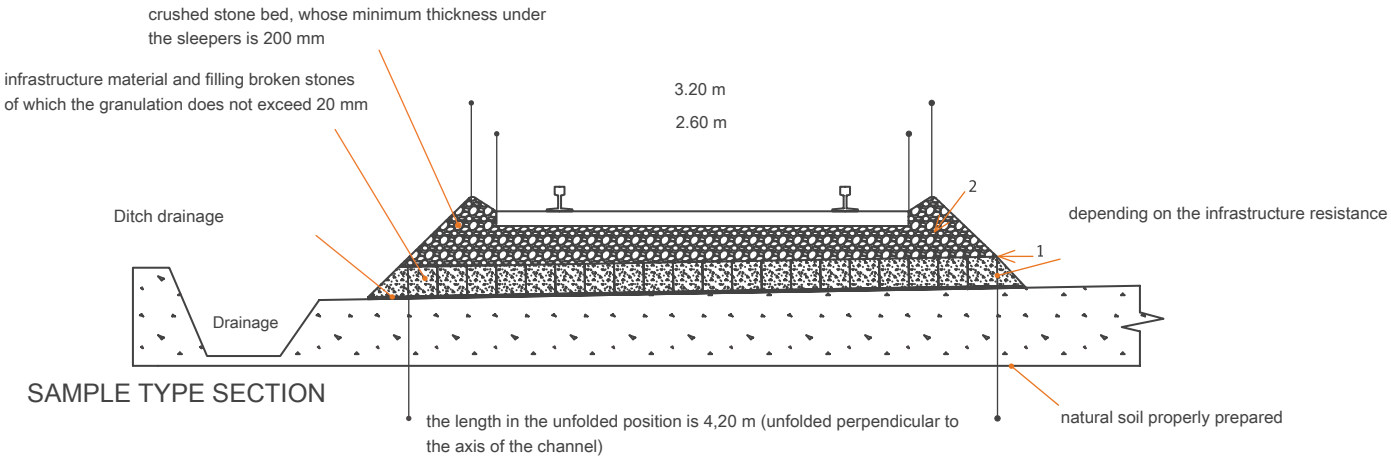
☑ repair or upgrade much faster, often by making possible the exploitation of the neighboring track
☑ stabilize and secure embankments and slopes of excavations and embankments against erosion
☑ build embankments on low resistance soils
☑ build retaining walls or acoustic barriers earthen

The experience in solving geotechnical problems associated with the repair, modernization and construction of railways has confirmed the possibility and the technical and economic merits of using finely con systems

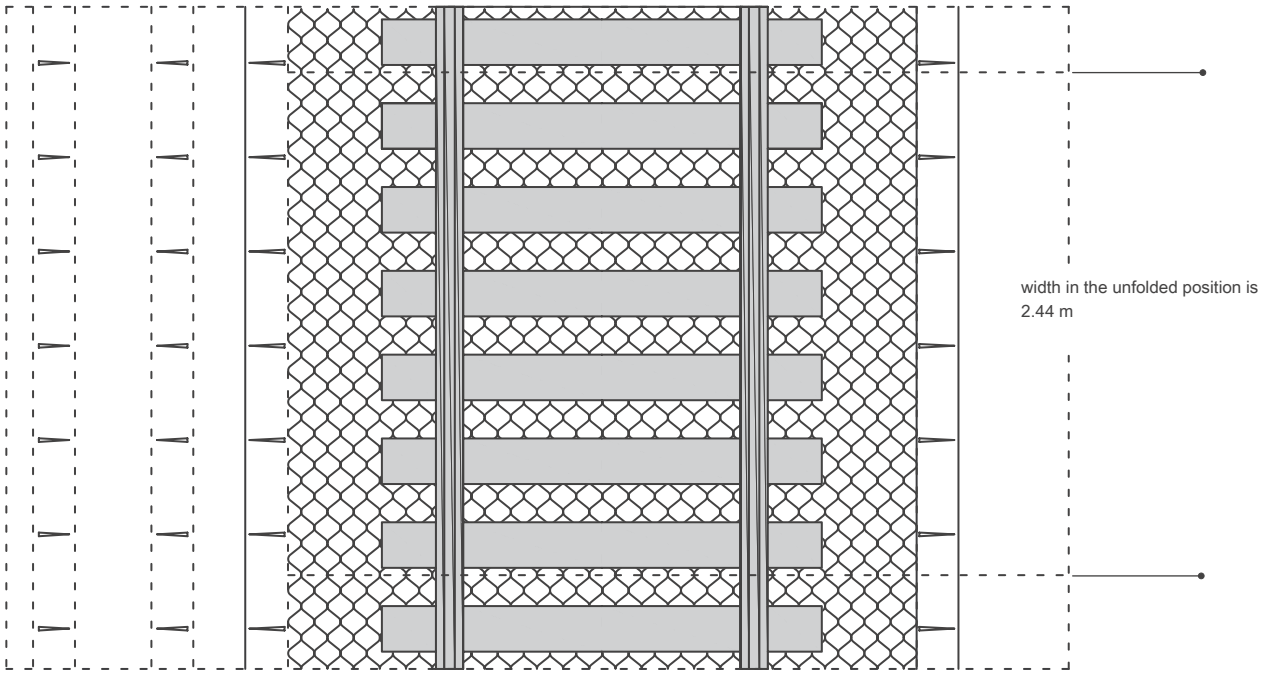
géocellulaires in some applications kinds.

STABILIZING PLATE TRACKS IN PROTECTION AGAINST EROSION DITCH DRAINAGE WATER AND SLOPE





SAMPLE TYPE SECTION



Seen from above

STABILIZING PLATE TRACKS ATTITUDE

Installing the system trim ways to Ptaszkowa

Cellular Geogrids

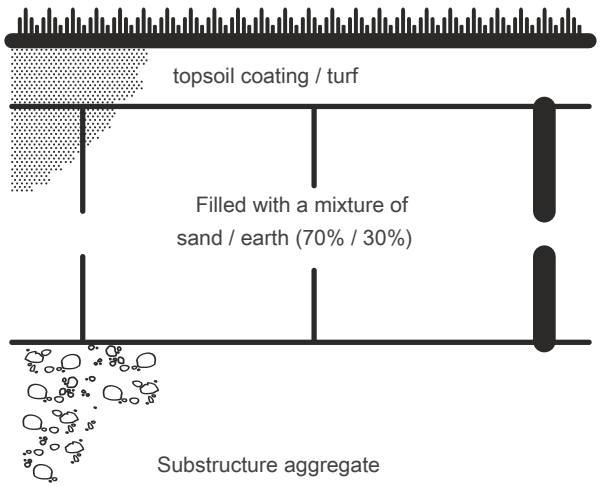
in airport construction and infrastructure of civil and military aviation

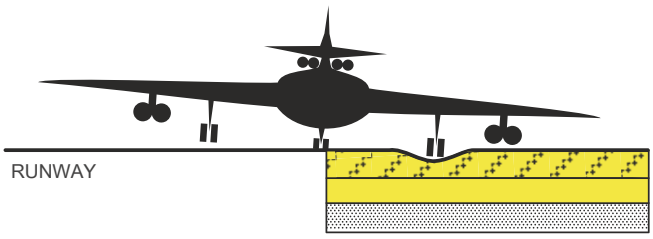
More than 25 years of practical use has shown that **geogrids**
an alternative technical and economic solution and justi fi ed, especially in the presence of weak or unstable soils during construction, among others, the following books:

- ☑ runways (substructure conventional coatings or directly in the form of coatings or grassy ground)

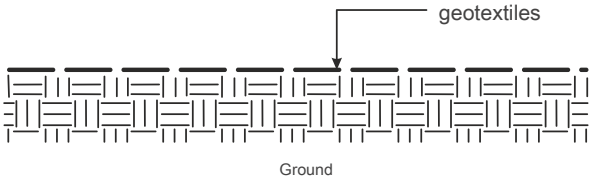
- ☑ borders deicing platforms runways aircraft
- ☑ parking areas of aircraft Aerodrome
- ☑ protective dikes
- ☑
- ☑ tanks wastewater after washing of the substructure and safety tanks airports
- ☑ coatings for tank repair kits Fuel airports bombarded (Engl. ADR)
- ☑
- ☑ camp for ammunition depots and fuel stations protections shooting substructures and ground
- ☑ platforms for special devices (eg autonomous structures reinforced earth for the radar installation)

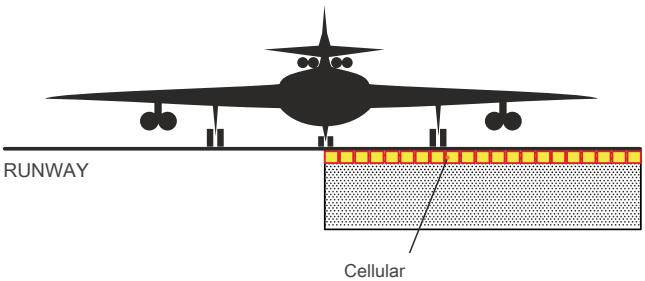
The diagrams show the indicative type sections for runways with the coating grass or clay, as well as the edges of runways.





EDGE OF LOW FLOOR TRACK





BORDER ENHANCED BY CELLSYSTEM

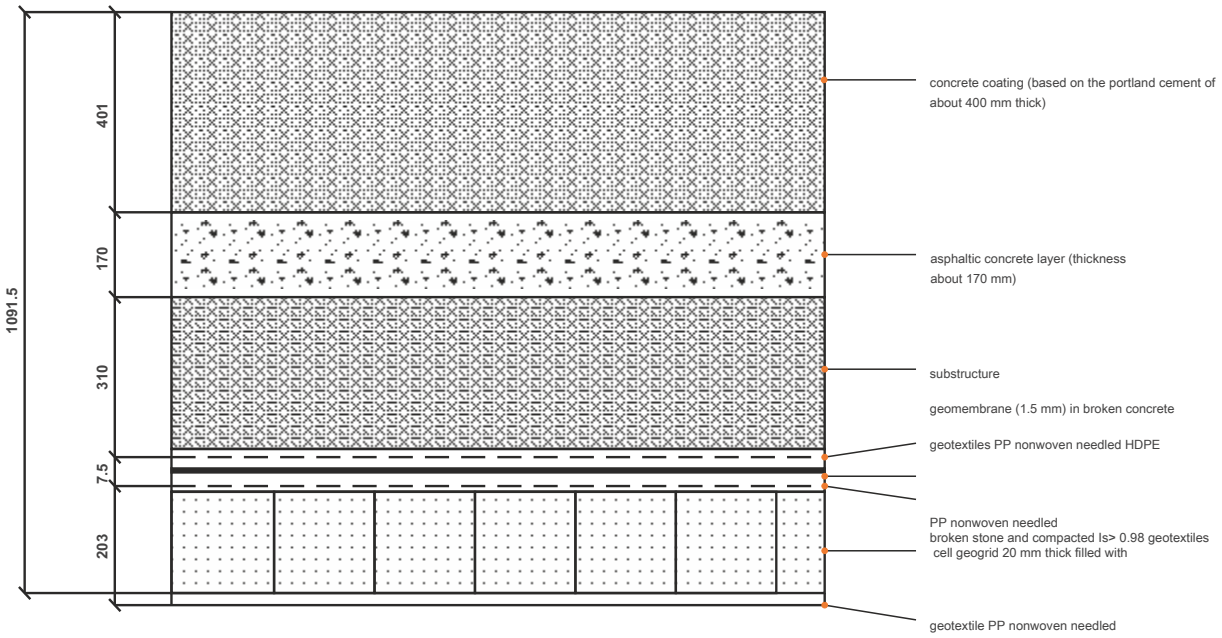
icing aircraft platforms - an engineering problem and environmental protection

In the program of modernization and construction of airports in Poland (Warsaw, Gdansk, Poznan), construction of aircraft deicing platforms is part of airport infrastructure elements required for a given class airport in the given climatic conditions .

Research by FAA (Federal Aviation Administration) in the US have shown that a thin layer of 0.4 mm of ice on the aircraft wings was able to reduce flight capacity rise from 12 to 24%. For security reasons, take off all frosty air is prohibited.

Apart from the factors of safety of air traf fi c, it is also important to protect soil and water against environmental degradation caused by pollution.

This is a significant problem because the surfaces of such platforms dan international airports can handle 6 to 12 hectares (equivalent to about 7 to 11 football fields)



section example of a rollback platform aircraft

Most often, the aircraft deicing is eectué using liquids, namely a mixture of ethylene glycol (60%) and water (40%) or propylene glycol whose freezing point is lower. Covering a plane of a layer of this product helps protect against icing for about 70 minutes. In case of high air humidity in some winter conditions must 700-4 500 liters of the liquid, and sometimes 18 000 liters in the most dicult conditions. Some flows over the parking area and the rest comes off the plane during takeoff. In case of delayed departure, defrosting must be repeated. The liquids used for deicing are toxic. They must not remain on the

The complexity of the problem lies in the fact that deicing platforms must have a suitable drainage system that regenerates and purifies wastewater, which insulates the soil pollution. The infrastructure of such a platform must protect the entire work against building a aaissement irregular. In the case of weak soils, compressible and heterogeneous, replace the soil to a depth. Given the surface area of a platform which should serve several aircraft, this is an important fi nancial expense.