



GRAVEL[®]

THE STRONG GRAVEL STABILISATION SYSTEM



EUROPEAN
QUALITY
PRODUCT





TABLE OF CONTENTS

| | |
|--------------------------------|----|
| Who is ECCO? | 3 |
| Applications | 4 |
| Why gravel stabilisation? | 5 |
| Why the ECCOgravel® brand? | 7 |
| Specifications | 9 |
| Step-by-step installation plan | 10 |
| Sheet selection | 10 |
| Gravel selection | 12 |
| Sub-base | 14 |
| Installation | 16 |
| ECCOgravel® maintenance | 17 |
| Frequently Asked Questions | 19 |



EUROPEAN
QUALITY PRODUCT

WHO IS ECCO?

MISSION

ECCO is a *manufacturer and product developer* of innovative and user-friendly products with a *high level of added value* for the private and public sectors, which wants to be a *trendsetter* at *European level*.

VISION

ECCO *constantly analyses the market* and always goes further in the development of *intelligent products*.

We keep the *entire process flow in-house* (from development to sales) and can therefore apply *stringent quality parameters* ourselves.

We rely on a *selective network of dealers and importers* who market of our products *throughout Europe* to distribute our products. This commercial network is supported by strong and innovative marketing tools.



APPLICATIONS

GRAVEL®



the strong gravel stabilisation system

FENCE



GABIONS
prefilled | self-filled

SEDUM



GREEN ROOFS
pre-grown sedum tiles

LIGHTING



GARDEN LIGHTING
atmospheric LED lighting

NEW

borders for various applications in different materials

WAARDE CONVENIENT UV BESTABILISEER
PRODUCTS IMPACT VALUE ECCO GR
SEERDTORQUE RESISTANCE MADE
TWAANDE **ECCO GRAVEL®** IMPACT
WRINGLAST GREEN ROOFS
UV STABILISED HANDIG WRING
WRINGLAST **ECCO PRODUCTS** MADE



WHY GRAVEL STABILISATION?

Gravel surfacing is very popular, but it has one major drawback. If you walk or drive over them a lot the gravel can start shifting. This can severely affect the surface.

PAST SOLUTION

You can opt for gravel with many fine particles. This will cause the gravel to stay in place (e.g. a gravel type of 0-5 or 0-15 mm). However, more fine particles decrease the water permeability. This creates puddles, pits and tracks and the fine particles stick to one's shoes...

THE SOLUTION: ECCO GRAVEL® GRAVEL STABILISATION

Use gravel without fine particles (from 4 mm). The gravel is held in place by the sheets and the sheets are covered with a top layer of gravel.

RESULTS

You end up with functional and stable gravel surfacing that looks sleek and modern and is perfectly permeable.

ECCOgravel® is the gravel stabilisation system with a very high compressive strength in an unfilled state. One should at all times avoid getting gravel under the sheets of gravel stabilisation systems. ECCOgravel® uses the most sophisticated bonding techniques and the geotextile is bonded so strongly, that this risk is virtually zero.

3 REASONS TO APPLY A SURFACE WITH GRAVEL STABILISATION

1 ECOLOGICAL

- 100% recyclable 
- low energy consumption during production
2.5 kg of High-density polyethylene (HDPE) is needed per m³ ECCOgravel®. Production therefore requires little compared with paving bricks, tiles or asphalt pavements.
- The surface is 100% water-permeable
Rainwater can seep into the soil and replenish the groundwater. With traditional surfaces this is impossible. In this way, ECCOgravel® keeps rainwater out of the sewer.





2 FUNCTIONAL

- Stability & anti-weed feature

One should at all times avoid getting gravel under the sheets of gravel stabilisation systems. The geotextile, which is firmly attached to the bottom surface prevents gravel from getting beneath the sheets and eventually pushing them up. The geotextile also prevents weeds from growing through.

- Neutral sheet colour (transparent white, optional custom colours available)

- Flexibility (the sheets need to shape themselves perfectly to the sub-grade (foundations))

- The open structure of the geotextile avoids the risk of clogging

6

3 ECONOMICAL

- Very fast installation: save significantly on installation costs

- No drainage system required

WHY ECCO GRAVEL® ?

- 1 European quality product
- 2 High pressure resistance (> 100 tonnes/m² unfilled) for heavy vehicles.
- 3 High flexibility (even at low temperatures) for driving vehicles.
- 4 High torque resistance for turning vehicles
- 5 100% bonding ULTRA strong geotextile prevents gravel being pressed under the sheet.
- 6 Large dimensions enables quick installation, yet convenient to transport because the sheets are foldable.

¹ COMPRESSION TEST (SYNTHETIC MATERIAL)

In this test, a sheet with a diameter of 15 cm was placed on a gravel stabilisation system without gravel. A weight was then placed on this sheet. The compression load at which there is deformation of the synthetic material is an *indication of the maximum load that the product can tolerate*. CAUTION: filled, the test can reach up to 400 tonnes/m².

² IMPACT TEST

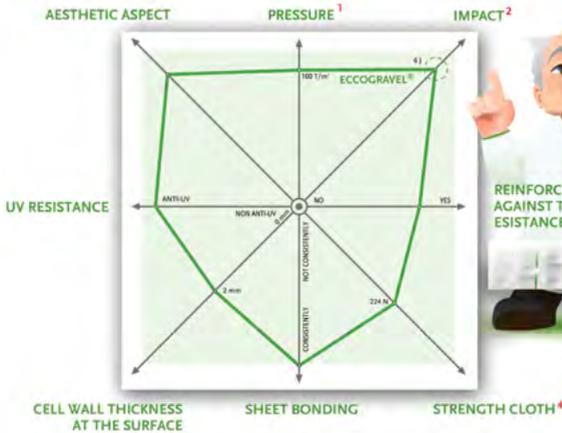
A 1 kg hammer was dropped on the intersections of the honeycomb from different heights (250, 500 and 1000 mm). To simulate the worst possible case scenario, the honeycomb was not filled with gravel. The test was conducted at both room temperature and at -35°C. Afterwards, the sheet was *examined in detail to look for any damage*.

³ TORQUE TEST (MECHANICAL FAILURE)

For this test a gravel stabilisation system was filled with gravel as required. A construction was placed on a car wheel on this sheet. The weight on this construction was 370 kg. Once loaded, the wheel was rotated from left to right and back five times. Afterwards, the *product was analysed for errors*.

⁴ TEAR TEST (TEXTILES)

For this test, a punch with a diameter of 20 mm was pressed on the geotextile. Thus it was examined what power the geotextile could resist and at *what pressure the welded geotextile would let go*. This test was carried out on both sides of the product (bottom and top layer).



| PARAMETER | TEST |
|--|---------------------------------------|
| PRESSURE | COMPRESSION TEST (SYNTHETIC MATERIAL) |
| IMPACT | IMPACT TEST |
| REINFORCEMENTS AGAINST TORQUE RESISTANCE | TORQUE TEST (MECHANICAL FAILURE) |
| SHEET BONDING | VISUAL TEST |
| STRENGTH CLOTH | TEAR TEST (TEXTILES) |
| CELL WALL THICKNESS AT THE SURFACE | MEASURED THICKNESS IN MM |
| UV RESISTANCE | IS THE SHEET UV RESISTANT? |
| AESTHETIC ASPECT | HOW DOES THE SHEET LOOK AFTER DAMAGE |

WHY?

The maximum extent to which an empty sheet can be loaded.

The extent to which the gravel stabilisation system is resistant to falling loads.

The extent to which the sheet is resistant to turning loads (e.g. manoeuvring).

A good bonding prevents gravel getting under the sheets and them being raised in this way.

This prevents gravel being pressed through the cloth.

Thicker cell walls are stronger.

Plastic treated against UV rays is less brittle when exposed to sunlight.

A sheet without sharp edges means it's safer to work with.



DESCRIPTION OF REQUIREMENTS & SPECIFICATIONS

INTRODUCTION

The honeycomb structure, together with the thermally attached and water permeable geotextile are responsible for the stabilisation of the gravel. The sheets are placed on a substructure, which is constructed in accordance with the loads to be expected. The sheets are then filled and covered with decorative gravel or pebbles. This prevents the pebbles or gravel from still moving relative to each other. This creates an extremely strong base and a surface that can be driven or walked on with the greatest of ease and in all weather, albeit not with intense frequency.

PROPERTIES

Properties of the honeycomb structure

| | |
|---------------------------|---|
| Sheet dimensions (*) | 160 x 120 cm |
| Sheet height (**) | 4 cm (ECCOgravel 40 Double) & 3 cm (ECCOgravel 30 Double) |
| Honeycomb diameter | 43 mm |
| Density HDPE | 0,95 g/cm ³ |
| Honeycomb material | 100% HDPE - high-density polyethylene |
| Colour ECCOgravel white | Milky white with occasional slight nuances |
| Colour ECCOgravel black | Black |
| Breaking strain, unfilled | ISO 844 - 90 tonnes per square metre |
| Breaking strain, filled | ISO 844 - 400 tonnes per square metre |

Geotextile properties

| | |
|------------------------|--|
| Material | Non-woven polyester |
| Colour | White |
| Geotextile weight | 50 g/m ² |
| Geotextile bonding | Adhesion resistance to honeycomb structure |
| Overlap geotextile | On two sides of the sheet (long and short side) the geotextile sticks out at least 10 cm |
| Tensile resistance | 65 N/5 cm (EN 29073/3) |
| Resistance to cracking | 70 N (DIN 53363) |

Mechanical properties

| | |
|----------------------------------|---|
| Flexibility | Very high |
| Chemical stability | Very high |
| UV stability | With prolonged exposure: yes - in storage: n/a |
| Coefficient of thermal expansion | N/A (the expansion forces are absorbed by the flexibility of the sheet) |
| Cold temperature behaviour | Retains its flexibility |

PRACTICAL INFORMATION ECCOGRAVEL®

| Height | Dimensions | m ² / sheet | sheet per pallet | gravel / m ² |
|--------|------------|------------------------|------------------|-------------------------|
| 40 | 160 x 120 | 1,92 | 93 | 80 kg |
| 30 | 160 x 120 | 1,92 | 123 | 65 kg |

* with a tolerance of about 2 %

** with a tolerance of about 1,5 mm



STEP-BY-STEP INSTALLATION PLAN

1. SHEET SELECTION

You can choose between a sheet of 30 mm or 40 mm thick.

The ECCOgravel® sheet of 30 mm and that of 40 mm have similar characteristics (torque resistance, pressure resistance, flexibility, etc.). The load distribution (of cars, ...) of the foundation, however, is better with a sheet of 40 mm than with one of 30 mm.

Example

1. You put a piece of paper in your hand and hit it with a hammer.
2. You put a telephone directory in your hand and hit it with a hammer.

Conclusion: the load distribution is better in the second case. Applying this to ECCOgravel® we can conclude that the foundation will be less stressed if the sheet is thicker.

Can the ECCOgravel® 30 sheet never be used in applications with cars?

It can, on the condition that the foundation is very solidly executed. The extra cost for this additional reinforcement does not outweigh the savings of a thinner plate.

An ECCOgravel® 40 sheet can be used for all of the following applications.

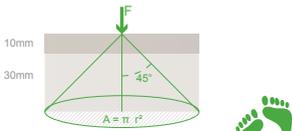
In addition, traders stock ECCOgravel® 40 in large quantities so that a 4 cm sheet is usually a better buy than a 3 cm sheet.

Driveways and access roads (speed < 10 km/h)
 Car parks with vehicles < 3,5 tonnes
 Driveways and access roads with occasional heavy traffic
 Car parks with occasional heavy goods traffic
 Paths
 emergency lanes
 Bicycle paths
 Terraces
 Garden paths
 Flat roofs
 Cemeteries
 Sporting grounds spectators

| | ECCOGRAVEL® 30 | ECCOGRAVEL® 40 |
|---|----------------|----------------|
| | | X |
| | | X |
| | | X |
| | | X |
| X | | X |
| | | X |
| X | | X |
| X | | X |
| X | | X |
| X | | X |
| X | | X |

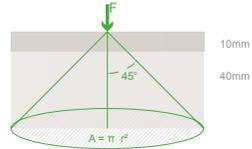
ECCOgravel®

Suitable for applications
with loads < 250 kg



ECCOgravel®

Suitable for applications
with vehicles



THE CHOICE OF THE GRAVEL | 4 PARAMETERS

2. GRAVEL SELECTION





SIZE

It is recommended not to use gravel types with a fraction of less than 4 mm. Finer fractions could stick to people's shoes or get between the profiles on the tyres of cars. For an optimum compaction in the honeycomb we recommend limiting the maximum diameter of the gravel to 16 mm.

FORM

When we speak of round gravel types, we mean pebble, and when we talk about broken gravel types we mean gravel. Pebble is nicer for terraces and garden paths, whereas gravel has the advantage that the top layer (this is the layer on top of the honeycomb structure, to make the structure invisible) is less likely to shift. Gravel is therefore preferred in places where vehicles will be driving over the surface.

HARDNESS

Hard gravels are less likely to crumble under moving loads and grow less weeds because they retain less water (low porosity). A soft rock, with a high porosity, however, crumbles easily and dissolves in time. Consequently, soft rock will become water-permeable in the long term, leading to puddles and rutting. Moreover, it will become green on non-sunny sides. Finally, gravel made of soft rock will cause dust in the summer and stick to one's shoes in the winter.

COLOUR

Gravel or pebbles are a natural stone and will retain their colour even after a long time.

3. SUB-BASE

NO FROST-FREE DEPTH REQUIRED



NO FROST

Due to the flexibility of the sheets and because the gravel is not bound, frost heaving has no effect on the ECCOgravel® surface. When designing foundations for asphalt and concrete paving blocks one must remember to take into account that no water remains in the zone where frost may occur in the foundation. In the event of frost, this could in fact lead to the break-up of the asphalt or concrete pavement. This is why the foundation depth for such materials is so large.

The depth of the foundation with ECCOgravel® is therefore only determined by the burdens which the surface will have to endure.

NO SLOPE REQUIRED



Unlike concrete paving blocks or pavements, ECCOgravel® requires no minimum slope. Even with very heavy rainfall, the buffering capacity will be sufficient to handle the rainwater.

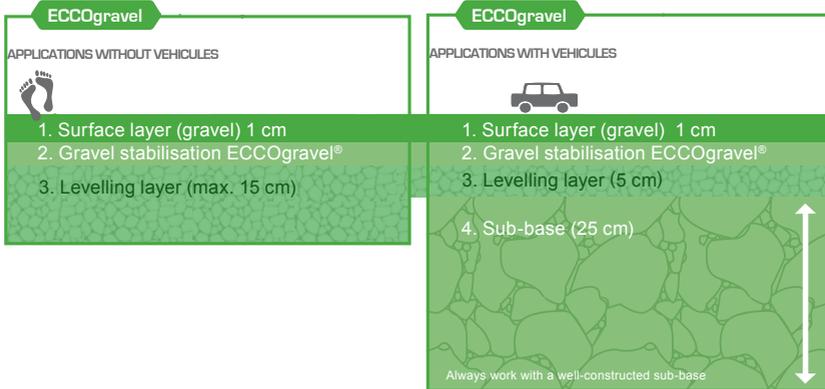
A quick calculation

The maximum 20-yearly rainfall in Belgium is 270 l/s/ha. For 10 minutes, this will correspond to 16.2 l/m².

The rainwater will immediately flow in between the hollow spaces of the gravel and the underlying foundations.

Thus we reduce the risk of a reduction in functionality of the paving due to water remaining on the surface.

A gravel layer of 5 cm may store up to 10 litres of water. It goes without saying that a minimal gravel foundation will take care of the rest.



1 SURFACE LAYER

The honeycomb structure should be just covered with gravel. For finer gravels this will be 1 cm, 2 cm for coarser gravels.

2 HONEYCOMB SHEET

See 'Sheet Selection' p. 10

3 LEVELLING LAYER

The levelling layer can be made with

- Limestone or porphyry 2-4 mm; 1-3 mm or 0-4 mm
- Sharp sand

4 SUB-BASE

Limestone rubble, porphyry rubble or broken concrete rubble (grain size: 0-32 or 0-40 mm). We do not recommend brick rubble, as this is ultimately pulverised.

4. INSTALLATION

1. Perform the necessary *excavation*. Always remove the topsoil.
2. Place the *borders*. These should be 2 cm above the level of the top of the sheet.
3. Dig the *foundations*. Work in max. layers of 20 cm and compact with a vibrating plate.
4. Install the *levelling layer* in fine gravel, compact and level.
5. Install the ECCOgravel® with overlapping geotextile. Cut with a cutting disc. Then, lay sheets in half-brick bond.
6. Lay the *gravel*. First the gravel then moving loads. Level with a shovel, brush, rake and tamp.
Do not compact the *decorative gravel*. Leave the gravel ± 2 cm above the sheets. The gravel will sink slightly as a result of natural compaction. Eventually, there should be just enough gravel to hide the ECCOgravel® sheets.
7. Inspect and *level* a few weeks after initial use. Add gravel where necessary.
Sinking will no longer occur.



1 perform the excavation works



2 installing the borders



3 compact with vibrating plate



4 levelling the levelling layer



5 installing ECCOgravel®



6 Cutting ECCOgravel®



7 placing the gravel

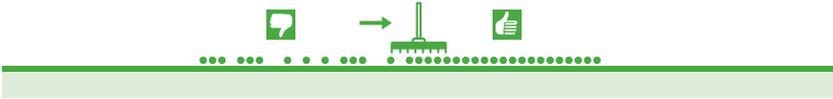


8 levelling the gravel

ECCO GRAVEL® MAINTENANCE

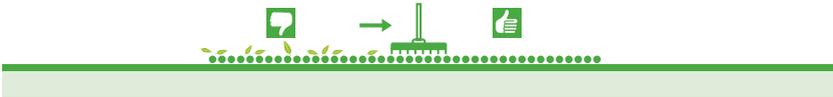
SURFACE LAYER

Occasional inspection is advisable depending on the traffic volume and how the surface is used. It is recommended to cover the honeycomb sheet again in places where it is exposed.



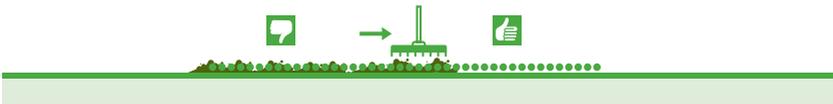
LEAVES

Preferably remove any leaves by raking, blowing or sucking once a year. Tests have shown that the minimum fraction of your gravel may certainly not be less than 4 mm if you wish to avoid drifting of the gravel.



SOIL | MANURE

If soil or manure end up on the surface, this is best removed with a shovel down to the honeycomb structure. A new layer of gravel (± 1 cm) on top of the honeycomb structure is sufficient to recreate a perfect surface. The manure or earth that has been rinsed between the hollow spaces in the honeycomb structure will have no effect on the water permeability.



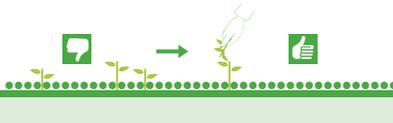
WEEDS

Consider the following things to prevent weed growth.

- Do not use gravel types that have a high porosity.
High porosity = water retained longer = more weeds.
- Do not use gravel types with a high lime content, because this promotes weed growth.
- Create a foundation that has no nutritive constituents and that drains water well.

Any remaining weeds (from seed initially already present in the soil) can be prevented from growing by the anti-rooting mat at the bottom of the ECCOgravel®.

The weeds can be removed easily by hand, because the roots are concentrated in the honeycomb structure. It is also possible to remove the weeds using hot air or burners. These solutions are preferable to chemical weed killers.



THAWING SALTS

Salt has no negative effect on the ECCOgravel sheet.



FREQUENTLY ASKED QUESTIONS

Will ECCOgravel® remain water-permeable in time?

When placing ECCOgravel® it is filled with gravel. To open and porous structure to ensure it is best not to gravel fractions finer than 4 mm. After installation, the gravel will compact, but water permeability will be guaranteed in the long term if you avoid the use of a fine fraction.

If fine particles (e.g. dust, sand, earth, remnants of leaves, etc.) eventually end up on the surface this will not affect the water-permeability. These fine materials will fill the voids without continuing to be compacted. The gravel will continue to distribute the load.

Due to the presence of the anti-rooting mat at the bottom of the honeycomb structure fine fractions (e.g. dust) will not rinse through the underlying foundations. This guarantees the water buffering in the foundations in the long term.

After placement of the gravel, the honeycomb structure is quickly exposed. What is the cause?

Either too little gravel was used during installation or the wrong kind of gravel was chosen. If the gravel is significantly compacted after placement (this is especially the case if the minimum and maximum fraction vary widely), this is not a problem per se. This will only have an effect during the first weeks after installation. Once the compaction is completed (preferably in a natural way, and not mechanically), the gravel will not sink any further. The welded anti-rooting mat under the ECCOgravel® sheet helps ensure this.

Won't the gravel slide on top of the honeycombs?

The gravel in the honeycombs forms a rough surface that the loose gravel will hook into. The upper layer will therefore only shift minimally. Covering the honeycombs with a layer of gravel is not only aesthetically pleasing, but the honeycombs are also maximally protected this way. The surface layer should not be too thick, otherwise the gravel stabilisation effect is lost.

To what extent can ECCOgravel be used for applications with cars or heavy trucks?

- In car parks that are used very intensively and at speeds of over 10 km/h, we recommend installing the driven areas in a bonded material (asphalt/concrete).
- ECCOgravel® is a perfect solution in areas where vehicles are parked. The sub-base of ECCOgravel® can be designed so that it can also process the water from the carriageway.
- With such a foundation, ECCOgravel® can handle occasional heavy traffic. Short turn-arounds by tractor-trailers or similar vehicles must be avoided at all times.



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