

**Installation Guidelines for Enkagrid[®]
Geogrids**

Colbond bv

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1 Areas of application

The summarized information contained in these installation instructions for Enkagrid PRO, Enkagrid MAX and Enkagrid TRC mirrors the experience gathered over time by Colbond and corresponds with state of the art technology.

The actual procedure for installation must be aligned in individual cases to suit the circumstances on the building site and the available working equipment.

2 Transport and storage

The rolls are approximately 5.05 m long and weigh between 100 kg and 200 kg, depending on the Enkagrid product type.

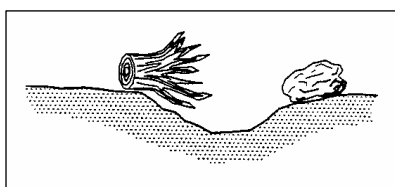
The rolls are packaged for normal transport, with the packaging offering sufficient protection against normal weather impact.

The rolls must be handled with care during unloading and transport on the building site. In particular, uncontrolled rolling off the transport surface or severe bending of the rolls during transport with fork lifts and loaders, etc. should be avoided.

Up to four geogrid rolls can be stacked on top of each other. However, they must not be burdened with any additional loads.

Ensure that the geogrids cannot roll away when they are stacked or stored individually.

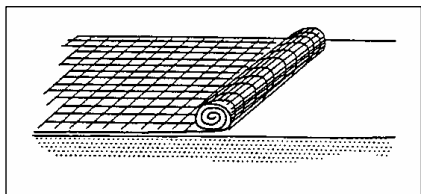
3 Preparation of the sub-base surface



Before installing the geogrid, the sub-base surface must be prepared according to location and height and must be compacted. Tree root residues, stones and other objects that may damage the geosynthetic product insert or that may have negative effects on its functions must be removed from the bed in advance.

The usual demands on the preparation of sub-base surfaces must be adhered to, too.

4 Installation of Enkagrid



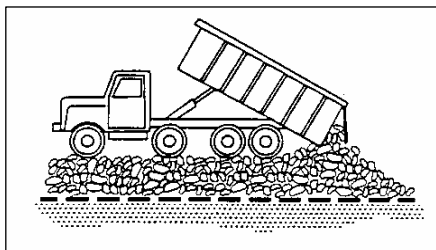
The installation direction is specified in the planning documents. When dealing with Enkagrid PRO, the uniaxial geogrid, the main pulling direction follows the black bars. Enkagrid MAX and TRC, the biaxial geogrids, can be strained equally in longitudinal and lateral direction.

The geogrid sheets must be installed smoothly and, if necessary, be weighted by hand using packing material in order to prevent them slipping or being blown away.

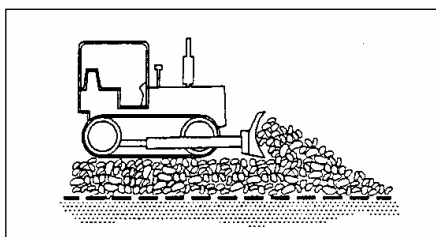
The geogrids must be installed without overlapping in the strain direction in supporting constructions or on embankments. If this is unavoidable, separate validation of the overlapping must be provided.

When dealing with reinforcement of unbound supporting layers in road construction, the overlap must be at least 50 cm in normal circumstances and at least 1.00 m in every direction if the subsurface is very soft.

5 Installation of the fill material



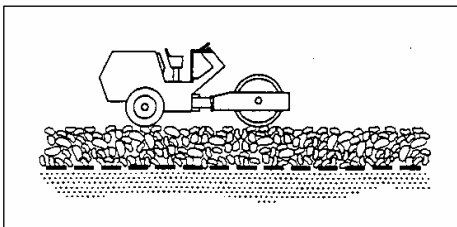
The granular distribution of the mineral substance mixture in the supporting layer material must be aligned with the geogrid reinforcement. High water content should be expected, especially in cohesive soils, which may fluctuate significantly, depending on the season. Accordingly, the proportion of fine components < 0.063 mm should be restricted to no more than 5 % of the weight, in order to enable smooth water drainage without significant pressure.



This requirement must be defined to an even stricter degree when dealing with recycling construction materials and recycling construction material mixtures, where the proportion of fine components < 0.063 mm must be considerably less than 5 % of the total weight.

Once installed, the geogrids have to be prevented from being directly driven on. An at least 20 to 30 cm thick layer of supporting material must be installed and compacted in front-spread method before the surface can be exposed to traffic. The thickness of the first layer must in this be aligned to suit the granular composition of the supporting layer material and may therefore be larger.

6 Compaction and compaction control



In order to ensure that the supporting layer material can be easily compressed and to prevent the mixture from breaking down, the water contents in the supporting layer material must be optimized.

A combination of initial static followed by dynamic rolling procedures has proven to be favourable.

In order to ensure that the reinforcing effects of the geogrid are activated as soon as possible, it is advisable to start the compaction process in the middle of the structure and to then work outwards to the edges.

Whenever possible, the frequency of the compaction equipment should be within the range of the characteristic frequency of the sub-base/sub-structure.

The thickness of the individual fill layers must be in line with the sub-base/sub-structure, the installed material and the equipment available for compaction.

Driving over the installed and compacted supporting layer is a good method to monitor and confirm the system's load-bearing capacity. The observation of deformation on the surface of the ground enhancement layer in those areas that the wheel load passes, and the depths of the tracks enable an initial, rough assessment of the load-bearing capacity of the construction and the effectiveness of the geogrid in dependence on the sub-base/sub-structure.

An unchanged depth of tracks along the entire route is an indication for even quality of the installation up to that point. "Pumping" under the load reveals the reaction of the sub-base/sub-structure. In such cases, a series of additional plate bearing or CBR tests permits an evaluation and qualitative assessment.

7 Instructions on supporting constructions and embankments

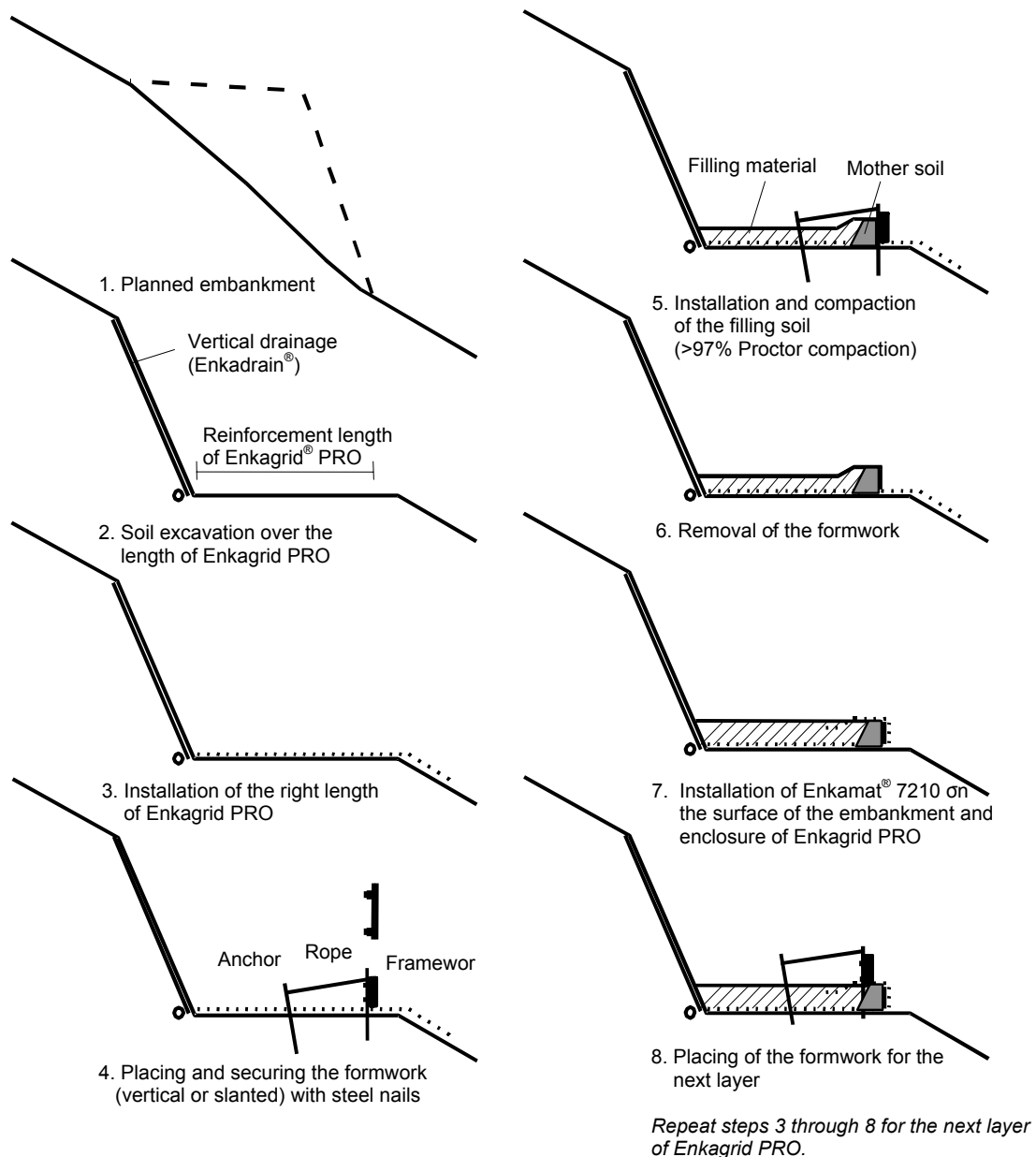
Embankment reinforcement usually must be implemented as specified in the diagram on page 5. Enkagrid PRO is always installed with the main pulling direction (black bars) at right angles to the edge of the embankment. During installation, the geogrid should be supported by a formwork at the front and be fixed in place in the embankment body before the installation of the next reinforcement layer. The overlap for installation in the embankment should be at least twice the layer thickness, but at least 1.00 m.

In addition, depending on the construction material and the possible loads to which the construction is going to be exposed after completion, it may be necessary to protect the embankment surface against erosion, UV radiation, fire or vandalism. Depending on the specific requirements, erosion-protection mats such as Enkamat[®] 7210 can be installed in the reinforcement in such cases to prevent fine granulate from the fill material falling out. The suspension of an erosion-protection mat, e.g. Enkamat 7020, allows hydro-seeding on the top of the embankment to provide additional hold and to complete the embankment in an aesthetic manner.

On request, Colbond offers to provide additional information on special systems for the embankment surface, also in combination with other constructive elements.

When working at elevations more than 2 above the top edge of the ground surface, measures must be taken in accordance with the trade association accident prevention regulations to prevent falls. Information on this issue can be obtained from the respective trade associations.

Stages of construction for a supporting construction reinforced with a geogrid.



8 Summary

Reinforcement of earthwork constructions using geogrids is a well-accepted economical and ecological alternative to traditional construction approaches. In some areas, it has even become a standard construction method. However, one must not neglect the fact that the installation of geosynthetics requires a certain care and that the standards and regulations for earthwork must be adhered to.

These installation instructions can only cover the most important points. In case of questions regarding the above or related items, we will be pleased to be of assistance at any time.

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