

Advantages of PET/PP Combigrid®



- ✓ reinforcement, filtration, separation and drainage in just one product, reducing aggregate thickness
- ✓ firmly bonded composite product
- ✓ robust needle-punched staple fiber nonwoven geotextile separates aggregate from fine soils
- ✓ very high strength at low strains
- ✓ immediate interlocking with cover aggregate
- ✓ low creep characteristics
- ✓ high angle of friction because of the structured geogrid surface
- ✓ high resistance against installation damage
- ✓ nonwoven geotextile firmly bonded between uniformly extruded PP or PET bars
- ✓ high resistance against biological and chemical degradation
- ✓ 4.75 m wide rolls
- ✓ quick and easy to install
- ✓ ISO 9001 : 2000 certified
- ✓ CE marked



Combigrid®

Combigrid® geogrids are the next generation of geogrids produced with state of the art manufacturing technology, unlike any other geogrid on the marketplace today. The reinforcement element

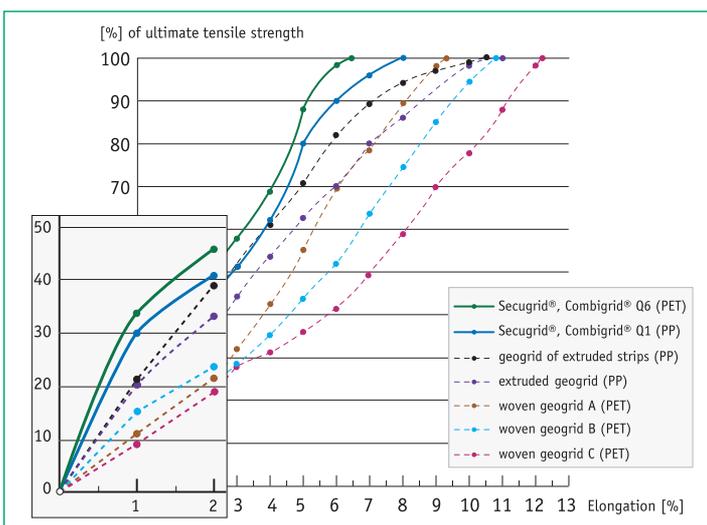


Combigrid® is a highly oriented polypropylene or polyester bar that is uniformly extruded and drawn to achieve a high modulus and strength at low elongations. The Secutex® nonwoven geotextile is placed between the Secugrid® bars during the manufacturing process and is firmly bonded between the reinforcement bars with the NAUE patented welding technology to provide a structurally sound and stable geogrid. Combigrid® geogrids are mainly used in conjunction with soft and low CBR soils where soil reinforcement in combination with separation and filtration is needed, such as in base reinforcement, embankment reinforcement and pile cap platforms.

Figure 1
Stress/strain curves
of Combigrid® and
selected geogrids.
Enhanced view
outlines realistic
working strains
($\leq 2\%$ elongation)

Advantage: Stress/strain behaviour

Geogrid composites like Combigrid® are used wherever a high strength is required at low



elongation. The stress/strain behaviour (also known as strength/elongation) of the geogrid is important when selecting which type of geogrid is to be used or specified. Geogrids will typically have a maximum elongation at break of 6 % to 15 %. However, the internal angle of friction of medium to densely compacted soils, in realistic design conditions, is reduced when the soil is subjected to an elongation of less than 2 %. It is necessary to align the stress/strain behaviour of the installed geogrid to the elongation behaviour of the soil.

The performance of the geogrid at a stress/strain ratio in the range of 2 % is therefore important and here Combigrid® shows its strength. Combigrid® has excellent tensile strengths at low elongations (Fig. 1) and demonstrates its advantages in the critical required elongation ranges.

Advantage: Soil separation

The three dimensional fibre matrix of the needle-punched Secutex® nonwoven, that is firmly secured between the Secugrid® bars during the manufacturing process, acts as a separation layer between different grain size soils and ensures long-term separation and filter stability. Such a separation layer is typically recommended in base course applications for subsoils with a CBR less than 3 % or in applications where fines should be prevented from moving into the reinforced aggregate above.

The high elongation capacity of Secutex® nonwoven geotextiles ensures excellent resistance to damage. This robust characteristic of Secutex® products allows them to easily accommodate irregular or soft subgrades. When covered with the aggregate, the Secutex® nonwoven geotextile fibres are reoriented around the stones, preventing damage to the nonwoven structure. With this excellent elongation property the interlocking effect of Combigrid® with the fill material is not reduced so that the stress transfer to the geogrid through the high strength Secugrid® bars is ensured.

Advantage: Low costs

Combigrid®, a bonded composite of a Secugrid® geogrid and a Secutex® nonwoven geotextile, can be used if a geosynthetic product is required to

provide both reinforcement functions as well as separation, filtration and/or drainage functions between the cover layer and subsoil. Due to its composite nature, Combigrid® can easily be rolled out in a one step installation process. Additionally Combigrid® allows for cost savings when designing a base course reinforcement as less gravel material and excavation is required when compared to an unreinforced design.

■ APPLICATION

Combigrid® reinforced bypass

The implementation of the Kuestrin-Kietz roadway bypass project on federal road B1, east of Berlin, Germany, called for a grade-separated crossing combining an all-purpose rural road with the construction of the actual bypass. The project is in a classic low-lying area of the Oder river and the subsoil here is primarily peat. This presented the designers with the problem of providing a secure foundation for the up to 8 m high earthen ramps connecting the rural road to the overpass bridge. The foundation design had to minimize settling and be able to absorb expansion forces in the embankments base. A two-layer geosynthetic reinforcement was selected in the design in conjunction with preloading a layer of crushed stone over the subsoil to avoid much more costly foundation techniques, such as support pilings.

Combigrid® installation over the soft subgrade (Kuestrin-Kietz, Germany)



About 7,000 m² of Combigrid® 60/60 Q1 251 GRK 4 were used as the bottom reinforcement layer. Combigrid® ensured the separation and filtration between the embankment's bulk material and the finely grained subsoil along with providing the first layer of soil reinforcement.

The second reinforcing layer consists of 6,000 m² of Secugrid® 40/40 Q1 geogrid and is positioned 500 mm above Combigrid®.

The advantages of Combigrid® are an immediate interlocking and transfer of stress into the reinforcement bars of the Combigrid® with an integrated filtration and separation layer against soft subsoils. And only one material needs to be handled versus two separate layers. The absence of larger overlaps as required for a single separation nonwoven geotextile layer also reduces costs and makes the installation faster, easier and cheaper. Additionally, with Secugrid® and Combigrid®, an edge wrap around the aggregate soil reinforcement material is not required.

Temporary road in Espelkamp, Germany

A temporary roadway for construction traffic over an estimated period of 3 years had to be built over a length of 1 km over a soft soil with a CBR of less than 3 %. The design asked for a CBR on the top level of the road of 24 %. The first approach therefore requested a minimum of 70 cm of crushed material 0/80 mm to allow this value. An alternative solution from the winning contractor suggested a Combigrid® 30/30 Q1 151 geogrid and only 45 cm of fill material, based on the NAUE calculation diagram. After removal of



Combigrid® over an extreme weak soft soil (Espelkamp, Germany)

100 mm of the topsoil, the Combigrid® composite geogrid was easily placed on the weak subsoil due to its stiffness properties. The crushed gravel was then placed directly on top of Combigrid® and was additionally compacted to increase the base course strength. In applications like these, it is important that the selected geogrid immediately transfers the stress into the reinforcing geogrid elements. Immediate interlocking, high strength at low elongations and filter stability between the soft subgrade and the base course were therefore the required properties. This solution saved the owner roughly 10,000 Euros just on the fill material.

Installation of Combigrid®



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