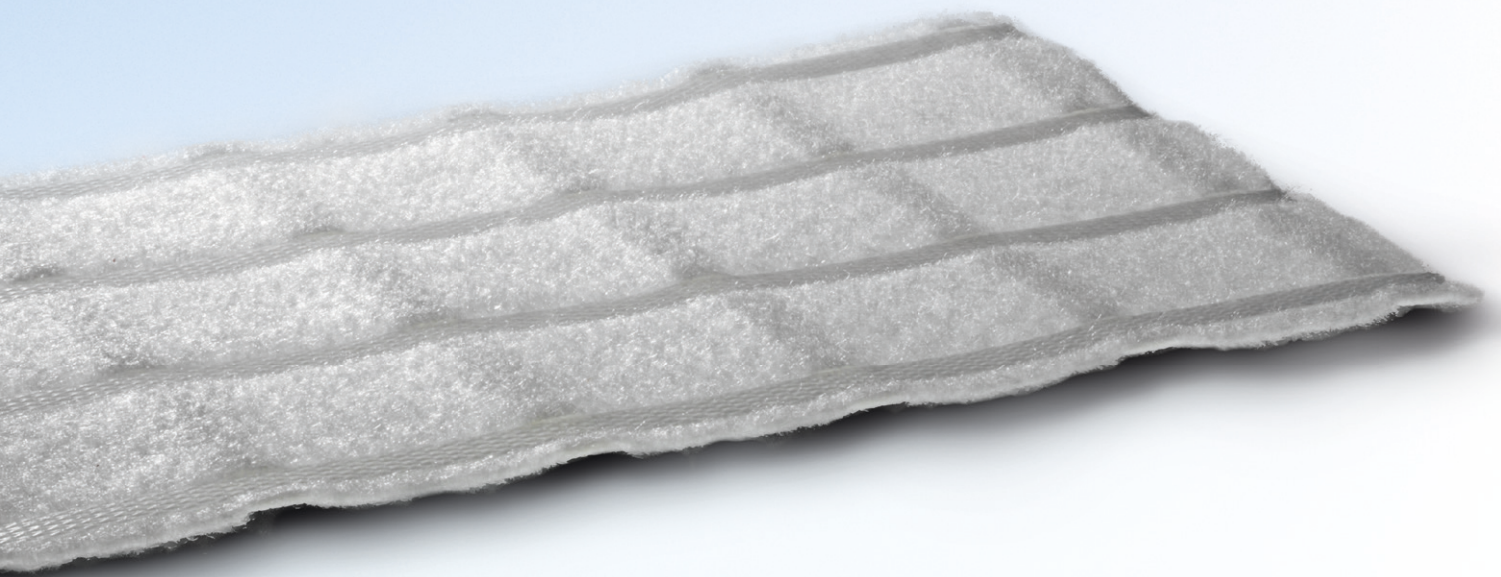


Advantages of
COMBIGRID®



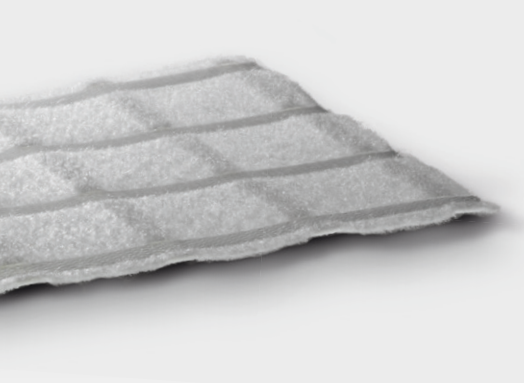
The inventor of structurally sound, laid and welded geogrids.
Material Science - Engineering – Innovation

COMBIGRID® - THE ORIGINAL!



COMBIGRID®

Combigrid® is composite of a laid geogrid made of stretched, monolithic flat bars with welded junctions and a mechanical bonded geotextile welded within the geogrid structure.



- ✓ Reinforcement/stabilisation, filtration, separation, and drainage in just one product
- ✓ Firmly bonded composite product
- ✓ Biaxial tensile strength up to 120kN/m
- ✓ Immediate interlock with fill material (no construction related strain)
- ✓ Cost saving with reduced aggregate thickness
- ✓ Excellent stress strain behavior (High tensile stiffness)
- ✓ High torsional rigidity
- ✓ High radial stiffness
- ✓ High cyclic tensile stiffness
- ✓ Robust against installation damage and chemical and biological attack
- ✓ 4.75m wide rolls facilitate quick, easy and cost-effective installation
- ✓ Verified and proven design methods with user-friendly design tools
- ✓ Mitigation of settlements and extension of project service life
- ✓ Ecological preservation of resources with reduced soil excavation

Combigrid® geocomposites benefit from NAUE's decades of reinforcement experience. Continuous improvement of the manufacturing process, stringent quality control in raw material selection and expert engineering support ensure safe and economical constructions.

Combigrid® is a geocomposite reinforcement solution. The unique manufacturing process produces structured, high strength, monolithic, pre-stressed polypropylene or polyester reinforcing bars with a continuous molecular structure. The extraordinary high extensional stiffness of Combigrid® efficiently reduces deformations in the subgrade which extends the service life of modern infrastructure.

The geocomposite additionally embeds a Secutex® nonwoven geotextile within the reinforcing bars. The welding process that strongly joins the longitudinal and transverse reinforcement bars, creates a firm and robust geocomposite for use in reinforced foundation layers.

This combination provides reinforcement, filtration, separation and drainage in a single product.

The geogrid-nonwoven geotextile geocomposite is used primarily on soft soils with low bearing capacity, such as unbound, dynamically loaded layers that require filtration and separation support. Typical applications include base and sub-base reinforcement for temporary and permanent roads, railways, storage yards, container terminals, temporary working platforms, airport runways, sludge lagoons and tailings ponds.

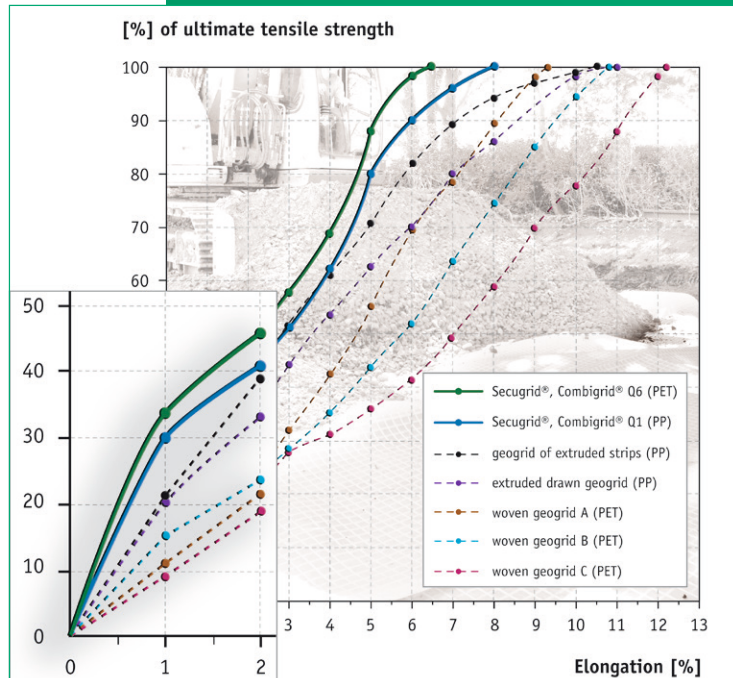




SELECTED ADVANTAGES OF COMBIGRID® ADVANTAGE 1: STRESS/STRAIN BEHAVIOUR

Geocomposites like Combigrig® are used wherever high strength is required at low elongation. The stress-strain behavior (also known as tensile stiffness) of the geogrid is important when selecting which type of geogrid is to be used. Geogrids will typically have a maximum elongation at break of 6% up to 15%, depending on the choice of polymer and manufacturing technology. However, the internal angle of friction of medium to densely compacted soils 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 with the elongation behavior of the soil.

Figure 1
Stress-Strain curves of different geogrids. Scaled up detail outlines typical working strain levels ($\leq 2\%$ elongation).



Permanent Deformation: CBR = 1% ($c_u = 30$ kPa), Wheel load = 9 kips (40 kN)

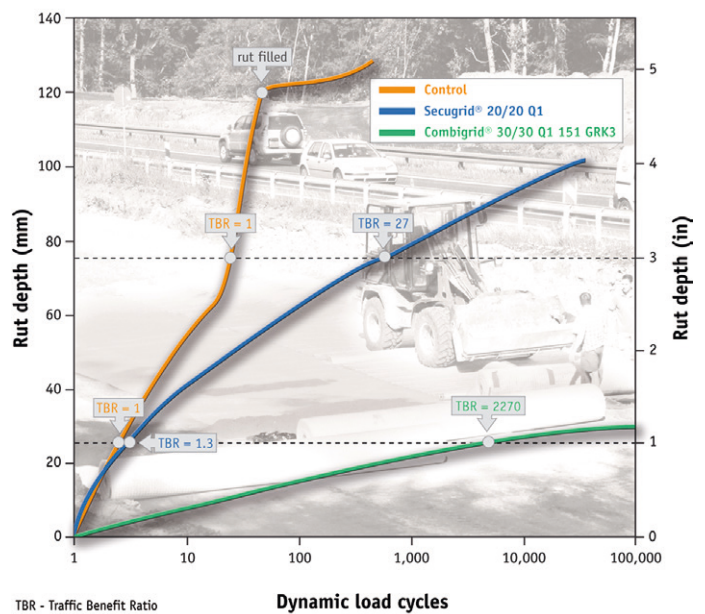


Figure 2
Combigrig® and Secugrid® traffic benefit ratio (TBR) over a very weak subsoil, compared to an unreinforced design (for subsoils CBR 1%, for details see Euro-Geo4, paper 229)

The performance of the geogrid at a stress-strain ratio in the range of 2% is therefore important and here Combigrig® shows its strength. Combigrig® has excellent tensile strength properties at low elongations and demonstrates its advantages in this important strain range.

ADVANTAGE 2: SOIL SEPARATION

The three-dimensional fibre matrix of the needle-punched Secutex® nonwoven, acts as separation layer between fine grained subgrade soil and coarse aggregate base course layers and ensures long-term filter stability. The properties of separation, filtration and reinforcement are combined in the product Combigrig®.

Tests to simulate the traffic passages on an unreinforced base course resulted in 3 inch (75mm) deep ruts after 20 load cycles, and it took 540 load cycles when Secugrid® 20/20 Q1 was used. However, when Combigrig® was used, the maximum rut depth of 3 inches was not reached even after 100,000 load cycles. Using a composite product made of a geogrid and a nonwoven needle-punched geotextile firmly bonded between the longitudinal and cross bars at the interface between soft subgrade and base course layer worked really well. Combigrig® - not just a geogrid. THE solution for infrastructure projects on low bearing capacity subsoil.

COMBIGRID®

Combigrid® Soil Reinforcement Applications:

- Base and subbase course reinforcement
- Basal reinforcement for embankments
- Load transfer platforms over piles
- Bridging of mining voids and sinkholes
- Reinforced foundations
- Airport runways and graded portions
- Working platforms
- Pipe trenches



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