TENCATE

TenCate Solutions for Slope and Wall Reinforcement

TENCATE GEOSYNTHETICS

TenCate Solutions for Slope and Wall Reinforcement

Tencate Geosynthetics offers effective solutions for the reinforcement of slopes and walls with TenCate Miragrid® GX geogrids and TenCate Polyfelt® PEC composite geotextiles. Both products are engineered from high tenacity polyester yarns which offer the required criteria critical for effective reinforcement of slopes and walls. High tenacity polyester yarns have high tensile strengths, low creep characteristics and are inert to chemical degradation –making them suitable for long term (>100 years) reinforcement applications.

The polymer coated flexible structure of Miragrid® GX geogrids ensures high interlock and high soil interaction. It is suitable for granular soil used in the reinforcement of slopes and walls.

Polyfelt® PEC composite geotextiles combine reinforcement with superior filtration and drainage functionality to enable finer-grained soils to be reinforced. The rapid release of pore water along the geotextile significantly reduces horizontal earth pressure and increases structural stability.

Both Miragrid® GX and Polyfelt® PEC are quick and easy to install and work effectively with various types of facing systems. Practical green-facing systems can also be easily adopted to blend in with the surrounding environment.

TenCate Miragrid® GX.

TenCate Polyfelt® PEC.

Reinforced Slopes with Miragrid® GX Geogrid

Wrap-around and vegetated facings

Geogrid-wrapped facings utilize soil-filled bags as the slope facing units with engineered soil backfill behind. They are especially suitable for the construction of steep slopes in areas where operations can be mobilised without incurring high costs. The use of soilbags to form the facing profile makes construction of complex shaped structures a relatively easy task while the soil fill encourages rapid vegetation growth of the system. The engineered soil backfill is reinforced with TenCate Miragrid® GX geogrids. The geogrid reinforcement is wrapped around the soilbags to a specific designed height and then laid back into the soil with sufficient anchorage length. Soil backfill is then placed and compacted, and the process is repeated until the slope height has been completed.

This facing system is suitable for slopes with angles up to 80° and heights varying from 3m to 50m. Ground water seepage is controlled by installing a geosynthetic wrapped stone drainage layer at the rear of the reinforced soil structure with the ground water discharged through drainage pipes into surface drains. The completed structure, when vegetated, blends easily with the surrounding environment. It is a proven and cost effective alternative to conventional concrete structures.

Miragrid® GX *geogrids being wrapped around stacked geobags to contruct a wall.*

Case Study

project	Slope Repair for Highway Construction
location	Thailand

In order to reinstate a collapsed highway due to a slope failure, TenCate Miragrid® GX geogrid was used to reinforce the backfill soil of the slope. In this construction process, bags with soil infill and seeds were used to provide the facing system. Construction began by laying TenCate Miragrid® GX geogrids on a prepared horizontal surface up to the edge of the slope, leaving a small excess of geogrid overhanging. Then, the soilbags were stacked to the designed height and required slope angle on the geogrid at the edge of the slope. The overhanging geogrid was pulled back to wrap around the soilbags. Soil backfill was placed behind the soilbags and compacted. This construction process was repeated until the full height of the slope was completed. The slope was covered with grass after several weeks of completion.

Case Study

project	Slope Reinforcement with Vegetated Facing
location	Malaysia

A failed slope had caused the road above to collapse. TenCate Polyfelt PEC® was used as reinforcement to repair the slope. The geotextile was laid horizontally on the prepared surface with slight tensioning and soil backfill was placed and compacted over it. On the slope surface, additional soil was placed and compacted, extending about 1m from the geotextile's edge. The construction process was repeated until each berm height. Excessive soil was then trimmed to the required slope inclination. Finally, soil erosion control geosynthetic was placed on the slope surface to aid vegetation growth and to restore the original slope's appearance.

Reinforced Slopes with Polyfelt® PEC Composite Geotextile

Vegetated facings

Construction of a slope with vegetated facing is made easy with the use of TenCate Polyfelt® PEC high strength composite geotextile and erosion control geosynthetics. Suitable for slope angles up to about 60° and multiple berm heights, this construction method uses TenCate Polyfelt® PEC as the reinforcement in the soil backfill and erosion control geosynthetics placed on the surface of the slope. The system also allows the use of on-site soil backfills (usually with poor drainage properties) as the composite geotextile enables in-plane drainage.

The wide range of erosion control geosynthetics available from TenCate such as TenCate Polyfelt® Polymat EM and TenCate Polyfelt® Envirofelt CF are ideal for promoting vegetation growth. They retain topsoil and provide optimum conditions for seed germination that result in rapid vegetation coverage on the slope surface, protecting it against long term soil erosion.

This proven system is a preferred choice for designers and contractors alike because of the easy and rapid construction technique and, especially, its cost effectiveness.

Establishing vegetation onto a completed reinforced slope.

Reinforced Slopes with Miragrid® GX or Polyfelt® PEC

Steel mesh formwork facings

The combination of steel mesh formwork and TenCate Miragrid® GX geogrid or TenCate Polyfelt® PEC composite geotextile effectively shapes and reinforces soil slope structures. The system consists of pre-formed galvanized steel mesh stabilised by restraining hooks to form a stable facing slope for the geosynthetic reinforced soil mass. Biodegradable geotextiles are inserted behind the steel mesh facing to prevent soil erosion and encourage vegetation growth.

TenCate Polyfelt® PEC is most commonly used as the reinforcement when the soil mass consists of finer-grained backfill that has poor drainage properties. Alternatively, TenCate Miragrid® GX geogrid is typically used to reinforce coarser-grained soil backfills. This system is ideal for slopes with angles up to 80° and heights ranging from 2m to 25m. It provides a stable facing that blends with the surrounding landscape.

Steel mesh formwork being set-up above layers of Polyfelt® PEC *geotextiles.*

Front of a steep slope with steel mesh formwork facing nearing completion.

Case Study

project	Slope Construction for Factory Lots
location	Malaysia

A development area for factory lots required the construction of a 18m high steep slope at the edge of the land boundary. The length of the slope was about 50m. To assist with the construction of the slope facing, 70° angled steel mesh lined with an erosion control mat was used. TenCate Polyfelt® PEC composite geotextile was placed against the steel mesh facing and extended into the soil backfill to provide reinforcement and drainage capabilities. Proper compaction was carried out on each lift of soil backfill laid over each layer of TenCate Polyfelt® PEC composite geotextile. The construction process was repeated until the full height of the slope was reached. This construction method provided a cost-effective solution to the development project compared to conventional retaining structures.

Case Study

project	Reinforced Segmental Block Wall Construction
location	India

The yearly increase in visitors to a popular temple situated on a hilltop demanded a wider access road and more parking areas near the temple. In view of the tight boundary conditions, poor construction access and a stringent deadline to complete the project, it was decided that the most viable solution was to construct a reinforced soil wall using segmental concrete block facing. TenCate Polyfelt® PEC sandwiched between 2 or 3 lifts of concrete blocks (each about 200mm high) was used as reinforcement layers in the construction. The wall was constructed in 4 berms, each with a setback of about 1.5m. The completed wall provided a large land space at the top which allowed dual-lane road accesses and ample parking spaces for visitors.

Reinforced Walls with Miragrid® GX or Polyfelt® PEC

Segmental block facings

Reinforced segmental block wall systems consist of precast concrete blocks stacked to form the wall facing, with the soil backfill behind reinforced with either TenCate Miragrid® GX or TenCate Polyfelt® PEC. The blocks are moulded with an interlocking mechanism that allows them to be firmly interconnected. Geosynthetic reinforcement, laid horizontally in the soil backfill, is connected to the concrete blocks via the interlocking mechanism at specific design heights of the wall. The construction of the reinforced segmental block wall system provides a relatively flexible structure that can tolerate differential settlement without causing distress to the structure.

Installation of the block wall facing, geosynthetics and the soil backfill are all in one construction process. Thus, the construction is relatively fast without the need for special lifting equipment and highly skilled labour. Reinforced segmental block walls have become an accepted practice for a fast, durable, aesthetic and cost effective retaining wall. The system is suitable for applications ranging from landscape terraces, housing developments to major structural walls.

Reinforcing with Miragrid® GX *geogrids.*

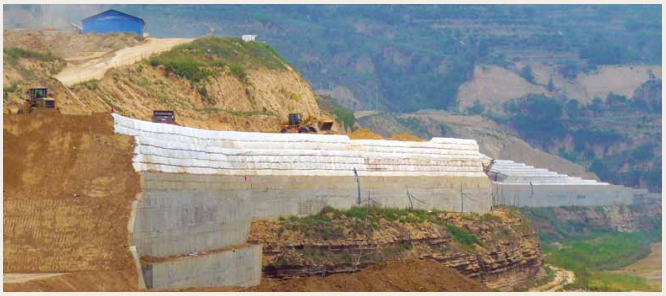
Segmental block wall nearing completion.

Reinforced Walls with Polyfelt® PEC Composite Geotextile

Full-height wall facings

Full-height wall facing structures typically comprise of TenCate Polyfelt® PEC (or TenCate Miragrid® GX) reinforced soil mass with full-height concrete facing panels. These concrete panels are typically precast and provide a strong, durable and aesthetic facing, making them ideal for high wall constructions for bridge approaches, highway ramps and major wall structures.

Compacting reinforced fill close to wall face.

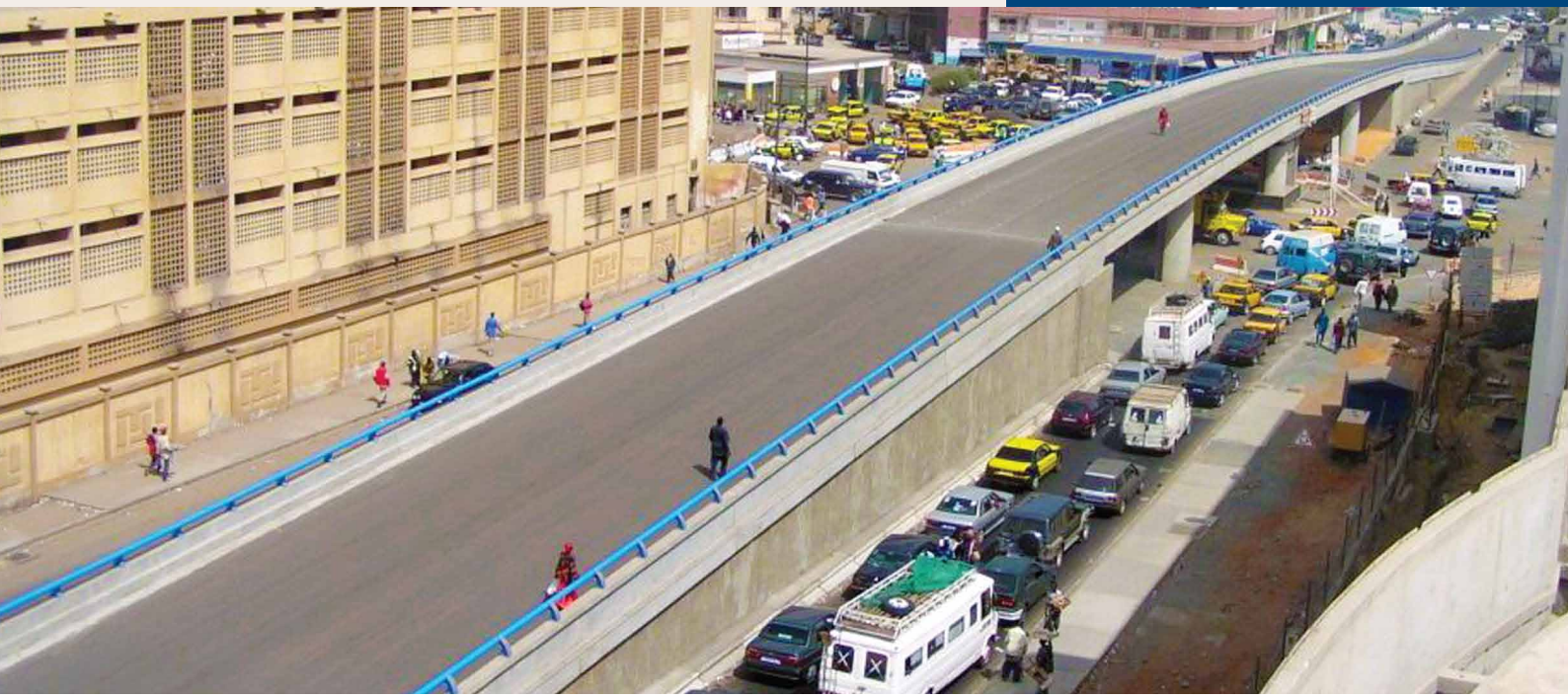


Reinforced soil wall during construction.

Case Study

project	Airport Runway Extension
location	Thailand

Due to the elevated embankment of the existing airport runway, extensions at both ends required substantial earthworks and a large land area. To mitigate this, a wall reinforced with TenCate Polyfelt® PEC was constructed. The geotextile was wrapped around the compacted fill of about 0.6m thick to form the facing. Temporary formwork was used to support the geotextile-wrapped facing and to aid soil compaction nearby. The geotextile was laid with pretensioning for effective reinforcement at each soil backfill layer. This was repeated until full height of the wall. For a durable finish and to protect the geotextile, a full-height concrete facing panel was constructed about 0.4m in front of the geotextile-wrapped facing and anchored at several locations into the reinforced soil wall.



TenCate develops and produces quality products that increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

Distributed by

GEOFABRICS®
Smarter Infrastructure

1300 60 60 20
www.geofabrics.co

100 301-gb-05 | 18

TenCate Geosynthetics Asia Sdn Bhd
14 Jalan Sementa 27/91 Seksyen 27
40400 Shah Alam
Selangor Darul Ehsan
Malaysia
Tel: +60 3 5192 8568
Fax: +60 3 5192 8575
Email: info.asia@tencategeo.com

TenCate Geosynthetics North America
365 South Holland Drive
Pendergrass
Georgia 30567
United States of America
Tel: +1 706 693 2226
Fax: +1 706 693 4400
Email: spec@tencategeo.com

TenCate Geosynthetics Austria GmbH
Schachermayerstrasse 18
A-4021 Linz
Austria
Tel: +43 732 6983 0
Fax: +43 732 6983 5353
Email: service.at@tencategeo.com

www.tencategeo.asia

TENCATE GEOSYNTHETICS