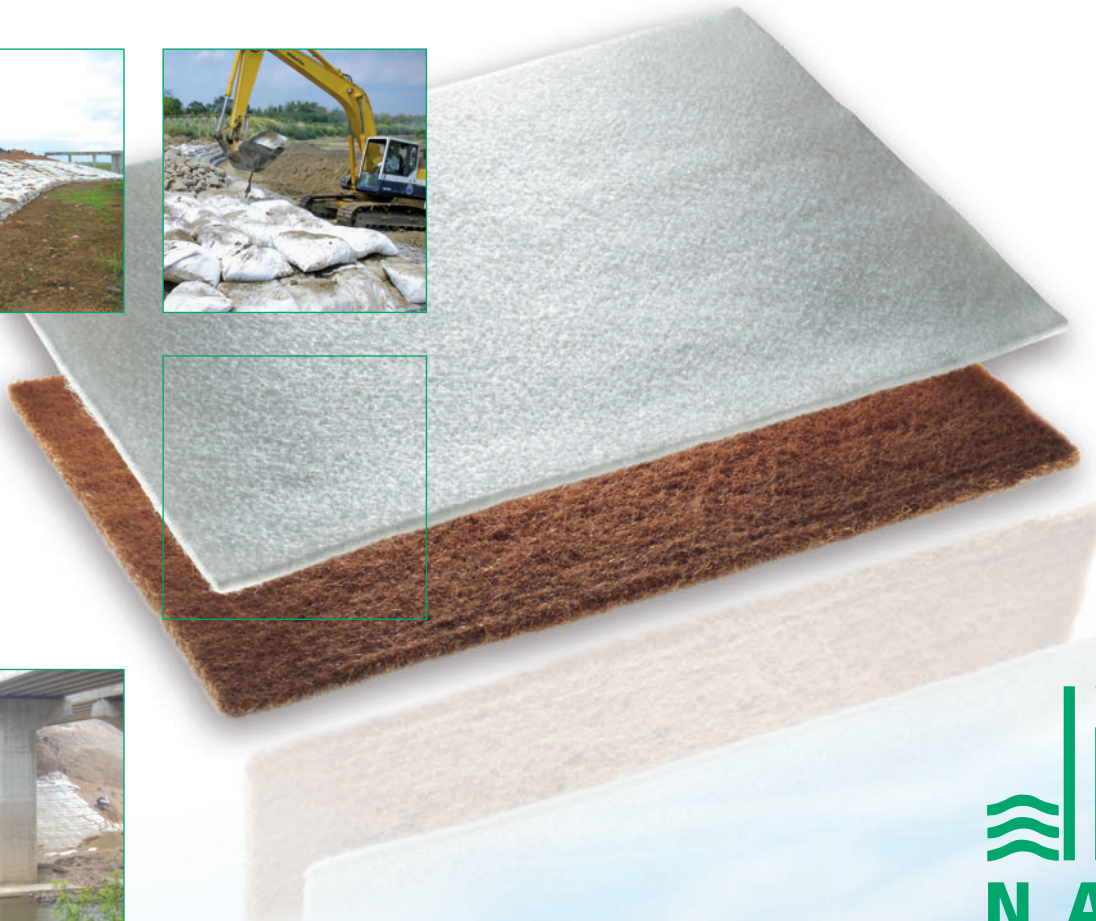
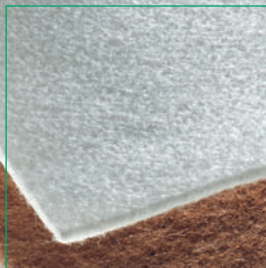




Advantages of Secutex®/ Terrafix® Soft Rock Sand Containers

- ✓ Erosion control, filtration and drainage in one product for coastal, off-shore, waterfront, waterway structures and foundation applications
- ✓ Soft Rock RS includes UV resistance and an anti-vandalism protection layer
- ✓ Superior to woven geotextile bags for friction properties and abrasion resistance
- ✓ Utilizes local fill materials
- ✓ Improves installation safety due to robust nonwovens
- ✓ Conforms to uneven terrain without sacrificing strength
- ✓ Environmentally smart: reduces carbon footprint, creates habitat zones, minimizes site disturbance
- ✓ Transforms erosion-prone soils into erosion-resistant systems
- ✓ Long-term durability and performance
- ✓ Available with Terrafix® or Secutex® nonwoven geotextiles
- ✓ ISO 9001 certified
- ✓ CE marked



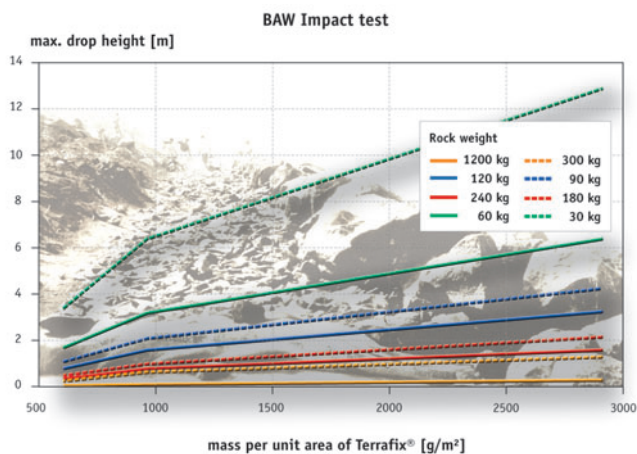
Soft Rock Sand Containers

Soft Rock geotextile containers for soil containment transform erosion-prone local materials into an erosion-resistant system through the utilization of needlepunched nonwoven Terrafix® or Secutex® geotextiles. It is well-suited to erosion control in waterfront construction, beach renourishment, scour protection, artificial reef construction and many other applications that require exceptional strength, the flexibility to conform to uneven terrain, and long-term performance. Terrafix Soft Rock® RS offers an additional attached coarser geotextile on the outside. The uniquely durable nonwoven geotextile provides elevated UV-resistance, higher protection against vandalism and numerous environmental advantages.

Advantage: Robustness

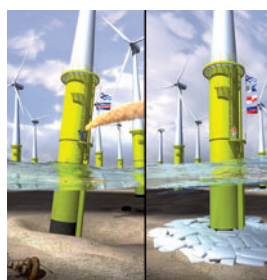
Needlepunched Terrafix Soft Rock® nonwoven geotextile containers can withstand harsh installation conditions, such as uneven terrain and tides, and challenging construction loads, such as heavy riprap. With the additional attached Soft Rock RS protection layer the added robustness also helps to protect against vandalism - a major benefit in any public waterfront installation. Terrafix® also demonstrates outstanding elongation properties due to its flexible, non-brittle, three-dimensional needlepunched fibre matrix. The entangled fibres retain soil particles, for cleaner and more dependable performance.

Fig. 1
The BAW (German Federal Institute for Hydraulic Engineering) impact test simulates the impact energy of falling stones onto geosynthetics and allows the correlation to a maximum drop height



ance. Also, additional erosion control is promoted through vegetation establishment (Plant roots can hold to the fibres). Marine life can grow and flourish upon Terrafix Soft Rock® RS without damaging the containers. The unique interaction of robustness and flexibility provides high puncture resistance without sacrificing frictional or filtration properties - an excellent choice for hydraulic and sustainable engineering applications.

Fig. 2
Successful scour protection in an off-shore windfarm (right)



Advantage:

Stronger Performance

Whether it's a revetment structure, scour protection, beach repair or another geotextile container application, one must be concerned with both - the overall resistance to environmental

threats such as wave energy and scour and the friction with other comparable solutions themselves. As waves push and pull at the Terrafix Soft Rock® structures, the individual containers may rub against one another. The durable, flexible fibre matrix of Terrafix® nonwoven geotextiles possesses elongation characteristics that are not only high but likely superior to woven geotextiles. Nonwovens are more flexible and possess a higher resistance to puncture. And puncture resistance may be a determining factor when using local materials rather than expensive, specially prepared fill materials. The strength of Terrafix Soft Rock® with its nonwoven geotextile greatly outperforms other solutions in regards to these vital design and performance concerns. Additionally, Terrafix Soft Rock® RS has a white bottom layer with a colored layer for additional UV resistance, as anti-vandalism protection layer and for improved under water habitat growth.

Advantage: More Secure Installations

Beyond the long-term durability benefits provided by the robustness of NAUE's Terrafix Soft Rock®, installations are also more secure. Some installation conditions can damage many types of geosynthetics. Terrafix® geotextiles eliminate that risk. The combination of strength and flexibility allows for rough handling (such as dropping bags into place), covering with heavy riprap and placement over uneven ground. Also, the additional geotextile puncture resistance of Soft Rock RS better protects against vandalism. Safer, more intact installations lead to maximized performance and longer service life.



Fig. 3
Terrafix Soft Rock® container in a dropping installation performance

Advantage: Environmentally Smart

Terrafix Soft Rock® possesses many environmental advantages. Nonwoven Terrafix® containers have a rough, durable outer surface to which plant life and other organisms can hold. This allows for underwater plant growth that provides additional erosion control and site protection while creating a habitat zone. For applications such as artificial reef construction, the characteristics of Terrafix Soft Rock® are essential to environmental success. For other installations, such as beachfront erosion control, the ability to use local material controls site costs, minimizes site disturbance, and reduces the carbon footprint of construction. Harvesting fill is both expensive and environmentally harsh, as it requires stripping and shipping it from elsewhere. Each day we see more and more how greener practices are not just nice ideas but economically smart.

Fig. 4
Plant growth and underwater habitat zone generate shortly after the installation of Terrafix Soft®



APPLICATION

JETTY 'MUARA KARANGSONG', INDRA-MAYU-CIRABON, INDONESIA

The project 'Muara Karangsong' a loading and docking road for fishermen was developed under the Department of Waterway Engineering, Ministry of Public Works, West Java, Indonesia. The previous design included more or less dumped stones and gabions. The budget for this project was very tight and the stones for the planned design would have had to be transported from long distances to the sites. The amount of trucks necessary for this would not only have had an environmental impact but also have caused severe damage to the current access road. For these reasons an alternative solution was selected, where 15,200 Soft Rock (sandfilled geotextile containers) ensured the stability of the existing loading road.

These containers (each with a filling size of 0.6 m³) were filled with existing soil which is a cost saving solution. The designers also changed the specification of the reinforcement: Secugrid® 40/40 Q6, a high quality geogrid made from interlaced extruded polymer bars with high strength monolithic welded junctions, from NAUE was used instead of the traditional bamboo mattresses.

The following system solution was applied (bottom to top):

- foundation system with wooden piles
- reinforcement with Secugrid® 40/40 Q6
- Soft Rock 601 containers, used as a core of the jetty
- stone gabion for cover and protection
- sand cover
- concrete pre-cast for the access road



Fig. 5
Placement of cover material over the Terrafix Soft Rock® jetty

The innovative solution shows various advantages comparing it to the original planned solution. With the Secugrid® reinforcement over the piles and the soft soil, combined with the erosionstable containment of the fill material in the Secutex® Soft Rock containers the loading and docking road is designed and built for long-term usage. Additionally the construction time frame was less than originally planned and the total costs were nearly half of the original budget. Overall: stable, safe and economically built with NAUE geosynthetics.

TO HALT EROSION, PHULAY BEACH SOFTENS UP

Thailand's Phulay Beach borders a tropical rain forest and the fabled islands of the Andaman Sea. It is setting that possesses what many might fairly describe as unsurpassed natural beauty.

Phulay tourism centers around its 2 km stretch of beach. But the combination of the constant tide and fast-developing tourism-oriented properties led to concerning erosion.

Softening Up

"Hard" beach stabilization structures, such as rock, may protect structures behind the beach, but, in stopping wave action from going beyond those rocks, hard solutions almost always cause erosion in front of themselves. The beach becomes inevitably narrower. The rock defense may be undermined. When that erosion breaches the rocks, debris from those rocks will be left on the beach and in the surf zone, further causing disruptions. As erosion continues, rock behind the beach becomes affected and leaves hazards. Phulay Beach was experiencing exactly this type of



Fig. 6
Soft Rock Containers on site and ready to be filled

Fig. 7
Terrafix Soft Rock® protected beach line while being covered with beach sand



erosion. The solution was to soften up the erosion control approach with Soft Rock, a sand-filled geotextile container made of non-woven staple fibre geotextiles.

Soft Rock provides durable, wave energy-diffusive, erosion-limiting performance but allow enough porosity that some water may dissipate through Terrafix® non-woven containers. This energy absorbing approach allows for softer deflection and dispersal of waves. Meaning: the presence of this type of erosion control will protect on both the back and front side of the structure.

At Phulay, the project team used 610 bags of Terrafix Soft Rock® type R601. They utilized suitable, on-site material for the Soft Rock container fill. This approach not only halted the beach's erosion but helped restore it. Waves not only carry an erosive force, but sediment and sand. Soft Rock helped retain that new beach material.

With the exceptional strength and robustness of the Soft Rock, the beach was protected. The resort owner whose concern prompted the work was very satisfied, not only with the preservation of the site's beauty but with the reduction of risk to tourists.

The solution at times seems too simple; but it is incredibly effective and economical.

INSTALLATION



Terrafix Soft Rock®
delivery on site



Filling of Soft
Rock containers



Filled Soft Rock
prior to closure



Soft Rock closure
by sewing



Soft Rock trans-
portation without
damage



Placement of
Terrafix Soft Rock®



Placed Terrafix Soft
Rock® prior to soil
coverage



Vegetation growth
shortly after con-
struction



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