



## NaBento® – Geosynthetic Clay Liner

Unique Product for Optimum Sealing Performance





## NaBento – Combining the Best of Nature and Technology



The NaBento geosynthetic clay liner (GCL) is a composite product, a mere 1 cm thick, comprising high-grade bentonite sandwiched between various geotextile cover and supporting layers. The main constituent of the incorporated bentonite is montmorillonite, a highly swellable, three-layer clay mineral.

The swelling action of the encapsulated bentonite due to water absorption is compounded by the loads acting on the NaBento GCL to create a waterproof clay barrier. The water permeability progressively falls as the loads increase: achievable values of  $5 \times 10^{-11}$  m/s make NaBento a safe and economical substitute for conventional mineral liners in numerous applications.

NaBento offers an efficient substitute for conventional mineral liners in numerous applications.



### NaBento – a reliable and cost-effective alternative offering a host of benefits

- Straightforward and largely weather-independent installation
- Thin sealing layers reduce volume of earthworks while increasing landfill capacity
- Suitability assessments by LAGA (Waste Working Group of German Federal and State Governments) for use as mineral liner in Class I and II landfill cover lining systems showed product to offer guaranteed service life > 100 years in terms of mechanical resistance and sealing performance (applies for types RL-C and RL-N)
- Lower susceptibility to settlement than conventional mineral liners
- Industrial production offers uniformly high, certified quality



## Production flexibility

NaBento is manufactured on state-of-the-art production lines. Apart from our time-tested standard models, we also fabricate purpose-designed GCLs to our customers' specifications. The use of alternative raw materials, higher component weights per unit area or the integration of additional polymer/geotextile layers allows fine-tuning of the product properties to local conditions.

## Enhanced performance thanks to coating

- The surface of NaBento RL-N and NaBento RL-C is coated with bitumen and expanded shale to boost the product's long-term external shear strength (friction) in contact with adjoining materials.
- NaBento RL-N and NaBento RL-C are less susceptible to desiccation than standard bentonite mats. This guarantees consistent sealing performance, even in difficult conditions.
- The water-repellent external coating also allows installation in damp weather.

## Reliable long-term waterproof barrier

The GCLs selected for most applications incorporate sodium bentonite due to its extremely high swelling capacity. This guarantees a reliable seal even under relatively low loads with permanent water exposure. Through long-term contact with natural soils, a major part of the bentonite's sodium constituent is converted into calcium through a process of ion exchange. This problem can be avoided and the shrinkage tendency of the bentonite reduced by the specification of NaBento RL-C, with calcium bentonite, as a useful alternative with more stable long-term properties for backfill heights exceeding 1.0 m.

## High internal shear strength

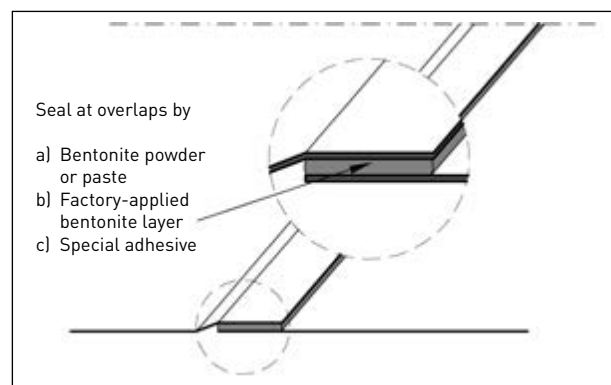
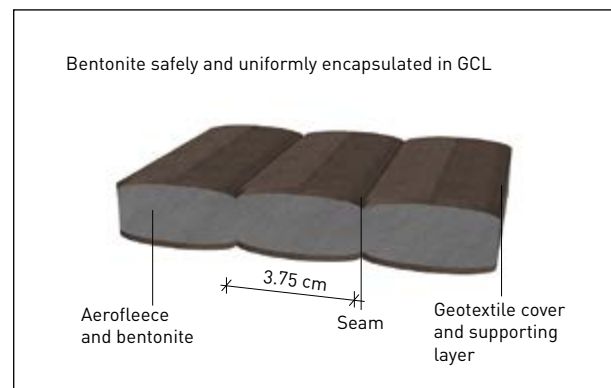
The product owes its high internal shear strength to the composite action of the supporting geotextile layers, aerofleece and bentonite, which is achieved by a special stitching technique.

This, in conjunction with the high external shear strength, allows trouble-free application on steep slopes with gradients of over 1:3.

## Optimization of overlaps

The overlaps between the individual NaBento sheets can be tailored to project-specific requirements. The standard solution involves the on-site application of either bentonite powder or bentonite paste to the overlap zone (a). As a further option, the factory application of a bentonite layer to Nabento RL-N- and RL-C sheets offers a means of simplifying and, most importantly, speeding up installation (b). All longitudinal overlaps can be easily formed by unrolling the liner over the edge of the previously installed sheet, with no need for any additional application of bentonite powder or paste.

A special adhesive is available for cases where the joints are required to resist tensile or shear loads (c).







## Geosynthetic Clay Liner with a Reputation for Versatility

### Consistently guaranteed quality

Quality begins with the technical design of NaBento and the selection of its constituent materials. Stringent incoming goods inspections – covering everything from the bentonite to the geotextile components – guarantee that all materials exhibit the required properties. Weight and thickness are constantly checked during manufacture. Moreover, the achievement of all critical mechanical and hydraulic parameters – above all, permittivity ( $\psi$ ) – is ensured by means of systematic internal and external surveillance. External surveillance is regularly undertaken by independent, recognized test institutes.

Thanks to its outstanding properties, NaBento offers benefits which far exceed those needed for standard applications. Professional engineering and constructive collaboration with our customers pave the way for optimum product selection.

### The standard NaBento models are distinguished by

- Bentonite type (sodium = N, calcium = C), and
- Surface characteristics (R = rough)

### Reduction of carbon emissions

Carbon reductions of anything up to 89% are achieved, compared to solutions incorporating conventional materials (clay, cohesive soils etc.). Comprehensive studies have also estimated cuts in the cumulative energy demand of 50-85%.

These benefits were achieved by:

- Significant savings in material quantities
- Substantial reductions in transportation
- Lower emissions during manufacture
- Reliable long-term performance

## A unique range of options

- Bentonite type: - Sodium bentonite  
- Calcium bentonite
- Bentonite quantity: - 3.0 kg/m<sup>2</sup> to 15 kg/m<sup>2</sup>
- Cover and supporting layers: - Wovens and/or nonwovens with varying weights per unit area  
- Composites  
- With/without coating on one or both faces
- Additional features: - Incorporation of PE sheet as root barrier
- Interlayers: - PP, polymer or steel core
- Size: - 3.60 m or 5.10 m width as standard  
- Alternative widths possible where required
- Overlaps: - Bentonite powder/paste or special adhesive for structural continuity  
- Factory-applied bentonite layer on long edge of sheet



Cover lining systems for landfill sites



Canal linings

## NaBento applications

### ENVIRONMENTAL ENGINEERING

#### Landfill Construction

- Cover lining systems
- Improvement of geological barrier

#### Groundwater protection

- Roads/railways in water protection areas
- Stormwater holding basins
- Storage basins
- Landscape construction
- Airfield construction

#### Contaminated sites

- Cover lining systems
- Bottom lining systems

### HYDRAULIC ENGINEERING

#### Dams and dikes

- Waterbodies



Groundwater protection for roads and pavements



Linings for railways

### FURTHER DETAILS

NaBento lends itself to a wide variety of applications. For further information on the product's properties, applications and technical features, please contact us or visit our website at [www.HUESKER.com](http://www.HUESKER.com).

NaBento® is a registered trademark of HUESKER Synthetic GmbH.  
HUESKER Synthetic is certified to ISO 9001 and ISO 50001.



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