MINERALS TECHNOLOGIES

CETCO®

BENTOMAT®

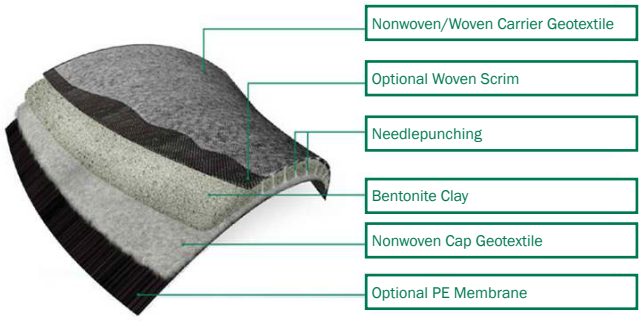
CLAY GEOSYNTHETIC BARRIER (GBR-C)

PRODUCT OVERVIEW

ECO PLATFORM EPD EN 15804 VERIFIED

Clay Geosynthetic Barrier

From the World's Leading Supplier of GBR-Cs



What is a GBR-C?

A geosynthetic clay barrier (GBR-C) comprises at least two geotextiles that are needle-punched together, encapsulating a layer of bentonite clay between them. GBR-Cs are known for having consistent, very low permeability. They have the unique ability to seal around penetrations, self-heal punctures, and self-seam at the overlaps.

What makes CETCO GBR-Cs unique?

- Durable needle-punched reinforcement ensures that CETCO GBR-Cs can withstand shear stresses on steep slopes. The high needle-punch density provides higher peak internal shear strengths without relying on additional processing.

- Granular bentonite creates less dust during installation than powdered bentonite and is less likely to shift through the needle-punch reinforcement process resulting in consistent hydraulic performance.
- Self-seam technology is a powder bentonite impregnation at the longitudinal overlaps. This feature eases the installation process by eliminating the need for supplemental bentonite and the additional labor to apply it.
- Lamination capabilities provide composite geomembrane-GBR-C products (PE membrane can be laminated either to carrier or cap geotextile).

What are the advantages of a GBR-C over compacted clay?

- Self-healing and self-seaming: Bentonite is a naturally occurring clay with a high affinity for water. When hydrated, sodium bentonite swells up to 15 times its original volume. This provides the ability to seal around penetrations, self-heal punctures, and self-seam at the overlaps.
- Better hydraulic performance: GBR-Cs have a total thickness of typically less than one cm and provide better hydraulic performance than several dozen cm of compacted clay.
- Resistant to varying weather conditions: GBR-Cs are less likely to be impacted by freeze-thaw or desiccation-rewetting cycles. Freeze-thaw cycles frequently cause compacted clay liners to crack and lead to increased leakage. A geosynthetic clay barrier provides consistent performance.

Bentonite is a clay whose main ingredient is the mineral montmorillonite. It was formed millions of years ago through the aqueous deposition of volcanic ash.

BENTOMAT® GBR-C

European Harmonized Standards

BENTOMAT® GBR-C can be used as a barrier in civil engineering and environmental engineering as per regulation EU number 305/2011 of 9 March 2011. This applies to placing on the market within the European Harmonized Standards listed below.

- EN 13361:2004 + EN 13361:2004/A1:2006 Geosynthetic barriers – Characteristics required for use in the construction of reservoirs and dams .
- EN 13362:2005 Geosynthetic barriers – Characteristics required for use in the construction of canals .
- EN 13492:2004 + EN 13492:2004/A1:2006 Geosynthetic barriers – Characteristics required for use in the construction of liquid waste disposal sites, transfer stations, or secondary containment.
- EN 13493:2005 Geosynthetic barriers – Characteristics required for use in the construction of solid waste storage and disposal sites.
- EN 15382:2013 Geosynthetic barriers – Characteristics required for use in transportation infrastructure.

GBR-C Applications

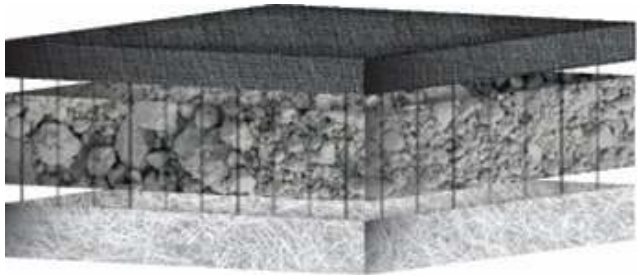
Common applications include:

- Landfills

  (bottom liners and final covers)
- Mining (heap leach pads, tailings

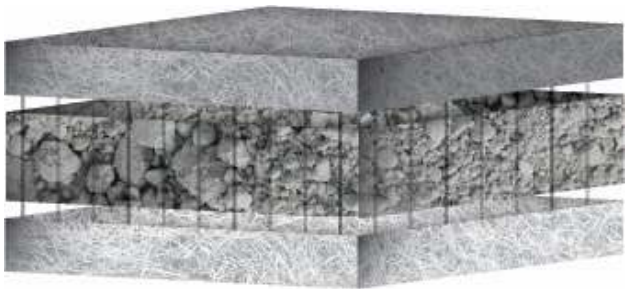
  impoundments)
- Ponds and reservoirs
- Canals
- Wetlands
- Secondary containment
- Roads
- Floodbanks

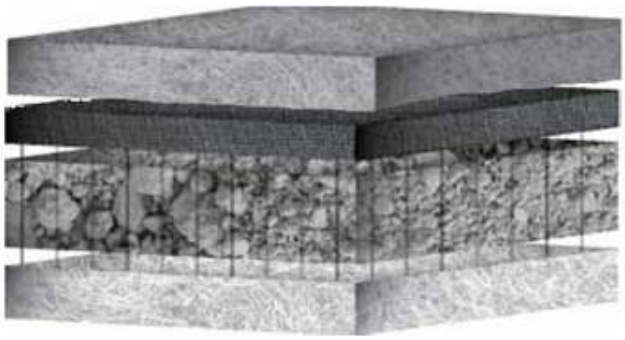
Types of CETCO GBR-C



BENTOMAT NS/AS

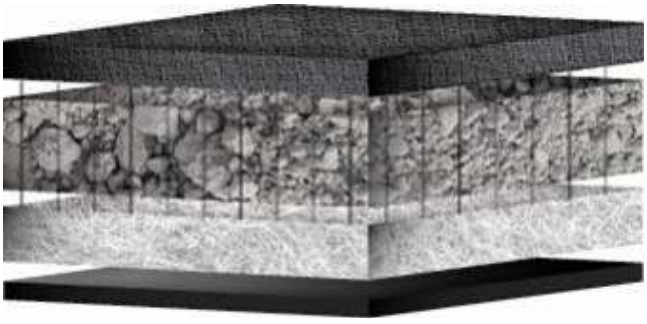
- Needlepunch-reinforced GBR-C with woven and nonwoven
- Commonly used in composite liner systems (landfill liners, caps, heap leach pads, etc.) on slopes up to 3H:1V





BENTOMAT DN/DNW

- Needlepunch-reinforced GBR-C with two nonwoven geotextiles (DN) and optionally with additional woven scrim (DNW) for dimensional stability
- Best choice for demanding (high normal stress, high shear stress) applications; slopes 3H:1V and steeper



BENTOMAT CL/CLT

- Bentomat NS/AS laminated to a PE geofilm/geomembrane from either woven or nonwoven side
- Used in ponds, secondary containment applications and cover applications
- Used on slopes up to 4H:1V for Bentomat laminated with smooth PE layer (CL)
- Used on slopes up to 3H:1V for Bentomat laminated with double sided textured PE layer (CLT)

Bentomat® NS75 Self and Bentomat® NS75-N Self

TECHNICAL DATA

MATERIAL PROPERTY	TEST METHOD	VALUE	TEST FREQUENCY
GBR-C			
Index Flux [1]	ASTM D 5887	$4{,}0\times10^{-09}$ $(m^3/m^2)/s$	Production week [2]
Hydraulic Conductivity	ASTM D 5887	$\leq 2{,}0\times10^{-11}$ m/s	Production week [2]
Total Mass/Unit Area [3]	EN 14196	4,30 kg/m²	5000 m²
Bentonite Mass/Unit Area [3]	EN 14196	4,00 kg/m²	5000 m²
Tensile Strength MD/CMD [4]	EN ISO 10319	11,0/11,0 kN/m	5000 m²
Elongation at Break MD/CMD [5]	EN ISO 10319	15%/10%	5000 m²
Puncture Resistance (CBR) [6]	EN ISO 12236	1,8 kN	5000 m²
Peel Strength [7]	ASTM D 6496	600 N/m	5000 m²
Thickness	EN ISO 9863-1	6,5 mm	5000 m²
Roll Length	—	40,0 m	Continuous
Roll Width	—	5,0 m	Continuous
BENTONITE			
Free Swell	ASTM D 5890	25 ml/2 g	5000 m²
Fluid Loss	ASTM D 5891	max 18 ml	5000 m²
Water absorption	DIN 18132 / ASTM E 946	450% / 600%	5000 m²
Cation Exchange Capacity	TP-1016	≥70 meq/100g	5000 m²
Methylene Blue adsorption	VDG P 69	300 mg/g	5000 m²
Ca Content (Calcite)	XRD	≤5%	Certified by supplier
Montmorillonite content	XRD	80%	Certified by supplier
GEOTEXTILES (PP)			
Non-Woven Mass/Unit Area	EN ISO 9864	200 g/m²	20000 m²
Woven Mass/Unit Area	EN ISO 9864	100 g/m²	20000 m²

Bentonite powder is impregnated into overlap area 50cm from both sides.

Notes:

[1] Index Flux with tolerance $+0{,}5\times10^{-09}$ $(m^3/m^2)/s$ | [2] Production week = average 75 000 m² of one type of Bentomat | [3] Bentonite mass/unit area reported at 0% moisture content | [4] Tensile Strength with tolerance –1,0 kN/m | [5] Elongation at break is average value based on statistical data for this type of geotextiles. It may vary from above data. | [6] Puncture Resistance (CBR) with tolerance –0,2 kN | [7] Peel Strength testing is performed in machine direction

Common Applications of Bentomat® NS75 and NS75-N Self

BENTOMAT® NS can be custom engineered to meet project-specific needs. It is available with various mass per unit area of bentonite and geotextiles configuration. It is also available with laminated smooth PE geofilm/membrane generally called BENTOMAT® CL or with double-sided textured PE membrane generally called BENTOMAT® CLT. For more reference, please contact CETCO.

Bentomat® NS75 and NS75-N Self is:

- One of the most commonly used GBR-C products .
- Low permeability and maximum performance under a wide variety of field conditions.
- With Self-adhering technology.
- The woven side is facing up when unrolling of Bentomat NS75 Self.
- The nonwoven side is facing up when unrolling of Bentomat NS75-N Self.

LANDFILL BOTTOM

ROADS

MINING

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