



CETCO[®]



Instytut Techniki Budowlanej

ENVIRONMENTAL PRODUCT DECLARATION TYPE III ITB NO. 131/2020

BENTOMAT[®]

CLAY GEOSYNTHETIC BARRIERS (GBR-Cs)



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(MTX symbol on the New York Stock Exchange)

OUR STANDARDS. YOUR PEACE OF MIND.



ISSUANCE DATE: 22.12.2020

VALIDITY DATE: 22.12.2025

MANUFACTURER

CETCO is the construction technologies business unit of Minerals Technologies Inc. (MTI), a resource- and technology-based growth company that develops, produces and markets worldwide a broad range of specialty mineral, mineral-based and synthetic mineral products and related systems and services. MTI is present in 35 countries, including 158 production locations and 12 Research & Development centers. CETCO's European headquarters are located in Szczytno, Poland, which includes a production plant and R&D center.

Passion for Innovation

Our multidisciplinary research and development team creates new products and provides the support our customers need. Our growing portfolio demonstrates our commitment to technological innovation across the markets that we serve. Established partnerships with research institutes and universities support our dedication to staying on top of global infrastructure challenges in our industry.

Focused on Bentonite

Commonly referred to as the "mineral of a thousand uses", bentonite is at the center of what we do. From innovative lining systems and remediation technologies to cutting edge waterproofing membranes and drilling products, CETCO continues to find new ways to utilize bentonite to help customers worldwide.

BASIC INFORMATION

This declaration is the type III Environmental Product Declaration (EPD) based on PN-EN 15804 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to PN-EN 15804 (see point 5.3 of the standard).

Life cycle analysis (LCA):

A1-A3, C3, C4 and D according to PN-EN 15804 (Cradle to Gate with options)

The year of preparing the EPD:

2020

Service Life:

Predicted to be durable for a minimum of 25 years in natural soils with $4 < \text{pH} < 9$ and soil temperature $< 25^\circ \text{C}$

PCR:

ITB-PCR A (PCR based on PN-EN 15804)

Declared unit:

1 m²

Reasons for performing LCA:

B2B

Origin:

Polish product



PRODUCT DESCRIPTION

BENTOMAT® – CLAY GEOSYNTHETIC BARRIERS (GBR-Cs) – are factory manufactured clay liners consisting of a layer of bentonite clay encased by at least two geotextiles which are needlepunched together. Additional flexible plastic membrane can be laminated to the outer geotextile. GBR-Cs are known for having consistently low permeability. They have the ability to seal around penetration, self-heal punctures and seal-seam at the overlaps.

The bentonite is a naturally occurring mineral that is composed predominantly of smectite. Most bentonites are formed by the alteration of volcanic ash in marine environments and occur as layers sandwiched between other types of rocks. The smectite in most bentonites is the mineral montmorillonite, which is a dioctahedral smectite. Sodium bentonite-based GBR-Cs are designed to provide a hydraulic barrier against many leachates. The swelling bentonite fills up pore space and constricts the flow paths of water, resulting in a low permeability hydraulic barrier.

What makes CETCO BENTOMAT® unique?

- **Needlepunched reinforcement** ensure that CETCO GBR-Cs can withstand shear stresses on steep slopes. The high needlepunch density provides higher peak internal shear strengths, without relying on supplemental processing.
- **Granular bentonite** creates less dust during installation than powdered bentonite and is less likely to shift through the needlepunch reinforcement process resulting in consistent hydraulic performance.
- **It can be custom engineered** to meet the project specific needs, available in a many geotextile's configurations.
- **Lamination capabilities** to provide geocomposite products.

What are the advantages of a BENTOMAT® GBR-C?

- **Self-healing and self-seaming** – Sodium 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.
- **Hydraulic performance** – GBR-Cs have a total thickness of less than 1cm and provide better hydraulic performance than several centimeters of compacted clay. A fully hydrated GBR-C typically has a permeability of 2×10^{-11} m/sec, approximately 20 times lower than a typical compacted clay liner permeability.
- **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 clay geosynthetic barrier provides consistent performance and is not subject to performance decreases resulting from varying moisture content, density, or clay content, like compacted clay liners.

Delivery and Packaging

The BENTOMAT® CLAY GEOSYNTHETIC BARRIERS (GBR-Cs) are delivered in the form of rolls with standard dimensions of 5 m x 40 lm. Other roll dimensions are available upon request. The rolls are packaged in a PE protective wrapping and marked with the manufacturer's label.

Placing on the market / Application rules

BENTOMAT® can be used as barrier in civil engineering and environmental engineering as per regulation EU number 305/2011 of 9 March 2011 applies for 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

The product is not a hazardous substance as defined by national and international regulations.

LIFE CYCLE ASSESSMENT (LCA) – GENERAL RULES APPLIED

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS is a line process in one factory of CETCO-Poland, Cetco Sp. zo.o. S.K.A. in Korpele (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction are allocated in A1 module of the LCA. 74.87% Impacts from line production of CETCO-Poland, Cetco Sp. zo.o. S.K.A were inventoried and were allocated to the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS production. Utilization of packaging material was taken into consideration. Module A2 includes transport of raw materials from their suppliers to CETCO-Poland, Cetco Sp. zo.o. S.K.A. in Korpele. Municipal wastes were allocated to module A3. Energy supply, emissions and wastes were inventoried and allocated to module A3.

System limits

The life cycle analysis of the declared products covers “Product Stage”, A1-A3, C3, C4 and D modules (Cradle to Gate with options) in accordance with PN-EN 15804+A1:2014-04 and ITB PCR A. The details of systems limits are provided in product technical report. All materials and energy consumption inventoried in factories were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with PN-EN 15804+A1:2014-04, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.



A1 and A2 Modules:

Raw materials supply and transport

Geosynthetics, polymers and packaging materials come from both local and foreign suppliers. Bentonite used in the analyzing period of 2017 originated from Turkish and other resources. Means of transport include trucks with load: <10t, 10 – 16t and >16 and ships with load > 3000t. For calculation purposes Polish and European fuel averages are applied.

A3: Production

The production process of the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS by CETCO-Poland, Cetco Sp. z o.o. S.K.A. is presented in Fig. 2.

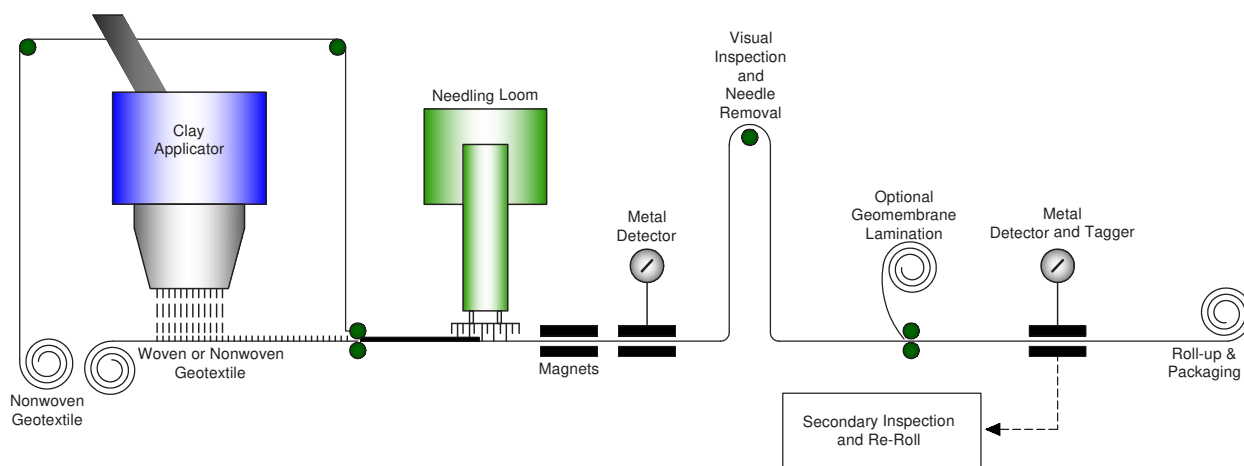


Fig 2. A schematic of manufacturing BENTOMAT® CLAY GEOSYNTHETIC BARRIERS by CETCO-Poland, Cetco Sp. zo.o. S.K.A.

End-of-Life (modules C and D)

Material	Material Recovery	Landfilling
Bentonite	0%	100%
PP textile	0%	100%

C3, C4 and D Modules: End-of-Life

It is assumed that at the end of life bentonite-based mats remain underground, in the place of installation (100% of landfilling). Environmental burdens occurring in module C4 are associated with exchanges to process-specific burdens (energy, land use), emissions to air via landfill gas incineration and landfill leachate. Impacts of packaging materials that constitute less than 1.0% of the total system flows was not taken into consideration.

LIFE CYCLE ASSESSMENT (LCA) – GENERAL RULES APPLIED

Data collection period

The data for manufacture of the declared products refer to a period between 01.01.2017 – 31.12.2017 (1 year). The life cycle assessments were prepared for Poland as reference area.

Data quality

The values determined to perform the LCA analysis originate from verified CETCO-Poland, Cetco Sp. z o.o. S.K.A. inventory data.

Assumptions and estimates

The impacts of the representative of the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS were aggregated using weighted average. Impacts were inventoried and calculated for all BENTOMAT® CLAY GEOSYNTHETIC BARRIERS.

Calculation rules

LCA was done in accordance with ITB PCR A document.

Databases

The data for the processes come from the following databases: Ecoinvent v.3.6, specific EPDs, ITB-Data. Specific data quality analysis was a part of external ISO 14001 audit.

LIFE CYCLE ASSESSMENT (LCA) – RESULTS

Declared unit

The declaration refers to declared unit (DU) – 1 m² of the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS by CETCO-Poland, Cetco Sp. zo.o. S.K.A.

Environmental assessment information

(MNA – Module not assessed, MD – Module Declared, INA – Indicator Not Assessed)

Product stage	Raw material supply	A1	MD
	Transport	A2	MD
	Manufacturing	A3	MD
Construction process	Transport to construction site	A4	MNA
	Construction-installation process	A5	MNA
Use stage	Use	B1	MNA
	Maintenance	B2	MNA
	Repair	B3	MNA
	Replacement	B4	MNA
	Refurbishment	B5	MNA
	Operational energy use	B6	MNA
	Operational water use	B7	MNA
End of life	Deconstruction demolition	C1	MNA
	Transport	C2	MNA
	Waste processing	C3	MD
	Disposal	C4	MD
Benefits and loads beyond the system boundary	Reuse-recovery-recycling potential	D	MD

Table 1. System boundaries for the environmental characteristic the BENTOMAT® CLAY GEOSYNTHETIC BARRIERS by CETCO-Poland, Cetco Sp. zo.o. S.K.A.

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930.

After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was PN-EN 15804 and ITB PCR A

Independent verification corresponding to ISO 14025 (subclause 8.1.3.)

● external

internal

External verification of EPD: Ph.D. Halina Prejzner

Input data verification, LCI audit, LCA: Ph.D. Eng. Justyna Tomaszewska, j.tomaszewska@itb.pl

Verification of LCA: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- PN-EN 15804+A1:2014-04 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 15804+A2:2020-03 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBiZE Emissivity rates CO₂, SO₂, NO_x, CO and total dust for electricity, December 2018
- EN 13361 Geosynthetic barriers – Characteristics required for use in the construction of reservoirs and dam
- EN 13362 Geosynthetic barriers – Characteristics required for use in the construction of canals
- EN 13492 Geosynthetic barriers – Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment
- EN 13493 Geosynthetic barriers – Characteristics required for use in the construction of solid waste storage and disposal sites
- EN 15382 Geosynthetic barriers – Characteristics required for use in transportation infrastructure





Owner of the EPD

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Instytut Techniki Budowlanej

EPD Program Operator

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

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