CETCO
A MINERALS TECHNOLOGIES COMPANY

Instytut Techniki Budowlanej

ENVIRONMENTAL PRODUCT DECLARATION TYPE III ITB NO. 950/2026
ISSUANCE DATE: 14.04.2026 | VALIDATION DATE: 06.05.2016 I VALIDITY DATE: 14.04.2031

BENTOMAT®

CLAY GEOSYNTHETIC BARRIERS (GBR-Cs)

CETCO
A MINERALS TECHNOLOGIES COMPANY

Owner of the EPD

CETCO-Poland, Cetco Sp. zo.o. S.K.A.
Address: Korpele nr 13A – Strefa
12-100 Szczytno, Poland
website: www.cetco.com
tel.: +48 89 624 73 00
fax.: +48 89 624 73 01
e-mail: biuro@mineralstech.com

www.cetco.com
biuro@mineralstech.com

Instytut Techniki Budowlanej

EPD Program Operator

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1,
00-611 Warsaw, Poland
website: www.itb.pl
Contact: Michał Piasecki
m.piasecki@itb.pl, energia@itb.pl

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

ECO PLATFORM EPD VERIFIED

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+A2 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-A4, C1-C4 and D according to PN-EN 15804+A2 (Cradle to Gate with options)

The year of preparing the EPD:
2026

Service Life:
Predicted to be durable for a minimum of 25 years in natural soils with 4<pH<9 and soil temperature <25°C

PCR:
ITB-PCR A (PCR based on PN-EN 15804+A2)

Declared unit:
1 m^2

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 needle-punched 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 m. 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. Specific 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-A4, C1-C4 and D modules (Cradle to Gate with options) in accordance with PN- EN 15804+A2 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+A2, 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 2024 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.

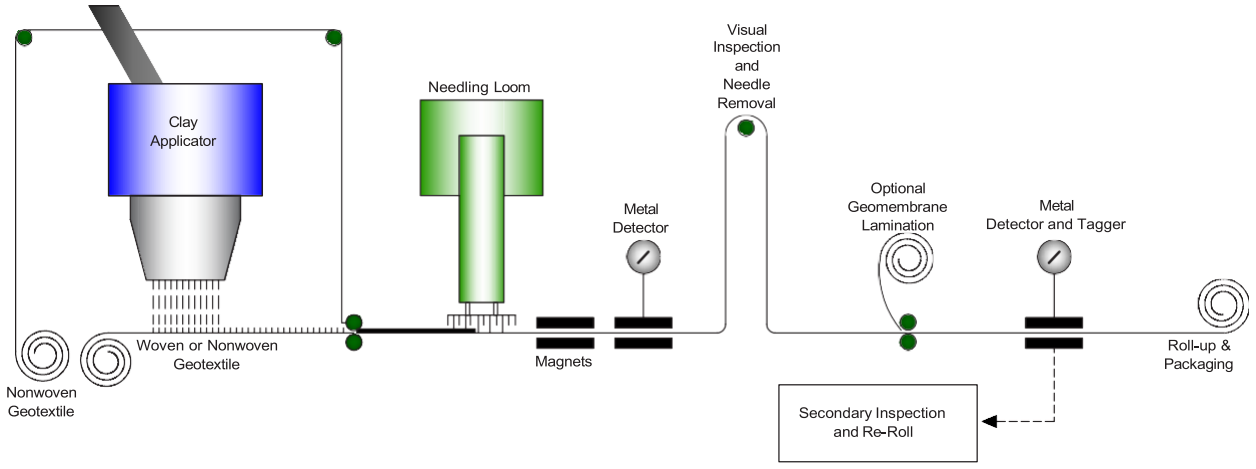

Fig 2. A schematic of manufacturing BENTOMAT® CLAY GEOSYNTHETIC BARRIERS *by CETCO-Poland, Cetco Sp. zo.o. S.K.A.*

End-of-Life (modules C and D)

Material	Material Recovery	Landfilling
Bentonite	50%	50%
PP textile	0%	100%

C1-C4 and D Modules: End-of-Life

It is assumed that at the end of life 50% bentonite-based mats remain underground, in the place of installation (50% 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. In the adapted end-of-life scenario, the de-constructed products are transported by 100 km on > 16t lorry EURO 5.

LIFE CYCLE ASSESSMENT (LCA) – GENERAL RULES APPLIED

Data collection period

The data for manufacture of the declared products refer to a period between 01.01.2024 – 31.12.2024 (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. No mass balance approach was used. Biogenic content less than 5%.

Databases

The data for the processes come from the following databases: Ecoinvent v.3.11, specific EPDs, ITB-Data. Specific data quality analysis was a part of external audit. Polish electricity (Ecoinvent v 3.11 supplemented by actual national KOBiZE data) emission factor used is 0.553 kg CO_2/kWh.

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	MA
	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	MD
	Transport	C2	MD
	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.

Table 2. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	3,01E+00	6,75E-01	1,17E-01	3,69E+00	9,47E-02	5,50E-02	8,30E-02	1,20E-01	2,65E-02	-2,50E-02
Greenhouse potential - fossil	eq. kg CO_2	3,09E+00	6,74E-01	1,14E-01	3,67E+00	9,46E-02	5,31E-02	8,27E-02	4,13E-02	2,62E-02	-2,49E-02
Greenhouse potential - biogenic	eq. kg CO_2	-7,80E-02	4,42E-04	3,06E-03	1,78E-02	6,05E-05	1,92E-03	2,83E-04	7,82E-02	2,64E-04	-1,49E-06
Global warming potential - land use and land use change	eq. kg CO_2	1,99E-03	4,31E-04	3,77E-05	1,79E-03	3,14E-05	2,30E-05	3,24E-05	1,62E-05	2,65E-05	-1,14E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	6,08E-08	9,50E-08	3,77E-09	1,49E-07	2,06E-09	1,34E-09	1,91E-08	9,56E-09	7,96E-09	-4,68E-09
Soil and water acidification potential	eq. mol H+	1,14E-02	1,55E-02	1,17E-03	2,70E-02	3,04E-04	7,30E-04	3,35E-04	1,68E-04	2,21E-04	-1,04E-03
Eutrophication potential - freshwater	eq. kg P	4,53E-04	3,71E-05	1,98E-04	6,05E-04	6,46E-06	1,25E-04	5,56E-06	2,78E-06	7,60E-06	-3,79E-05
Eutrophication potential - seawater	eq. kg N	2,47E-03	3,88E-03	1,70E-04	6,29E-03	1,02E-04	1,06E-04	1,01E-04	5,06E-05	7,62E-05	-9,28E-05
Eutrophication potential - terrestrial	eq. mol N	2,57E-02	4,31E-02	1,45E-03	6,81E-02	1,11E-03	8,93E-04	1,10E-03	5,52E-04	8,28E-04	-1,25E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	9,86E-03	1,15E-02	4,61E-04	2,11E-02	4,61E-04	2,50E-04	3,38E-04	1,69E-04	2,40E-04	-2,99E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,12E-05	1,39E-06	5,20E-07	1,20E-05	3,26E-07	3,21E-07	2,93E-07	1,47E-07	8,86E-08	-7,42E-06
Abiotic depletion potential - fossil fuels	MJ	7,08E+01	8,85E+00	1,99E+00	7,70E+01	1,34E+00	1,11E+00	1,23E+00	6,13E-01	6,05E-01	-8,74E-01
Water deprivation potential	eq. m^3	1,57E+00	3,78E-02	3,68E-02	1,49E+00	7,03E-03	2,30E-02	5,67E-03	2,84E-03	3,51E-03	-6,47E-02

Table 3. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 m²)

Indicator	Unit	A1-A4	B1-B7	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA

Table 4. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.12E+00	8.63E-02	1.31E-01	6.74E-01	2.18E-02	8.26E-02	1.76E-02	8.80E-03	1.06E-02	-1.00E-01
Consumption of renewable primary energy resources used as raw materials	MJ	7.90E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.70E+00	1.61E-01	1.32E-01	1.41E+00	2.18E-02	8.26E-02	1.76E-02	8.80E-03	1.06E-02	-1.00E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.89E+01	3.14E+00	1.77E+00	3.23E+01	1.34E+00	1.12E+00	1.23E+00	6.13E-01	0.00E+00	-8.74E-01
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.46E+01	0.00E+00	0.00E+00	1.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	7.30E+01	9.32E+00	2.02E+00	7.95E+01	1.34E+00	1.12E+00	1.23E+00	6.13E-01	6.54E-01	-8.74E-01
Consumption of secondary materials	kg	7.96E-03	1.65E-03	1.80E-04	5.97E-03	5.99E-04	1.02E-04	4.11E-04	2.06E-04	0.00E+00	-5.29E-04
Consumption of renew. secondary fuels	MJ	1.33E-02	1.80E-05	9.08E-07	1.81E-03	7.86E-06	5.67E-07	4.53E-06	2.27E-06	0.00E+00	-3.21E-05
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	1.42E-03	1.42E-03	0.00E+00	9.01E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	2.98E-02	6.01E-04	1.43E-03	2.96E-02	1.62E-04	3.02E-04	1.54E-04	7.72E-05	9.43E-05	-1.58E-03

Table 5. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	2.85E-01	5.50E-03	2.29E-03	2.85E-01	1.92E-03	1.15E-05	1.38E-03	6.88E-04	9.52E-07	-6.10E-03
Non-hazardous waste	kg	6.14E-01	1.47E-01	3.24E-03	5.17E-01	4.12E-02	5.99E-04	2.44E-02	1.22E-02	2.49E+00	-1.70E-01
Radioactive waste	kg	3.48E-05	4.24E-05	1.40E-06	6.92E-05	3.95E-07	8.35E-07	9.16E-08	4.58E-08	3.68E-06	-2.30E-06
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.15E-03	5.22E-05	1.29E-02	1.50E-02	1.60E-05	1.15E-06	3.80E-06	1.90E-06	0.00E+00	-1.18E-05
Materials for energy recovery	kg	2.27E-06	2.04E-07	8.95E-02	8.95E-02	8.51E-08	1.01E-08	3.07E-08	1.54E-08	0.00E+00	-1.10E-06
Exported Energy	MJ	4.23E+00	2.17E-03	5.29E-03	4.22E+00	5.87E-04	3.32E-03	0.00E+00	0.00E+00	0.00E+00	-2.37E-03

Verification

The process of verification of this EPD is in accordance with ISO 14025.
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: PhD. Eng Halina Prejzner
LCI data, audit and verification: M.Sc. Eng. Michał Chwedaczuk
LCA data verification: PhD., D.Sc., Eng. Michał Piasecki

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (see ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

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
- ecoinvent.org
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and frame- work
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- PN-EN 15804+A2– 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 CO_2, SO_2, NO_x, CO and total dust for electricity, December 2024
- 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

LCA,LCI, input data verification
Michał Piasecki, PhD. D.Sc.

Qualified electronic signature

Head of Thermal Physic, Acoustic and Environment Department
Agnieszka Winkler-Skalna, PhD.

Qualified electronic signature

Owner of the EPD

CETCO-Poland, Cetco Sp. zo.o. S.K.A.
Address: Korpele nr 13A – Strefa
12-100 Szczytno, Poland
website: www.cetco.com
tel.: +48 89 624 73 00
fax.: +48 89 624 73 01
e-mail: biuro@mineralstech.com

EPD Program Operator

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1,
00-611 Warsaw, Poland
website: www.itb.pl
Contact: Michał Piasecki
m.piasecki@itb.pl, energia@itb.pl

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

Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 950/2026
of TYPE III ENVIRONMENTAL DECLARATION

Product:

BENTOMAT®
CLAY GEOSYNTHETIC BARRIERS (GBR-Cs)

Manufacturer:

CETCO-Poland, Cetco Sp. z o.o. S.K.A

Korpele No. 13A - Zone, 12-100 Szczytno, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued for the first time on
14th April 2026
is valid for 5 years or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, April 2026

www.cetco.com
biuro@mineralstech.com

OUR STANDARDS. YOUR PEACE OF MIND.