



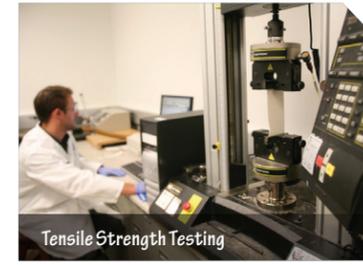
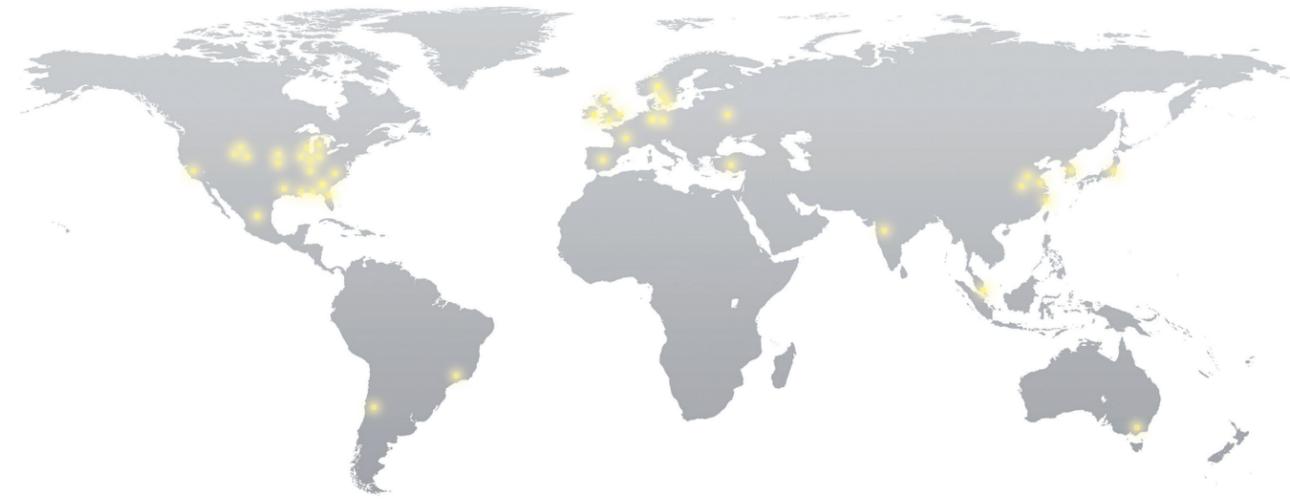
ENGINEERED **LINING** TECHNOLOGIES

EXPANDING BEYOND TRADITION

GEOSYNTHETIC CLAY LINERS | POND LINERS | GEOTEXTILES | GEOCOMPOSITES | SOIL SEALANTS



CETCO is a subsidiary of **AMCOL**[®], the world's largest bentonite company. For more than 25 years, the lining technologies business unit of **CETCO** has been an industry-leading manufacturer of geosynthetic clay liners (GCLs), having sold well in excess of one billion square feet of material. **CETCO** products provide consistent performance in a wide variety of lining, capping, and water containment applications, complemented by unparalleled engineering support. Our full range of engineered environmental liner systems includes **BENTOMAT** geosynthetic clay liners, **AKWASEAL** pond liners, **TEXDRAIN** drainage geocomposites, geotextiles, and **VOLCLAY** bentonite soil sealants.



World-Class Research & Development

With 55 researchers worldwide and 12 Ph.D.'s, **CETCO** is a global leader in research and development. Our lab services drive product innovation while supporting individual customer needs in the field.

Our in-house lab offers site-specific GCL chemical compatibility testing. Additionally, **CETCO** extends the knowledge and expertise of our research scientists to design engineers for the development of specialty polymer-treated GCLs. These GCLs are designed to enhance performance and meet strict regulatory requirements with potentially aggressive leachates.

Where requirements are less demanding, **CETCO** also offers site-specific soil testing to determine an appropriate bentonite application rate to lower the soil's permeability.

LINING APPLICATIONS:

- | | | |
|-----------------------|--------------------|--------------------------|
| Landfill Caps & Cells | Mine Processes | Coal Combustion Residual |
| Wastewater Lagoons | Dams & Canals | Secondary Containment |
| Stormwater Basins | Agricultural Waste | Wetlands |



Needlepunch Reinforcement



SuperGroove Technology



Easy Roller Installation

Geosynthetic Clay Liners

25 Years of Ground Water Protection

A geosynthetic clay liner (GCL) is a type of geocomposite that is frequently used in environmental containment applications and is an alternative to a traditional compacted clay liner. BENTOMAT® GCLs consist of two layers of geotextiles surrounding a layer of low permeability sodium bentonite that are needlepunched together to increase internal shear resistance.

FEATURES & BENEFITS

- ▶ **SUPERGROOVE™ TECHNOLOGY:** BENTOMAT products are the only GCLs that feature a groove in the nonwoven fabric that allows the bentonite to migrate out and self-seam at the overlap. This feature decreases bag bentonite costs and the labor to apply it by a factor of ten.
- ▶ **GRANULAR BENTONITE:** BENTOMAT GCLs feature granular bentonite, which creates less dust during installation than powdered bentonite and is less likely to shift through the needlepunch reinforcement, thus providing consistent hydraulic performance.
- ▶ **DURABLE NEEDLEPUNCHED REINFORCEMENT:** BENTOMAT reinforced GCLs can withstand shear stresses on steep slopes. The high needlepunch density provides higher peak internal shear strengths without relying on supplemental processing.



Self-Healing & Self-Seaming



Resistance to Varying Weather Conditions



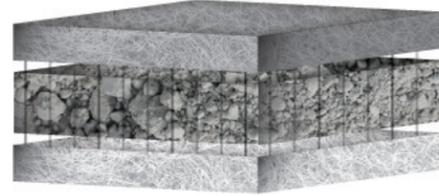
Ease of Installation

In addition to offering high quality products, CETCO provides unparalleled engineering support. Our technical staff is well trained in specification review and can offer testing or design assistance. Additionally, CETCO maintains a full library of laboratory test reports from past projects and reference articles to assist you on your project.

ADVANTAGES Over Compacted Clay

- ▶ **SELF-HEALING & SELF-SEAMING:** BENTOMAT® GCLs contain sodium bentonite, which 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:** GCLs have a total thickness of less than one inch and provide better hydraulic performance than several feet of compacted clay. A fully hydrated GCL typically has a permeability of 5×10^{-9} cm/sec, approximately 20 times lower than a typical compacted clay liner permeability.
- ▶ **RESISTANT TO VARYING WEATHER CONDITIONS:** A GCL is less likely to be impacted by freeze-thaw cycles. Freeze-thaw cycles frequently cause compacted clay liners to crack and lead to increased leakage. A GCL is not subject to performance decreases resulting from varying moisture content, density, or clay content like compacted clay liners.
- ▶ **EASE OF INSTALLATION & INCREASED AIR SPACE:** GCLs require significantly less installation effort than a compacted clay liner. One truckload of GCL is equivalent to 150 truckloads of compacted clay, thereby consuming fewer natural resources. When a GCL is used in place of a thicker compacted clay liner it also takes up less air space, which leaves more room for waste.

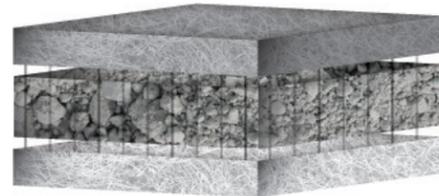
Standard Reinforced GCL



- NonWoven Geotextile
- Granular Sodium Bentonite
- NonWoven Geotextile

BENTOMAT® DN

- ▶ Commonly used in canyon landfills where slopes are as steep as 1.5H:1V
- ▶ Suitable for applications requiring high internal and interface shear strength
- ▶ Consists of a layer of VOLCLAY® sodium bentonite between two heavier-weight nonwoven geotextiles

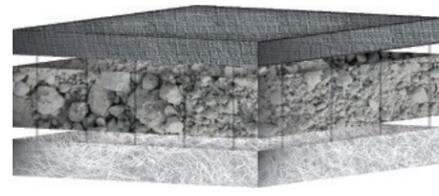


- Woven Geotextile
- Granular Sodium Bentonite
- Nonwoven Geotextile

BENTOMAT® ST

- ▶ Ideal for applications involving slopes up to 3H:1V
- ▶ Most commonly specified GCL in the world
- ▶ Consists of a layer of VOLCLAY sodium bentonite between a woven and nonwoven geotextile

Non-Reinforced GCL

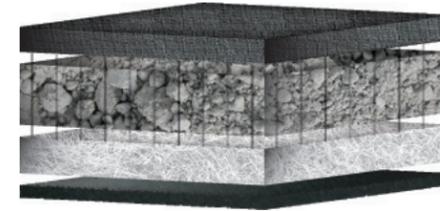


- Woven Geotextile
- Granular Sodium Bentonite
- Nonwoven Geotextile

BENTOMAT® 200R

- ▶ Acts as low-permeability liner under a geomembrane in applications with slopes up to 10H:1V or where high internal shear strength is not critical
- ▶ Excellent cost-effective alternative to compacted clay
- ▶ Consists of a layer of VOLCLAY sodium bentonite between a woven and light-weight nonwoven geotextiles

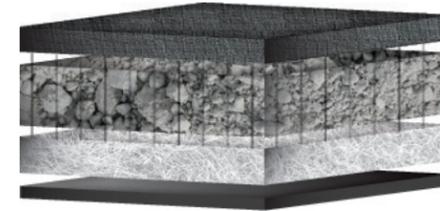
Composite Laminate GCL



- Woven Geotextile
- Granular Sodium Bentonite
- Nonwoven Geotextile
- Textured HDPE Geomembrane

BENTOMAT® CLT

- ▶ Ideal for more demanding landfill covers and liquid containment applications involving steep slopes
- ▶ Excellent hydraulic performance, with puncture and tensile strengths surpassing conventional plastic membranes
- ▶ Consists of a layer of sodium bentonite between two geotextiles laminated to a textured HDPE geomembrane



- Woven Geotextile
- Granular Sodium Bentonite
- Nonwoven Geotextile
- Polyethylene Geofilm

BENTOMAT® CL

- ▶ Used in landfill covers, ponds and liquid containment involving slopes up to 3H:1V
- ▶ Excellent hydraulic performance, with puncture and tensile strengths surpassing conventional plastic membranes
- ▶ Consists of two carrier geotextiles encapsulating a layer of sodium bentonite with a polyethylene geofilm laminated to one side

AKWASEAL® Pond Liner

Two lining systems in one

Akwaseal is a pond liner consisting of two water barriers: bentonite clay and a flexible plastic membrane. The bentonite clay is encapsulated between two geotextiles that are needlepunched together, and the flexible plastic membrane is laminated to the outer geotextile surface. The result is an easy-to-install, self-healing liner system without the drawbacks of traditional compacted clay liners and plastic membranes.



Pulte Homes: Mt. Juliet, Tennessee



LANDFILL CELL

In Egg Harbor Township, New Jersey, approximately 810,000 square feet of BENTOMAT ST was used to construct a municipal solid waste landfill facility. BENTOMAT ST was chosen for its performance and interface capabilities on moderate slopes.

New Jersey State regulations require the facility to have a primary and secondary layer of GCL due to the inadequate availability of compacted clay in the geographic region.

LANDFILL CAP

In New Jersey, 732,975 square feet of BENTOMAT DN was used in the landfill cap liner system. BENTOMAT DN was chosen for its reliability as an additional leak protection layer in the flat areas beneath the geomembrane component of the geosynthetic liner system.

MINING

In Lovelock, Nevada, 3,900,000 square feet of BENTOMAT DN was installed for the new leach pad facility at the Coeur Rochester Gold Mine.

BENTOMAT DN was chosen for its high internal and interface shear strength, meeting the stringent shear strength requirements for the project. By replacing unavailable native clay, the GCL expedited the construction schedule and met the lining system regulatory requirements, resulting in savings in both time and cost for the project.

RESERVOIR

In Fremont, Ohio, approximately 1,300,000 square feet of BENTOMAT DN and 3,300,000 square feet of BENTOMAT 200R were used to line a raw water reservoir. The liner design included GCL overlain by 40 mil HDPE geomembrane and a 10 oz./sq. yd nonwoven geotextile protective cushion. Due to poor soil conditions on site, it was determined that a composite liner design consisting of a GCL overlain by a geomembrane liner was the most effective containment solution for a new water supply reservoir.

COAL COMBUSTION RESIDUAL

In Carrollton, Georgia, approximately 3,300,000 square feet of contaminant resistant BENTOMAT 200R and 2,200,000 square feet of contaminant resistant BENTOMAT SDN were used to line the disposal cells and ponds at the Plant Wansley site.

The project was designed with GCL because sufficient 1×10^{-7} cm/sec clay was not available. The owner decided that the best design would be GCL and two feet of 1×10^{-5} cm/sec clay, in line with the typical Georgia Environmental Protection Division rules for municipal solid waste.

OIL & GAS

In Erie, Colorado, 95,000 square feet of BENTOMAT 200R and BENTOMAT DN were installed for secondary containment around a series of deep pylons used to support a tank farm.

The BENTOMAT products were chosen for ease of working around penetrations and the wide construction window for installation of the product. Additionally BENTOMAT DN and BENTOMAT 200R are compatible with cathodic protection systems in place on the project.



Bentonite Enhancement for Pipe Penetration



Supplemental Bentonite for Seams



Brookhaven Landfill: Brookhaven, New York

VOLCLAY® Soil Sealants

Highest quality bentonite from the largest reserves in the world

When VOLCLAY bentonite soil sealants are mixed with soil and hydrated, they expand to fifteen times its volume, forming a mechanical bond with surrounding soils and filling the voids between the soil particles. This creates a barrier that effectively stops further seepage through the soil, and decreases the permeability of soil by several orders of magnitude.

- ▶ Bentonite can withstand desiccation, hydration and freeze-thaw cycling without losing its sealing ability.
- ▶ Because of the high swelling capacity of VOLCLAY bentonite soil sealants, only a small amount is needed to reduce the hydraulic conductivity of the on-site soils.



Fremont Raw Water Reservoir: Fremont, Ohio



Goenet Tie-in



Fresh Kills Landfill: Staten Island, New York

Nonwoven Geotextiles

Nonwoven, needle-punched geotextiles provide a cushioning layer to protect adjacent geosynthetics. Their uniform consistency provides excellent filtration and drainage, while their strength helps reinforce and separate layers.

FEATURES AND BENEFITS

- ▶ Chemically resistant polypropylene construction provides long performance life in harsh environments.
- ▶ High interface shear strength against most surfaces allows for a high factor of safety, even in the most challenging of applications.

TexDrain™ Geocomposites

TEXDRAIN is a chemically resistant composite comprised of a three-dimensional extruded polyethylene geonet core thermally laminated to nonwoven geotextiles on either one or both surfaces.

FEATURES AND BENEFITS

- ▶ Cost-effective substitute for thick layers of coarse-grained soil in drainage applications, providing savings on materials, transportation, installation, and airspace.
- ▶ Preserves aggregate resources for structural applications where alternative materials can't be used.
- ▶ Three functions in one unit: filtration, drainage, and protection.
- ▶ Rapid installation in comparison to conventional soil drainage layers.



ABOUT AMCOL® INTERNATIONAL CORPORATION



www.AMCOL.com



www.CETCO.com

CETCO is a wholly owned subsidiary of
AMCOL International Corporation

Established in 1927, AMCOL International currently trades on the New York Stock Exchange under the symbol "ACO". With approximately 2,400 employees and over 68 facilities across 6 continents, AMCOL produces and markets a wide range of specialty mineral products used for industrial, environmental, and consumer-related applications. Headquartered in Hoffman Estates, Illinois, AMCOL prides itself in designing and delivering value-added, world-class quality products and services specially suited to fit our customers' needs.

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