



Geosynthetic Clay Liners (GCL's)

Geosynthetic Clay Liners (GCL's) are high performance environmental liners used in environmental containment applications. GCL's consist of two layers of geotextiles surrounding a layer of low permeability sodium bentonite that are needle punched together to increase internal shear resistance. The geotextiles offer a long lasting resistance to physical or chemical break-down in harsh elements, while the bentonite's high swelling capacity and low permeability provide an effective hydraulic seal.



GCL's provide an excellent alternative to conventional compacted clay liners by replacing a thick section of compacted clay with a thin layer of pure sodium bentonite. One truckload of GCL is equivalent to 150 truckloads of compacted clay. Benefits include easy installation, better hydraulic performance, and resistance to varying weather conditions.

Typical Lining Applications

- Canals, Stormwater Impoundments, and Wetlands
- Highway and Civil
- Landfill Liners
- Landfill Caps
- Mining
- Ponds
- Secondary Containment

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Product Specifications

Material Property	Test Method	Test Frequency m ² (ft ²)	Bentomat® ST	Bentomat® DN
Bentonite Swell Index ¹	ASTM D 5890	1 per 50 tonnes	24 ml/2 g min	24 ml/2g min
Bentonite Fluid Loss ¹	ASTM D 5891	1 per 50 tonnes	18 ml max	18 ml max
Bentonite Mass/Area ²	ASTM D 5993	4,000 (40,000)	3.6 kg/m ² min (0.75 lb/ft ²)	3.6 kg/m ² min (0.75 lb/ft ²)
GCL Grab Strength ³	ASTM D 6768	20,000 (200,000)	53 N/cm MARV (30 lbs/in MARV)	88 N/cm (MARV) (50 lbs/in MARV)
GCL Peel Strength ³	ASTM D 6496	4,000 (40,000)	6.1 N/cm min (3.5 lbs/in)	6.1 N/cm min (3.5 lbs/in)
GCL Index Flux ⁴	ASTM D 5887	Weekly	1 x 10 ⁻⁸ m ³ /m ² /sec max	1 x 10 ⁻⁸ m ³ /m ² /sec max
GCL Hydraulic Conductivity ⁴	ASTM D 5887	Weekly	5 x 10 ⁻⁹ cm/sec max	5 x 10 ⁻⁹ cm/sec max
GCL Hydrated Internal Shear Strength ⁵	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) Typ 200 psf	500 psf (24 kPa) Typ 200 psf

Bentomat ST is a reinforced GCL consisting of a layer of sodium bentonite between a woven and a nonwoven geotextile, which are needle punched together. Bentomat DN is a reinforced GCL consisting of a layer of sodium bentonite between two nonwoven geotextiles, which are needle punched together.

Notes

- Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.
- Bentonite mass/area reported at 0 percent moisture content.
- All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.
- Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5x10⁻⁹ cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.
- Peak values measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

CETCO has developed an edge enhancement system (SuperGroove™) that eliminates the need to use additional granular sodium bentonite within the overlap area of the seams. It comes standard on both longitudinal edges of Bentomat® ST. It should be noted that SuperGroove™ does not appear on the end-of-roll overlaps and recommend the continued use of supplemental bentonite for all end-of-roll seams.

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