

BENTOMAT® CL CERTIFIED PROPERTIES

CETCO® Bentomat® CL is a reinforced geosynthetic clay liner (GCL) consisting of a layer of sodium bentonite between a polypropylene woven geotextile and a polypropylene nonwoven geotextile, which are needle-punched together and laminated to a polyethylene geofilm.

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	CERTIFIED VALUES
Bentonite Moisture Content ²	ASTM D2216	1 per 50 tonnes	12% max.
Bentonite Swell Index ²	ASTM D5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss ²	ASTM D5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area ³	ASTM D5993	40,000 ft ² (4,000 m ²)	0.75 lb/ft ² (3.7 kg/m ²) min.
Geofilm Density ¹	ASTM D1505	200,000 ft ² (20,000 m ²)	0.92 g/cm ³
Geofilm Thickness ¹	ASTM D5199	200,000 ft ² (20,000 m ²)	5 mil (0.12 mm) min.
Geofilm Break Strength ^{1,4}	ASTM D882	200,000 ft ² (20,000 m ²)	14 lbs/in (2.5 kN/m) min.
Total Mass/Area ³	ASTM D5993	40,000 ft ² (4,000 m ²)	0.84 lb/ft ² (4.1 kg/m ²) min.
GCL Moisture Content	ASTM D5993	40,000 ft ² (4,000 m ²)	35% max.
GCL Grab Strength ⁵	ASTM D6768	200,000 ft ² (20,000 m ²)	30 lbs/in (5.3 kN/m) min.
GCL Peel Strength	ASTM D6496	40,000 ft ² (4,000 m ²)	3.5 lbs/in (610 N/m) min.
GCL Hydraulic Conductivity ⁶	ASTM D5887	250,000 ft ² (25,000 m ²)	5 x 10 ⁻¹² m/s max.
GCL Index Flux ⁶	ASTM D5887	250,000 ft ² (25,000 m ²)	1 x 10 ⁻⁹ m ³ /m ² /s max.
GCL Hydrated Internal Shear Strength ⁷	ASTM D6243	1,000,000 ft ² (100,000 m ²)	500 psf (24 kPa) typ.@ 200 psf (9.6 kPa)

Notes:

- ¹ Geosynthetic property tests performed on the geosynthetic components before they are incorporated into the finished GCL product.
- ² Bentonite property tests performed before the bentonite is incorporated into the finished GCL product.
- ³ Reported at 0% moisture content.
- ⁴ Geofilm tensile break strength performed in the machine and cross-machine directions using ASTM D882.
- ⁵ GCL tensile strength testing is performed in the machine direction using ASTM D6768.
- ⁶ ASTM D5887 is modified to include the laminated thin flexible membrane on the test specimen. Index flux and hydraulic conductivity testing with deaired distilled/deionized water at 80 psi (550 kPa) cell pressure, 77 psi (530 kPa) headwater pressure and 75 psi (515 kPa) tailwater pressure. ASTM D5887 (modified) testing is performed only on a periodic basis because the thin flexible membrane is essentially impermeable. The Bentomat® GCL core (without the flexible membrane) has a maximum hydraulic conductivity of 5 x 10⁻¹¹ m/s with deaired distilled/deionized water. For more information, see CETCO® Technical Reference (TR) Nos. 111 and 112.
- ⁷ Peak values measured at 200 psf (9.6 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.