

CONSTRUCTION SPECIFICATION

VA-798. GEOSYNTHETIC CLAY LINER

1. **SCOPE**

This work will consist of the furnishing and installation of a geosynthetic clay liner (GCL).

2. **MATERIALS**

All GCL material will be packaged in individual rolls in a wrapping that is resistant to UV light deterioration. Each roll will contain a label identifying the length and width of the roll, the manufacturer, the product, lot number, and roll number. Granular bentonite used at panel joints and around penetrations and structures will be of the same quality as the bentonite that is encapsulated in the GCL.

The GCL material will be manufactured by one of the following processes:

- Needle punched process by which the bentonite is encapsulated between the geotextile layers by a mechanical bonding process without the use of any chemical binders or adhesive, or
- Lock stitched to provide internal shear strength and the integrity and consistency to the thickness and unit weight of the material.

No GCL material will be accepted that exhibits any visible defects and the GCL material will meet the requirements listed in the table below.

Property	Test Methods	Requirements
Swell Index, ml/2g	ASTM D5890	24 (minimum)
Fluid Loss, ml	ASTM D5891	18 (maximum)
Bentonite mass/unit area, lb/ft ²	ASTM D5993	0.75 (minimum) (at 12% moisture)
Index Flux, m/s	ASTM D5887	1 x 10 ⁻⁸ (maximum)*
Hydraulic Conductivity, cm/s	ASTM D5887	1 x 10 ⁻⁶ (maximum)**

* 1x10⁻⁹ (maximum) at 2 psi (4.6 ft. of head) is also an acceptable value for this testing procedure.

** Hydraulic conductivity calculated per ASTM D5887, Appendix X2.

3. **SHIPPING AND STORAGE**

The GCL material will be transported to the job site and stored onsite in a manner that does not damage the rolls. The rolls will be handled at the site with equipment capable of safely doing the job with no damage to the material. The rolls will be stored on a flat, dry surface and will be kept dry at all times.

4. SUBGRADE PREPARATION

Irregularities and any abrupt grade changes will be eliminated from the surface prior to placing the GCL. When the GCL is placed, the subgrade will be dry, smooth, and free of debris, roots, ruts, and stones or any projection of more than 0.5 inch. All projections of more than 0.5 inches will be removed, crushed, or pushed into the surface with a smooth-drum roller.

5. GCL PLACEMENT

The contractor will confine the work to an area that can be completely installed and covered by the end of the normal working day in a manner that will prevent the occurrence of hydration prior to being covered with the specified cover soils. Daily completion will be defined as the full installation of the liner, covering around appurtenances, and placement of the specified cover soils.

The rolls will be carefully rolled down the slope and not allowed to unroll freely and out of control. The GCL will be placed so that seams are parallel to the direction of the slope. When it is necessary to drag liner panels, a geosynthetic subgrade covering known as a rub sheet will be used to reduce friction and protect the GCL during placement.

The rolls will be placed with the woven geotextile or geomembrane side against the subgrade. The GCL panels will be placed so that the long axis of the panels is oriented up and down the slope. This panel orientation will apply to all covered slopes including corner slopes. All seams will be overlapped a minimum of 6 inches. End-of-roll seams will be located at least 3 feet from the toe or crest of the slope. Seams at the base of the slope will be a minimum of 6 feet from the toe.

Seams at the ends of panels will be constructed such that they are shingled in the direction of the grade to prevent flow from entering the overlap zone. The end of roll overlap will be a minimum of 24 inches. All seam areas or runs will be augmented with granular bentonite. Granular bentonite will be dispersed evenly to cover the entire lapped area from the panel edge to the lap line at a minimum rate of 1 pound per 2 square feet of area covered. Seams will remain closed during the backfill operation in order to prevent contamination of the bond surface and to ensure the panels remain in intimate contact, where jointed, at all times.

For penetrations or structures the liner will contact, a 3-inch by 3-inch notch will be cut or dug in the subgrade around the penetration or structure.

For penetrations, the GCL will be brought up to the penetration and trimmed to fit into the notch. Granular bentonite or a compact mixture of 1 part bentonite to 4 parts soil (by volume), blended dry, will be placed into the bottom half of the notch. The GCL will then be inserted into the notch, with the remaining area in the notch filled with the granular bentonite or the 1 to 4 mixture, and compacted. A secondary GCL collar will be placed around horizontal penetrations. The collar will overlap the GCL a minimum of 12 inches in each direction.

For GCL terminated at a structure, granular bentonite or a compact mixture of one part bentonite to four parts soil (by volume), blended dry, will be placed in the notch and against the structure. The GCL will extend over the notch and a minimum of 3 inches vertically adjacent to the structure.

The GCL will be anchored at the top of the slope as shown on the construction drawings. The GCL will be placed in the anchor trench so that it covers the entire trench bottom and only one trench wall.

The GCL will not be placed in the rain, at times of impending precipitation, or in ponded water.

6. REPAIRS

GCL that has begun to hydrate before being covered with soil will be removed and replaced with dry GCL.

All damaged or flawed material will be repaired as follows:

- Completely expose the affected area.
- Remove all soil or other foreign objects.
- Place a GCL patch over the exposed area with a minimum overlap of 12 inches on all edges.
- Place granulated bentonite between overlap at the rate of 1 pound per 2 square feet of area covered, and spread to a minimum width of 6 inches.
- On a sloping surface, augment the bentonite-enhanced seam with construction adhesive.

7. COVER SOIL

A soil cover will be placed to the final depths and moisture content as specified on the construction drawings.

At all times during the soil cover operation, a minimum of 12 inches of soil material will be kept between the GCL and any equipment being used to spread soil cover. In frequently trafficked areas or roadways, a minimum cover thickness of 2 feet is required. The soil cover on slopes will be pushed up the slopes to prevent downhill stress on the GCL material. Avoid sharp turns and quick starts or stops that could pinch or shift the GCL.