

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION
CS-69: "GEOSYNTHETIC CLAY LINER"

69.1 SCOPE

The work shall consist of furnishing and installing a geosynthetic clay liner (GCL) with the necessary appurtenances as shown on the drawings or as specified.

69.2 MATERIAL

The liner material shall comply with the requirements of Material Specification 223, the applicable provisions in this specification, and those shown on the drawings.

Cover soil shall conform to this specification and those requirements shown on the drawings.

69.3 SHIPPING AND STORAGE

The liner material shall be transported to the job site in a manner that does not damage the rolls. The rolls shall be handled at the site with equipment capable of safely doing the job with no damage to the material. An appropriately sized core bar in combination with a spreader bar and lifting chains is one alternative. Another alternative is a forklift with a stinger attachment.

At the job site, the rolls shall be stored on a flat dry surface. They shall be kept dry at all times. A covering is recommended to prevent unnecessary stress on the packaging.

69.4 SUBGRADE PREPERATION

When the GCL is placed, the subgrade shall be a dry, smooth surface that is free of debris, roots, ruts, and stones or any projection of more than 0.5 inch. All projections shall be removed, crushed, or pushed into the surface with a smooth-drum roller. The smooth-drum roller shall be used to remove all irregularities and any abrupt grade changes.

69.5 GCL INSTALLATION

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

The liner rolls may need to be placed with a spreader bar to prevent damage to the ends of the roll. The rolls shall be carefully rolled down the slope and not allowed to unroll freely and out of control. Liner panels may be pulled up from the bottom of the slope, but care must be taken to minimize dragging across the subgrade and damaging the GCL surface. A temporary geosynthetic subgrade covering known as a rub sheet may be used to reduce friction and protect the GCL during placement.

The rolls are placed with the nonwoven geotextile side up and the woven geotextile side against the subgrade. The GCL panels are placed so that the seams are parallel to the direction of the slope. This is also true in the corners. All seams parallel to the slope direction shall be overlapped a minimum of 6 inches. End-of-roll seams shall be located at least 3 feet from the toe or crest of the slope. Seams at the base of the slope shall be a minimum of 6 feet from the toe.

When a roll end seam or joint occurs on a slope, construction adhesive shall be used in the lap area, with the overlap increased to 2 feet and shingled in the direction of the slope. All seam areas or runs shall be augmented with granular bentonite, of the same quality of that encapsulated in the liner, to ensure seam integrity. Granular bentonite shall be dispersed evenly from the panel edge to the lap line at a minimum rate of 1 pound per 4 linear feet continuously along all seams or overlap area. Construction adhesives may be used on seams to keep panels in contact during backfill operations if necessary.

For any penetrations or structures the liner will contact, a small notch shall be cut or dug against the edge of the area. The liner shall be brought up to the appurtenance and trimmed to fit into the notch. The contractor shall then apply granular bentonite or compact a mixture of 1 part bentonite to 4 parts soil (by volume), blended dry, into the bottom half of the notch. The liner shall 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.

The GCL shall be anchored at the top of the slope with a proper anchor trench as shown on the drawings. The GCL is placed in the anchor trench in such a manner that it covers the entire trench bottom, but does not extend up the rear trench wall.

Horizontal joints on the slopes shall be avoided if possible. The GCL shall not be placed in the rain, at times of impending precipitation, or in ponded water. Replace any GCL that has begun to hydrate before cover soil can be placed.

69.6 REPAIRS DURING CONSTRUCTION

All damaged or flawed material shall be repaired by completely exposing the affected area, removing all soil or other foreign objects, and placing a patch over the damage with a minimum overlap of 24 inches on all edges. Accessory bentonite shall be placed between the patch and the damaged area at the rate of 1 pound per 4 linear feet of edge, and spread to a 6-inch width. When the above procedures are to be implemented on a sloping surface, the edges of the patch shall be fastened to the repaired liner with construction adhesive in addition to the bentonite-enhanced seam.

69.7 PROTECTIVE SOIL COVER

A soil cover is placed for both protection of the liner and to provide a loading to develop the designed permeability characteristics of the liner system. The cover shall be placed to the final depths and moisture content as specified in section 9 of this specification or as shown on the plans.

At all times during the soil cover operation, a minimum of 12 inches of soil material shall be kept between the liner 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 all slopes shall be pushed up the slopes not down the slopes to prevent any downhill stress on the liner material. Avoid any sharp turns and quick starts or stops that could pinch or shift the liner.