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CONSTRUCTION SPECIFICATION  
CS-OR-098 GEOSYNTHETIC CLAY LINER

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098.1 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 herein.

098.2 MATERIAL

The liner material shall comply with the requirements of MS-OR-595, Geosynthetic Clay Liner, the applicable provisions in this specification, and those shown on the drawings.

Granular bentonite used at panel joints and around penetrations and structures shall be of the same quality as the bentonite that is encapsulated in the liner.

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

098.3 SHIPPING AND STORAGE

The liner material shall be transported to the job site and stored onsite 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. The rolls shall be stored on a flat, dry surface and shall be kept dry at all times.

098.4 SUBGRADE PREPARATION

Irregularities and any abrupt grade changes shall be eliminated from the surface prior to placing the GCL. When the GCL is placed, the subgrade shall 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 shall be removed, crushed, or pushed into the surface with a smooth-drum roller.

098.5 GCL INSTALLATION

The contractor shall 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 shall be defined as the full installation of the liner, covering around appurtenances, and placement of the specified cover soils.

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

The rolls shall be placed with the woven geotextile or geomembrane side against the subgrade. The GCL panels shall be placed so that the long axis of the panels is oriented up and down the slope. This panel orientation shall apply to all covered slopes including corner slopes. All seams 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.

Seams at the ends of panels should 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 shall be a minimum of 24 inches. All seam areas or runs shall be augmented with granular bentonite. Granular bentonite shall 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 shall 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 shall be cut or dug in the subgrade around the penetration or structure.

For penetrations, the liner shall 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, shall be placed 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. A secondary GCL collar shall be placed around horizontal penetrations. The collar shall overlap the GCL a minimum of 12 inches in each direction.

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

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

The GCL shall be placed so that seams are parallel to the direction of the slope. End of roll seams shall be a minimum of 3-feet from the toe or crest of the slope.

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

#### 098.6 REPAIRS DURING INSTALLATION

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

All damaged or flawed material shall be repaired as follows:

- a) Completely expose the affected area.

- b) Remove all soil or other foreign objects.
- c) Place a GCL patch over the exposed area with a minimum overlap of 12 inches on all edges.
- d) 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.
- e) On a sloping surface, fasten and augment the bentonite-enhanced seam with construction adhesive.

#### 098.7 PROTECTIVE SOIL COVER

A soil cover shall be placed to the final depths and moisture content as specified in Section 098.8 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 slopes shall be pushed up the slopes to prevent downhill stress on the liner material. Avoid sharp turns and quick starts or stops that could pinch or shift the liner.

#### 098.8 ITEMS OF WORK AND CONSTRUCTION DETAILS