

## Jen-Hill Geosynthetic Clay Liners

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**Geosynthetic Clay Liners (GCLs)** are needle-punch reinforced composites which combine two durable geotextile outer layers with a uniform core of natural sodium bentonite clay to form a hydraulic barrier. Fibers from the outer non-woven geotextile are needle-punched through the layer of bentonite and incorporated into the other geotextile (either a woven or a non-woven). A proprietary heat treating process – the Thermal Lock process – is then used to modify and more permanently lock the needle-punched fibers into place. Unique properties, including increased internal shear resistance and long term creep resistance, result from this production. When hydrated under confinement, the bentonite swells to form a low permeability clay layer with the equivalent hydraulic protection of several feet of compacted clay. The excellent hydraulic properties and slope performance of the GCLs make the product ideal for many lining and cap containment projects.

### GENERAL BENEFITS of the GCL include:



- High internal shear strength
- Uniform bentonite content
- Greater Installation durability
- More versatile than compacted clay
- Increased airspace and liner efficiency
- Easy to install

Contact Jen-Hill @ 1-800-452-4435 for additional information

# **GCL Installation**

## **Geosynthetic Clay Liner General Installation Guidelines**

### **SURFACE AND SUBGRADE PREPARATION**

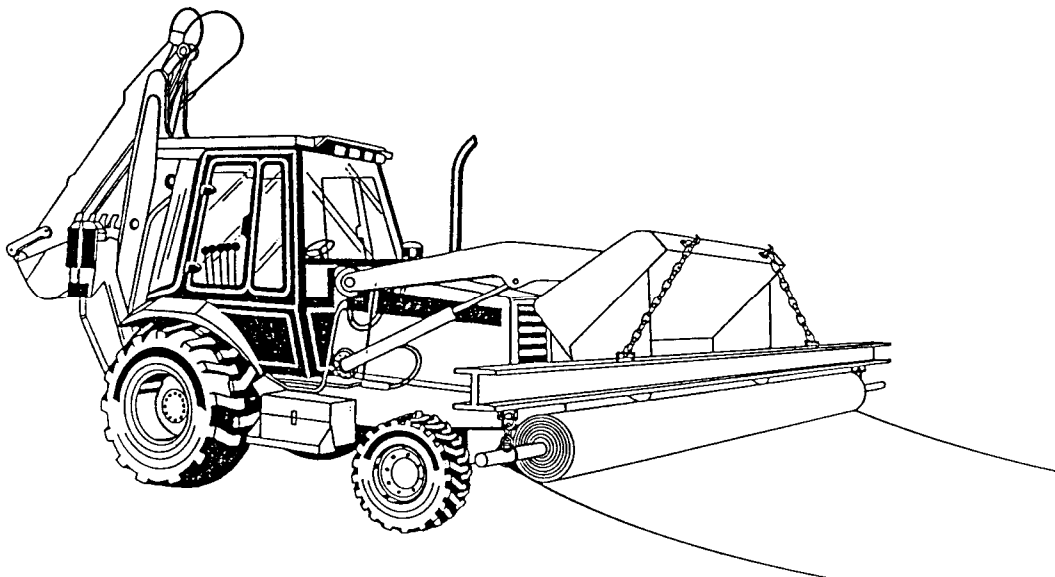
The subgrade or fill material should be free of any angular or sharp rocks larger than 2 inches (5 cm) in diameter as well as any organics or other deleterious materials. Compaction of the subgrade should be in accordance with the design specifications, or, at a minimum, to the extent that no rutting is caused by installation equipment or vehicles.

Prior to deployment of the GCL (geosynthetic clay liner), the subgrade should be final graded to fill all major voids or cracks and proof rolled to provide a smooth surface for the installation of the liner. The surfaces to be lined should be smooth and free of debris, roots and angular or sharp rocks larger than 1 inch (2.5 cm) in diameter.

Minor variations in the subgrade surface are tolerable; however, no sharp irregularities should exist. Installations over other geosynthetic materials requires no additional surface preparation.

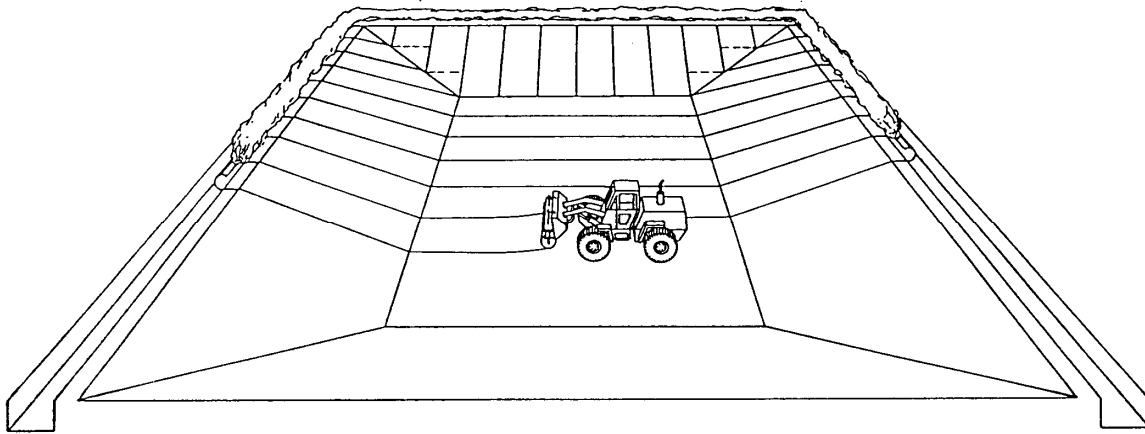
### **HANDLING AND PLACEMENT**

Depending on the type of subgrade at the site, the typical equipment used for deployment may range from an extendible boom forklift to a front end loader or backhoe. Suspending the GCL roll using a spreader bar and a core pipe through the core will facilitate deployment and will prevent damage to the panel edges caused by the suspending chains or straps.



Flat-bladed vise-type grips may be used by laborers for handling, but are not required. The GCL may be cut with a sharp utility knife, scissors, or with a battery-powered rotating blade cutter. Panels of GCL should be installed with the white nonwoven surface facing down in order to maximize friction against the subgrade. GCL rolls are wound at the plant so that they naturally unroll with this orientation.

Methods of deployment will vary based on site-specific conditions such as slope angle, berm widths, the type of project, the type of subgrade surface, and the subgrade preparation. As a general guideline, all seams should run parallel to the direction of the slope. Flat areas require no particular orientation; however, attention should be paid to the overlap orientation to prevent seam displacement during cover placement.



Deployment should proceed from the highest elevation to the lowest to facilitate drainage in the event of precipitation. GCL may be deployed by pulling the material from a suspended roll, or by weighing down one end of the roll end and then allowing it to unroll as the installation equipment slowly moves backwards along the intended path of deployment.

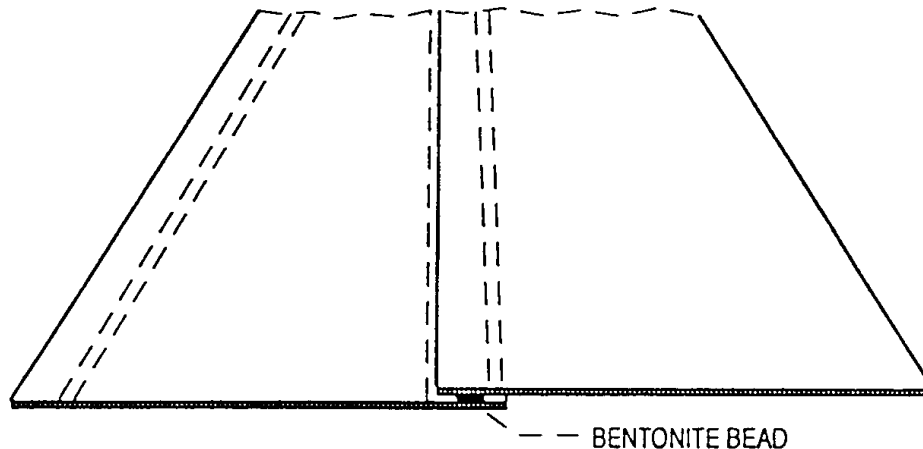
## **SEAMING PROCEDURES**

GCL seams are formed with a Volclay sodium bentonite enhanced overlap. The GCL has been engineered so that when properly installed and hydrated, a small amount of internal sodium bentonite will extrude through the edges where overlaps exist; however, secondary seaming measures are also recommended to insure that a continuous seal is achieved between panels.

A minimum of a 6-inch to 9-inch overlap should exist at all seam locations. A lap line as well as a match line have been printed on the GCL panel edges at 6 and 9 inches respectively, to ensure the proper overlap is achieved.

The GCL panels should be adjusted to smooth out any wrinkles or creases between adjacent panels, leaving a proper seam where the overlapping panel covers the lapline of the underlying panel but leaves the matchline exposed.

Any native soil and debris should be removed from the contacting GCL surfaces to ensure seam integrity. The overlapping panel edge should be pulled back and granular Volclay sodium bentonite similar to that used in the GCL itself should



be poured continuously along all seams and lap areas from the panel edge to the 6-inch lapline, at a minimum application rate of one-quarter pound per lineal foot (one bag per roll of GCL). Granular bentonite is supplied with each shipment of GCL for these purposes and for other detail work as required.

## **ANCHORING PROCEDURES**

Anchor trenches may be excavated in a number of ways, depending upon the size of the project and the maneuvering area available at the top of the slope. The preferred methods are to use a ditch trencher (set to the specified depth) or a small backhoe equipped with a bucket of appropriate width.

GCL should be placed in the trench such that the end of the panel covers the entire trench floor but does not extend up the rear wall.

The size of the anchor trench depends on site-specific criteria such as the soil type and general condition, the angle and length of the slope, as well as the thickness and type of proposed cover materials. In any case, anchor trench backfill should be well compacted to prevent water intrusion or ponding and to prevent liner pullout.

When using GCL in conjunction with other geosynthetic materials, the GCL may be put in a separate trench or placed as otherwise specified by the engineer.

## **PENETRATION SEALING**

For sealing around penetrations, a small notch should be made around the circumference of the pipe, into the subgrade. Volclay bentonite should then be packed around the pipe in the notch and on adjacent areas so that the pipe is encased by a pure bentonite seal.

The GCL panel should then be placed over the penetration and slit into a "pie" configuration where the pipe is to protrude. This procedure will create a snug fit between the GCL and the pipe once the laps are trimmed.

More sodium bentonite should then be spread around the cut edges of the GCL against the pipe and over adjacent areas.

To complete the detail, a collar of GCL should be cut in a manner similar to that made on the main panel and fit around the pipe, with additional Volclay sodium bentonite applied into any gaps that may remain.

When GCL is used above or in conjunction with other geosynthetic materials, notching below the liner may not be possible. In these cases, sprayable bituminous coatings may be applied around the penetrations and any other critical areas. All other penetration sealing steps should be followed to ensure a watertight seal is produced.

## **STRUCTURE SEALING**

Another critical area in an installation is the attachment or sealing of GCL to foundation walls, drainage outlets or concrete structures. Sealing panel edges against a wall or foundation is accomplished with the use of pure Volclay bentonite.

To start, a small notch should be made against the edge of the object to be sealed. The notch should be packed full of Volclay bentonite. The GCL panel is then brought up to the structure and trimmed to fit against the wall of the structure as shown. Care must be taken to ensure that the GCL is kept directly against the structure as the cover material is applied.

Once hydrated, the Volclay bentonite seal will allow for settlement or other stresses that may tend to pull the BENTOMAT from the edge.

## **PROTECTIVE COVER**

The protective cover should be composed of well graded soils, sands or crushed gravel free of sharp edged stones larger than 1 inch (2.5 cm) in diameter. Cover should be spread by low ground pressure equipment.

A minimum cover thickness of 12 inches should be kept between heavy equipment and the liner at all times. No vehicles should drive on the GCL until proper cover has been placed to the specified depth. Once the proper depth of cover soils have been applied, compaction equipment may be used.

Care should be taken to push materials upslope wherever possible and to avoid pinching or shifting the liner by making sharp turns or sudden stops.

## **DAMAGE**

Rips or tears may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch over the damage, with a minimum overlap of 12 inches on all edges.

Accessory bentonite should be placed between the patch and the repaired material at a rate of a quarter pound per lineal foot of edge spread in a six-inch width.

If damage occurs on a slope, the same basic procedure should be used; however, the edges of the patch should be fastened to the repaired liner with contact cement, epoxy, or some other construction adhesive, in addition to the bentonite-enhanced seam.

## **ACTIVATION**

For fresh water applications, the water to be contained will activate the GCL. If highly contaminated or non-aqueous liquids are to be contained, however, the GCL must be prehydrated with fresh water for 48 hours prior to use. Approximately one-quarter gallon of fresh water per square foot is necessary for prehydration. Prehydration may be accomplished by flooding the impoundment, using a sprinkler system, or by natural rainfall. In landfill applications, the leachate is typically sufficient to hydrate the GCL.

## **MAINTENANCE**

No regular maintenance of GCL is necessary under normal operational conditions. Should damage occur to the liner, the damage repair guidelines should be followed. Should unusual conditions exist or should the normal repair procedure not be possible, contact [Jen-Hill](http://www.jenhill.com) for further recommendations.



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