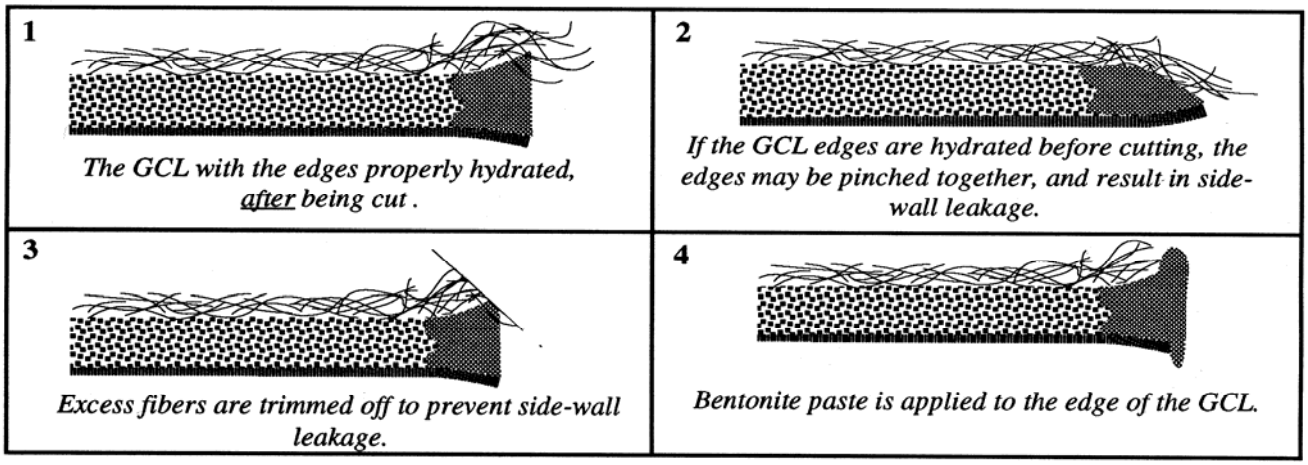
RECOMMENDED SAMPLE PREPARATION AND TEST PROCEDURES FOR FLEXIBLE WALL HYDRAULIC CONDUCTIVITY OF GEOSYNTHETIC CLAY LINERS (GCLs)

Flexible wall hydraulic conductivity testing methods are well established in ASTM D5084. However, this method only addresses the testing of compacted soil and does not offer any guidelines for the testing of Geosynthetic Clay Liners (GCLs). ASTM D5887 is a newly adopted flux test for GCLs. The purpose of this reference is to address in detail some of the areas that need special attention when testing GCLs in flexible wall permeameters.

Sample Preparation

The GCL should first be cut into a circle the size of the test apparatus. Samples should be no less than 4" in diameter or the diameter of the porous stone. The GCL should be cut in its as-received condition. Cutting can be accomplished with a utility knife or an electric textile-cutting tool. Exacto knives and razor blades should be changed often to assure that they are very sharp. Dull blades will pull fibers in the geotextiles and cause damage to the sample. As the GCL is cut, water is squirted from a water bottle to wet the exposed bentonite at the edge of the sample. This hydration should be performed immediately after the cut is made to minimize any bentonite loss (Figure 1). The GCL should not be hydrated prior to cutting. Hydration of the GCL or its edges prior to cutting can cause the GCL edges to be "pinched" together, resulting in side-wall leakage (Figure 2).



Figures 1-4

Sample Preparation (continued)

After the sample has been cut and the edges hydrated, any excess fibers from the edge of the GCL should be trimmed off (Figure 3). Once trimmed, a bentonite paste should be applied to the edges of the GCL to insure that side-wall leakage will not occur (Figure 4). Any loose bentonite on the surface of the GCL should be cleaned off prior to testing.

The sample is now ready to put into the test cell. As with any test, first place a saturated porous stone on the bottom platen and cover it with a saturated piece of filter paper*. Next, place the GCL upside-down on the stone (water flow during the test should be from the bottom up).

If possible, measurements of the GCL thickness should be taken throughout the test. Otherwise, take thickness measurements before and after testing.

Continue assembly of the test cell with another saturated filter paper, saturated porous stone, and top platen. Place membrane, o-rings, etc. as with any other sample, and fill the cell with water.

Saturation

Backpressure saturation is recommended for the GCLs. Saturation should begin at low pressures and increase at a rate of no greater than 10 p.s.i. per hour up the final test pressures. Once a test pressures, the sample should be allowed to saturate for at least 48 hours.

Testing

During the first few hours of testing, it is not uncommon to observe the sample continuing to hydrate. Often there is flow into the sample but not out of the sample. Water flow out of the inflow line has even been observed due to the swelling of the bentonite. As in ASTM 5084, testing should continue until the inflow equals the outflow.

Due to the extremely low flow rates through GCLs, bacterial growth and sedimentation are often observed in the water lines of the test equipment; therefore, the water lines should be flushed regularly.

Testing should continue until the conditions for termination set forth in ASTM D 5887 are met. It is not uncommon for the hydraulic conductivity of GCLs to continue to decrease after 7 to 10 days as the bentonite continues to swell and seal off hydraulic pathways. Thus, patience should be practiced on any samples that have not reached the specified hydraulic conductivity after only a few days of permeation. Any tests showing unusually high hydraulic conductivities should be permeated with a dye tracer to determine whether sidewall leakage is occurring.

CL/CLT Sample Preparation

Special preparation is required with the membrane-laminated GCLs, Bentomat® CL, Bentomat CLT and Claymax® 600CL. CETCO recommends the following modified procedure:

1. Cut a 4.5 inch square specimen from the sample.

2. Place the specimen between 4-inch diameter acrylic plates and clamp with Jorgensen E-Z Hold II or equivalent device (Figure 5).

3. Using a razor blade, cut the specimen into a circle such that the geotextile side is the same diameter as the acrylic plates.

CL/CLT Sample Preparation (Continued)

4. Remove the specimen from between the plates. Cut any strands of geosynthetic fiber which are hanging from the edge and may cause bridging.

5. Place specimen between clamps. Apply a bead of silicone sealant (GE Silicone II Kitchen and Bath or equivalent) around the outer edge of the specimen (Figure 6).

6. Lightly feather the top and bottom of the silicone bead toward the geosynthetics to assure that the silicone is contacting them.

7. Wait approximately 5 minutes for the silicone to become tacky.

8. Assemble specimen, filter paper, porous stones and acrylic plates.

9. Apply baby powder to inside of 4"I.D., 0.012" wall membrane (Geotest S6842B or equivalent). Place membrane in a 4.5" diameter membrane stretcher or stretch manually to place around assembly.

10. Apply o-rings and complete set-up. Saturate and permeate per previous sections.

Figure 5. Clamping Device

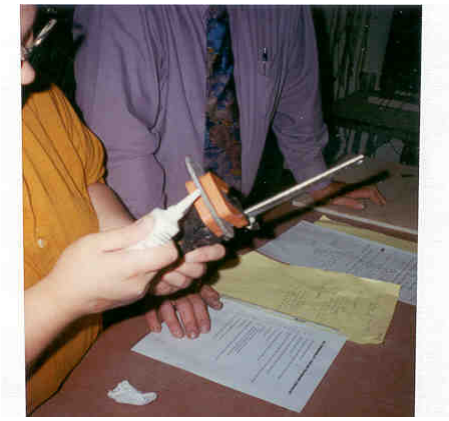


Figure 6. Applying Sealant