



Department of Energy

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DEC 04 2003

Mr. James A. Saric, Remedial Project Manager
United States Environmental Protection Agency
Region V, SR-6J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0065-04

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

**REQUEST FOR CONCURRENCE TO USE IMPROVED GEOSYNTHETIC CLAY LINER
MATERIAL IN THE ON-SITE DISPOSAL FACILITY**

CETCO is currently under contract with Fluor Fernald to provide Geosynthetic Clay Liner (GCL) products to the Fernald Closure Project (FCP). The CETCO "Bentomat" product has been used in cell liner and cap construction projects since 1998. This product is rigorously tested by the manufacturer and our Construction Quality Control Consultant each year to meet our procurement specifications and On-Site Disposal Facility (OSDF) Construction Quality Assurance Plan.

Currently, bentonite granules are required by the manufacturer to be manually placed between the 6-inch overlap as the panels are deployed in the cell. The addition of granular bentonite within the overlap area seals off planar flow at the overlap. Recently, CETCO has developed a precision cut, or SuperGroove in the nonwoven geotextile of the Bentomat that allows bentonite to more freely extrude from the product, therefore, eliminating the need to place additional bentonite granules manually on the lengthwise overlap area. Manual placement of bentonite granules will still be required at the end-to-end overlaps.

Since CETCO does not require additional bentonite to be placed at the overlaps of the Bentomat with SuperGroove, there is no change to the current specifications. The OSDF Technical Specification 02772 Part 3.04, Article E states, "Use of granular or powdered bentonite to enhance bonding at the seams shall be in accordance with the geosynthetic clay liner and cap Manufacturer's recommendations." The components of the Bentomat

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product are manufactured using the same woven and non-woven products as used in previous years. The SuperGroove will not impact any quality assurance testing required to be performed on the GCL product.

Not only does the SuperGroove enhance placement by eliminating manual placement of bentonite at the lengthwise overlap areas, but it will also reduce the risk of seam failure on the overlaying geomembrane. When bentonite granules are manually distributed, excess granule residue may adhere to the underside of the geomembrane, therefore, creating an unclean condition for fusion seaming and thereby creating the possibility of contamination in a seam. Elimination of the manual placement of bentonite granules greatly reduces that condition.

Based on these facts and the additional information enclosed, DOE-FCP request your concurrence with our decision to purchase the CETCO product with the SuperGroove.

If you have any questions or concerns, please contact Johnny Reising at (513) 648-3139.

Sincerely,


William J. Taylor
Director

FCP:Reising

Enclosure: As Stated

Mr. James A. Saric
Mr. Tom Schneider

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cc w/enclosure:

D. Pfister, OH/FCP
J. Reising, OH/FCP
T. Schneider, OEPA-Dayton (three copies of enclosure)
G. Jablonowski, USEPA-V, SR-6J
F. Bell, ATSDR
M. Cullerton, Tetra Tech
M. Shupe, HSI GeoTrans
R. Vandegrift, ODH
AR Coordinator, MS78

cc w/o enclosure:

R. Abitz, Fluor Fernald, Inc./MS64
L. Barlow, Fluor Fernald, Inc./MS41
T. Beasley, Fluor Fernald, Inc./MS60
C. Carney, Fluor Fernald, Inc./MS60
J. Chiou, Fluor Fernald, Inc./MS64
F. Flack, Fluor Fernald, Inc./MS60
R. Friske, Fluor Fernald, Inc./MS64
T. Hagen, Fluor Fernald, Inc./MS1
K. Harbin, Fluor Fernald, Inc./MS60
W. Hooper, Fluor Fernald, Inc./MS64
U. Kumthekar, Fluor Fernald, Inc./MS64
S. Lorenz, Fluor Fernald, Inc./MS41
T. Poff, Fluor Fernald, Inc./MS65-2
D. Powell, Fluor Fernald, Inc./MS64
C. Van Arsdale, Fluor Fernald, Inc./MS64
B. Zebick, Fluor Fernald, Inc./MS60
ECDC, Fluor Fernald, Inc./MS52-7



GCL Performance & Design Reference

BENTOMAT® **THE GCL WITH THE "WINNING EDGE™"**

Available now and standard on all Bentomat products, the "Winning Edge™" is a new two-part edge enhancement system that brings higher levels of performance and convenience to the world's best-selling GCL. The patented SuperGroove™ eliminates the need for accessory bentonite in the overlapped seam, and the WrapAround™ seals the edge of Bentomat to prevent incidental loss of bentonite during shipping, handling, and installation. Available only on Bentomat products, the SuperGroove and the WrapAround will increase performance and decrease GCL installation headaches.

The SuperGroove™

All Bentomat products have at least one nonwoven needlepunched geotextile. In comparison to woven geotextiles, needlepunched nonwovens are thicker and can transmit flow in the plane of the geotextile. Planar flow can cause excessive leakage in the overlapped seam of a GCL. The addition of granular bentonite within the overlap area can eliminate this preferential flow by sealing the nonwoven geotextile, which has been the standard of practice for many years.

The SuperGroove is a precision cut in the nonwoven geotextile of Bentomat that allows bentonite to more freely extrude into the overlap zone (Figure 1). Upon hydration, a seal is formed, eliminating the possibility of preferential seam flow (Figure 2). Supplemental bentonite is not required.

Figure 1. The SuperGroove on Bentomat.

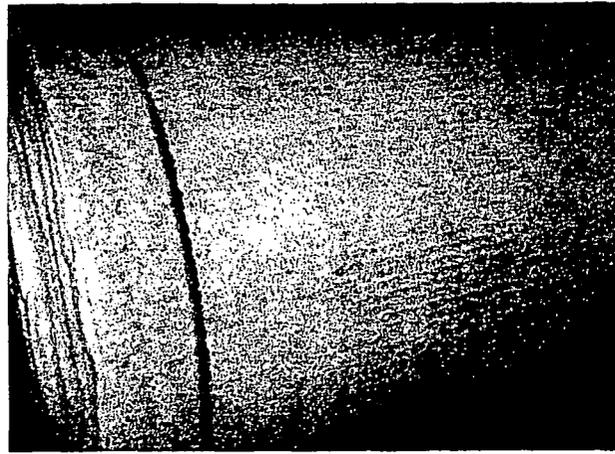
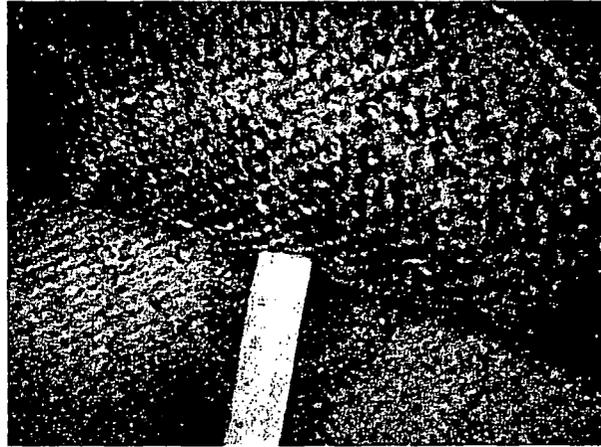


Figure 2. A test overlap showing bentonite "stain" on the surface of the woven geotextile, indicating extrusion from the non-woven.



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The SuperGroove ensures that the hydraulic performance of the entire seamed GCL system is equal to that of unseamed portions. Added benefits include:

- No need for supplemental bentonite
- No concerns over improper seaming technique
- Eliminates labor associated with adding bentonite
- Simplifies CQA/CQC procedures
- Eliminates a source of geomembrane seam contamination

The SuperGroove is located approximately 3 inches (75 mm) inside the outermost limit of the bentonite clay component of the GCL, about 4 inches (100 mm) outside the first lap line (Figure 3). The SuperGroove is placed on both longitudinal edges of the Bentomat product.

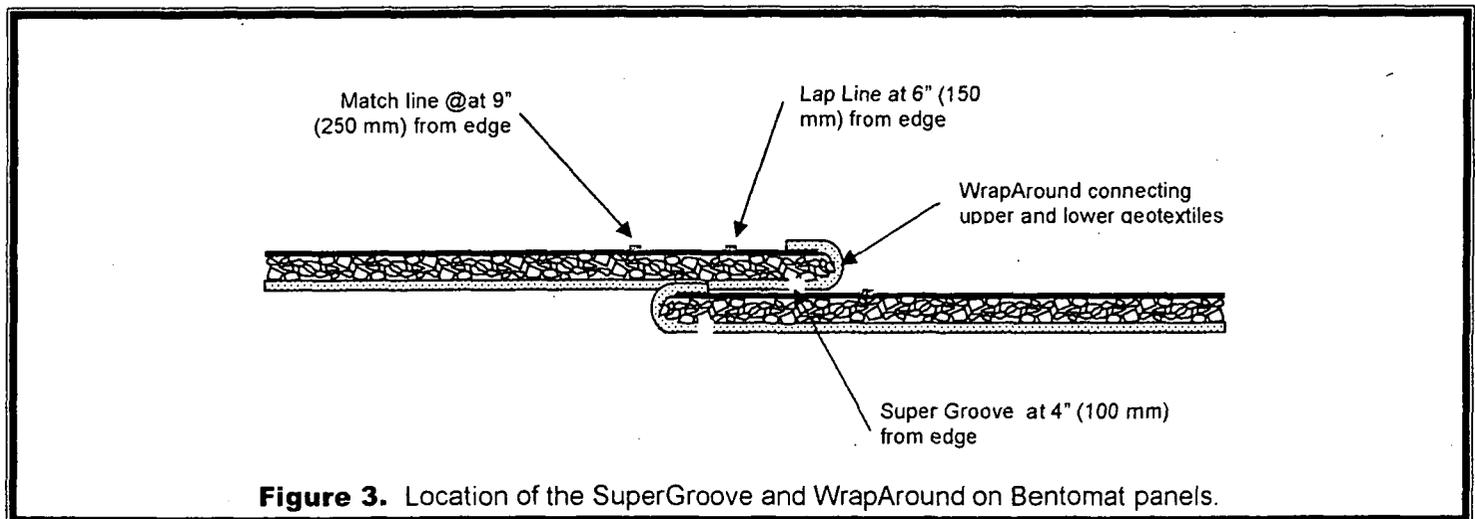


Figure 3. Location of the SuperGroove and WrapAround on Bentomat panels.

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Performance of the SuperGroove seam was evaluated in comparison to a traditional bentonite-enhanced seam. Third-party laboratory tests were performed under a variety of head pressures and confining pressures. A test at low confining pressure is a "worst-case" scenario because the volume of void spaces in the overlap is larger than when a higher confining pressure is applied. Even in low-stress conditions, test data shows that the SuperGroove still allowed extrusion to completely seal the overlap (Table 1).

Table 1. Comparative performance of Bentomat ST with traditional bentonite-enhanced seam and with new SuperGroove™.

Hydraulic Pressure (psi)	Unseamed Flow (m ³ /m ² /s)	Seamed Flow (m ³ /m ² /s)	Flow difference (m ³ /m ² /s)	Seam correction factor*	Seam flow (m ³ /m ² /s)**
2	4.4 x 10 ⁻¹⁰	5.28 x 10 ⁻¹⁰	8.8 x 10 ⁻¹¹	3.4207	2.57 x 10 ⁻¹¹
5	1.37 x 10 ⁻⁹	1.63 x 10 ⁻⁹	2.6 x 10 ⁻¹⁰	3.4207	7.6 x 10 ⁻¹¹
10	3.41 x 10 ⁻⁹	3.85 x 10 ⁻⁹	4.4 x 10 ⁻¹⁰	3.4207	1.29 x 10 ⁻¹⁰

*Laboratory tests are performed with 3.4207 times more seam length (per unit area of GCL) than in field seams.

**Flow difference divided by seam correction factor results in estimated preferential flow per unit area through field seam.

The test data shows that in all test conditions, the unseamed flow is greater than the seam flow, indicating that there is no preferential flow through the Bentomat seam.

It should be noted that the SuperGroove does not appear on end-of-roll overlaps. CETCO recommends the continued use of supplemental bentonite for all end-of-roll overlaps of Bentomat.

The WrapAround™

The WrapAround is CETCO's exclusive technique for sealing the edge of the Bentomat product to prevent incidental bentonite loss during shipping, handling, and installation. Prior to needlepunching, the edge of the bottom geotextile on Bentomat is guided around the exposed edge and over the top geotextile. The needlepunching process then permanently secures the textiles together and seals the edge of the Bentomat. The result is a clean, geotextile-encased edge that prevents incidental bentonite loss. The WrapAround provides several significant benefits:

- Eliminates a potential source of bentonite dust, which can contaminate the welded seam of a geomembrane.
- Greatly reduces the potential for bentonite to infiltrate and diminish the flow capacity of an underlying drainage geocomposite.
- Eliminates the potential for performance problems through excessive bentonite loss at the edges of the GCL.

Bentomat—the GCL with the Winning Edge™

The Winning Edge, featuring both the SuperGroove and the WrapAround, comes on all orders of Bentomat ST, Bentomat DN, and Bentomat CL. For more information about the Winning Edge, contact your local CETCO representative.

References

SGI Project No. SGI1029, Document No. SGI 01071, "Final Report, Large-Scale Flow Rate Testing, Seamed and Unseamed Bentomat GCL," 3 August 2001.

SGI Project No. SGI1029, Document No. SGI 01071, SGI02037, "Final Report, Large-Scale Flow Rate Testing, Seamed and Unseamed Bentomat GCL," 4 February 2002.

FAQs ABOUT THE WINNING EDGE

Does the bentonite fall out of the SuperGroove during handling? No. CETCO's production process allows most of the bentonite to remain within the SuperGroove. Even if small amounts of bentonite are lost during installation, the resulting void spaces are rapidly filled by swelling bentonite particles immediately adjacent to the SuperGroove.

Will the SuperGroove affect the strength of the Bentomat? No. The narrow groove affects a tiny percentage of one geotextile component of Bentomat. The nonwoven geotextile is still securely needlepunched on either side of the SuperGroove and therefore does not affect the shear or tensile strength of the product.

Will bentonite extrusion from the SuperGroove leave a void where preferential leakage can occur downward through the GCL? No. The bentonite does not leave a large void, and the SuperGroove is located only where there is already a double layer of bentonite (in the overlap), so there is no possibility of a "short circuit" around or through it.

How do I know the SuperGroove is really present? The SuperGroove is on the bottom of the Bentomat, such that it faces the installer and inspector as the roll is unrolled and installed. The SuperGroove is in plain sight throughout the deployment process. Random checks after installation can also be included in a CQA plan as needed to document its continuous presence.

Is the SuperGroove present in the upper geotextile component of Bentomat also? No. It is only present in the lower geotextile.

Will the WrapAround affect the performance of the SuperGroove? No. The Wraparound is located completely outside the SuperGroove.

How much bentonite is lost from Bentomat without the WrapAround? Bentonite loss has always been minimal due to the tightness of CETCO's needlepunching process and because moisture added to the bentonite during production helps to adhere it to the geotextiles. However, it has been shown that only small amounts of bentonite are required to interfere with the strength of a heat-welded geomembrane seam. The WrapAround simply eliminates the potential for this to occur.

How do I specify the Winning Edge? CETCO has modified its GCL specification guidelines to include generic language regarding GCL edge treatment. Please visit our GCL engineering website for the latest Bentomat specification document.