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

Available now and standard on all Bentomat products, the "Winning Edge™" is a new overlapped seam 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. Available only on Bentomat products, the SuperGroove 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.



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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.

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.



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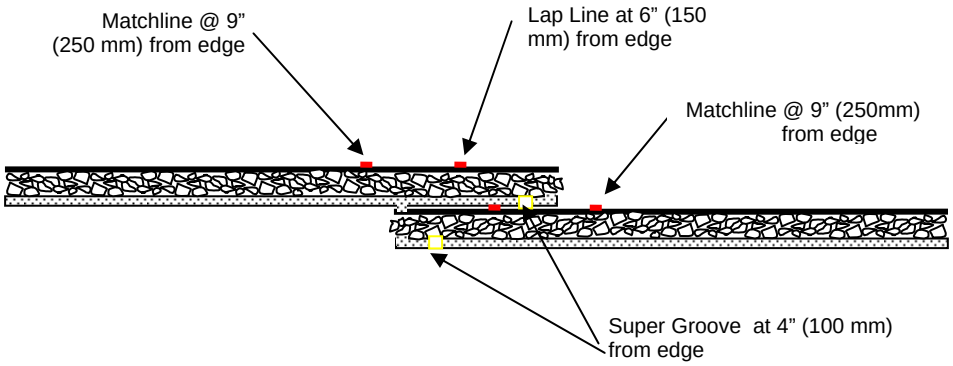


Figure 3. Location of the SuperGroove on Bentomat panels.

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 Flux ($m^3/m^2/s$) | Seamed Flux ($m^3/m^2/s$) | Flux difference ($m^3/m^2/s$) | Seam correction factor* | Seam flux ($m^3/m^2/s$)** | Seam flux, % of total flux of seamed sample |
|---|---|---|---|---|---|---|
| 2 | $4.4 \times 10^{-10}$ | $5.28 \times 10^{-10}$ | $8.8 \times 10^{-11}$ | 13.7 | $6.42 \times 10^{-12}$ | 1.2% |
| 5 | $1.37 \times 10^{-9}$ | $1.63 \times 10^{-9}$ | $2.6 \times 10^{-10}$ | 13.7 | $1.90 \times 10^{-11}$ | 1.2% |
| 10 | $3.41 \times 10^{-9}$ | $3.85 \times 10^{-9}$ | $4.4 \times 10^{-10}$ | 13.7 | $3.21 \times 10^{-10}$ | 0.8% |

*Laboratory tests are performed with 13.7 times more seam length (per unit area of GCL) than in field seams.
**Flux 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, there is a very small component of the total flux that is attributable to the overlapped seams. Expressed as a percentage of total seam area (3.9% on full-size GCL rolls laid in a large area, it can be seen that the percentage of total seam flux is proportionally less than the percentage of seamed area. Thus, it can be concluded that SuperGroove seams function effectively.

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.

## Bentomat—the GCL with the Winning Edge™

The Winning Edge, featuring the SuperGroove, comes on all orders of Bentomat ST, Bentomat DN, Bentomat SDN and Bentomat YSDN. 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.

**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.



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