

Enkamat® R²M

*DIVISION 2
Site Construction*

Slope Protection

Shoreline Protection

Channel Lining

Landscape Contractor:

Heikes Farms

Lakeville, MN

Engineer:

Anderson-Johnson

Associates, Inc.

Minneapolis, MN



Enkamat during BFM installation.

Lake Prior High School after first growing season.

Unique Erosion Control Application Protects New High School

The city of Savage, Minnesota, a suburb of Minneapolis, Minnesota constructed a new high school in 2001. Like many construction projects, the seeding and erosion control was applied in late September to the middle of October. The objectives for this portion of the grading and sitework were vegetation establishment to minimize erosion on the slopes prior to winter and allow continuation of vegetation establishment and topdressing in the spring where needed. Installation of both temporary and permanent protection was required on critical locations - on slopes and drainage swales, for both short and long term erosion protection.

Anderson-Johnson Associates, Inc. from Minneapolis, Minnesota developed the erosion control plan. Initially, the project was designed with a Turf Reinforcement Mat (TRM) that combines a long-term biodegradable component with permanent components to satisfy the short and long

term requirements. However, after closely considering the final grades, the site soils, the desired permanent vegetation, the time of year for seed application, and the probability of over-seeding in the spring, an alternative erosion control system was chosen. This hybrid erosion control system consists of a combination of Enkamat R²M, a Root Reinforcement Matrix manufactured by Colbond, Inc. of Enka, North Carolina and Soil Guard[®], a bonded fiber matrix (BFM) by Mat Inc. from Floodwood, Minnesota. The erosion control system was installed by Heikes Farm of Lakeville, Minnesota.

The alternate design was developed and confirmed using the EnkaGreen[®] design software from Colbond that utilizes state-of-the-practice methodologies. EnkaGreen employs HEC-15 methods for channel design and RUSLE* for slopes. This design approach considers site topography, channel geometry, type of vegetation, historical rainfall data and anticipated

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stormwater runoff. Special consideration was required for the permanent erosion protection system along a detention pond where all the runoff is collected from the site and actually doubles as a green area to promote a native eco-system.

The site was rough-graded and then topsoil was spread for the finish grade. Enkamat was installed according to the manufacturer's recommendation and the desired best management practice (BMP). In lieu of the traditional deployment of Enkamat parallel down the slope face, the contractor opted to install the Enkamat perpendicular with the slope face, from the toe (or shoreline of the pond) and proceed toward the top with a layered (shingled) installation. The contractor advised it was their experience that this installation procedure was much better at keeping runoff on top of the Enkamat to prevent rills from occurring under the erosion protection - a common result with poorly installed erosion protection. Trenches were used along the top of the slope but now instead of acting as anchor trenches they were simply a means of allowing the runoff on top of the erosion protection.

The contractor proceeded to place staples in a pattern as required by the standard of practice for the given slope. However, in order to ensure intimate contact with ground surface to develop the Enkamat-BFM system, a few extra staples were used where it was deemed necessary - this is done at the experienced installer's discretion. The Enkamat was terminated approximately 2 feet below the anticipated normal shoreline water level of the retention pond. [Enkamat is manufactured from nylon, which has a specific gravity of greater than 1 - translated into practical terms this means it does not have a buoyancy factor so it remains submerged. Other TRMs are made from polypropylene which do tend to float if installed in a submerged condition.]

Approximately 11,000 square yards of Enkamat were installed around the retention pond area. The Enkamat was secured to the ground using 6 inch long

U-shape staples. After all the Enkamat was fully installed, the contractor hydraulically applied the seed and the Soil Guard BFM, together with fertilizer, directly into the Enkamat. The purpose of the Soil Guard was to enhance the time of the germination of the seed by retaining moisture and maintaining temperature. The BFM provides additional assurance of intimate contact with the soil and Enkamat gives the permanent root reinforcement required to ensure performance long after the vegetation is established. The combination of seed, mulch, and fertilizer (BFM) caught within the Enkamat also prevents the vegetation tenting effect that occurs when seed placement proceeds mat/blanket installation - typical of all other TRM composite or blanket installations.

Both the contractor and the engineer were very pleased and impressed with the system. Particularly impressive was how easily the BFM flowed into the Enkamat to develop a composite system providing the effective entanglement of the seed, soil, roots, and Enkamat. After the Soil Guard cured (within hours), the erosion protection system acted as a very durable permanent turf reinforcement system throughout the entire vegetation establishment process - from unvegetated phase through maturity. The three-dimensional open structure of the Enkamat was determined to be drastically more efficient at allowing the hydroseed, fertilizer, and mulch of the BFM to penetrate and contact the soil - a vital element to seed germination and protection - something impossible to accomplish with other composite TRMs.

This particular superior open structure feature of Enkamat has proven advantageous in developing the balanced approach to this new TRM technology, by incorporating different types of mulches in the field with the Enkamat - particularly a bonded fiber matrix (BFM.) This has proven especially effective in decreasing soil loss in the unvegetated state, but more importantly, it provides improved performance of vegetation establishment. Establishment of vegetation through a BFM reduces the likelihood of tenting - the effect of vegetation that germinates but then is inhibited

by the closely entangled (natural or synthetic) fibers of the protection component of other composite TRM products causing the TRM to be lifted from contact with the soil surface by the newly established vegetal layer below. The superior performance of Enkamat with a BFM is a result of a combination of the less restrictive BFM material, the vegetation enhancement of a carefully selected BFM recipe, and direct, intimate contact typically determines how well an RECP will reduce erosion in the unvegetated state and how well it will perform as a permanent erosion control component.

In this case, the vegetation established well in the spring and was so healthy that over-seeding was not required. The uniqueness of this system is that the temporary component degrades at a rate that, if desired, over-seeding can take place to increase the vegetation density - unlike other composite TRMs that have a long-lasting biodegradable component. It is impossible to overseed such products resulting in poor maintenance capabilities. Although it was the first TRM and has been utilized in erosion control applications for over 30 years, the uniqueness and versatility of Enkamat make it like no other product on the market today.

* FHWA Highway Engineering Circular - No. 15 and the Revised Unified Soil Loss Equation from USDA.

For more information about Enkamat R²M and other quality products manufactured and marketed by Colbond, Inc. please call our toll free number or visit our website.

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