

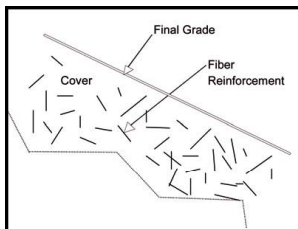
Geofibers®

- REPAIR OF FAILED SLOPES
- STABILIZATION AND REINFORCEMENT
- LANDFILL COVER VENEER REINFORCEMENT
- ENHANCEMENT OF EVAPOTRANSPIRATIVE COVER SYSTEMS
- REDUCE DESICCATION CRACKING IN COMPACTED CLAY LINERS

Geosynthetic solutions.com line of reinforcing fibers has been specifically designed to maximize shear strength enhancement of natural soils. We have products to reinforce all soil types. From fat clays to sugar sands, we have a fiber to reinforce it. These products have been extensively lab tested and field proven to give consistent performance.

GEOFIBERS® are typically 1-2 inches long discrete fibrillated or tape polypropylene strands that are mixed or blended into sand or clay soils. During the blending process the fibers open or filamentize into net, grid and fiber configurations that mechanically reinforce sand and clay. This process creates a new soil structure with enhanced engineering properties.

FIBER REINFORCED VENEER



GEOFIBERS® composite soils exhibit greatly improved performance properties. Stress-strain curves from unconfined compression tests show the addition of fibers increase the strain energy and residual bearing capacity when compared to un-reinforced or chemically treated soil systems.



In addition to the strength increase provided by **GEOFIBERS®**, a significant increase in desiccation crack resistance in compacted clay liners is also achieved.

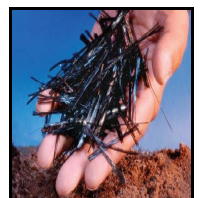


Triaxial and direct shear tests show a 20 to 50 percent increase in the shear strength of cohesive soils reinforced with fibers. Therefore, fiber reinforced soils used in slope construction or slope repair exhibit higher factors of safety against failure than un-reinforced soils.

Depending upon actual soil characteristics and desired performance levels, a design specific dosage rate of **GEOFIBERS®** is mixed into the soil using standard construction methods. The fiber reinforced soil is also placed and compacted using standard procedures and equipment. Chemical stabilizers (such as hydrated lime or portland cement) may also be used in conjunction with fiber soil reinforcement when circumstances necessitate. The end result is an isotropic, reinforced soil with enhanced engineering properties and performance characteristics.

STABILIZE & REINFORCE

Mixing **GEOFIBERS®** into cohesive soils for slope repair and new slope construction increases the shear strength of the material. This benefit may allow steeper slopes to be constructed without the high costs associated with conventional retaining wall construction. Because of its simple application method, **GEOFIBERS®** reinforcement is ideal for use in slope repair projects. Slope failures are expensive maintenance problems that can be repaired by mixing **GEOFIBERS®** with fill soils prior to replacement. Utilizing **GEOFIBERS®** reinforcement in a slope repair is easily accomplished using standard construction techniques. Soils to be used in the slope repair are spread to a lift thickness which can be effectively mixed and meet compaction requirements.



GEOFIBERS® are placed on the soil lift at a dosage rate calculated to the soil's dry unit weight. The soil is then blended with the fibers using a rotary-pulverizer mixer. The soil is then replaced and compacted in lifts to build the intended slope geometry.

SLOPE REPAIR

Soft subgrade soils, and tight construction budgets are factors that favor the use of in-situ stabilization techniques. Rather than using planar geosynthetics such as geotextiles or geogrids, **GEOFIBERS®**

blended into these materials homogenize and improve the performance characteristics of the soil itself. **GEOFIBERS®** reinforcement helps stabilize subgrade and can be used in conjunction with chemical stabilization to create a strong reinforced soil composite.

The fibers are placed on the soil layer at a calculated dosage rate, evenly spread over the lift, and mixed into the soil with a commercial size rotary pulverizer mixer. The fiber-reinforced soil is placed and compacted using standard procedures and equipment. When circumstances necessitate chemical stabilizers (such as hydrated lime or portland cement) may also be used in conjunction with fiber soil reinforcement to further increase subgrade performance.

TESTING

Laboratory tests, field tests, and actual installation successes have shown that mixing **GEOFIBERS®** with untreated subbase and base courses, or chemically stabilized sand and clay

soils, improves the performance of those materials. These improvements have been demonstrated through unconfined compression, triaxial, and flexural beam tests in the laboratory, increased number of passes to failure in field tests, and through projects and applications constructed in North America.

Laboratory tests show that **GEOFIBERS®** reinforcement improves the shear strength and cohesion of soils to be used in slope construction. Direct Shear tests (ASTM D4767) have quantified these improvements. Further analysis verified the repeatability of direct shear testing in cohesive soils reinforced with **GEOFIBERS®**. Because of the homogeneous nature of the fiber reinforced soil, the lab test results can be used to accurately predict shear strengths expected in the field.

LABORATORY TESTING ON FIBER REINFORCED COMPACTED CLAY:

Compacted Clay Liners (CCL's) are commonly used in landfills as hydraulic barriers. The presence of desiccation cracks has detrimental effects on CCL's. Cracks increase the permeability of the CCL, and reduce its strength. Research by Dr. Miller and her team at Wayne State University indicated that fiber reinforced clay achieved crack reduction up to 88% thanks to increased tensile strength of the composite soil and fiber ratio up to 0.5% had little effect on the compaction behavior and permeability

Reference: Miller, C.J. and Rifai, S. Fiber reinforcement for waste containment soil liners. ASCE Journal of Environmental Engineering, Special edition on: Waste Containment Barrier Materials. 2003.

CORPS OF ENGINEERS FIELD TEST

In 1991, the US ARMY Corps of Engineers, Waterways Experiment Station (WES) entered into a Research and Development Program (CRDP). This was part of the Construction Productivity Advancement Research Program (CPAR). CPAR is designed to assist in the advancement of technologies that will have a direct positive impact on construction productivity and project costs. The primary purpose of this research was to investigate the structural benefits of the inclusion of **GEOFIBERS®** in chemically treated stabilized soil layers. The data obtained from this study clearly demonstrates the improved performance of untreated and chemically stabilized soil layers using **GEOFIBERS®** soil reinforcement in pavement structures.

The 12" fiber-reinforced silty sand section provided a 33% increase in the number of traffic passes versus the similar unreinforced section

