Geotextiles

By Chuck Wilson, UNH T² Center Project Assistant

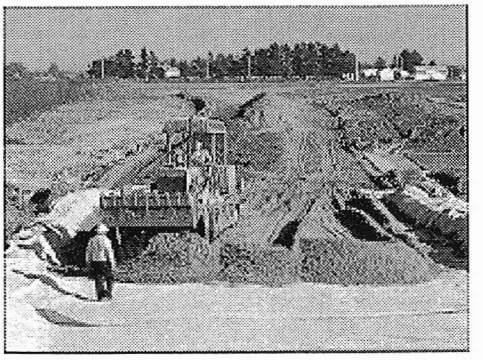
In 1992 alone, 400 million square yards of geotextiles were sold in North America. Today these materials still greatly contribute to the geosynthetics market in terms of overall sales. New Hampshire road managers can benefit from greater use of geotextiles. For example, towns with muddy, boggy unpaved roads would benefit from using a geotextile to improve road conditions.

The term "geosynthetics" is used to describe a group of materials. These include geotextiles, geogrids, geonets, geomembranes, and geosynthetic clay liners. Of these materials, geotextiles are used in a broad range of civil engineering applications. Geotextiles are essentially made of either polypropylene or polyester. They are manufactured in a manner similar to household fabric using conventional textile weaving machinery.

Geotextiles, sometimes called "fabrics" or "geosynthetics," exist in two forms: woven and non-woven. *Woven* fabric contains interconnecting threads, which make it high in tensile strength (can be stretched without breaking). *Non-woven* fabric is made with threads running parallel to each other. Because it has a lower tensile strength, it can not be stretched as much as a woven fabric.

Type	Use
Woven	• Soil reinforcement • Soil separation • Road stabilization
Non-woven	• Drainage applications • Soil filtration applications • Landscape stabilization

Geotextiles separate, filter, drain, and reinforce soils. In particular, they can be used in soft soil stabilization, base reinforcement and erosion control/slope stability. They are also being used to make tubing for the transport of water and wastewater biomass (residuals).



After fabric is laid, aggregate is "back-dumped" on top of it.

Unpaved Roads

New Hampshire road managers and officials can save money geotextiles when reconstructing an unpaved road. A road manager should consult a manufacturer to determine whether woven or non-woven fabric is best for a particular situation. Unpaved, rural roads are often subject to severe degradation due to underground springs, extreme boggy conditions, and severe drainage problems. These conditions sometimes make a road impassable during certain periods. Geotextiles can help correct these damaging conditions.

Since soil is the basic material of any road, its stability has the greatest effect on the condition of the road. The road condition will in turn affect driver safety. A geotextile will separate the surface gravel and the roadbed, and significantly reduce distresses. When a roadbed that contains clays, silts, or peats becomes saturated with water, mud slurry forms. Then vehicles travel over the road, applying loads to the softened roadbed, and the slurry is "pumped" upward. The slurry coats the gravel, reducing friction between aggregates. Friction is reduced or lost, and the aggregates slide past one another and fall into the unstable roadbed below. This results in rutting. A geotextile, carefully placed between the subgrade and the surface gravel will help prevent rutting. It separates the two layers, not allowing the slurry to pump upward.

Installation

A two-person crew can install Geotextiles. The fabric should be rolled out at a point that allows easy access to the area by construction vehicles. The starting point should have a firm subgrade, and the fabric should be rolled out towards the softer subgrade areas. This anchors the geotextile in place during the rollout. Crews should never drag the fabric across the subgrade, *and should always lay it out in the direction of traffic*. Sections of fabric should overlap by about 1.5 to 3.0 feet, depending on the subgrade strength. Overlaps should be at the centerline of the road, if possible, and *never in the wheel paths.* If the subgrade is extremely soft, the sections should be sewn together with nylon thread, rather than just overlapped.

Crews must "back-dump" aggregate onto the fabric, taking care to prevent the wheels of the dump truck from touching the fabric. They should anchor the perimeter of the fabric with soil, rocks, or pins during the first lift of aggregate placement. A tracked bulldozer is the best machine to prepare and spread the aggregate. Aggregate lift thickness should be at least six inches. If the fabric is damaged during installation the damaged area should be patched with a new piece.

Crews should compact the aggregate according to project specifications. Initial compaction is achieved by "walking" the bulldozer back and forth over the aggregate while waiting for the next load. Final compaction is done with a vibratory compactor. The operator makes several passes without vibration, and then with full vibration.

As with any construction project, monitoring is necessary. If rutting in the aggregate layer is observed, for example, then design specifications might have to be changed.

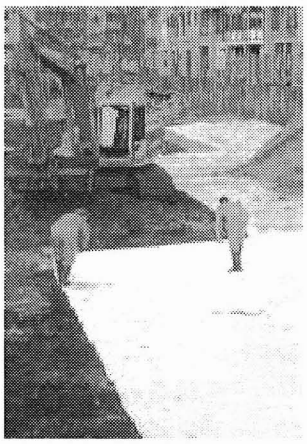
Fabrics in NH

The Town of Temple used a geotextile in 1988 to separate the layers of a gravel road (See *Road Business* vol. 3, no. 4). Before placement of the geotextile, it had impassable, muddy conditions with ruts up to one foot deep. Today, the conditions are as good as just after the fabric was placed.

In 1991, the Town of Lyndeborough paved Wilton Road with a geotextile separating the pavement and the base. Prior to installation it was a "corduroy road;" the conditions before the reconstruction were both muddy and swampy with heavy rutting. There hasn't been a crack since.

Other Benefits and Uses

Another benefit of geotextiles is the manner in which they drain water. Drainage is crucial to the performance of a road. Water can weaken subgrade soils and decrease their allowable bearing capacity. Geotextiles allow water to filter through, preventing the buildup of moisture.



Crews laying a geotextile in a construction operation

Geotextiles play a major role in the reinforcement of the base course. Non-woven geotextiles have excellent frictional characteristics, locking the aggregates in place. This locking action increases the strength of the base course. Because of this, aggregate particles don't have to be as thick. With this "locking" ability, erosion can also be controlled using geotextiles.

Retaining walls are another use for geotextiles. The fabric can provide the retained backfill with additional strength.

For more information about geotextile applications, contact the UNH T^2 Center at 1-800-423-0060.

Sources:
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