



## ■ Installation Guidelines: FX<sup>®</sup> Separation / Stabilization Geotextiles

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### **INTRODUCTION**

Carthage Mills' FX<sup>®</sup> Line of geotextiles can enhance the performance of paved and unpaved roadways, parking lots, airports, loading docks, and storage areas through separation/stabilization of the roadway structure. The geotextiles provide three important functions: separation/stabilization, drainage, and reinforcement. The fabric serves as a permeable separation/stabilization layer, preventing the aggregate and subgrade soils from intermixing while allowing the passage of water. The geotextile also enhances the structural properties of the subgrade and the roadway aggregate to minimize the cost of the road structure.

The successful use of geotextiles in these applications requires proper installation. The four basic steps of proper installation include:

- Subgrade preparation
- Geotextile placement
- Aggregate placement
- Aggregate compaction

Carthage Mills' FX<sup>®</sup> stabilization geotextiles can be used in most weather and temperature conditions.

Adequate planning and preparation for each installation step will speed construction and ensure good performance.

These guidelines provide recommendations for installation of geotextiles in separation/stabilization applications.

The guidelines are intended to assist the contractor responsible for installation of the specified geotextile.

They are to be considered general guidelines, appropriate for common construction conditions. Specific site conditions, design requirements, or other variables may require modification to these guidelines.

### **SUBGRADE PREPARATION**

Initially, the site should be cleared of tree stumps, large stones, and other sharp objects that could puncture the fabric. This step should be performed regardless of subgrade strength.

Roadway subgrade preparation typically involves removal of all vegetation, roots, and topsoil. Localized soft or otherwise unsuitable subgrade areas may be required to be excavated and backfilled with select material. In some very soft soil applications, it is beneficial to leave vegetation, roots, and topsoil in place to limit subgrade soil disturbance and loss of strength.

## GEOTEXTILE PLACEMENT

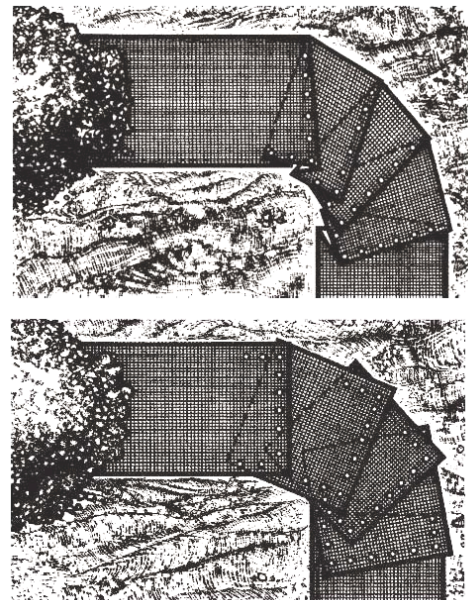
Two people can easily place FX<sup>®</sup> separation/stabilization geotextiles. The fabric should be rolled out onto the subgrade beginning at a point that allows easy access for construction equipment yet is consistent with the layout plan. On very soft subgrades (CBR<I) the fabric layout and aggregate placement should begin on firm soil on the site perimeter, to establish an "anchor point." From there the fabric can be rolled onto softer sections. The geotextile should not be dragged across the subgrade. The geotextile is usually laid in the direction of construction traffic; however, specific project dimensions may alter this layout. Geotextile panels should be overlapped both side-to-side and end-to-end, in the direction of aggregate placement. The recommended overlap ranges from 1.5 to 3 feet, depending on subgrade strength. Overlap recommendations are provided in Table 1.

**Table 1. Recommended Geotextile Overlaps**

Subgrade CBR Value	Subgrade R-Value (California)	Subgrade Shear Strength (lb/in <sup>2</sup> )	Field Estimation of CBR	Recommended Minimum Overlap
< 0.5	_____	< 2	_____	Sewn seam required
> 0.5 to 1	_____	> 2 to 4.5	A person can easily walk on the site	3 ft.
> 1 to 2	> 0 to 10	> 4.5 to 8.5	A low ground pressure bulldozer can access the site without significant rutting	2.5 ft.
> 2	> 10	> 8.5	A D4 bulldozer can access the site without significant rutting	1.5 ft.

Alternatively, adjacent fabric edges can be sewn together rather than overlapped. Sewn seams must be used when the geotextile provides significant tensile reinforcement. This is the case, for example, when the subgrade is very soft (CBR<0.5). Sewn seam strength and fabric orientation are important design parameters. In these critical applications, adjacent panels must be placed and sewn in accordance with the specifications provided by the design engineer. Field sewing is performed using a portable sewing machine and typically requires three or four laborers. Pre-sewn panels can be supplied from the factory.

Soil, rocks, or pins can be used to hold fabric edges and overlaps down until aggregate is placed. On curves, the geotextile may be folded or cut to conform to the curve, as shown in Figure 1. The fold or overlap should be in the direction of construction and can be held in place as described above.



**Figure 1:** TOP, forming a curve using folds. BOTTOM, forming a curve using cut pieces

## **AGGREGATE PLACEMENT**

Aggregate is placed and spread on the fabric using conventional construction practices and equipment. Soil, rocks, or pins should be used to anchor the leading edge of the fabric to prevent it from lifting during placement of the first aggregate lift. The aggregate is typically back-dumped onto the geotextile, as the truck should not drive directly on the fabric. The aggregate is then spread over the geotextile. A tracked bulldozer is best used for this operation. Low ground pressure models are recommended for work on soft subgrades.

Lift thickness should not be less than 6 inches. The first lift should be as thick as necessary to limit rutting to less than 4 inches. During spreading, the bulldozer should blade into the load and slightly upward to prevent stressing the fabric. This procedure should be followed for each load until the fabric is completely covered. The dozer operator can determine which areas may need additional aggregate for good stability by observing aggregate layer rutting.

On very soft subgrades, care should be taken during aggregate placement to ensure that the fabric is not moved out of position nor the subgrade overstressed. Over some very soft soil conditions, "mud waves" may appear during or subsequent to aggregate placement. Mud waves result from overstressing the subgrade during fill placement, causing the subsurface soil to move away and up from the loaded area. They are normally not a problem if they do not heave above the surface of the aggregate base. If severe mud waves are anticipated, a Carthage Mills representative can provide information on construction procedures to minimize their adverse effects.

Sudden stops or turns by equipment operating over the geotextile should be avoided. Under typical conditions, vehicles should not be allowed to drive directly on the geotextile. If space constraints make this impractical, the possible damage from direct vehicle contact should be evaluated on a test section of the geotextile. If the fabric is damaged such that it cannot fulfill project requirements, a more damage-resistant geotextile should be specified. If the fabric is damaged during installation, the damaged section should be exposed and a patch of fabric placed over it. The patch should be large enough to overlap onto undamaged areas as recommended in Table 1. The aggregate is then replaced and compacted.

## **AGGREGATE COMPACTION**

The aggregate must be compacted as required by the project specifications. The aggregate should be initially compacted by "walking" the tracked bulldozer back and forth over the aggregate while waiting for the next aggregate load. Construction traffic will then compact the aggregate until reasonable stability is obtained. Final compaction is achieved by rolling the area with a vibratory compactor, first without vibration for several passes and then with full vibration. Any weak areas found during final compaction usually indicate inadequate aggregate thickness in those locations. Do not grade ruts down; simply fill with additional aggregate and compact to the specified density. This also applies to any future rut maintenance that might be required.

## **CONSTRUCTION MONITORING**

It is important that the construction conditions and process be monitored. If the actual subgrade has lower strength than that assumed for design, the structural section design thicknesses must be re-evaluated. Observation of rutting of the aggregate layer, for example, can pinpoint weak subgrade areas, allowing design adjustments to be made on site if necessary. One advantage of an unpaved road is the ability to identify and resurface weak areas to avoid overdesigning the entire road. Aggregate base placed for a new pavement may also be monitored for weak areas and corrected before the pavement layer(s) is placed.