

INSTALLATION GUIDELINE

Geotextiles used in filtration and drainage applications



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1. INTRODUCTION

This document is prepared to help ensure that a subsurface drainage geotextile, once installed, will perform its intended design function. To do so, the geotextile must be identified, handled, stored, and installed in such a way that its physical property values are not affected and that the design conditions are ultimately met as intended. This document contains information consistent with generally accepted methods of identifying, handling, storing and installing geotextile materials. Failure to follow these guidelines may result in the unnecessary failure of the geotextile in a properly designed application.

2. MATERIAL IDENTIFICATION, STORAGE AND HANDLING

The geotextile shall be rolled on cores having strength sufficient to avoid collapse or other damage from normal use. Each roll shall be wrapped with a plastic covering to protect the geotextile from damage during shipping and handling, and shall be identified with a durable gummed label or the equivalent, clearly readable on the outside of the wrapping for the roll. The label shall show the manufacturer's name, the style number, and the roll number. Roll identification corresponding to the proposed location of the roll as shown on the construction drawings and as approved by the engineer, owner and contractor can be provided.

While unloading or transferring the geotextile from one location to another, prevent damage to the wrapping, core, label, or to the geotextile itself. If the geotextile is to be stored for an extended period of time, the geotextile shall be located and placed in a manner that ensures the integrity of the wrapping, core, and label as well as the physical properties of geotextile. This can be accomplished by elevating the geotextile off the ground on dunnage and ensuring that it is adequately covered and protected from ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, fire or flames including welding sparks, temperatures in excess of 60C (140F), and human or animal destruction.

Before unrolling the geotextile, verify the roll identification, length, and installation location with the contract drawings. While unrolling the geotextile, inspect it for damage or defects. Repair any damage that occurs during storage, handling or installation as directed by the engineer. Normally light traffic will not damage the exposed geotextile. However, as a safety precaution, it is recommended that traffic not run on exposed geotextile.

3. FRENCH AND TRENCH DRAINS

A. Site preparation

Excavate the drainage trench to the design dimensions (minimum 8 in/20 cm wide), placing excavated material well away from the sides of the trench. If unstable soil conditions exist, it may be necessary to excavate a trench with sloping sides to ensure wall integrity during the rest of the project. Trim any large roots to be flush with the trench sides to prevent puncturing or tearing the geotextile. Refill any voids with fill dirt so that the excavation sides are smooth.

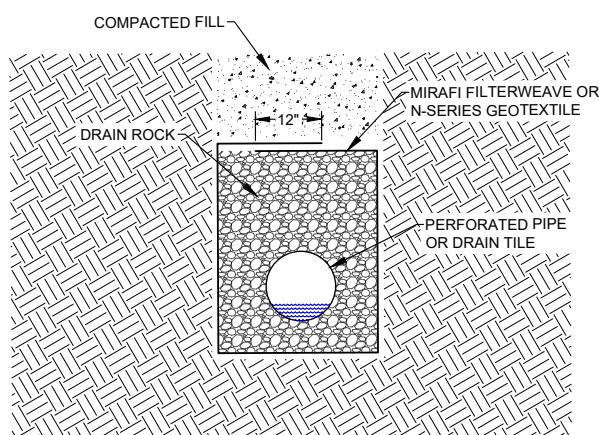


Figure 1a: Typical French drain/underdrain overlap

B. Geotextile placement

Cut geotextile to proper width prior to placement. Width should be enough to conform to the trench perimeter with at least a 12 in (30 cm) top overlap or the trench width (whichever is less), as shown in Figure 1a. Place the geotextile roll over the trench and unroll enough geotextile that the geotextile can be placed down into the trench. Anchor the edges of the geotextile with heavy objects to prevent the geotextile from falling into the trench. Where overlaps are necessary between rolls, allow for 3 ft (7 cm) overlap from the upstream to the downstream roll.

C. Aggregate placement and compaction

If drainage pipes are to be used, place a 3 in (7 cm) to 6 in (15 cm) layer of drainage aggregate on top of the geotextile, then install the drainage pipe.

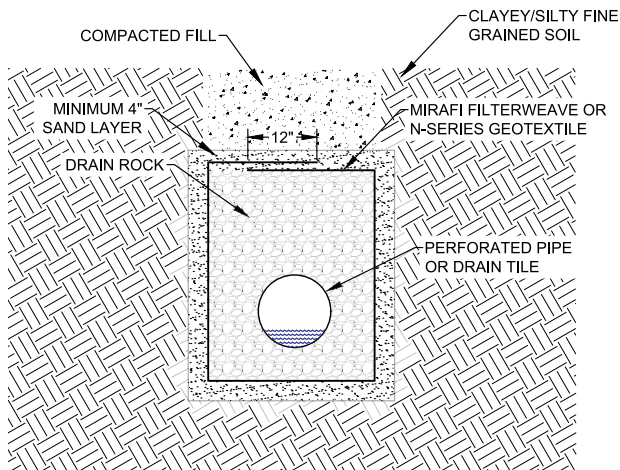


Figure 1b: French drain/underdrain for problematic soils

Fill the trench with the specified aggregate and compact using plate compactors. Ensure that no foreign material is included within the aggregate. Compact aggregate to ensure the geotextile conforms to the excavation sides. Allow for a maximum loose lift thickness of 12 in (30 cm). Fold leftover geotextile over aggregate to form a longitudinal lap. Backfill the trench to the recommended specifications.

Problematic soil conditions (high fines content, dispersive silts and clays, gap graded silts, etc.) that may clog, blind or pipe through the geotextile, should be installed with a minimum 3 in (7 cm) layer of sand encapsulating the geotextile within the trench (Figure 1b). For French drains adjacent to footing structures, a sand layer is not required between the geotextile and the concrete footing /wall, as shown in Figure 1c. The sand retains problematic soils, while the geotextile retains the sand creating a stable filter system.

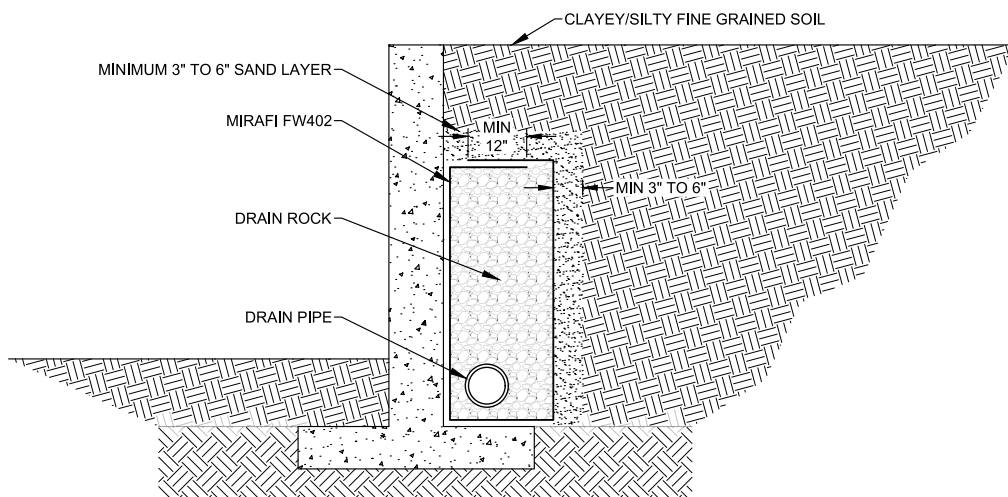


Figure 1c: French drain/underdrain for problematic soils over footing

4. BLANKET DRAINS

A. Site preparation

Grade the soil surface smooth, removing roots, vegetation, and sharp objects that could puncture or tear the geotextile. Fill in any existing surface voids.

B. Initial geotextile layer placement

Place geotextile smoothly and wrinkle-free over the ground surface. Allow enough geotextile to conform to the ground surface, while maintaining the required raft dimensions and completely covering any edge drains/French drains below the blanket drain (Figure 2). If possible, place a single continuous piece of geotextile to line the bottom, sides and top of the blanket drain with a single 1 in (3 cm) overlap over the top of the blanket drain aggregate (Figure 2). If geotextile overlaps at the base of the blanket are necessary (in either direction), use 1 in overlaps for firm soils (CBR \geq 3) and up to 3 in (7 cm) for softer soils (CBR < 3). Secure with pins if necessary (not required).

C. Drainage aggregate placement

Place aggregate in lifts, avoiding direct equipment operation on the geotextile. Smooth aggregate to the designed thickness. Follow French drain installation procedures (above) to provide drainage below the blanket (if required).

D. Cover geotextile layer placement

Lap the remaining geotextile over the aggregate raft following the same overlap dimension requirements stated above. Smooth wrinkles in the geotextile and secure with pins, sandbags, or heavy objects until cover material is applied.

E. Cover material placement

Place cover material in lifts, avoiding direct equipment operation on the geotextile. Start at the downstream end (if possible) and apply enough material to protect the geotextile from UV degradation.

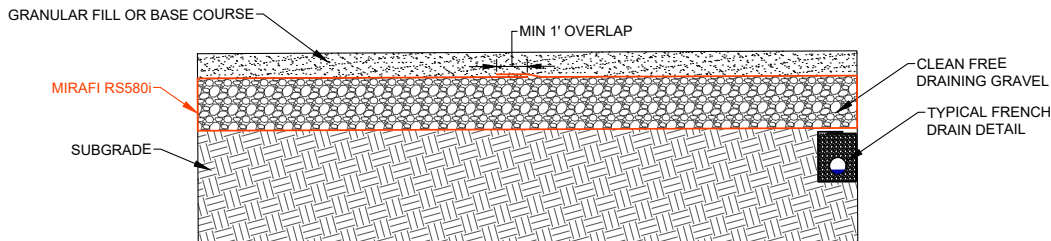


Figure 2: Blanket drain

5. BANK STABILIZATION / ROCK (ARMOR STONE) UNDERLAYMENT

A. Site preparation

Clear the site of large stones, roots, or other debris that could damage the geotextile. Excavate and shape the site to the lines and grades as directed by the engineer. Fill depressions or holes to ensure intimate contact between the geotextile and the prepared surface.

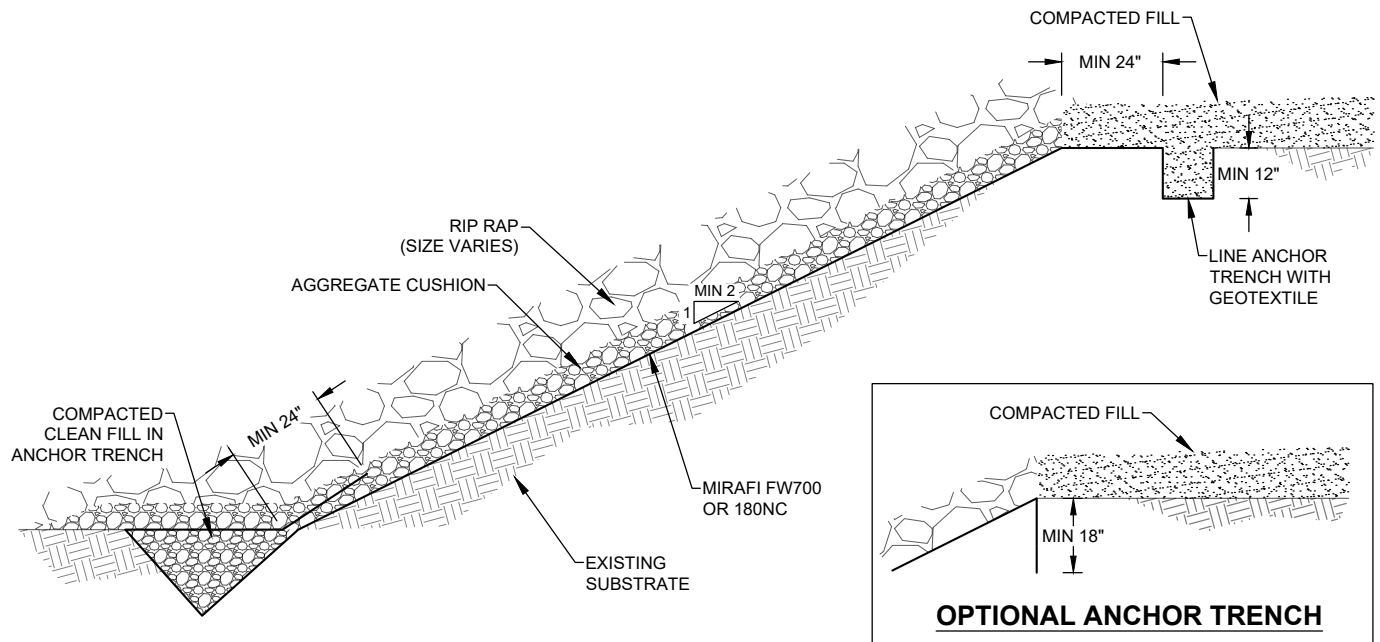


Figure 3: Permanent erosion control using Armor stone

Place the geotextile in close contact with the soil, eliminating folds or excessive wrinkles both longitudinally and transversely (Figure 3). Tension is not required on the geotextile prior to placement of armor stone or other materials. Use care in placing the geotextile to avoid possible damage. The geotextile shall be placed with the machine direction parallel to the direction of water flow, which is normally parallel to the slope for erosion control runoff and wave action (Figure 3), and parallel to the stream or channel in the case of streambank and channel protection.

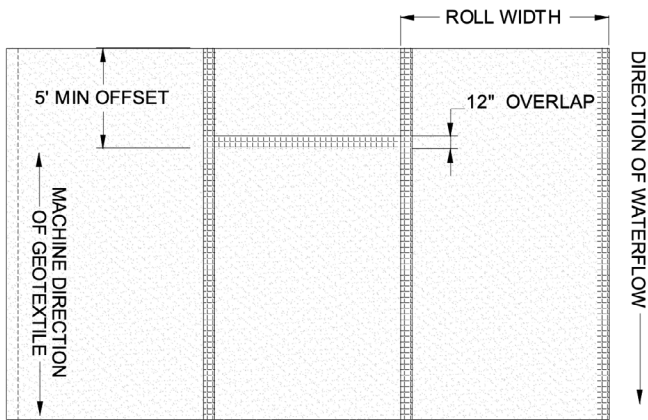


Figure 4: Geotextile overlap and offset below Armor

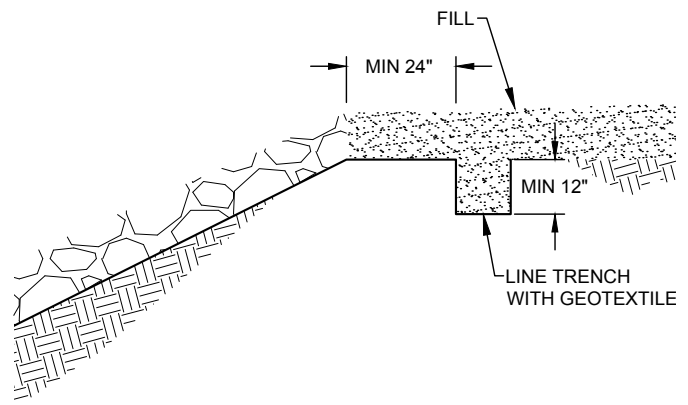


Figure 5a: Typical Armor stone anchor trench

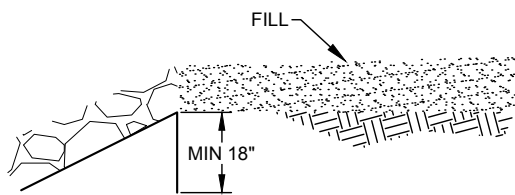


Figure 5b: Armor stone anchor trench (ow runoff)

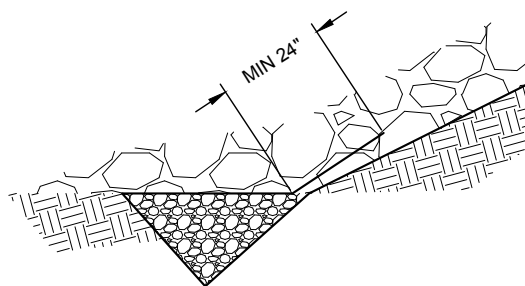


Figure 5c: Armor stone toe anchor

slopes without anticipated wave action or lower water flow from runoff, the geotextile may be placed along one edge of a 0.46 m (18 in) trench, as shown in Figure 5b. To ensure good anchorage in the trench compact soil thoroughly.

When placing geotextile along a stream or other places where water movements are expected, anchor the toe of the geotextile with a minimum 2 ft (0.6 m) upslope overlap, as shown in Figure 5c, to prevent scouring beneath it.

B. Rock (Armor) placement

Stone or armor block may be placed directly (without a cushion layer) on **MIRAFI** products shown in Table 1, below or as directed by the project engineer. Use of lighter nonwoven geotextiles, such as **MIRAFI 180N**, that only meet minimum AASHTO Class I specifications, may require the placement of an aggregate cushion before placement of armor stone (Figure 6). The cushion layer should be a minimum 6 in (15 cm) thick aggregate bedding layer designed to be compatible with the armor layer being placed directly above it. Armor stone and heavy rock cover shall not be dropped onto the geotextile from a height of more than 1 ft (0.3 m). Slope protection and smaller sizes of rock cover shall not be dropped onto the geotextile from a height exceeding 3 ft (1 m). Any geotextile damaged during placement shall be replaced as directed by the project engineer (typically a patch that extends 3 ft (1 m) beyond the edge of damage). Following placement of the armor stone, grading of the slope shall not be permitted if the grading results in movement of the stone directly above the geotextile.

Geotextiles can be joined by overlapping or sewing. The minimum overlap distance in the transverse or longitudinal direction is 12 in (30 cm), as shown in Figure 4, except in underwater installations where the minimum overlap is 3 ft (1 m). Sewn seams are allowed if the overlap in the transverse or longitudinal direction is at least 6 in (15 cm). In cases where wave action or multidirectional flow is anticipated, all seams perpendicular to the direction of flow shall be sewn.

To expedite construction on steeper slope conditions, 0.45 m (18 in) anchoring pins placed on 2–6 ft (0.6–1.8 m) centers (depending on the slope soils of the covered area) may be used.

Anchor the geotextile firmly at the top of the slope using an anchor trench. For maximum effectiveness, the trench should be at least 2 ft (0.6 m) from the crest of the slope and at least 1 ft (0.3 m) deep, as shown in Figure 5a. For

Recommended MIRAFI geotextiles for stone armor sizes (D50) without a cushion layer

D50 of 6-16 in (30-220 lbs)	D50 of 14-18 in (180-550 lbs)	D50 > = 20 in (800-2000 lbs)
MIRAFI FW700, MIRAFI FW404 (granular soils only) MIRAFI 180N	MIRAFI FW700, MIRAFI 180NC, MIRAFI RS580i (for granular soils only)	MIRAFI 1100NC (< 800 lbs) MIRAFI S1600 (2000 lbs) MIRAFI RS580i (for granular soils only)

Note: Weight of armor stone based on typical stone specific gravity of 155 pcf.

Table 1

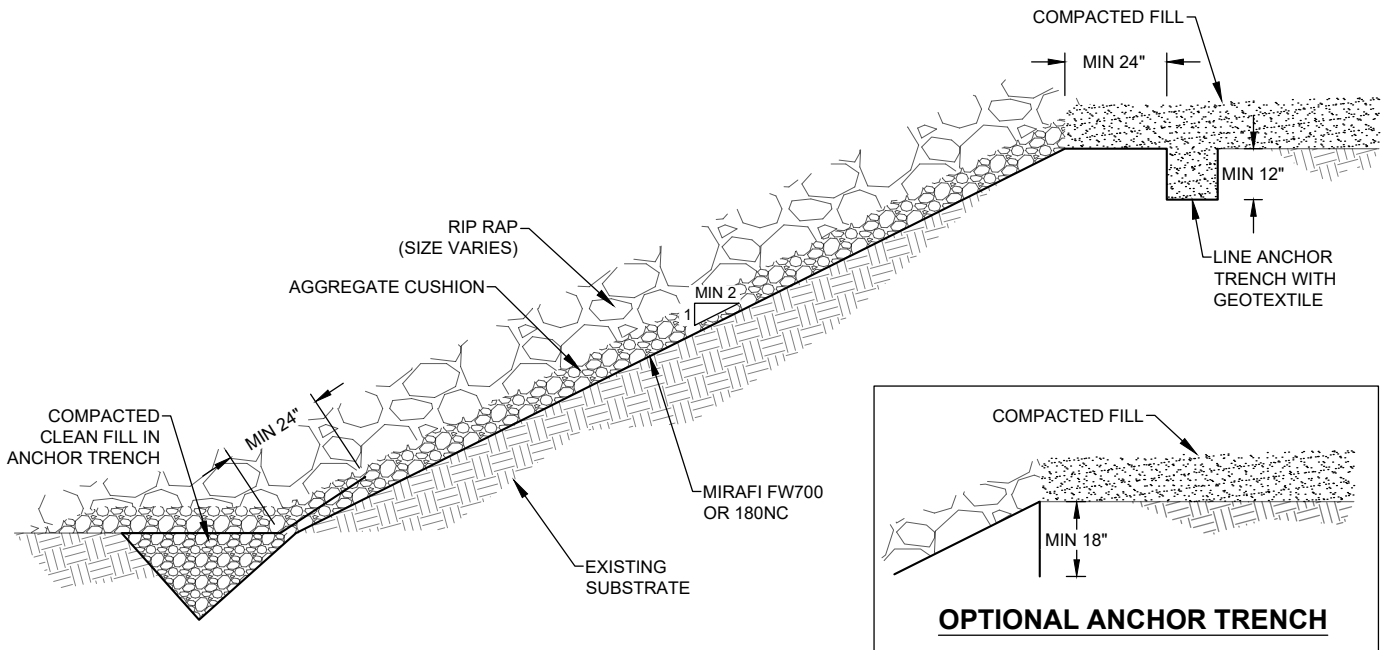


Figure 6: Permanent erosion control with cushion layer