

INSTALLATION GUIDELINE

# **PROPEX** Landlok Turf Reinforcement Mat (TRM) for slopes



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# 1. INTRODUCTION

Thank you for purchasing the **PROPEX** Landlok TRM® Turf Reinforcement Mat (TRM) by Solmax. This document provides installation and maintenance guidelines for **PROPEX** Landlok TRM used as slope armoring to increase earthen slope resiliency. **PROPEX** Landlok TRM provides permanent erosion protection on either the flood side and/ or protected side of an earthen slope.

Temporary securing pins (pins) are used during installation to hold **PROPEX** Landlok TRM in place. Pins also promote vegetation establishment keeping **PROPEX** Landlok TRM in intimate contact with the soil.

**PROPEX** Landlok TRM is an engineered solution with a unique design for each specific project. While Solmax has made every effort to ensure general validity, this information should not be used for a specific application without independent professional examination and verification of its suitability, applicability, and accuracy. The information provided herein is for general information only, and is intended to present installation guidance. Project specific contract documents take precedence when pin placements are different than what is represented in this document. Depending upon the critical nature of the structure to be armored, work restrictions may be in place such as limiting work based on growing seasons, weather patterns, etc. Work should be performed under the provisions set forth for the specific project. Solmax Engineering Services is available for support during installation to consult for solving constructability issues encountered in specific applications. Please feel free to contact our technical support at [smatch@solmax.com](mailto:smatch@solmax.com) or 706-693-2226.

## 2. BEFORE INSTALLATION

**Coordinate with a Solmax Representative:** A pre-construction meeting is suggested with the construction team and a representative from Solmax. This meeting should be scheduled by the contractor with at least a two week notice.

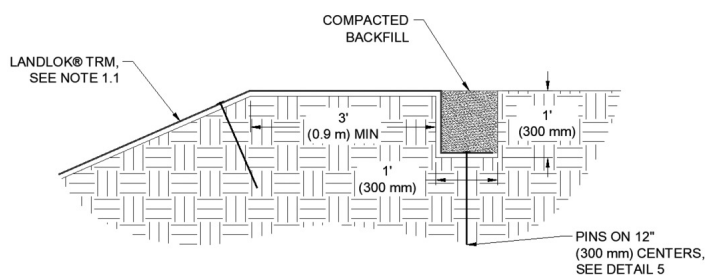
**Gather the tools needed:** Tools that you will need to install **PROPEX** Landlok TRM include a pair of industrial shears to cut **PROPEX** Landlok TRM, tape measure, and mallet or hammer.

**Determine how to establish vegetation:** The method of vegetation establishment should be determined prior to the start of installation. Different vegetation establishment methods require different orders of installation. Refer to Establish Vegetation for further guidance.

## 3. INSTALLATION: SITE PREPARATION

It is recommended during all stages of site preparation that disturbed soils remain unprotected for not more than a single day. Depending on project size this may require progressive site preparation during installation.

1. Grade and compact the area on the slope where **PROPEX** Landlok TRM will be installed. The slope surface should be uniform and smooth, having all rocks, clods, vegetation or other objects removed so that during laydown, **PROPEX** Landlok TRM comes in direct, intimate contact with the slope surface.



**Figure 1: Crest of Slope (COS) Trench**

2. Prepare the area to be armored with **PROPEX** Landlok TRM by loosening the topsoil to promote better vegetation establishment. This may be accomplished with a rotary tiller on slopes 3:1 or flatter. For slopes greater than 3:1, prepare topsoil in a safe manner.
3. Excavate a Crest of Slope (COS) trench 12 in x 12 in (300 mm x 300 mm) minimum at a distance of 3 ft (900 mm) from the crest of the slope. (Figure 1).



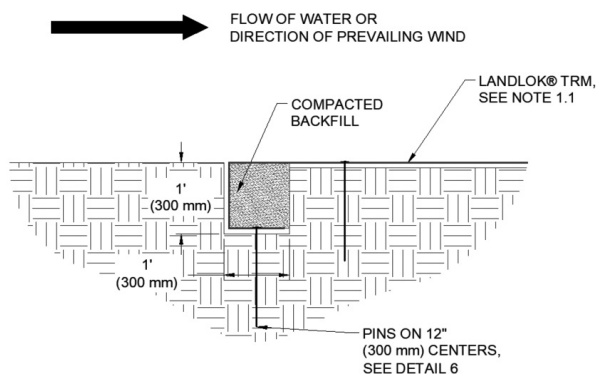


Figure 2: Toe of Slope (TOS) Trench

## 4. PROPEX LANDLOK TRM LAYDOWN

1. Begin the **PROPEX** Landlok TRM laydown process by starting with the downstream/downwind end of the site. To ensure proper pining of the overlapped areas the proceeding roll width must be laid out before the current roll width can be pinned with exception to the final roll width. For straight sections of a slope, the TRM panel lengths should be long enough to construct COS and TOS trenches while also covering the surface of the slope being armored (Figure 12). Panel edges should rest approximately perpendicular to the slope center line. For best results, panels of TRM should be continuous and free from seams or roll end overlaps that are parallel to the centerline of the slope. Panel edge overlapping should follow a pattern of placing each proceeding panel's edge overtop the previous panel edge, shingling the panels in the direction of the water flow or prevailing wind.
2. Starting at the COS trench, lay **PROPEX** Landlok TRM roll so that the roll ends point towards the crest of the slope (Figure 3), with a 3 in (75 mm) overlap created at adjacent panel edge locations. Ensure that adjacent panel edges maintain a minimum 3 in (75 mm) overlap during **PROPEX** Landlok TRM laydown. (Figure 8)

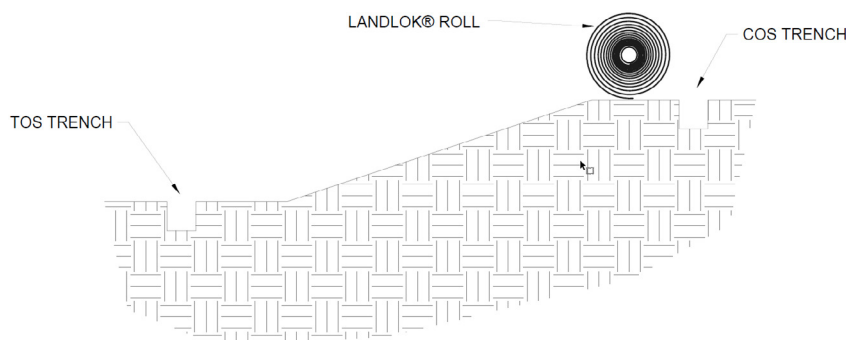


Figure 3: Crest of Slope (COS) Trench Alignment

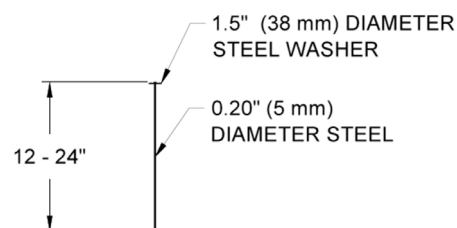


Figure 4: Securing Pin

3. Secure **PROPEX** Landlok TRM with pins in the COS trench. Pins may be either washer pins or wire staples.
  - Washer pins should be made of steel with a 0.20 in (5 mm) minimum diameter, having a 1.5 in (38 mm) diameter washer at the head, and a length between 12 and 24 in (300 mm - 600 mm) with sufficient ground penetration to resist pullout (Figure 4).
  - Wire Staples should be made of steel with a 6 in x 1 in x 6 in (152 mm x 25 mm x 152 mm) 11 gauge wire or 8 in x 1 in x 8 in (204 mm x 25 mm x 204 mm) 8 gauge wire with sufficient ground penetration to resist pullout. (Figure 5).
  - Longer pins/staples may be required for looser soils. Heavier metal stakes may be required in rocky soils.
  - Suggested placement of pins for the COS trench is along the bottom of the trench with pins on 12 in (300 mm) centers. Pins/Staples should also be installed on panel edge overlaps in the COS trench.

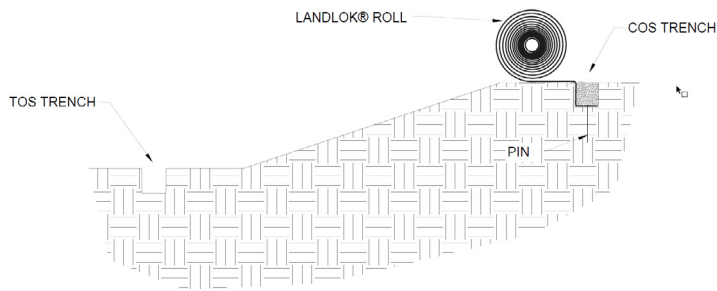


Figure 5: Crest of Slope (COS) Trench Placement

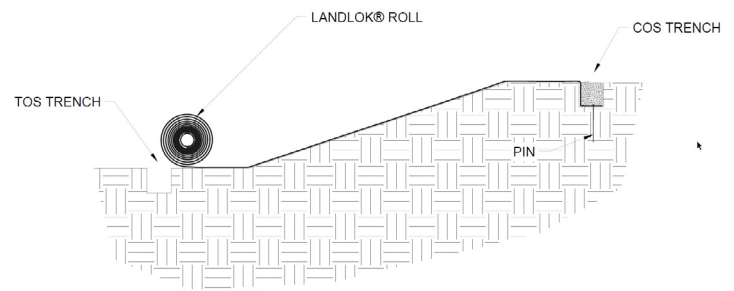


Figure 6: Placement of PROPEX Landlok TRM across Slope

4. Backfill and compact the COS trench in the location of the first TRM panel only (Figure 5).
5. Unroll the **PROPEX** Landlok TRM roll on the slope surface in the area to be armored (Figure 6). Ensure that the TRM has intimate contact with the ground and all irregular surfaces beneath it are removed.

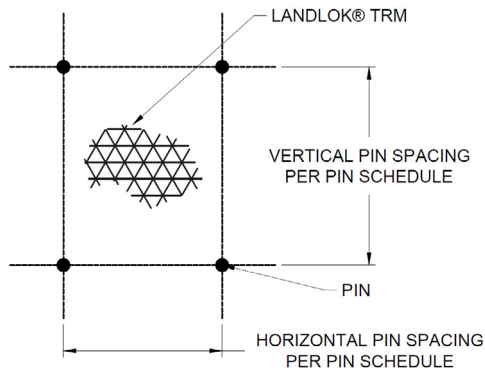


Figure 7: Example Pin Pattern

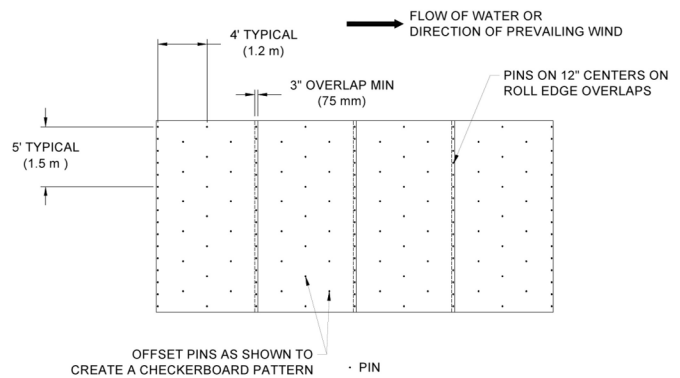


Figure 8: Example of Panel Overlap

6. Secure TRM panels in place using pins across the slope surface according to the project's engineered design. Pin placement should reflect a staggered checkerboard pattern across the slope surface for best results (Figure 7 and Figure 8).
  - The leading edge of the first TRM panel should be secured on the Slope Armoring Edge (SAE) with pins on 12 in (300 mm) centers.
  - Roll edges shall be overlapped a minimum of 3 in (75 mm) and a maximum of 6 in (150 mm) with pins placed on 12 in (300 mm) centers (Figure 8).
  - Roll ends shall be overlapped a minimum of 6 in (150 mm) with upstream / upwind panel on top. Secure roll end overlaps with two rows of pins staggered 6 in (150 mm) apart on 12 in (300 mm) centers (Figure 9)

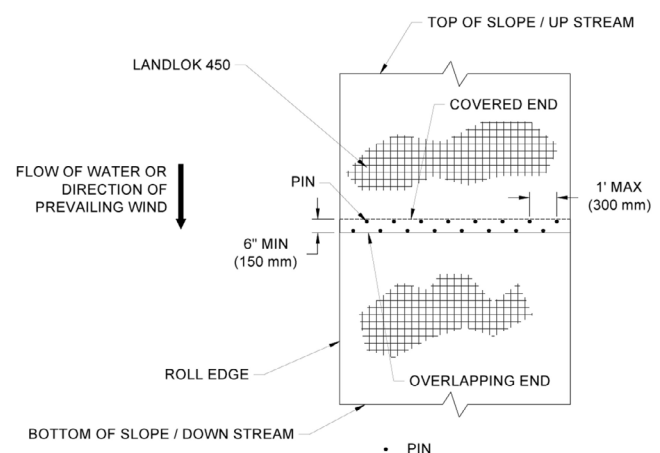
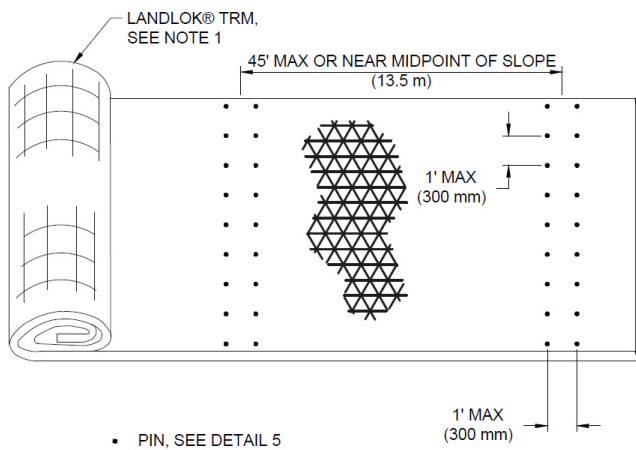
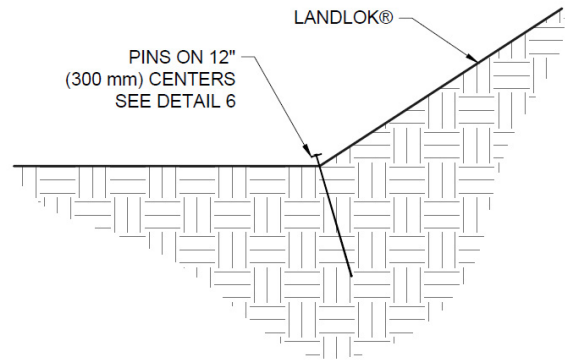


Figure 9: Roll End Overlap

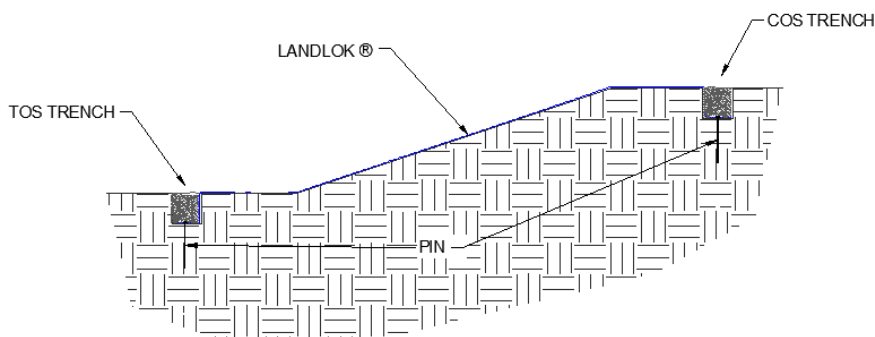


**Figure 10: Simulated Check Slot**



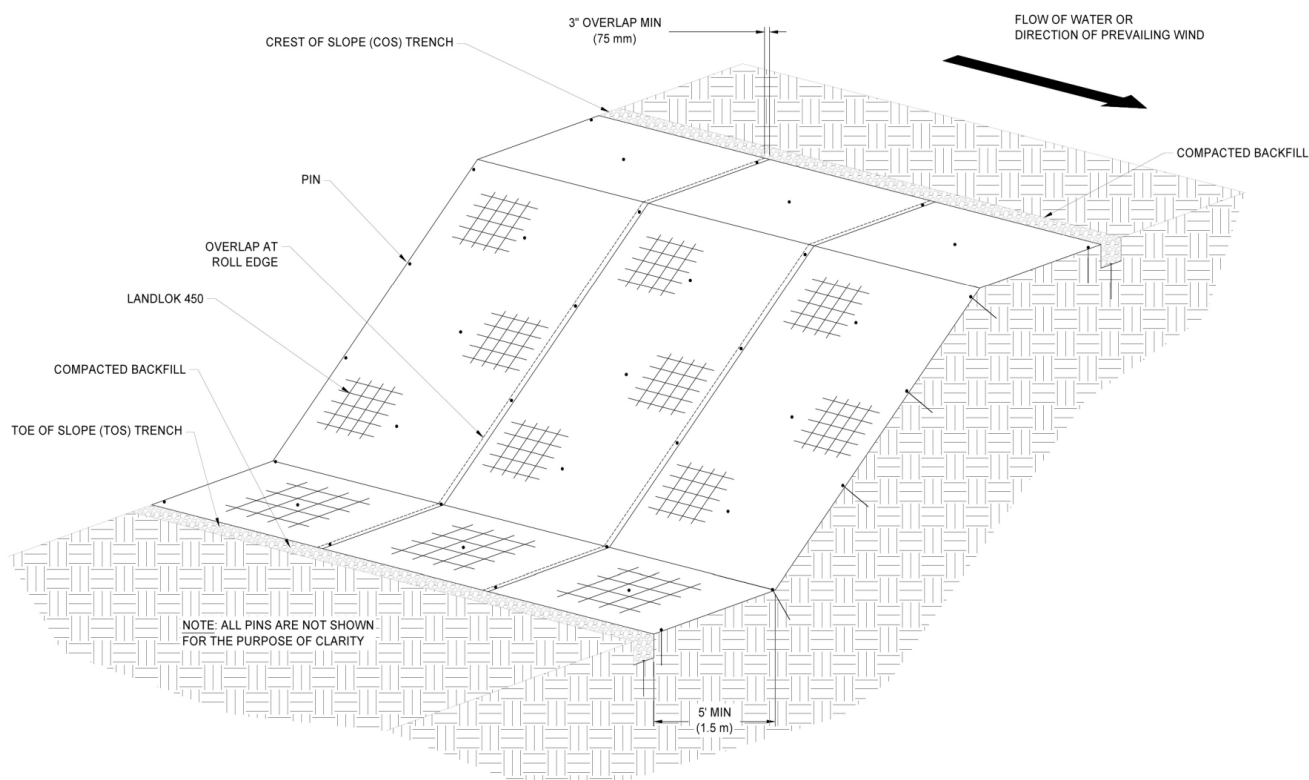
**Figure 11: Break in Slope Interface**

- For slope lengths greater than 45 ft (13.7 m), install simulated check slots. This method includes placing two rows of pins 12 in (300 mm) apart on 12 in (300 mm) centers at 45 ft (13.7 m) maximum intervals or across the midpoint of the slope for slope lengths less than 60 ft (18.2 m) (Figure 10).
  - At the break in slope interface towards the TOS, it is suggested that pins be installed on 4 ft (1.2 m) centers (Figure 11).
7. Secure **PROPEX** Landlok TRM with pins in the TOS trench. Suggested placement of pins for the TOS trench is along the bottom of the trench with pins on 12 in (300 mm) centers (Figure 12).
  8. Backfill and compact the TOS trench. (Figure 12)



**Figure 12: Crest of Slope (COS) Trench and Toe of Slope (TOS) Trench Complete**

9. Continue to work down the length of the slope by repeating steps 1 through 8 overlapping each adjacent TRM panel by 3 in (75 mm) (Figure 8). The last TRM panel should terminate on the Slope Armoring Edge (SAE) with pins on 12 in (300 mm) centers. At a minimum, TRM panels should be pinned entirely across the slope surface, pins should be installed in the trenches, and the trenches should be backfilled and compacted at the end of each day to minimize rework in the case of a major rain event. Specific project conditions may warrant further evaluation of installation order for ease. An example isometric view (Figure 13) of a slope armored with **PROPEX** Landlok TRM can be seen below for overall reference. Consult Solmax Engineering Services at [smatch@solmax.com](mailto:smatch@solmax.com) or 706-693-2226.



**Figure 13: Completed Slope Isometric View**

## 5. ESTABLISH VEGETATION

Vegetation can be established with **PROPEX** Landlok TRM by broadcast seeding, hydraulic seed application (hydroseeding), or sodding. Seed application rate, seed type, sod type, and irrigation rate should be selected based on local or site specific knowledge and time of year. For best results, consider having a site specific soil test performed to help determine what soil amendments, such as lime and fertilizer, need to be incorporated into the soil to promote healthy vegetation.

Irrigate as necessary to establish and maintain vegetation until 75% of vegetation has established and has reached a height of 2 in (51 mm). Frequent, light irrigation will need to be applied to seeded areas if natural rain events have not occurred within two weeks of seeding. When watering seeded areas, use a fine spray to prevent erosion of seeds or soil. Do not over irrigate. Proper irrigation guidance is provided under the Maintenance portion of this document.

## 6. CONSIDER PROJECT SPECIFIC NEEDS

1. A deeper terminal trench and/or hard armoring may be required when slopes have severe scour potential at the toe location.
2. For installing TRM panels around curved sections of a slope, trim panels at an angle so that no more than two layers of TRM overlap at any point in time. Additional pins may be needed to secure panel edges towards the toe of the slope depending upon the radius of the curved slope. Install pins as necessary to securely fasten **PROPEX** Landlok TRM to the ground.
3. Vehicular traffic should not be allowed on **PROPEX** Landlok TRM at any time.
4. Disturbed areas should be reseeded. If ruts or depressions develop for any reason, rework soil until smooth and reseed such areas.

## 7. SHORT-TERM AND LONG-TERM MAINTENANCE

The purpose of this section is to provide some general guidelines for performing short-term and long-term maintenance of **PROPEX** Landlok TRM with respect to maintaining vegetation reinforced with **PROPEX** Landlok TRM, and patching of **PROPEX** Landlok TRM (in the event it needs to be removed or replaced). These procedures are to be considered minimum guidelines for proper maintenance, and further maintenance techniques may be appropriate considering local practices and procedures.

### 1. PROPEX Landlok TRM protected slopes

For **PROPEX** Landlok TRM to be most effective, it is important to ensure that it is properly maintained both during construction and after construction. Identifying trouble areas is easy, and it can make identifying potential threats much simpler and manageable. Look for areas with sparse, dying, or no vegetation as these are obvious signs that the TRM is losing intimate contact with the slope surface. If loss of ground surface occurs, **PROPEX** Landlok TRM will need to be removed and reinstalled as described in Patching and Repairs Section after the eroded area is backfilled with compacted soil that is similar to material of the slope. After reinstallation, re-establish vegetation on the newly installed **PROPEX** Landlok TRM and disturbed areas. Monitor the sites to determine if frequent watering may be required to establish vegetation.

To minimize exposure to unwanted maintenance and repair, **PROPEX** Landlok TRM armored slopes should be free of vehicular traffic. Routine maintenance and slope inspections should be performed by foot traffic only. Tracked equipment such as skid steers, excavators, or dozers should only be allowed to traffic over **PROPEX** Landlok TRM in times of emergency after vegetation establishment is complete. Failure to control unauthorized traffic can result in the material being damaged resulting in erosion below **PROPEX** Landlok TRM during storm events.

### 2. Maintaining vegetation

Good vegetative cover will ensure maximum performance of **PROPEX** Landlok TRM. Vegetative cover care starts before a project is complete and is ongoing until all **PROPEX** Landlok TRM is installed. Vegetative cover should be given every opportunity to grow and establish well. This will require that a contractor periodically fertilize and water the grasses as needed until a project is complete in the short-term, with the owner of the slope fulfilling the maintenance of the slope in a similar fashion for the long-term. For the entire lifecycle of **PROPEX** Landlok TRM, every effort must be made to prevent unauthorized encroachments, grazing, vehicle traffic, the misuse of chemicals, or burning during inappropriate seasons.

1. After the installation of vegetation is complete, immediately water and soak the entire area using a fine spray to prevent erosion and loss of seeds. A suggested amount of water is identified below. Prior to installation if using sod, the sod pads in storage should be kept moist at all times and not stored for more than 24 hours from site arrival to installation. Warmer weather will necessitate more frequent applications than listed below.
  - A. For each reach/segment of installed vegetation, watering shall be conducted immediately after each installation or the day's work.
  - B. For initial vegetation establishment, water vegetation in a manner consistent with best practices for vegetation type and location.
  - C. Establish a watering schedule and follow until vegetation is well established and will thrive in the absence of manual watering.
  - D. Avoid excessive application of water, so that surface runoff does not occur. Runoff should be prohibited. However, additional watering may be required for repaired or damaged areas.
2. Fertilizer should be applied as needed to address any nutrient deficiencies revealed in soil testing.
3. Mowing over **PROPEX** Landlok TRM is not permitted at any time.



## Patching and repairs

**PROPEX** Landlok TRM may require localized repair at times. For emergency repairs, an adequate supply of **PROPEX** Landlok TRM should be maintained in inventory with the necessary tools to install. This will allow for a timely, initial repair of the system.

1. In order to identify areas in need of repair, the site should be patrolled immediately after rain events of 2 in (50 mm) or more. When patrolling look for areas of sparse vegetation, exposed edges of **PROPEX** Landlok TRM, and areas where direct contact between the TRM and the slope surface is compromised. **PROPEX** Landlok TRM should be rated as Acceptable, Minimally Acceptable, or Unacceptable during inspection.
  - A. Acceptable (A) - The rated area is in satisfactory, acceptable condition, and will function as designed and intended during the rain event. **PROPEX** Landlok TRM has no exposed edges, is installed tightly by maintaining direct contact to the slope surface with no rilling beneath, and has over 90% vegetation cover. There is no noticeable damage present.
  - B. Minimally Acceptable (M) - The rated area has a minor deficiency that needs to be corrected. The minor deficiency will not seriously impair the functioning of the area during the next rain event; however, the overall reliability of the project will be lowered because of the minor deficiency. **PROPEX** Landlok TRM has 75% vegetation cover with un-vegetated patches as large as one square yard. Edges of **PROPEX** Landlok TRM are exposed with noticeable damage. Minimal erosion has occurred underneath the TRM.
  - C. Unacceptable (U) - The rated area is unsatisfactory. The deficiency is so serious that the area will not adequately function in the next rain event. **PROPEX** Landlok TRM has been physically torn, ripped, or lifted from the slope surface. Less than 75% vegetation cover is present with un-vegetated patches being greater than 1 square yard, and there is evidence that erosion is occurring beneath **PROPEX** Landlok TRM.
2. Repair any raised or exposed edges of **PROPEX** Landlok TRM by driving existing and additional pins along the edges as necessary to securely fasten to the ground. Inspect areas where the vegetation is not growing on top of **PROPEX** Landlok TRM. Many times this is an indicator that the TRM has lost contact with the ground beneath. Check for voids beneath the TRM and fill any holes, gullies, etc. with compacted fill material if possible. Replace **PROPEX** Landlok TRM as described below.
3. To repair **PROPEX** Landlok TRM, cut out and remove damaged areas in a square configuration a minimum size of 2 ft by 2 ft (0.6 m x 0.6 m). Remove all vegetation and debris atop of **PROPEX** Landlok TRM. Loosen the top 1 in to 2 in (25 mm - 50 mm) of soil in the patch area then seed. The subgrade of area to be patched shall be prepared to be smooth and uniform and transition smoothly into the in-situ area. Cut a square **PROPEX** Landlok TRM patch a minimum of 12 in add (305 mm) greater than the damaged area for all four sides of the patch. Overlap the patch area in all directions a minimum of 12 in add (305 mm). The patch overlaps shall be tucked under the existing damaged **PROPEX** Landlok TRM material (Figure 14 and Figure 15)

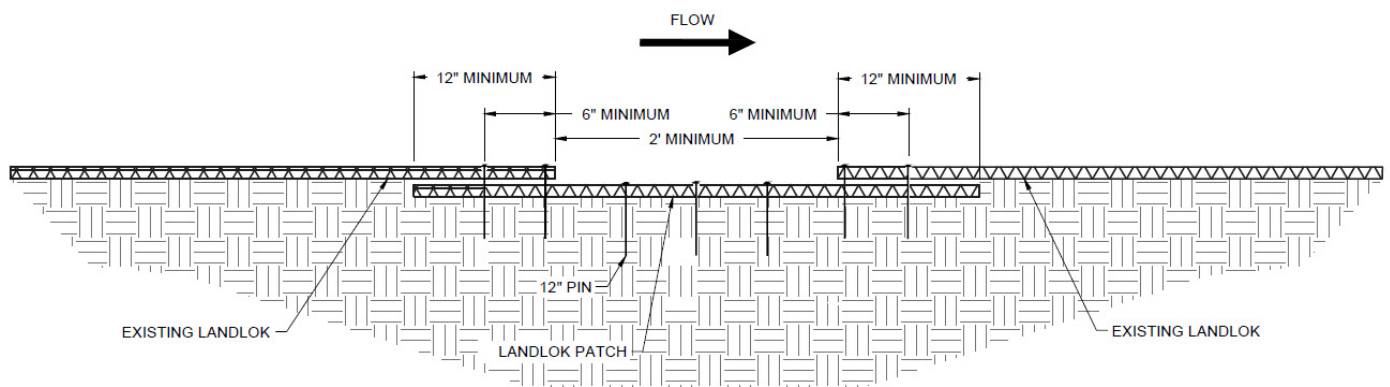
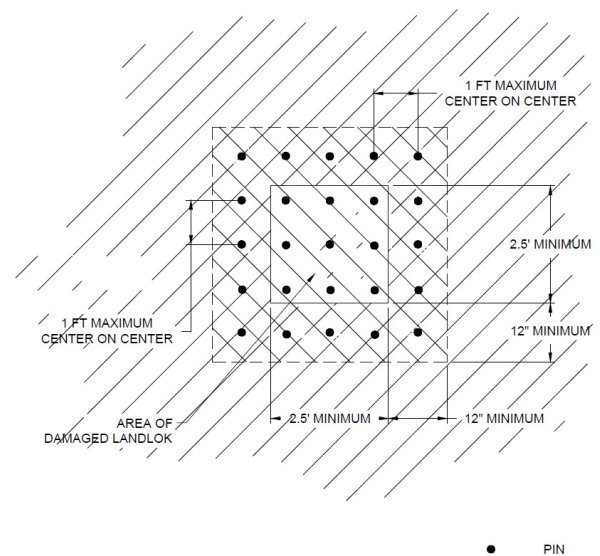


Figure 14: **PROPEX** Landlok TRM Patch Cross Section

4. Install pins on 6 in (150 mm) (max) centers. For larger areas of damage, pins should be installed to match existing pin pattern. Once **PROPEX** Landlok TRM is in place, vegetate per project specifications.

#### 4. Summary

Maintenance should consist of watering and weeding, repair of all erosion, and any re-seeding as necessary to establish a uniform stand of vegetation during construction and beyond. A minimum of 70% of the armored area should be covered with no bare or dead spots greater than 10 ft<sup>2</sup> (1 m<sup>2</sup>). Throughout the duration of the project, the Contractor should water all grassed areas as often as necessary to establish satisfactory growth and to maintain its growth throughout the duration of the project. After the project is complete, it is the responsibility of the Owner to maintain and upkeep all **PROPEX** Landlok TRM installed areas for long term performance and best results as described herein for superior slope armoring.



**Figure 15: PROPEX Landlok TRM Patch Plan View**

### **About Solmax**

Solmax is a world leader in sustainable construction solutions, for civil and environmental infrastructure. Its pioneering products separate, contain, filter, drain and reinforce essential applications in a more sustainable way – making the world a better place.

The company was founded in 1981, and has grown through the acquisition of GSE, TenCate Geosynthetics and PROPEX. It is now the largest geosynthetics company in the world, empowered by more than 2,000 talented people. Solmax is headquartered in the province of Quebec, Canada, with subsidiaries and operations across the globe.

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### SEDIMENT CONTROL

Inlet Protection

- Grated Inlet, Curb Inlet, Area Inlet Protection

Ditch Checks

- Triangle Silt Dike
- GeoRidge

Perimeter Protection

- High and Low-Porosity Silt Fence, Straw Wattles, Silt Socks
- Safety Fence

Flocculants & Water Treatment

- Polymer-Based & Natural Flocculants

Sediment Basin Skimmers

Dewatering Bags

Trackout Control

- FODS
- Rumble Grates

Turbidity Curtains

### EROSION CONTROL

Basic Hydraulically Applied Mulches

- Wood
- Paper
- Blends
- Straw

High-Performance Hydraulically

Applied Products

- BFM
- FGM
- Additives & Tackifiers

Temporary Erosion Control Blankets

- Coir & Jute Mat/Nettings
- Short-Term ECBs
- Extended-Term ECBs

Permanent Erosion Control Blankets

- Turf Reinforcement Mats
- HP-TRMs
- Anchor Reinforced Vegetation System

Structural BMPs

- Transition Mats
- Geoweb Cellular Confinement
- Composite Vegetated Armor System
- Flex MSE Vegetated Wall System
- Articulated Concrete Block
- Gabions
- Grout-Filled Geotextile Mats

Vegetation Establishment

- Native Seed & Turf Seed
- Fertilizers
- Organic Soil Additives
- Stratavault Soil Cells

### STORMWATER MANAGEMENT

Water Quality

- Inlet Filter Boxes
- Pre-Treatment Chamber
- Nutrient Separating Baffle Boxes
- High-Flow Biofiltration Media
- Hydrodynamic Separators
- Stratavault

Water Quantity

- Modular Underground Storage Systems
- Chamber Detention Systems

Drainage

- HDPE Swale Liner
- Pipe & Fittings
- Drainage Composites
- Strip Drain

Inlet Structures

- PVC
- Drain Basins, In-Line Drains
- Landscape

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- Permeable Articulating Concrete Block
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