



INSTALLATION GUIDELINE

PROPEX Landlok Turf Reinforcement Mat (TRM) for channels



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1. INTRODUCTION

Thank you for purchasing the **PROPEX** Landlok® Turf Reinforcement Mat (TRM) by Solmax. This document provides installation and maintenance guidelines for **PROPEX** Landlok TRM used as channel armoring to increase channel resiliency towards forces created by high velocities and shear stresses. **PROPEX** Landlok TRM provides permanent erosion protection on the side slopes and/or bed of a channel.

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 documentation provided herein is for general information only, and is intended to present installation guidance only. 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 installation 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 or 706-693-2226.

2. BEFORE INSTALLATION

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

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

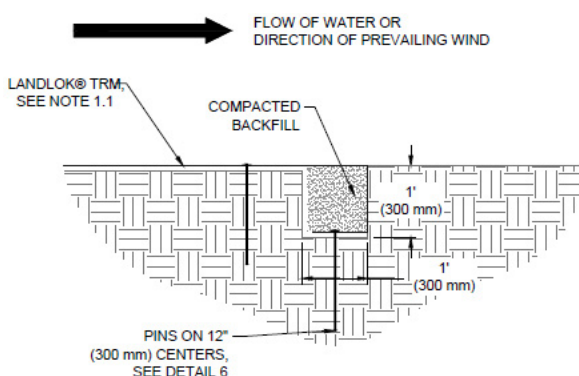


Figure 1: Initial Channel (IC) Trench

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 an Initial Channel (IC) trench a minimum of 12 in x 12 in (300 mm x 300 mm) across the channel at the downstream end of the project (Figure 1). Deeper IC trench and/or hard armoring may be required for channels that have the potential for scour.

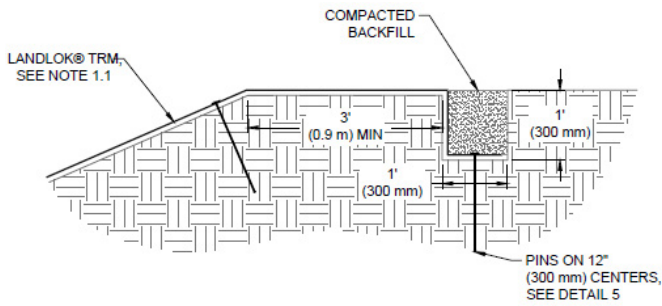


Figure 2: Crest of Slope (COS) Trench

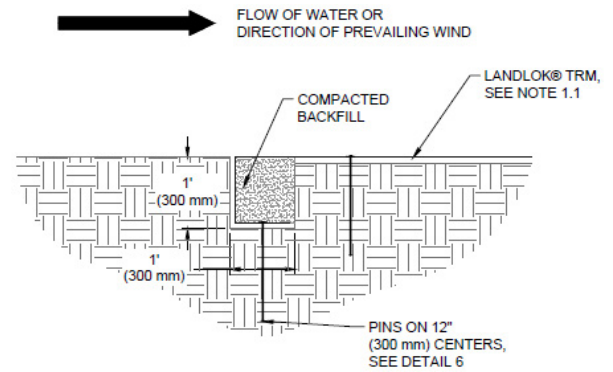


Figure 3: Terminal Channel (TC) Trench

4. Excavate a Crest of Slope (COS) trench a minimum of 12 in x 12 in (300 mm x 300 mm) along both sides of the installation. Each COS trench must be a minimum of 3 ft (900mm) over the crest of the bank, preferably on a relatively flat surface (Figure 2).
5. Excavate a Terminal Channel (TC) trench a minimum of 12 in x 12 in (300 mm x 300 mm) across the channel at the upstream end of the project (Figure 3). Deeper TC trench and/or hard armoring may be required for channels that have the potential for scour.
6. If seeding, refer to vegetation establishment for additional considerations during site preparation.

4. PROPEX LANDLOK TRM LAYDOWN

1. Starting with the downstream end of the site select one of the COS trenches to begin the **PROPEX** Landlok TRM laydown process. To ensure proper anchoring of the overlapped areas the proceeding roll width must be laid out before the current roll width can be anchored with exception to the final roll width at the TC trench. For straight sections of a channel, TRM panel lengths should be long enough to construct both COS trenches while also covering the surface of the channel being armored. (Figure 17) Panel edges should rest perpendicular to the channel center line. For best results, panels of **PROPEX** Landlok TRM should be continuous and free from seams or roll end overlaps that are parallel to the centerline of the channel. 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.
2. Lay the TRM panel on the downstream side of the IC trench (Figure 4). Place the panel edge in the IC trench, ensuring full coverage along the bottom of the entire IC trench with the **PROPEX** Landlok TRM (Figure 5).

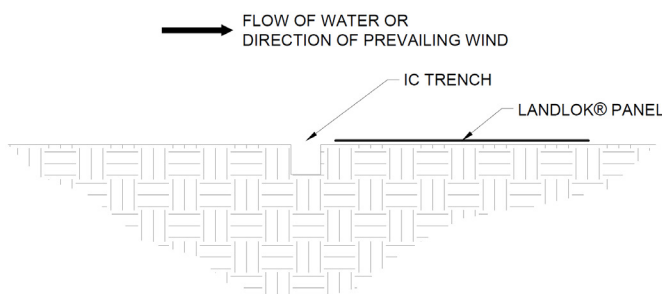


Figure 4: Initial Channel (IC) Trench Alignment

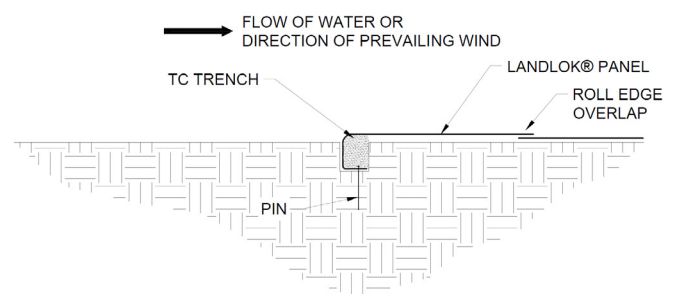


Figure 5: Initial Channel (IC) Trench Placement

3. Secure the TRM with pins in the IC trench (Figure 5). 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 (38mm) diameter washer at the head, and a length between 12 in and 24 in (300 mm - 600 mm) with sufficient ground penetration to resist pullout (Figure 6).

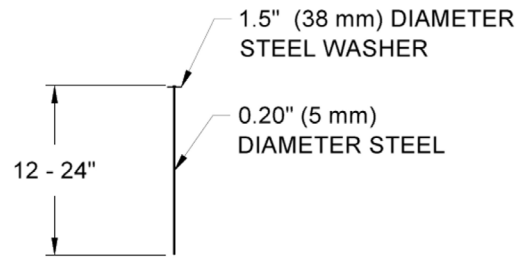


Figure 6: Securing Pin

- Wire staples should be made of steel with a 6 in X 1 in X 6 in (11 gauge wire) or a 8 in X 1 in X 8 in (8 gauge wire) with sufficient ground penetration to resist pullout (Figure 7).
- Longer pins may be required for looser soils. Heavier metal stakes may be required in rocky soils.

Suggested placement of pins for the IC trench is along the bottom of the trench with pins on 12 in (300 mm).

Suggested placement of pins for the COS trench is along the bottom of the trench with pins on 12 in (300 mm) centers. Pins should also be installed on panel edge overlaps in the IC trench.

4. Backfill and compact the IC trench (Figure 5).

5. Fold the TRM panel over the top of the compacted IC trench (Figure 7) and place each panel end into the respective COS trenches.

6. Place the next TRM panel by laying the **PROPEX** Landlok TRM roll so that the roll end points towards the COS trench (Figure 9), 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 13)

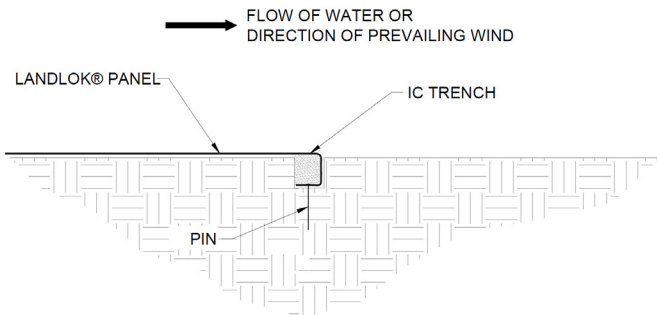


Figure 7: Initial Channel (IC) Trench Complete

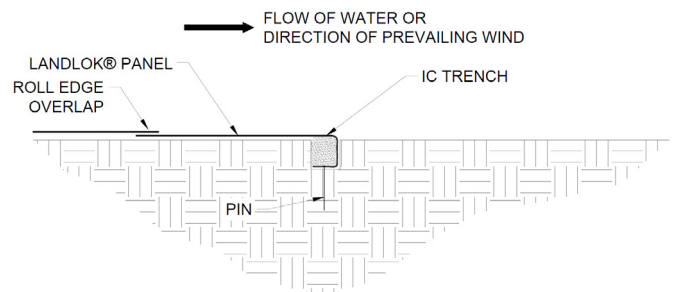


Figure 8: Initial Channel (IC) Trench Complete & Overlapped

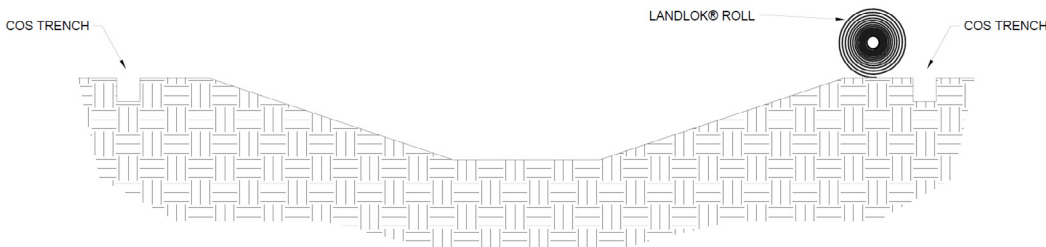


Figure 9: Crest of Slope (COS) Trench Alignment



Figure 10: Crest of Slope (COS) Trench Placement



Figure 11: Perpendicular Placement of PROPEX Landlok TRM across Channel

7. Secure **PROPEX** Landlok TRM with pins in the COS trench (Figure 10). Suggested placement of pins for the COS trench is along the bottom of the trench on 12 in (300 mm) centers. Pins should also be installed on panel edge overlaps in the COS trench.
8. Backfill and compact the COS trench in the location of the first **PROPEX** Landlok TRM panel only (Figure 10).
9. Unroll the **PROPEX** Landlok TRM roll on the channel surface in the area to be armored. (Figure 11) Ensure that TRM has intimate contact with the ground and all irregular surfaces beneath the material are removed.
10. Secure TRM panels in place using pins across the channel surface according to the project's engineered design. Pin placement should reflect a staggered checkerboard pattern across the channel surface for best results (Figure 12 and Figure 13).
 - 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 13).

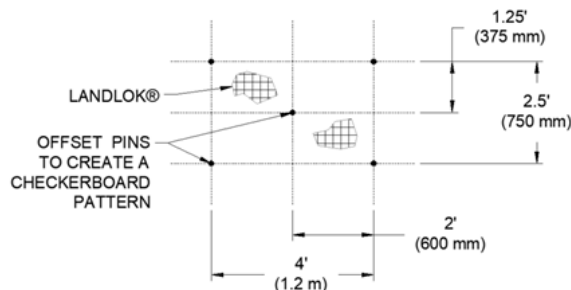


Figure 12: Example Pin Pattern

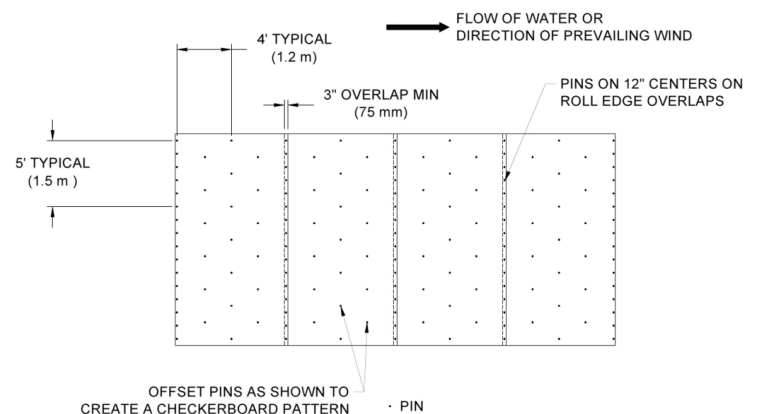


Figure 13: Example Edge Overlap Pattern

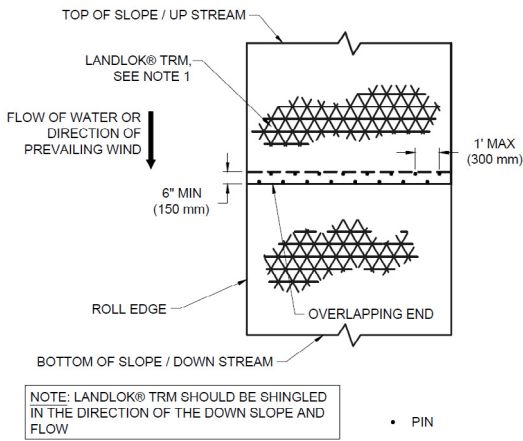


Figure 14: Roll End Overlap

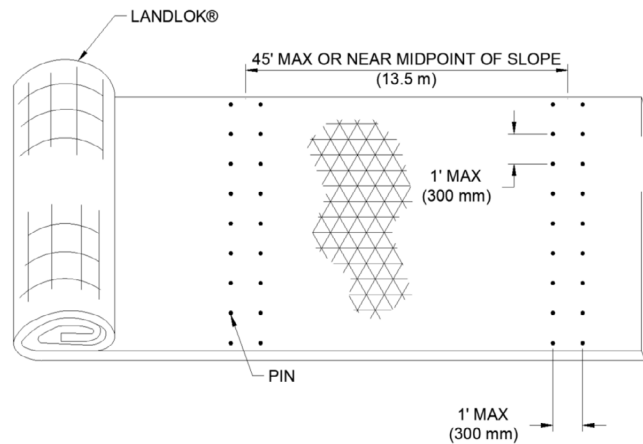


Figure 15: Simulated Check Slot

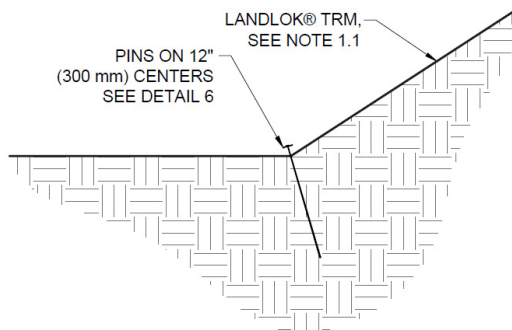


Figure 16: Break in Slope Interface

- Roll ends shall be overlapped a minimum of 6 in (150 mm) with upstream panel on top. Secure roll end overlaps with two rows of pins staggered 6 in (150 mm) apart on 12 in (300 mm) (Figure 14)
- For channel bank heights or channel bottom widths 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 15).
- At the break in slope interface towards the channel bed, it is suggested that Pins be installed on 12 in (300 mm) centers (Figure 16).

11. Secure **PROPEX** Landlok TRM with pins in the opposite COS trench. Suggested placement of pins for the opposite COS trench is along the bottom of the trench on 12 in (300 mm) centers (Figure 17).
12. Backfill and compact the opposite COS trench in the location of the first TRM panel only (Figure 17).
13. Continue to work down the length of the channel by repeating steps 6 through 9 overlapping each adjacent TRM panel by 3 in (75 mm) (Figure 13). The last TRM panel should terminate on the Terminal Channel (TC) trench with pins on 12 in (300 mm) centers
14. Lay the last TRM panel on the upstream side of the TC trench (Figure 18). Place the panel edge in the TC trench, ensuring full coverage along the bottom of the entire TC trench with the **PROPEX** Landlok TRM (Figure 19).

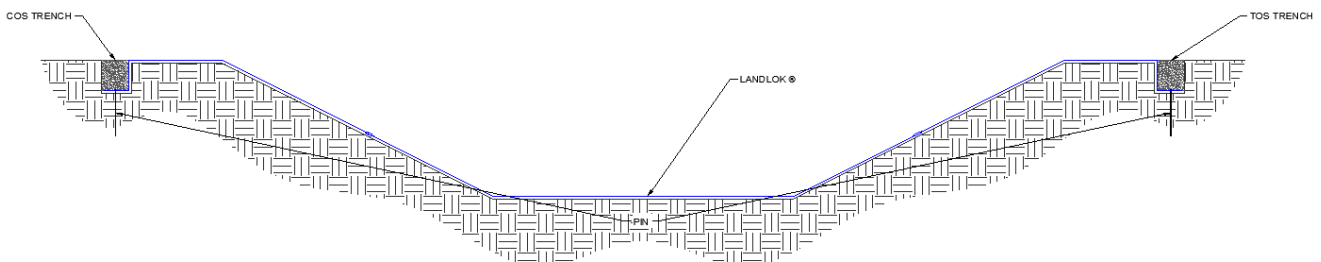


Figure 17: Crest of Slope (COS) Trenches Complete

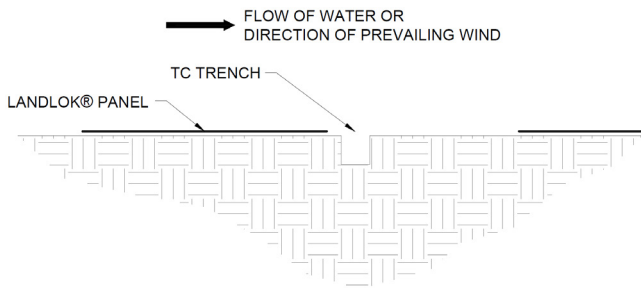


Figure 18: Terminal Channel (TC) Trench Alignment

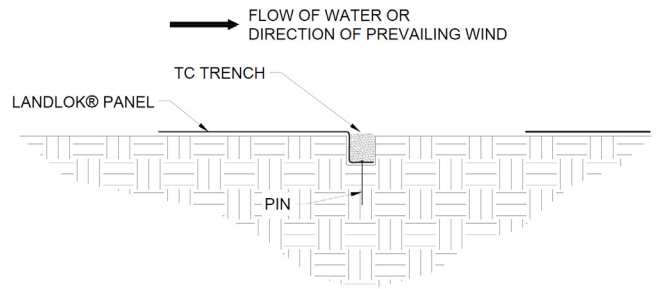


Figure 19: Terminal Channel (TC) Trench Placement

15. Secure **PROPEX** Landlok TRM with pins in the TC trench. Suggested placement of pins for the TC trench is along the bottom of the trench with pins on 12 in (300 mm) centers (Figure 19).
16. Backfill and compact the TC trench (Figure 19).
17. Fold the **PROPEX** Landlok TRM panel over the top of the compacted TC trench (Figure 20) ensuring a minimum 3 in (75 mm) overlap and place each panel end into the respective COS trenches.

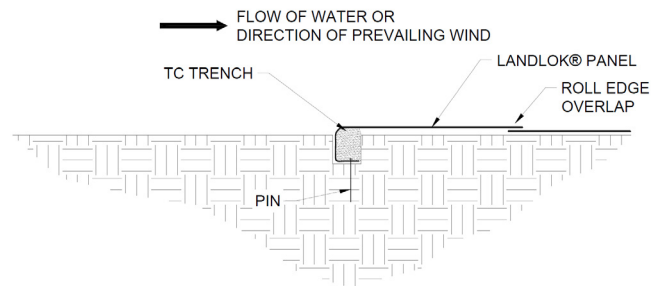


Figure 20: Terminal Channel (TC) Trench Complete

At a minimum, TRM panels should be pinned entirely across the channel 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 21) of a channel armored with **PROPEX** Landlok TRM can be seen below for overall reference. Please feel free to contact our technical support at smatch@solmax.com or 706-693-2226.

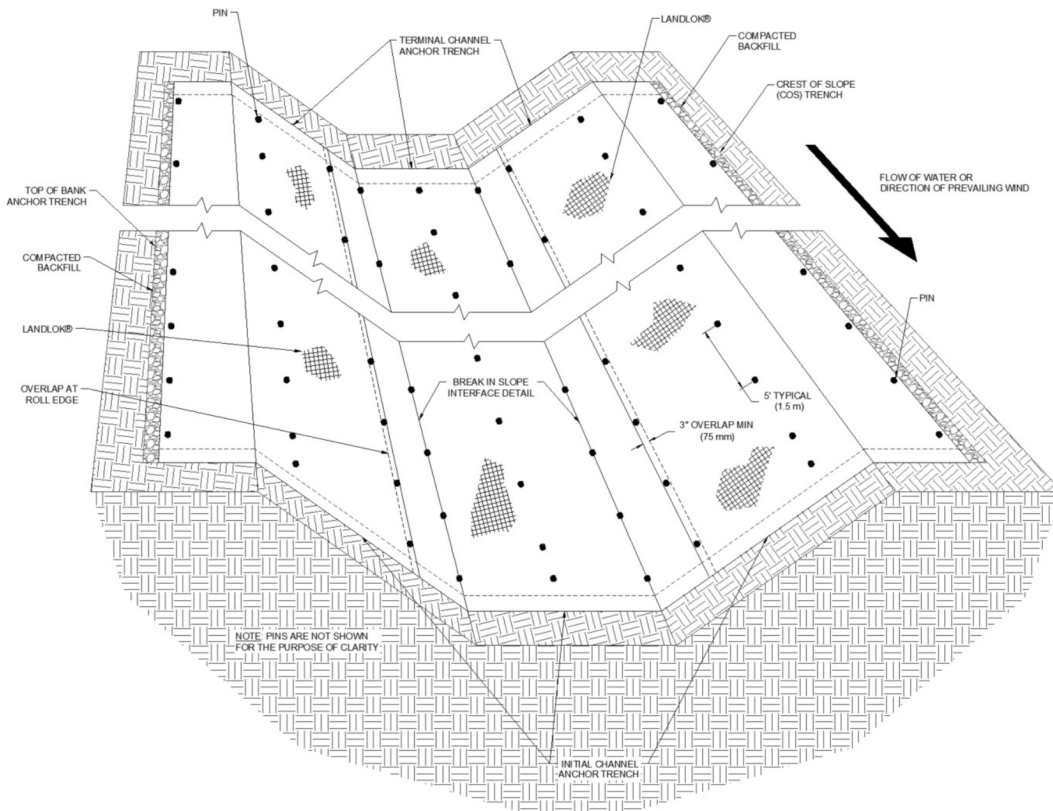


Figure 21: Completed Channel Isometric View

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 (50 mm). Frequently, 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 trench and/or hard armoring may be required when channels have severe scour potential at IC and TC trenches.
2. For installing TRM panels around curved sections of a channel, 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 break in slope interface depending upon the radius of the curved channel. 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 or sod 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 channel

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 with **PROPEX** Landlok TRM, 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 **PROPEX** Landlok TRM is losing intimate contact with the channel 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 channel. After **PROPEX** Landlok TRM is reinstalled, 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 channels should be free of vehicular traffic. Routine maintenance and channel 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 **PROPEX** Landlok TRM 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.

3. 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 channel 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 channel 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 channel 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.

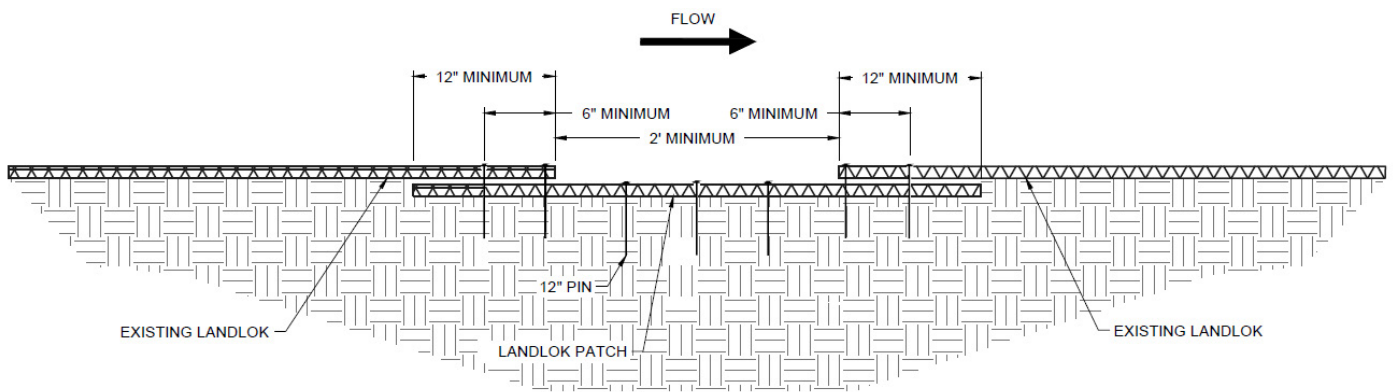


Figure 22: PROPEX Landlok TRM Patch Cross Section

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 (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 (305 mm). The patch overlaps shall be tucked under the existing damaged **PROPEX** Landlok TRM material (Figure 22 and Figure 23).
4. Install pins on 6 in (150 mm) (max) centers. For larger areas of damage, anchors should be installed to match existing anchor pattern. Once **PROPEX** Landlok TRM is in place, vegetate per project specifications.

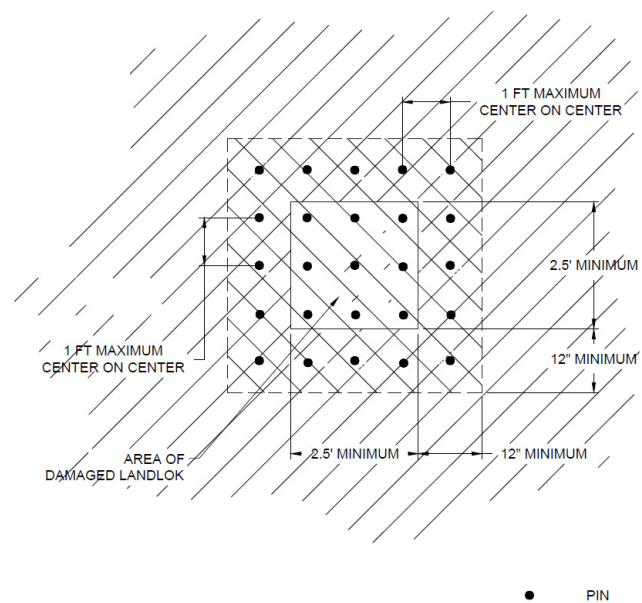


Figure 23: PROPEX Landlok TRM Patch Plan View

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 ft² (1 m²). 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.

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.

Uncompromised quality

Our products are manufactured to strict international quality standards. All our products are tested and verified at our dedicated and comprehensive laboratories which maintain numerous accreditations. We offer our partners a wide scope of testing according to published standards to ensure products delivered to sites meet specified quality requirements.

Let's build infrastructure better



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