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Securing the Foundation, Anchoring for Effective Erosion and Sediment Management

Michael Jotzke, CPESC

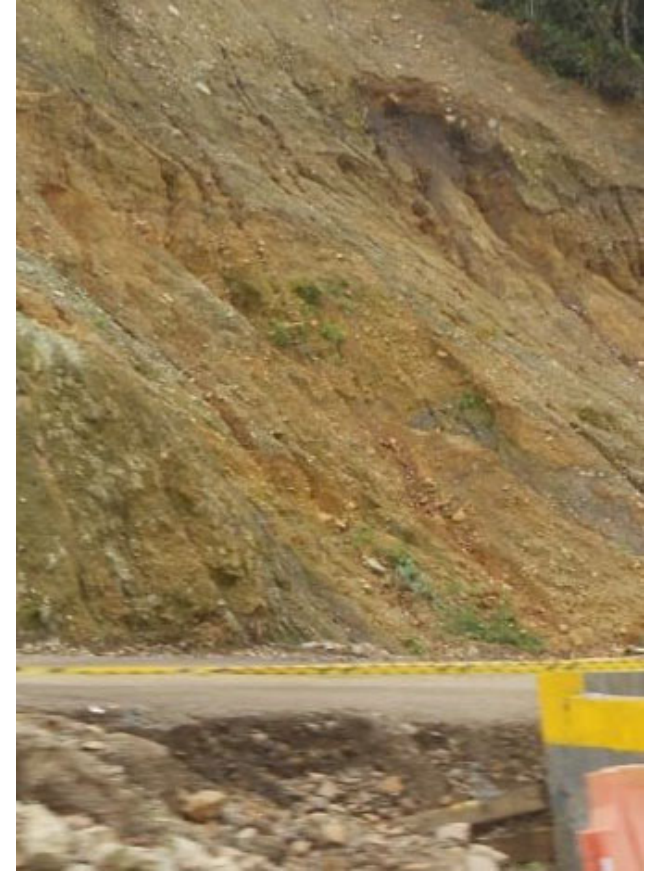


North American Green • 5401 St. Wendel-Cynthiana Road Poseyville, IN 47633 • (800) 772-2040
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Erosion

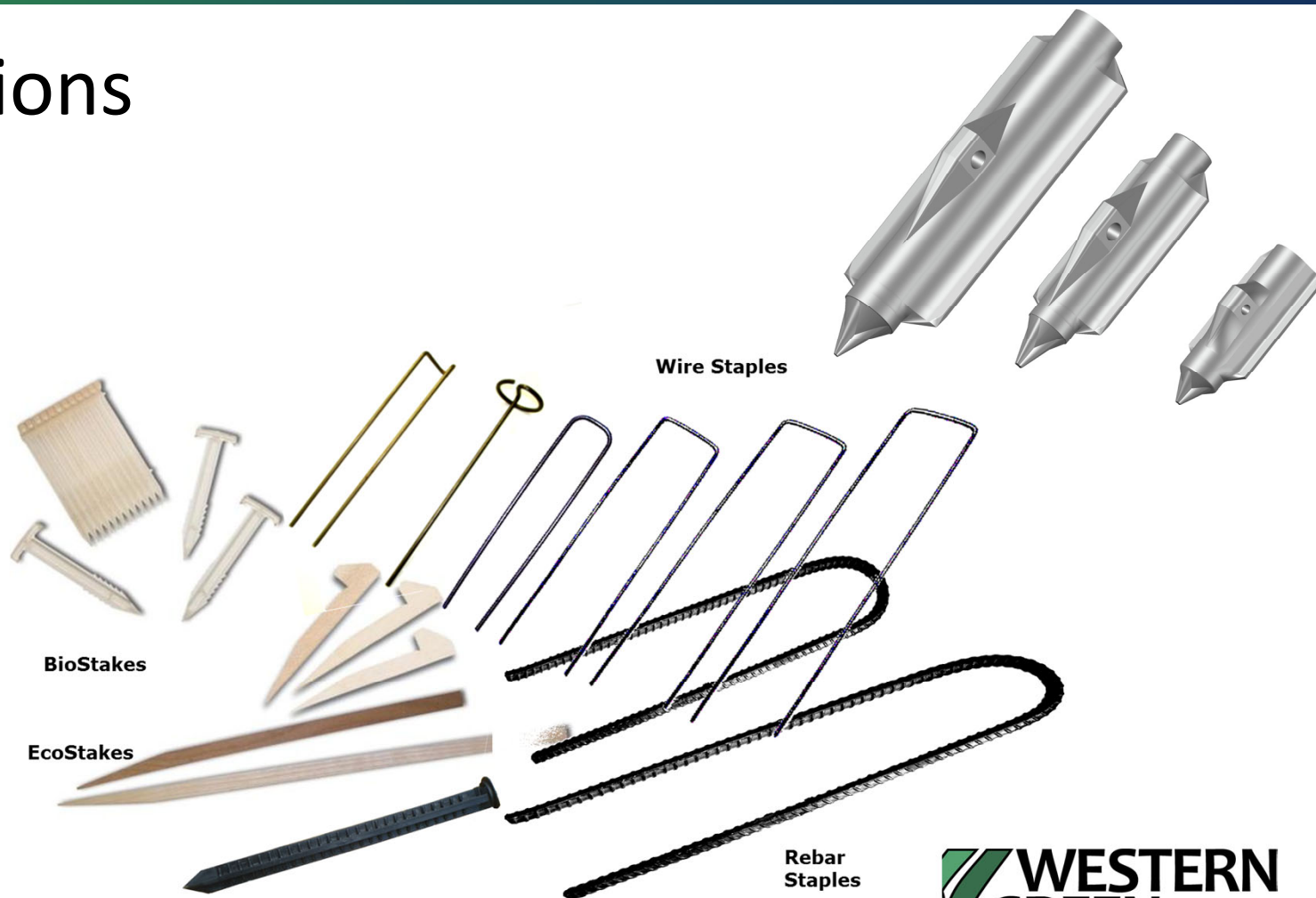
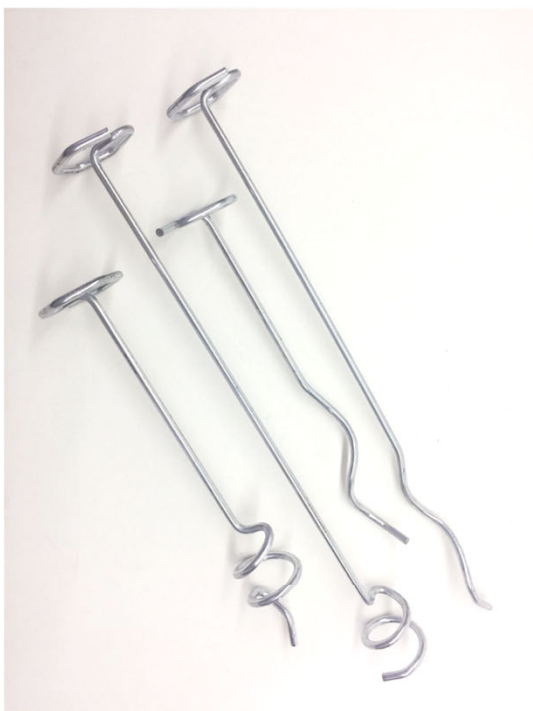
- *Erosion is the **TRANSPORT** of soils detached by water (or wind), and **Sedimentation** is the **DEPOSITION** of soils as a result of erosion.*



Incorrect Installation



Anchor Options



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Vegetation is our best option



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Sod Staples / Pins



Wire U-Staples

6"-11 gauge: 1000/box, 60 box/pallet
8,10,12" – 8 gauge: 500/box,
50 box/pallet



Round Top Pins

Wire Round Top Pins available in 6"-
11-gauge wire with a 1.5" circular
head. 1000/box, 50 box/pallet

Bio “Plastic”



GreenStake is made from the by-products of processed plant matter i.e. wheat and potato starches. This is a readily renewable resource and completely natural.



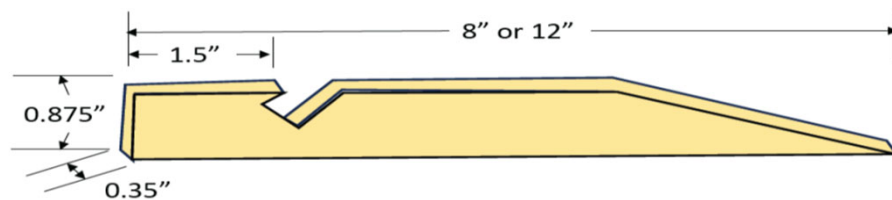
EcoPegs™ Wood Stakes



INSTALLATION



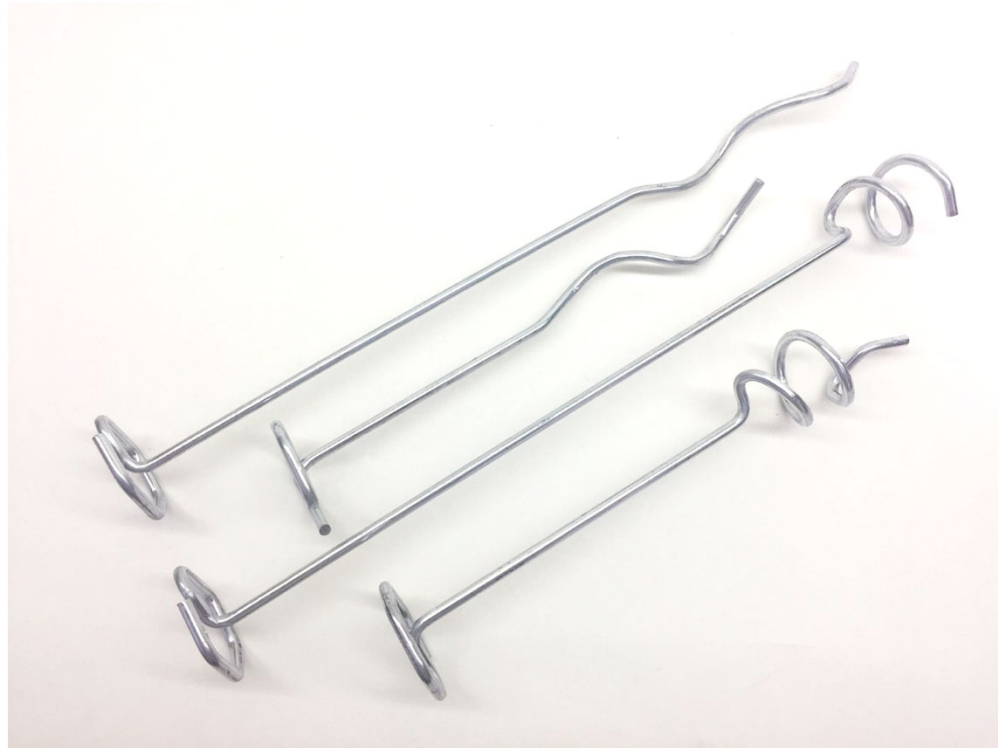
ROLLED EROSION CONTROL



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Falcon Hex Pins

- Used in Conjunction with and RECPs, ideally suited for TRM tie-down
- Large Head catches on mattings, without need of washers
- Provides 10X the pull out resistance of other fasteners
- Various coil types designed for varying soils
- Galvanized for extended life
- Hex head installs easily with hand drill



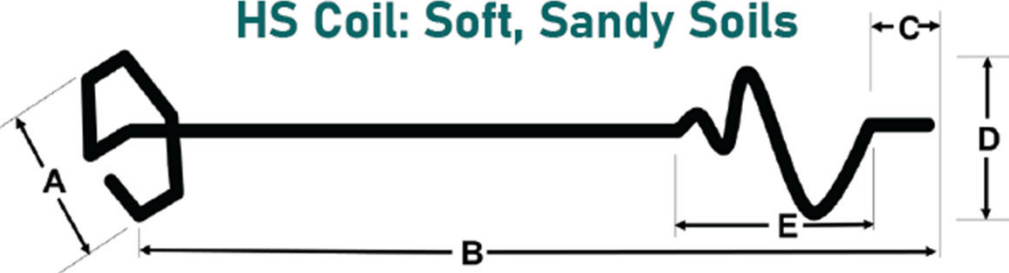
FALCON PINS™

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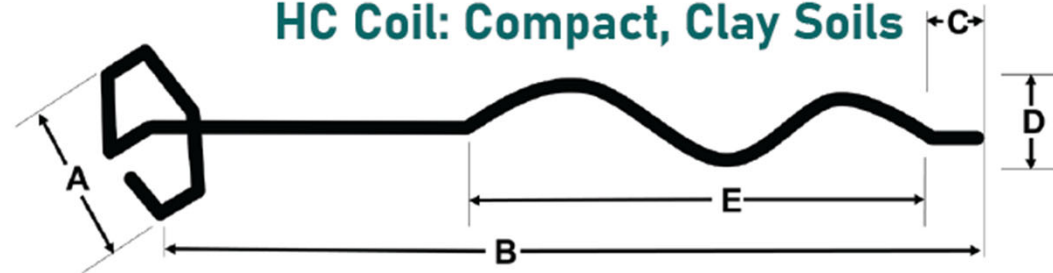
Falcon Hex Pin Selection



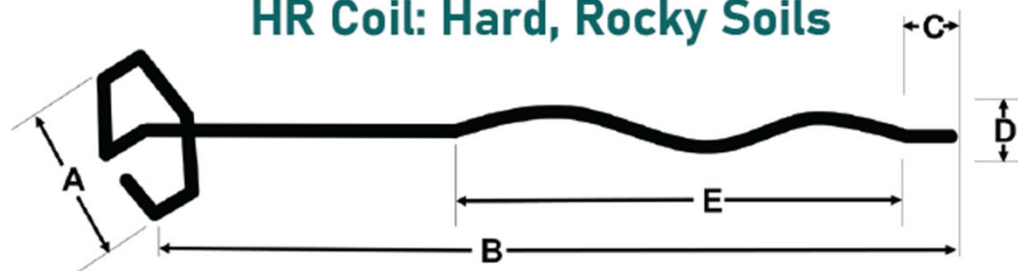
HS Coil: Soft, Sandy Soils



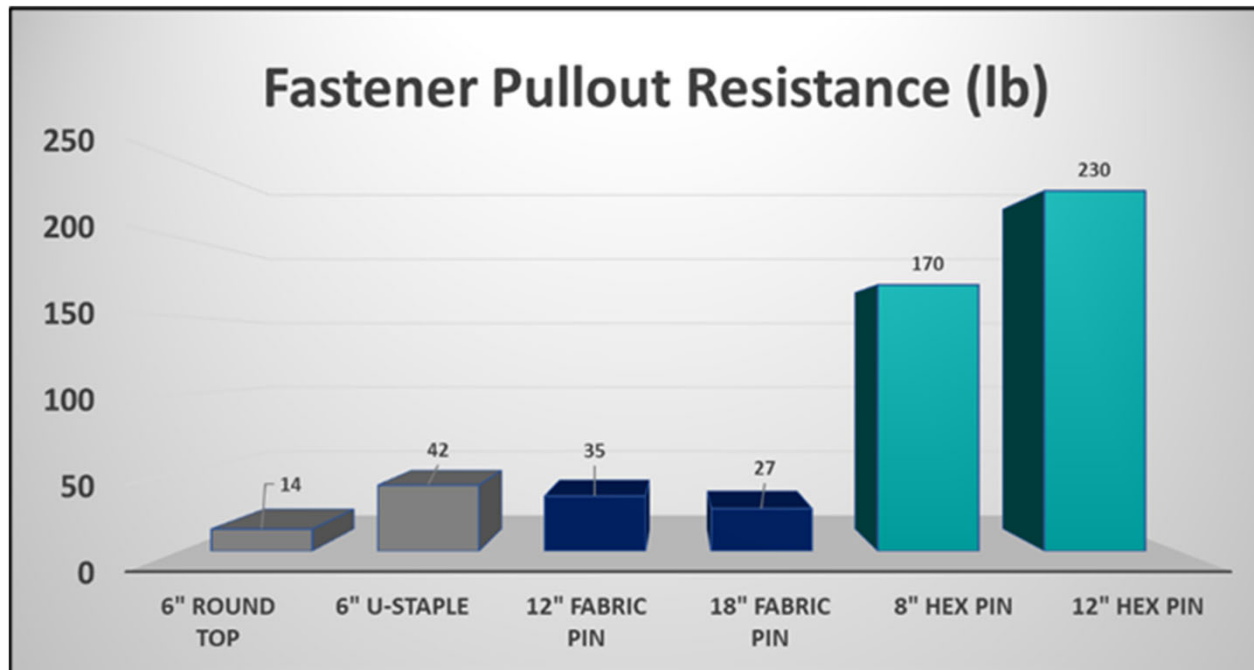
HC Coil: Compact, Clay Soils



HR Coil: Hard, Rocky Soils



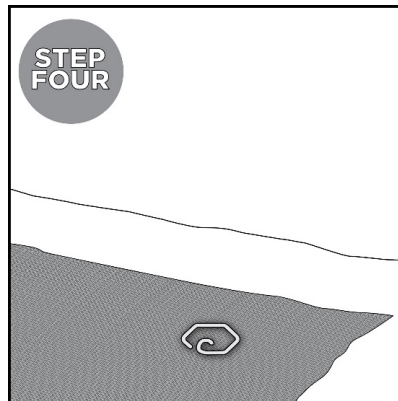
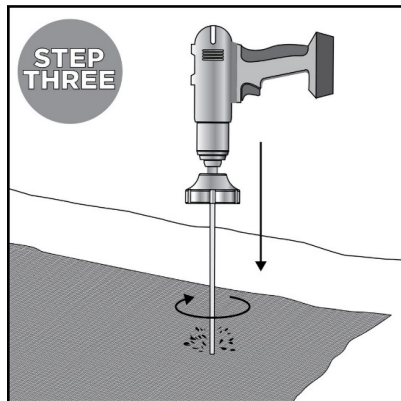
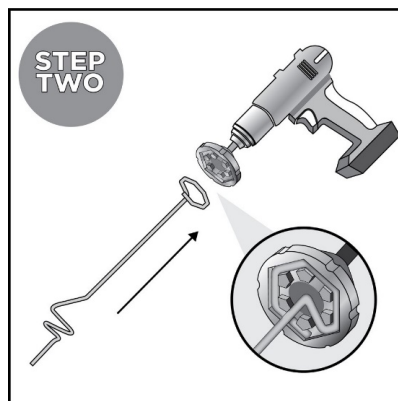
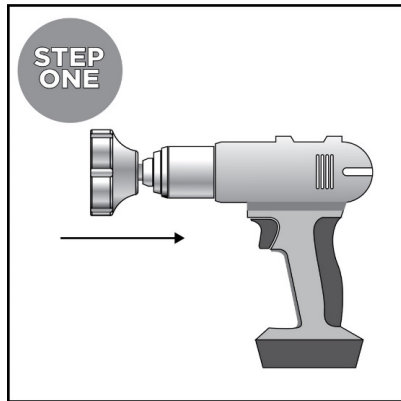
Falcon Hex Pin Performance



- Falcon Hex Pins show superior pullout strength compared to other standard fasteners.
- Pullout resistance will vary based on soil type. A pullout test should be conducted to verify strength.
- A minimum 20 lbs of pullout resistance is recommended for use with rolled erosion control products.



Falcon Hex Pin Installation



STEP 1: Install the custom chuck or a 1.5 inch hex socket into a hand drill

STEP 2: Place the Falcon Hex pin into the socket. Ensure no debris is on the pin before installing.

STEP 3: Place the end of the Falcon Hex pin through the erosion control matting before engaging the drill. Install the pin with slight pressure until the pin is fully installed, flush with matting.

STEP 4: A properly installed Falcon Hex pin will impart a slight depression on the erosion control matting. If using lightweight netting, edge installation may need to be help as not to twist the matting.



Why Anchor

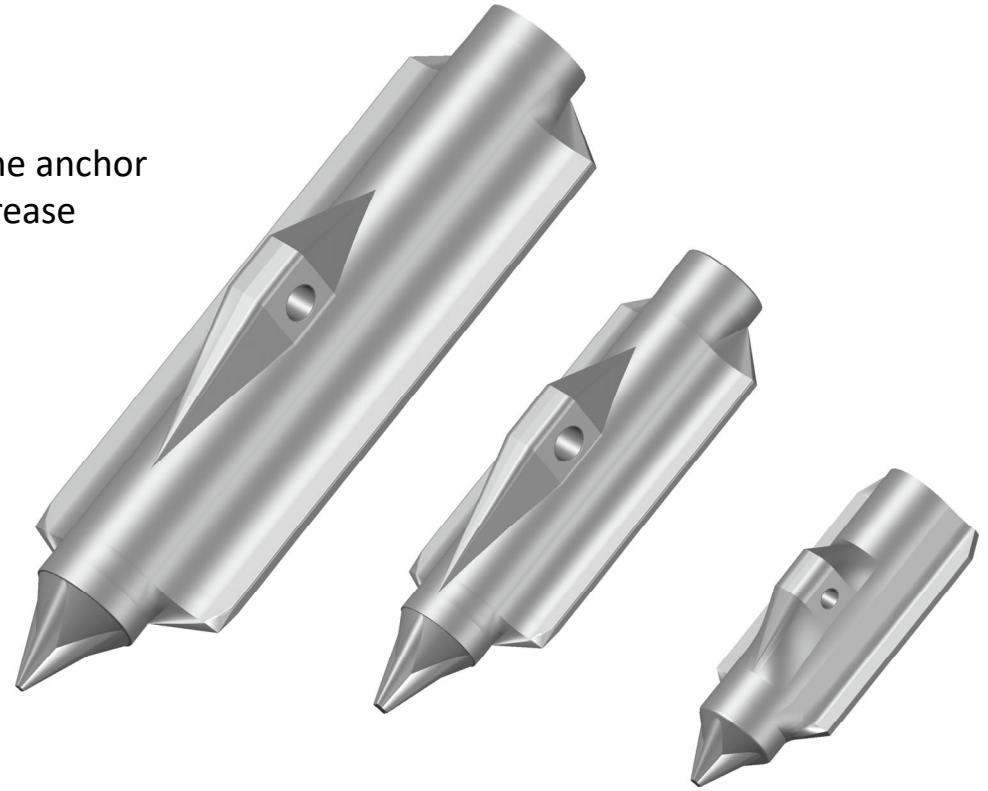
- Prevents uplift
- Actually tightens the higher the shear
- Increases factor of safety
- Allows material to do their job effectively
- Maintains contact
- Deeply connects erosion control material to soil.
 - Surface anchoring is often insufficient. US standards allow $\frac{1}{2}$ inch of soil loss. Greatly affecting the anchorages from pins alone.



Anchor Range

Anchors are available in three sizes. As the size of the anchor increases, working load and ultimate resistance increase

- F80, Zinc Die Cast, Surface area: 3.4 in²
- F120, Zinc Die Cast, Surface area: 6.0 in²
- F170, Zinc Die Cast, Surface area: 13.0 in²



F170 (170 mm length)

F120 (120 mm length)

F80 (80 mm length)

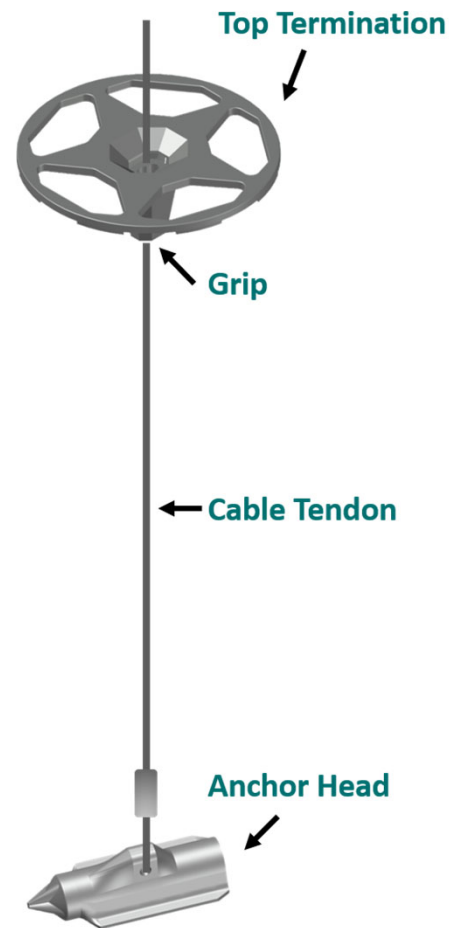
Top Plate Termination

- Secures system
- Maintains tension
- Connects and locks to tendon
- Flexible tendons
 - Crimped
 - Self locking

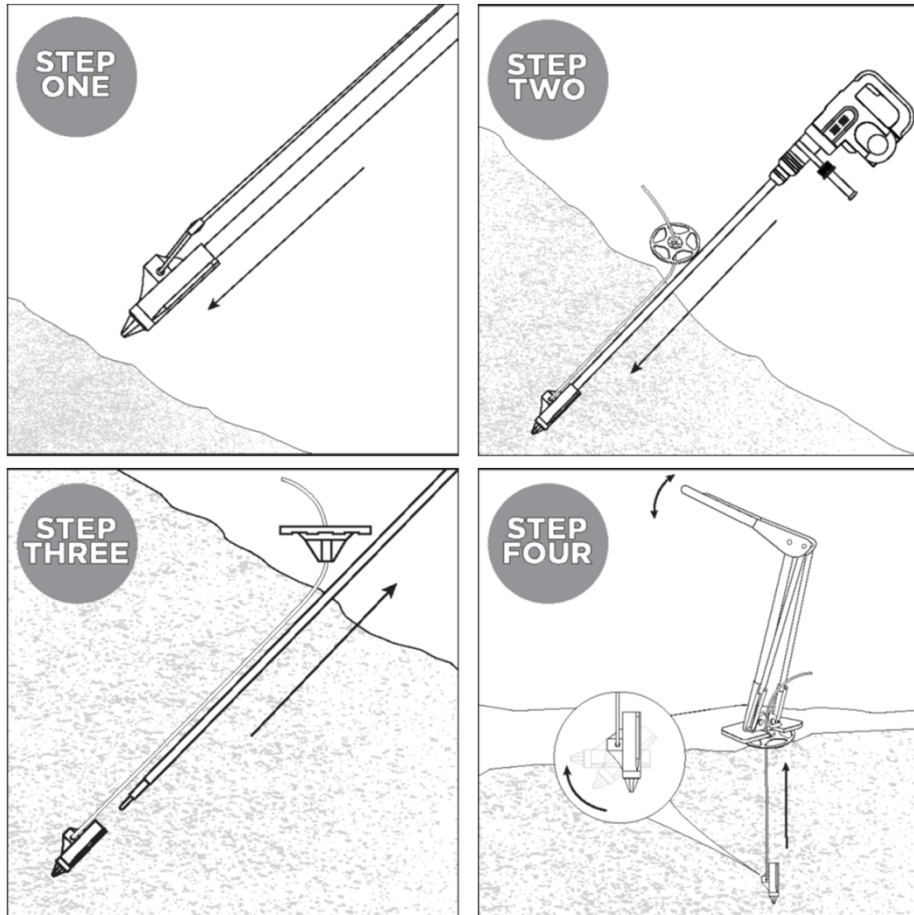


Tendon Details

- Connecting member
- Transmits load
- Provides upper limit
 - Diameter
- Wire rope
 - Flexible
 - Installation benefits



Falcon Anchor Installation



STEP 1: Insert Drive Rod into the Falcon Anchor and place perpendicular to the slope. Drive rod with the anchorhead swiftly through the mat.

STEP 2: Drive the Falcon anchor to the desired depth. Anchors can be driven using sledge hammers, gas powered drivers, or hammer drills.

STEP 3: Remove drive rod. Drive rod can be removed by hand, or using a Jackjaw in tougher soils.

STEP 4: Load lock the anchor. Slide the termination cap flush to the ground. Use Jackjaw to activate the anchor.



Anchor Installation Demonstration

- Start by Placing Anchor on Tip of Drive Rod
- Position Anchor to Designation Location
- Place Gas Driver on Rod and Set Anchor to Design Depth
- Remove Gas Driver and Pull Drive Rod Out
- Slide Anchor Cap to Soil Surface
- Tighten Cable and Set Anchor
- Connect Extra Cable



ROLLED EROSION CONTROL PRODUCTS (RECPs)



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Various Types of RECP Netting

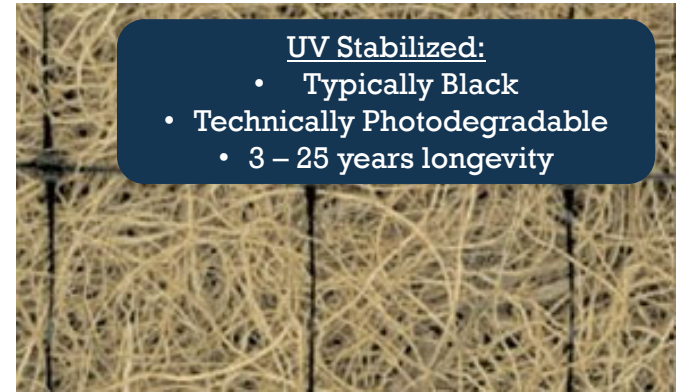
Rapid Degradable:

- Typically White or Clear
- Photodegradable
- 6 weeks to 6 months longevity



UV Stabilized:

- Typically Black
- Technically Photodegradable
- 3 – 25 years longevity



Natural - Biodegradable:

- Typically Jute Scrim
- Completely Biodegradable
- 2-3 years longevity



Regular Degradable:

- Typically Green
- Photodegradable
- 1-2 years longevity



Various Matrix Types for Blankets



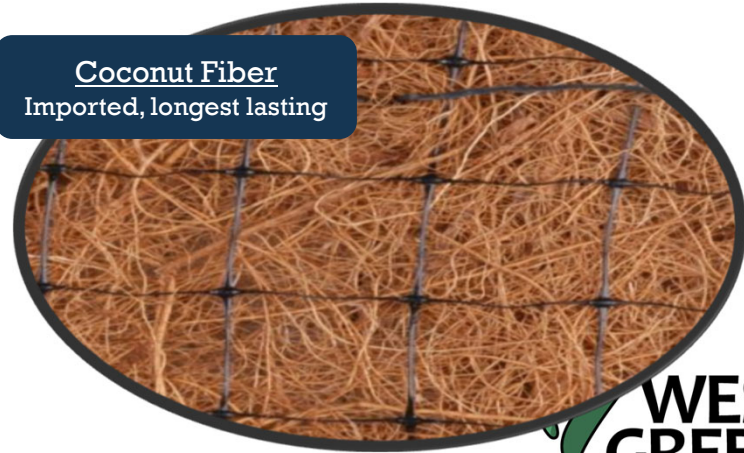
Straw Fiber
Typically wheat or rice



Blended Fiber
Typically straw & coconut



Excelsior Fiber
Machine-made long fiber



Coconut Fiber
Imported, longest lasting

Sod Staple

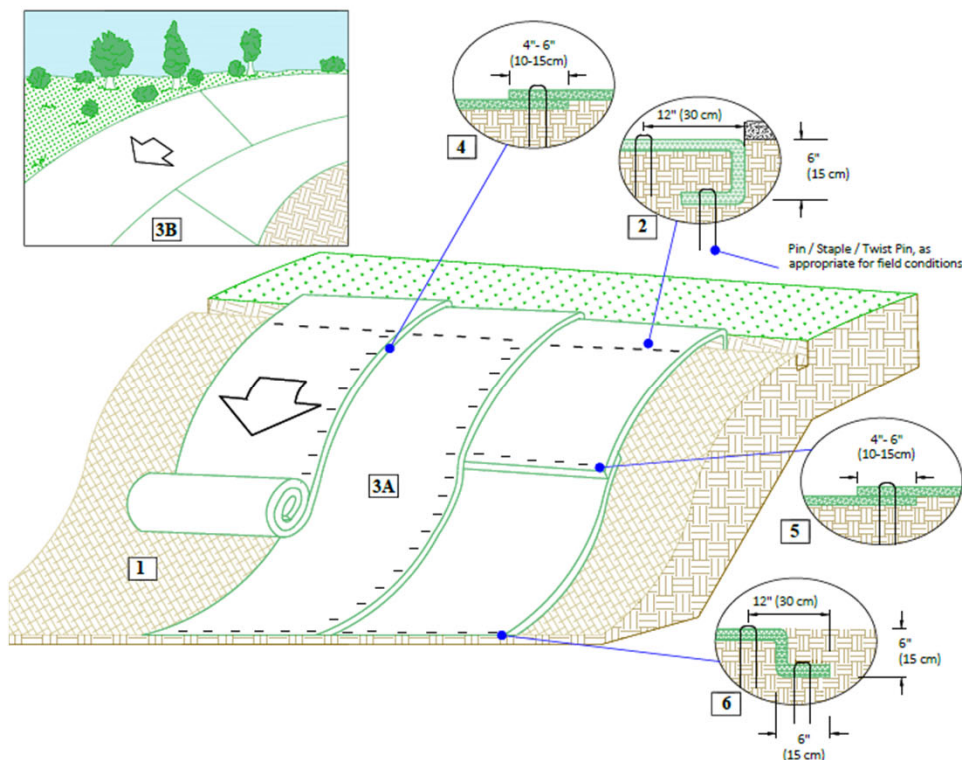


Bio



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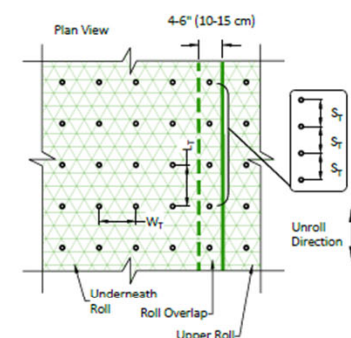
Install



Instructions

1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed. Ground surface must be free of debris, rocks, clay clods and raked smooth sufficient to allow intimate contact of the RECP with the soil over the entirety of the installation.
2. Begin at the top of the slope by anchoring the RECPs in a 6" (15 cm) deep X 6" (15 cm) wide trench. Anchor the RECPs with a row of staples/stakes/pins spaced at S_T apart in the bottom of the trench. Backfill and compact the trench after stapling and fold the roll over downslope. Secure RECPs over compacted soil with a row of staples/stakes/pins spaced at S_T apart across the width of the RECPs.
3. Roll the RECPs (A) down or (B) horizontally across the slope. When laying RECPs horizontal, a maximum of two roll widths or 16 feet, whichever is less, may be applied up the slope. If two roll widths or 16 ft is insufficient to cover the slope, material shall be placed vertically. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes/pins in appropriate locations as shown in the staple pattern guide. RollMax RECPs and ECs should utilize Staple Pattern C, TRMs and VMax materials should utilize Staple Pattern D.
4. The edges of parallel RECPs must be stapled with approximately 4" - 6" (10 - 15 cm) overlap.
5. Consecutive RECPs spliced down the slope must overlapped with the upstream mat atop the downstream mat (shingle style). The overlap should be 4" - 6" (10 - 15 cm).
6. At the terminal end, secure each mat across the width with a row of staples/stakes/pins spaced at S_T . If exposed to flow, foot traffic, wind uplift or other disruption, trench the terminal end in as shown in detail.
7. Fasteners should provide a minimum of twenty pounds of pullout resistance. Six-inch (10 cm) X one-inch (2.5 cm) eleven gauge staples are typically adequate. In loose soils, longer staples may be necessary, twist pins can provide the greatest pullout resistance. In hard or rocky soils, straight pins may be used where staples or twist pins are refused, provided the minimum pullout requirements are met. Bio-degradable fasteners shall not be used with TRM or HPTRM materials.

Staple Pattern Guide



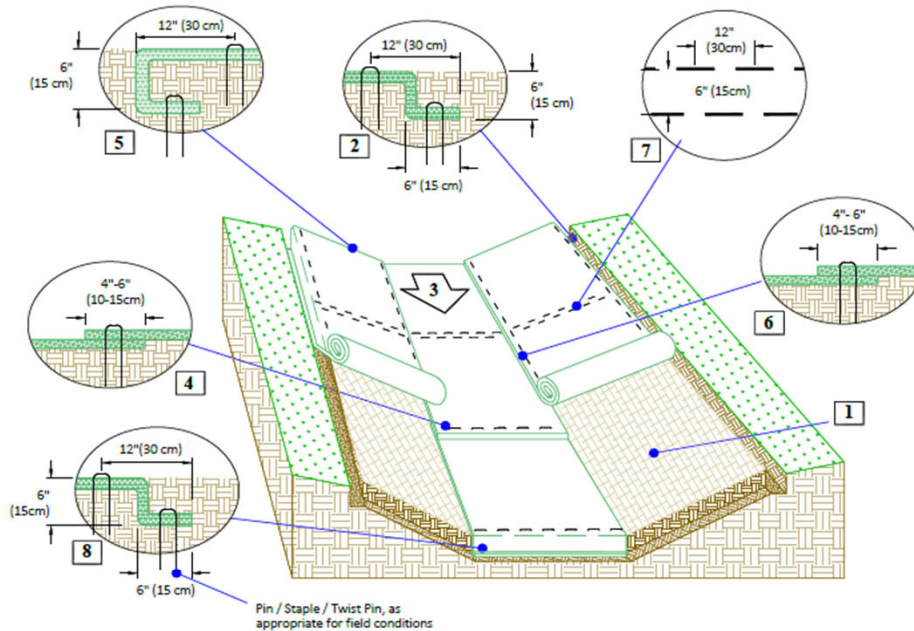
• Pin / Staple / Twist Pin, as appropriate for field conditions

Dimension	Staple Pattern	
	C	D
W_T	30" (75 cm)	22" (55 cm)
L_T	30" (75 cm)	22" (55 cm)
S_T	18" (45 cm)	18" (45 cm)
Nominal Frequency	1.7 / SY	3.0 / SY
Application	ECB (Degradable)	TRM (Permanent)
Required Fastener	Min. 20# pullout	Min. 20# pullout

*Note: Staple Pattern A and B used prior to 8/2019 have been discontinued.



Install



CRITICAL POINTS

- A. Overlaps and Seams
- B. Projected Water Line
- C. Channel Bottom/Side Slope Vertices



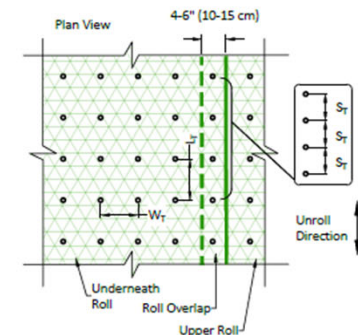
NOTES:

*Horizontal staple spacing should be altered if necessary to allow staples to secure the critical points along the channel surface.

Instructions

1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed. Ground surface must be free of debris, rocks, clay clods and raked smooth sufficient to allow intimate contact of the RECP with the soil over the entirety of the installation.
2. Begin at the top of the channel by anchoring the RECPs in a 6" (15 cm) deep X 6" (15 cm) wide trench with approximately 12" (30 cm) of RECPs extended beyond the up-slope portion of the trench. Use ShoreMax mat at the channel/culvert outlet as supplemental scour protection as needed. Anchor the RECPs with a row of staples/stakes/pins approximately 12" (30 cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12" (30 cm) portion of RECPs back over the seed and compacted soil. Secure RECPs over compacted soil with a row of staples/stakes/pins spaced approximately 12" (30 cm) apart across the width of the RECPs.
3. Roll center RECPs in direction of water flow in bottom of channel. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes/pins in appropriate locations as shown in the staple pattern guide.
4. Place consecutive RECPs end-over-end (Shingle style) with a 4"-6" (10-15 cm) overlap. Use a double row of staples staggered 4" apart and 4" on center to secure RECPs.
5. Full length edge of RECPs at top of side slopes must be anchored with a row of staples/stakes/pins spaced at S_T apart in a 6" (15 cm) deep X 6" (15 cm) wide trench. Backfill and compact the trench after stapling.
6. Adjacent RECPs must be overlapped approximately 4"-6" (10-15 cm) and secured with staples/stakes/pins at S_T .
7. In high flow channel applications a staple check slot is recommended at 30 to 40 foot (9-12m) intervals. Use a double row of staples staggered 6" (15 cm) apart and 12" (30 cm) on center over entire width of the channel.
8. The terminal end of the RECPs must be anchored with a row of staples/stakes/pins spaced at S_T apart in a 6" (15 cm) deep X 6" (15 cm) wide trench. Backfill and compact the trench after stapling.
9. Fasteners should provide a minimum of twenty pounds of pullout resistance. Six-inch (10 cm) X one-inch (2.5 cm) eleven gauge staples are typically adequate. In loose soils, longer staples may be necessary, twist pins can provide the greatest pullout resistance. In hard or rocky soils, straight pins may be used where staples or twist pins are refused, provided the minimum pullout requirements are met. Bio-degradable fasteners shall not be used with VMax (TRM) or TMMax (HPTRM) materials.

Staple Pattern Guide



- Pin / Staple / Twist Pin, as appropriate for field conditions

Staple Pattern	
Dimension	E
W_T	20" (50 cm)
L_T	20" (50 cm)
S_T	18" (45 cm)
Nominal Frequency	3.8 / SY
Required Fastener	Min. 20# Pullout



TURF REINFORCEMENT MATS (TRMs)



TURF REINFORCEMENT MAT (TRM):

RECPs Lasting Greater than Thirty-Six Months are Considered Permanent Turf Reinforcement Mats (TRMs) composed of non-degradable synthetic fibers, filaments, nets, wire mesh and/or other elements, processed into a permanent, three-dimensional matrix. They are designed to impart immediate erosion protection, enhance vegetation establishment, and provide long-term functionality by permanently reinforcing vegetation during and after maturation



Various Types of Turf Reinforcement Mats

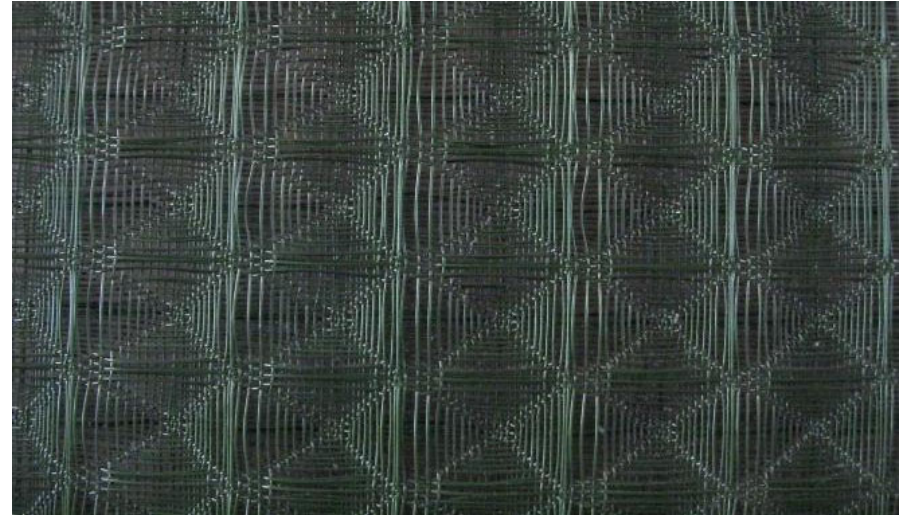
Stitch-Bonded:

- Fiber-filled (synthetic or blend)
 - UV-stabilized
- Permanent thickness



Woven:

- Singular, homogeneous material
- Strongest, most stable & durable
- Loft & integrity from weaving



TRM Project Profile C350



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HIGH PERFORMANCE TURF REINFORCEMENT MATS (HPTRMs)



HIGH PERFORMANCE TURF REINFORCEMENT MAT (HPTRM):

TRM applications requiring more durability benefit from higher tensile strength/higher UV resistance materials. The group of materials offering a tensile strength greater than or equal to 3000 lb/ft (minimum) and high UV resistance (typically 80 - 90% strength retained at 3000 hours of laboratory exposure) are classified as High Performance TRMs (HPTRMs).



Anhinga Lake Bank Stabilization – Jacksonville Beach, FL

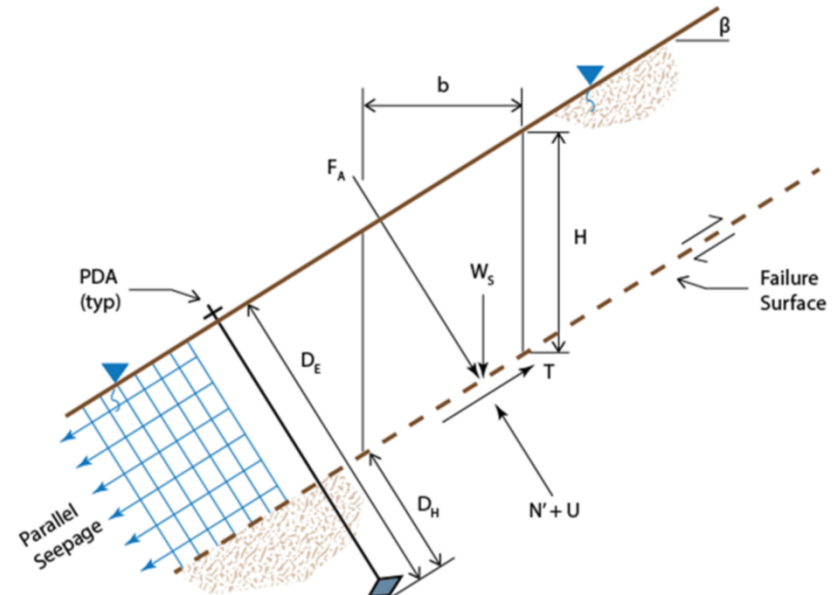
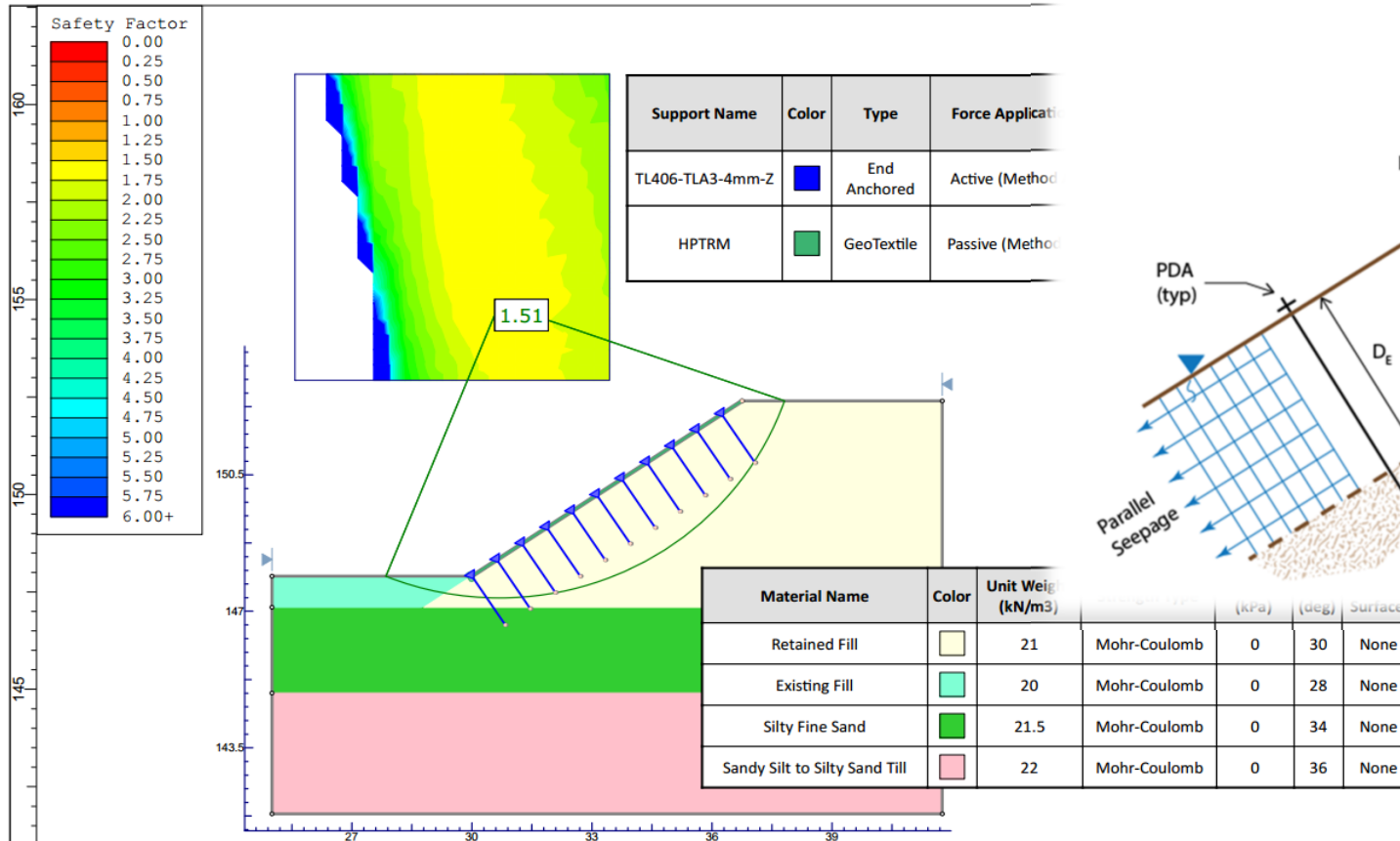




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Advantages Brought Through in Design – No Followers

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- Lor



TRANSITION MATTING



SCOUR PROTECTION TRANSITION MAT:

A manufactured, UV-stabilized flexible panel made to withstand scour-inducing flow in pipe-culvert outfalls, channels, and high hydraulic-impact shoreline applications.

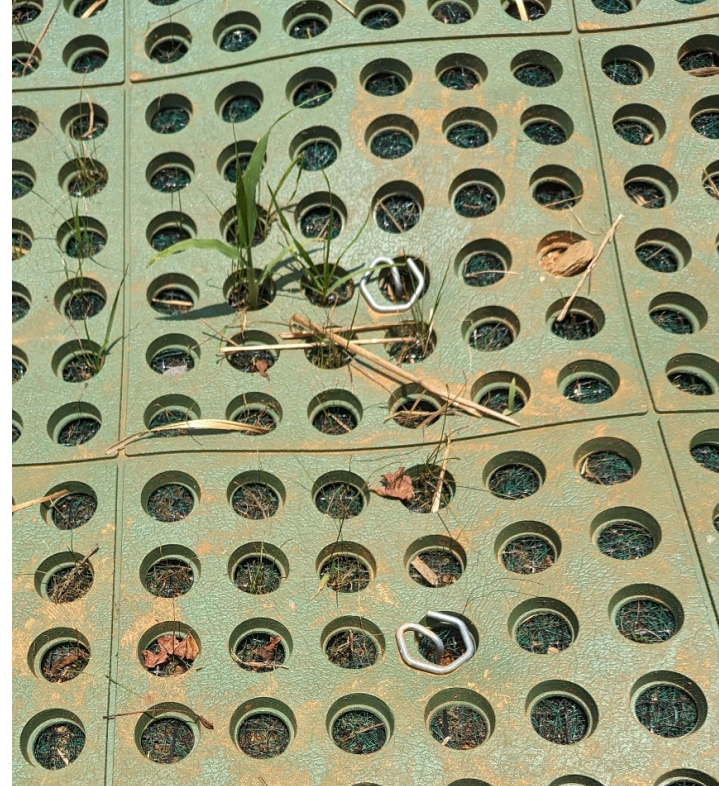


Replacing Hard Armor with Vegetated Scour Protection!



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Hex Pins



Designing for Erosion Control with ECMDS

[PROJECTS](#)[TUTORIALS](#)[DOCUMENTS](#)[PHOTOS](#)[ACCOUNT](#)[COST SAVING ESTIMATE](#)[HELP](#)

Erosion Control Materials Design Software ECMDS Version 7.0



LET ECMDS 7.0 WORK FOR YOU!

This powerful, easy-to-use tool provides guidance in the selection of materials for multiple hydraulic analyses, including slope erosion protection and channel scour resistance. ECMDS 7.0 ensures the proper evaluation and design for soil-loss prediction, product specification and project planning.

ECMDS 7.0 is a necessity for every engineer, designer and contractor who must comply with today's strict erosion and sediment control regulations, while ensuring design protection for your next project from start to finish.

Recommendations within ECMDS are based on data from controlled laboratory and field research involving erosion control blankets, turf reinforcement mats, vegetation establishment, hydraulic mulches, sediment control devices, and transitioning devices. Clearly, ECMDS 6.0 is the most comprehensive erosion and sediment control design software available.

Multiple projects can be saved, including the output from individual analysis for the various hydraulic analyses. These projects can be printed or saved for future editing and reference while providing viewable and printable quantitative computations to support the output.

[Sign Out](#)

RECENT PROJECTS

Earthsavers Test
Evansville Airport
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test

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DOWNLOADS

[Design Manual](#)
[12 in EcoStake](#)
[12 inch Rebar Staple](#)
[6 inch Circle Top Pin](#)
[BioStake Specification](#)

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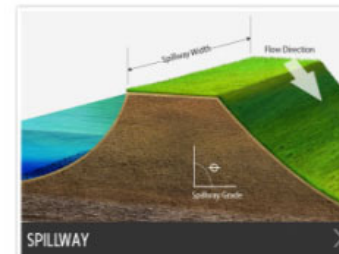
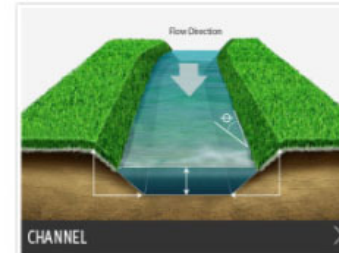
GET STARTED

[Training Tutorial](#)

ANALYSIS OPTIONS

[Home](#) > [Step 1 -- Information](#) > [Step 2 - Analysis Options](#)

Please select your Analysis Option below:



SEDIMENT DEVICES



Typical Sediment Control Methods & Devices





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Bio

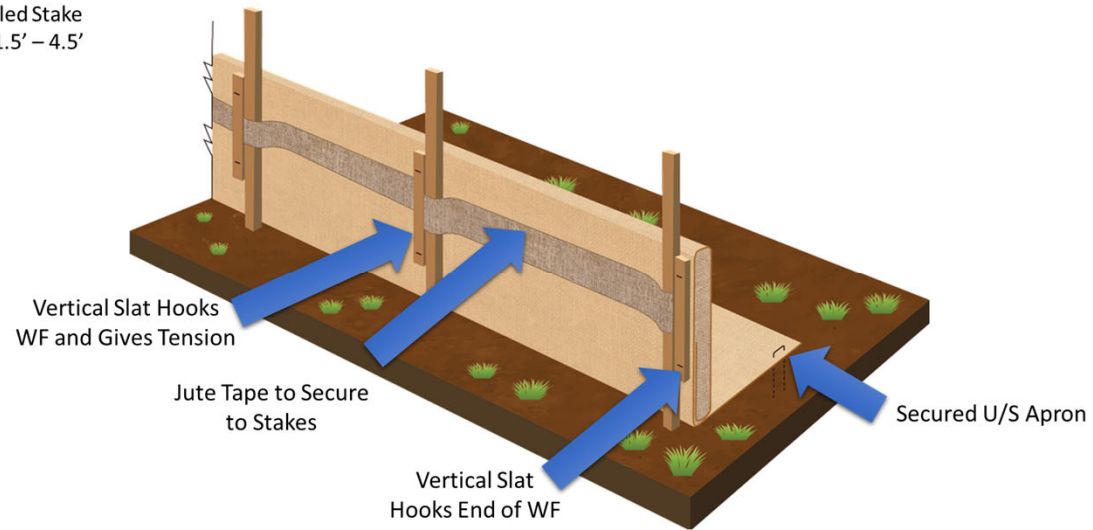
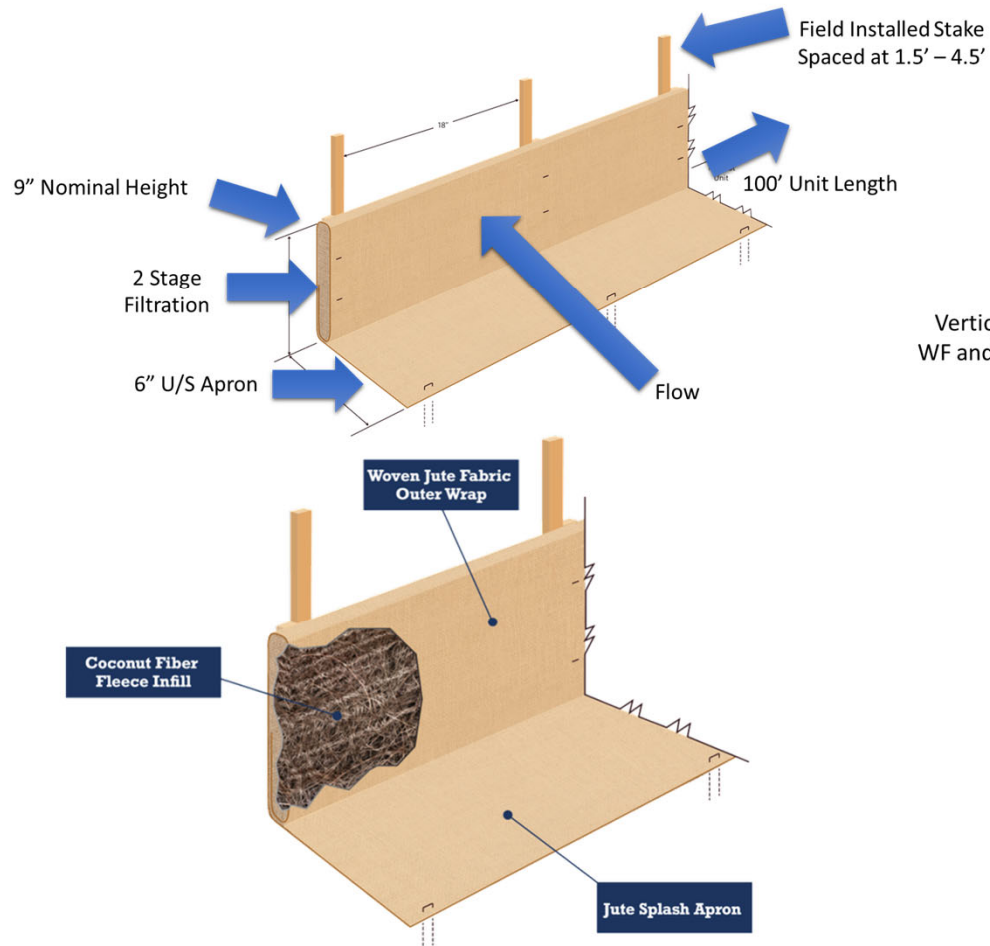


WATTLE FENCE



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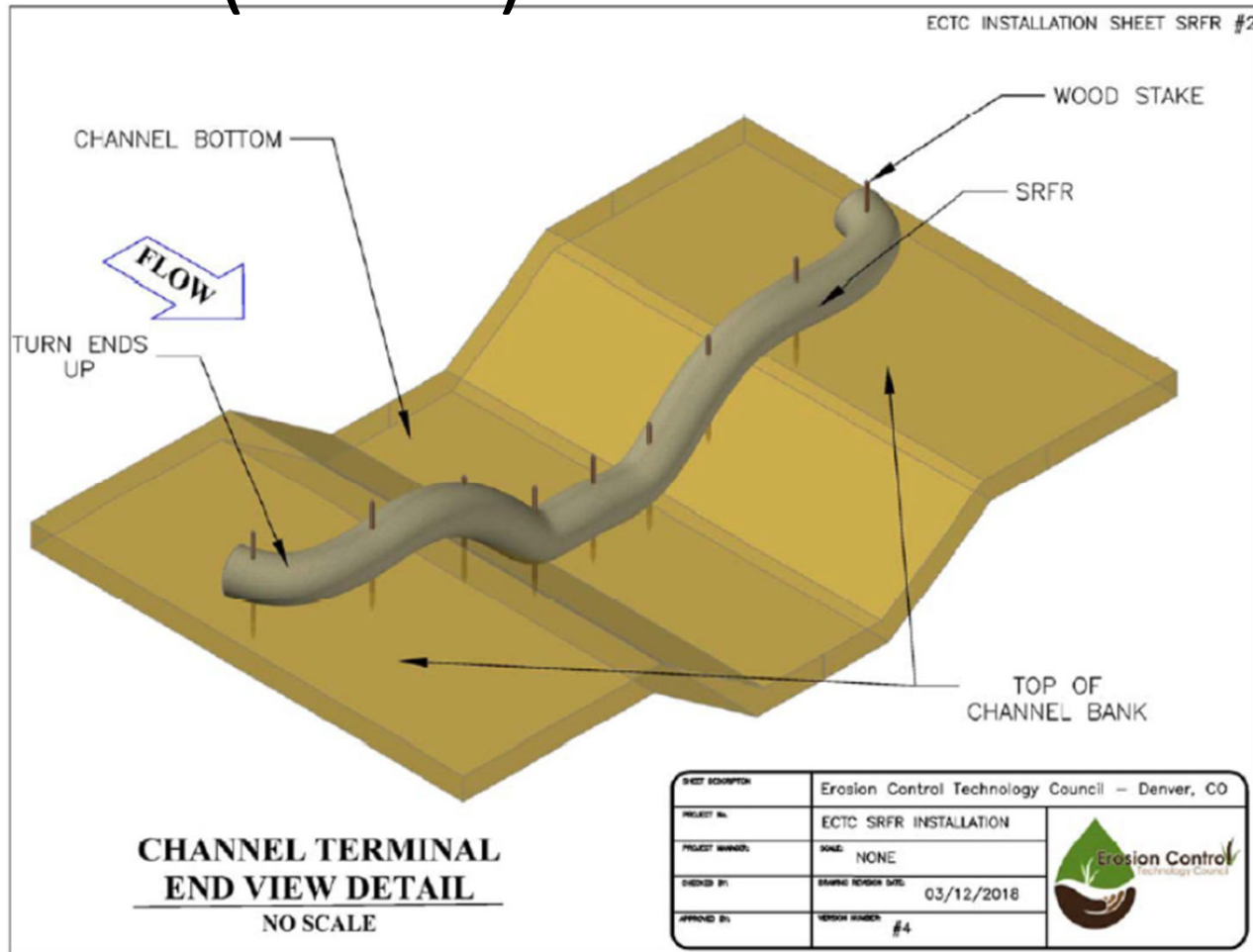
WATTLEFENCE: The Next Generation in Sediment Retention Products



WATTLEFENCE is a fully biodegradable hybrid between a sediment retention log (wattle) and silt fence. It boasts an easy, trenchless installation with superior performance over other sediment retention devices, and can be stored and shipped efficiently.

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SRFR (Round)





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*Questions
Thank You!*

Michael Jotzke, CPESC

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