



North American Green Vmax³ Composite-Turf Reinforcement Mats Exceed Industry Specifications and Performance Requirements for Permanent RECPs

EPA, ECTC and FHWA recognize incorporation of degradable components

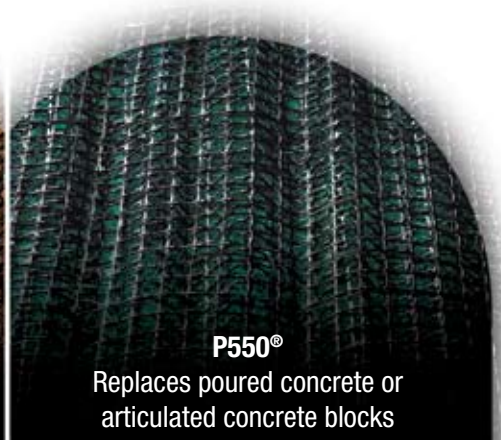
While the permanent reinforcement capabilities of a turf reinforcement mat are based on the synthetic, non-degradable portion of the matting alone, this does not preclude composite-TRMs incorporated with natural materials from meeting specifications developed by the Erosion Control Technology Council, Environmental Protection Agency and Federal Highway Administration.



SC250[®]
Compares to 24- to 30-inch
(60- to 76-cm) rock riprap



C350[®]
Exceeds protection of 30-inch
(76-cm) rock riprap



P550[®]
Replaces poured concrete or
articulated concrete blocks

V m a x ³ C o m p o s i t e R e i n f o r c e m e n t S e r i e s

EPA Recognizes Composite-TRMs

The “Storm Water Technology Fact Sheet” regarding turf reinforcement mats issued by the United States Environmental Protection Agency in September 1999 specifically states, “TRMs can incorporate natural fiber materials to assist in establishing vegetation.*”

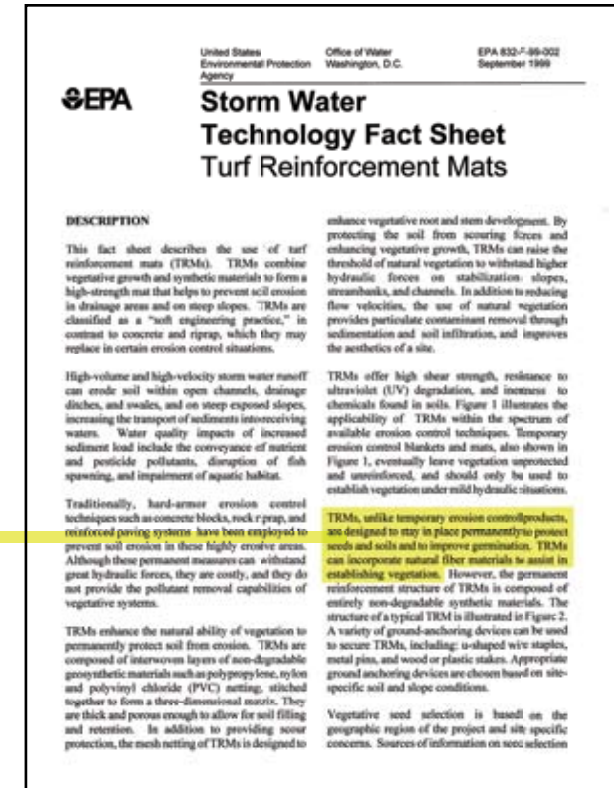
As opposed to TRMs composed of 100% synthetic materials, North American Green’s Vmax³ Composite-TRMs (C-TRMs) SC250[®] and C350[®] incorporate natural fibers for increased moisture retention, enhanced seed germination and plant growth.

But all C-TRMs are not alike. Some C-TRMs on the market utilize short mulch fibers similar to those typically used in hydraulic seeding applications. These short fibers, loosely adhered to the TRM structure through heating or spot gluing, are prone to separation and washout under substantial water flow conditions and rapid biodegradation. By using long fiber straw and coconut materials mechanically stitched into the permanent matting structure, SC250 and C350 C-TRMs provide the durability and longevity required for long-lasting, high performance erosion protection necessary for high flow channels, severe slopes, and shorelines.

“TRMs, unlike temporary erosion control products, are designed to stay in place permanently to protect seeds and soils and to improve germination. TRMs can incorporate natural fiber materials to assist in establishing vegetation.”

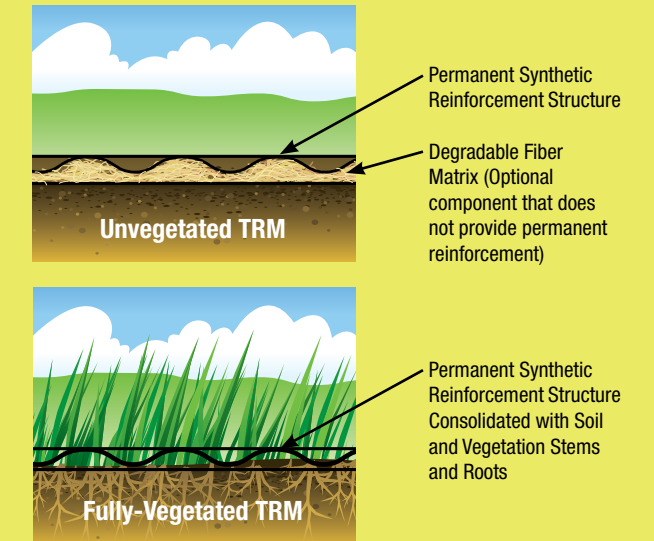
www.epa.gov/owm/mtb/mtbfact.htm

* Source: United States Environmental Protection Agency, Office of Water, “Storm Water Technology Fact Sheet, Turf Reinforcement Mats,” EPA 832-F-99-002



THE STRUCTURE OF A TYPICAL TURF REINFORCEMENT MAT

To illustrate the structure of a typical TRM in the “Storm Water Technology Fact Sheet,” the EPA utilized a representative drawing developed by North American Green for composite-TRMs.



Comparison of ECTC and FHWA Standard Specifications for Permanent Rolled Erosion Control Products and North American Green Vmax³ Composite-Turf Reinforcement Mats

“TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after maturation.”

For applications where vegetation alone will not sustain expected flow conditions and/or provide sufficient long-term erosion protection.

Permanent ¹ - All categories of TRMs must have a minimum thickness of 0.25 inches (6.35mm) per ASTM D 6525 and U.V. stability of 80% per ASTM D 4355 (500 hours of exposure).				
Product Description	Material Composition	Minimum Thickness ¹	Minimum Tensile Strength ^{1,2}	Channel Applications Maximum Shear Stress ^{1,3,4}
Type 5.A Turf Reinforcement Mat	Turf reinforcement Mat (TRM) - A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after maturation. Note: TRMs are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated.	0.25 in (6.35 mm)	125 lbs/ft (1.82 kN/m)	6.0 lbs/ft ² (288 Pa)
Type 5.B Turf Reinforcement Mat		0.25 in (6.35 mm)	150 lbs/ft (2.19 kN/m)	8.0 lbs/ft ² (384 Pa)
Type 5.C Turf Reinforcement Mat		0.25 in (6.35 mm)	175 lbs/ft (2.55 kN/m)	10.0 lbs/ft ² (480 Pa)

¹ For TRMs containing degradable components, all property values must be obtained on the non-degradable portion of the matting alone.

² Minimum Average Roll Values, machine direction only for tensile strength determination using ASTM D6818 (Supersedes Mod. ASTM D5035 for RECPs).

³ Required minimum shear stress TRM (fully vegetated) can sustain without physical damage or excess erosion (>12.7 mm (0.5 in) soil loss) during a 30-minute flow event in large scale testing.

⁴ Acceptable large-scale testing protocol may include ASTM D6460, or other independent testing deemed acceptable by the engineer.

North American Green Vmax ³ Composite-Turf Reinforcement Mats			
Product Description	Permanent ¹ TRM Thickness	Minimum ^{1,2} Tensile Strength	Maximum ^{1,3,4} Shear Stress
SC250 [®]	0.48 in (12.19 mm)	620 lbs/ft (9.05 kN/m)	10.0 lbs/ft ² (480 Pa)
C350 [®]	0.51 in (15.0 mm)	625 lbs/ft (9.12 kN/m)	12.0 lbs/ft ² (576 Pa)
P550 [®]	0.76 in (19.30 mm)	763 lbs/ft (11.15 kN/m)	14.0 lbs/ft ² (672 Pa)

ECTC and FHWA Acknowledge Composite-TRMs

The Standard Specifications for Rolled Erosion Control Products developed by the Erosion Control Technology Council and Federal Highway Administration state in their designations of RECPs that TRMs may be supplemented with degradable components.¹

Unlike conventional open-structured TRMs, the natural or synthetic fiber matrix incorporated into North American Green Vmax³ C-TRMs shields soil from the erosive forces of raindrop impact and helps prevent shear stress extraction of soil particles from or through the matting structure.

Furthermore, 100% synthetic open-structured or closed-weave TRMs generally require soil in-filling during installation to facilitate vegetation

growth and interaction. Vmax³ C-TRMs are open enough to allow vegetation growth up through the matting yet dense enough to provide optimum protection for underlying soils and root systems – all without the need for expensive, labor intensive soil in-filling of the matting, a process which leaves bare soil exposed to the elements and prone to erosion. The maximum shear stress data for Vmax³ C-TRMs derived through large-scale, fully vegetated testing on the matting’s permanent structures and reported in the table above, demonstrate the exceptional vegetation reinforcement capabilities of these products. In fact, Vmax³ products boast vegetation reinforcement capabilities significantly exceeding the performance requirements for TRMs established by the ECTC and FHWA.

Minimum Thickness and UV Stability Requirements

Additionally, the ECTC and FHWA specify that all TRMs must retain a permanent minimum thickness of 0.25 inches to provide sufficient interaction with and reinforcement for vegetation roots and stems. These structures must also retain at least 80% of their tensile strength through ASTM D4355 weatherometer testing.

North American Green Vmax³ C-TRMs, with their patented 3-dimensional, UV stabilized permanent structure, exceed the required thickness and UV resistance, offering permanent performance and reinforcement where other claimed composite “TRMs” do not.

www.ectc.org/Source_Docs/2005Site/Oct05Specification.pdf

www.wfl.fha.dot.gov/design/specs/Fp03_final_1224.pdf

¹ Source: Erosion Control Technology Council, “Standard Specification for Rolled Erosion Control Products,” ECTC/Final 060004 Version 3.0, Rev. 4904



Additional Considerations in Specifying and Using North American Green Vmax³ C-TRMs

Independently Proven Performance

All North American Green Vmax³ C-TRMs have been rigorously tested for their immediate erosion control (unvegetated), long-term erosion control (vegetated) and vegetation reinforcement properties to accurately quantify performance. Research facilities and results available at www.nagreen.com.

ECMDS[®] Software

North American Green's ECMDS[®] (Erosion Control Materials Design Software) provides computer-assisted design and selection of materials for slope erosion protection and channel scour resistance based on data from laboratory and field research involving North American

Green's erosion control blankets, TRMs, vegetation, TRM-reinforced vegetation, and riprap.

DOT System[®] for Optimum Installations

All Vmax³ C-TRMs feature the patented North American Green DOT System which provides color-coded visual references for correct placement of staples or stakes – helping to ensure maximum product performance through proper installation, and minimizing construction costs by increasing installation rates by up to 20%.

Product Performance Guarantee

North American Green offers the most comprehensive written product

performance guarantee in the industry – the *Ultimate Assurance Guarantee* – which warrants the performance of all Vmax³ C-TRMs on all registered projects designed using the latest version of ECMDS[®].

Erosion Solutions *Specialists*

Representatives of authorized North American Green distributors have the exclusive opportunity to participate in the Erosion Solutions *Specialist* Program. Those who pass the exit exam are uniquely positioned to assist customers in designing effective and economical erosion control measures for a wide range of applications.



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We are a proud participant in AASHTO's National Transportation Product Evaluation Program for RECPs

