



"Blanketing Nature With Nature"

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Effective: 4/14/2014

RE: Certificate of Conformance: PP5-Heavy Duty™

To Whom it May Concern:

This letter is to certify that Western Excelsior manufactures the Rolled Erosion Control Product (RECP) marketed as PP5-Heavy Duty. Each roll is subjected to Western Excelsior's Quality Assurance Program and is manufactured to the specifications listed in document number WE_EXCEL_PP5HD_SPEC. Further, Western Excelsior utilizes industry standardized test procedures to develop performance references for PP5-Heavy Duty. Document number WE_EXCEL_PP5HD_PERF presents the industry standardized testing and results. Installation instructions are provided in document numbers WE_EXCEL_PP5HD_SII and WE_EXCEL_PP5HD_CII for hillslope and channel installations, respectively. A copy of document number WE_EXCEL_PP5HD_SPEC is attached; all other documentation may be obtained by calling Western Excelsior Technical Services at 1-866-540-9810, at www.westernexcelsior.com or by email at wexcotech@westernexcelsior.com.

Regards,

A handwritten signature in black ink, appearing to read "Chad M. Lipscomb".

Chad M. Lipscomb, PE (CO), CPESC
Director, Technical Services
Western Excelsior Corporation

MATERIAL PROPERTIES AND DIMENSIONS



Specifications

Western Excelsior manufactures a full line of Rolled Erosion Control Products (RECPs). PP5-Heavy Duty™ is a fully synthetic, UV stable Turf Reinforcement Mat (TRM) manufactured by weaving continuous, synthetic thread elements by way of a proprietary (patent pending) process to form a lofty, three-dimensional pattern. PP5-Heavy Duty is resistant to environmental and climatic conditions and provides high strength, durability and turf reinforcement performance.

Each roll of PP5-Heavy Duty is made in the USA and manufactured under Western Excelsior's Quality Assurance Program to ensure a consistent distribution of strands and consistent thickness. PP5-Heavy Duty is constructed of UV stabilized, high strength synthetic yarns to be incorporated into turf and/or the soil matrix. For typical applications, the expected design life of PP5-Heavy Duty is twenty-five years, however, may be less or indefinite. Typical manufactured properties are provided in Table 1 and product characteristics are provided in Table 2.

Table 1- Specified Expected Values

Tested Property	Test Method	Value
Tensile Strength (MD) x (TD)*	ASTM D6818	2500 lb/ft (36 kN/m) x 2250 lb/ft (33 kN/m)
Elongation (MD) x (TD)	ASTM D6818	25 % x 20 %
Tensile Strength @15% Strain	ASTM D6818	2250 lb/ft (44 kN/m) - (MD &TD)
Initial Tangent Modulus (MD)	ASTM D6818	8.0 kip/ft (9.7 kN/m)
Initial Tangent Modulus (TD)	ASTM D6818	13.0 kip/ft (15.8 kN/m)
Mass Per Unit Area	ASTM D6566	9.2 oz/yd ² (312 g/m ²)
Thickness	ASTM D6525	0.30 in (8 mm)
Light Penetration	ASTM D6567	30 % open
Water Absorption	ASTM D1117	N/A %
Resiliency	ASTM D 6524	70 %
Porosity	Computed	96 %
UV Stability	ASTM D 4355	100% (500hr) / 90% (3000hr)

*Value specified as Minimum Average Roll Value (MARV)

Table 2 - Netting

PP5-Heavy Duty is a woven product, thus no netting is utilized in the construction of the material.

PP5-Heavy Duty is available in multiple roll sizes ranging in width from 8.0 ft to 12.0 ft. and 112.5 ft to 180 ft in length. Standard roll sizes are 100 square yards, measuring 8.0 ft wide by 112.5 ft long. Custom roll sizes are available upon request. Large rolls may require a cardboard core. PP5-Heavy Duty is manufactured in the USA with 100% of component materials derived from domestic sources.

Document # WE_EXCEL_PP5HD_SPEC. This document has been developed to provide the characteristic properties of the product described. For questions, to request performance data or installation recommendations, contact Western Excelsior at 866-540-9810 or wexcotech@westernexcelsior.com. Updated 4/14/2014.

DESIGN DATA AND TEST RESULTS



Specifications

A variety of test methods are utilized to determine performance and conformance values for Rolled Erosion Control Products (RECPs). Information within this document is presented to provide conformance values and recommended design values. Test results obtained for the PP5-Heavy Duty Turf Reinforcement Mat (TRM) and general design values are presented in Tables 1-4. For specific information detailing testing protocols, results and application of design values, refer to document number WE_EXCEL_PERF_GEN.

Table 1 - Bench Scale Testing / NTPEP

Test Method	Condition	Result
ASTM D7101 Bench Scale Rainfall and Rainsplash Test	2 in per hour	3.48
	4 in per hour	3.28
	6 in per hour	3.08
ASTM D7207 Bench Scale Shear Resistance Test	3.83 psf (183 PA)	0.5 in (12 mm)
ASTM D7322 Bench Scale Vegetation Establishment Test	Top Soil, Fescue, 21 Day Incubation	423 %

Table 2 - Texas Transportation Institute (TTI) Results

Class	Test Condition	Result
A	< 3H:1 Clay Slope Test	N/A
B	< 3H:1 Sand Slope Test	N/A
C	> 3H:1 Clay Slope Test	N/A
D	> 3H:1 Sand Slope Test	N/A
E	2 psf Partially Vegetated Channel Test	N/A
F	4 psf Partially Vegetated Channel Test	N/A
G	6 psf Partially Vegetated Channel Test	N/A
H	8 psf Partially Vegetated Channel Test	N/A

Table 3 - Recommended Design Values*

Design Value	Unvegetated	Vegetated
Typical RUSLE Cover Factor (C Factor)**	N/A	N/A
Maximum Slope Gradient (RUSLE)	N/A	N/A
Max Allowable Velocity (0.5 in (12mm) soil loss)***	N/A	20.0 ft/s (6.1 m/s)
Max Allowable Shear Stress (0.5 in (12mm) soil loss)***	N/A	12.0 psf (575 PA)
CF _{veg} /CF _{TRM}	N/A	0.26

**C Factor value compliant with ASTM D6459.
*** Shear Stress and Velocity values compliant with ASTM D6460.

Table 4 - HEC-15 Resistance to Flow Values

Design Value	Unvegetated
Manning's n @ Tau _{lower}	0.026
Manning's n @ Tau _{mid}	0.026
Manning's n @ Tau _{upper}	0.026

*Recommended Design Values are based on results of standardized industry full-scale testing and may not be applicable for all field conditions. For most accurate computation of field performance, consult Excel Erosion Design (EED) at www.westernexcelsior.com.

Document # WE_EXCEL_PP5HD_PERF. This document has been developed to provide information regarding the bench scale and/or performance testing conducted on the PP5-Heavy Duty TRM. For questions or installation recommendations, contact Western Excelsior Technical Services Division at 866-540-9810 or wexcotech@westernexcelsior.com. Updated 4/14/2014.



Slope Installation Instructions

PP5-Heavy Duty™

* Drawings Not to Scale

Step 1 - Site Preparation

Prepare site to design profile and grade. Remove debris, rocks, clods, etc.. Ground surface should be smooth prior to installation to ensure blanket remains in contact with slope.

Step 2 - Seeding

Seeding of site should be conducted to design requirements or to follow local or state seeding requirements as necessary.

Step 3 - Staple Selection

At a minimum, 6 in. long by 1 in. crown, 11 gauge staples are to be used to secure the blanket to the ground surface. Installation in rocky, sandy or other loose soil may require longer staples.

Step 4 - Excavate Anchor Trench and Secure Blanket

Excavate a trench along the top of the channel side slopes and the upstream terminal end of the channel to secure the edges of the blanket. The trench should run along the length and width of the installation, be 6 in. wide and 6 in. deep. Staple blanket along bottom of trench, fill with compacted soil, overlap blanket towards toe of slope and secure with row of staples (shown in Figures A, E and F).

Step 5 - Secure Body of Blanket

Roll blanket down slope from anchor trench. Staple body of blanket following the pattern shown in Figure D. Leave end of blanket unstapled to allow for overlap shown in Figure B. Place downstream blanket underneath upstream blanket to form shingle pattern. Staple seam as shown in Figure E. Secure downstream blanket with stapling pattern shown in Figure D. Stapling pattern shown in Figure D reflects minimum staples to be used. More staples may be required to ensure blanket is sufficiently secured to resist mowers and foot traffic and to ensure blanket is in contact with soil surface over the entire area of blanket. Further, critical points require additional staples. Critical points are identified in Figure G.

Step 6 - Continue Along Slope - Complete Installation

Overlap adjacent blankets as shown in Figure C and repeat Step 5. Secure toe of slope using stapling pattern shown in Figure E. Secure edges of installation by stapling at 1.0' intervals along the terminal edge, as shown in Figure E.

Figure A

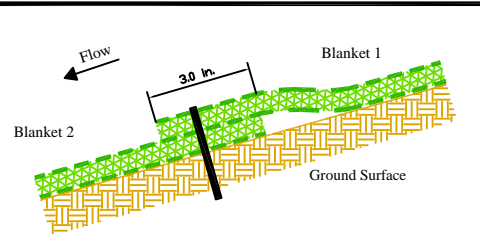


Figure B - Profile View

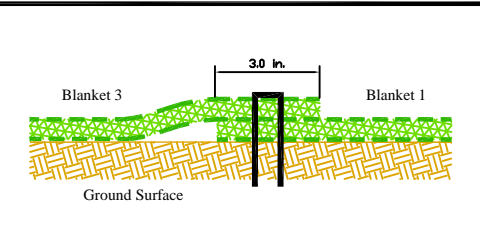


Figure C - Cross Section View

Product Application/Equivalency Specifications

PP5-Heavy Duty is produced by Western Excelsior and consists of a permanent Rolled Erosion Control Product (RECP) comprised of UV stable synthetic yarns continuously woven into a three-dimensional profile. PP5-Heavy Duty is designed and manufactured to provide immediate erosion control and permanent turf reinforcement and is comprised of physical properties sufficient to provide the intended longevity and performance. Additionally, PP5-Heavy Duty is constructed to yield a high tensile strength, high durability material. Product specifications may be found on document WE_EXCEL_PPHD_SPEC and performance information may be found on document WE_EXCEL_PPHDT_PERF. All documents are available from Western Excelsior Technical Support or www.westernexcelsior.com. Additional to above, equivalent products to PP5-Heavy Duty must meet identical criteria as PP5-Heavy Duty as follows:

1. Consist of woven synthetic yarns to form a high strength, interlocking three-dimensional matrix.
2. Sufficient tensile strength, thickness and coverage to maintain integrity during installation and ensure material performance. Provide permanent turf reinforcement with longevity greater than three years, immune from moisture damage or chemical conditions within the soil.
3. Listing within AASHTO NTPEP database.
4. Meet ECTC specification for category 5C product.

Figure E

Figure C

Figure F

Figure B/
Figure E

Figure D

Figure E

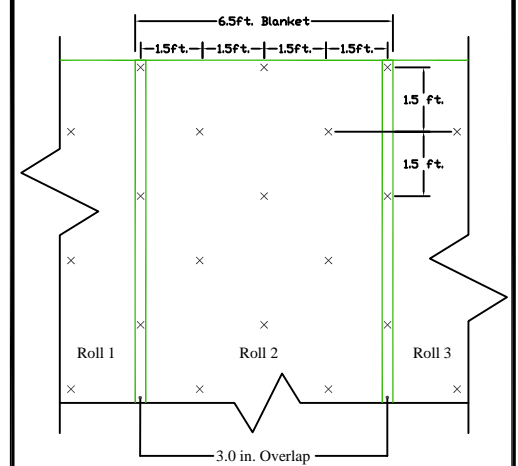


Figure D - Plan View × - Denotes Staple Location

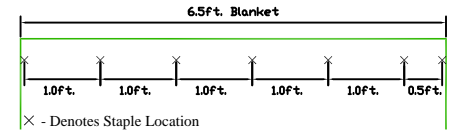


Figure E -
Plan View

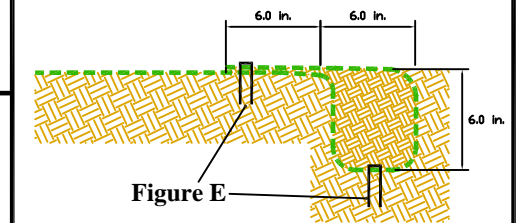


Figure E

Figure F - Profile View

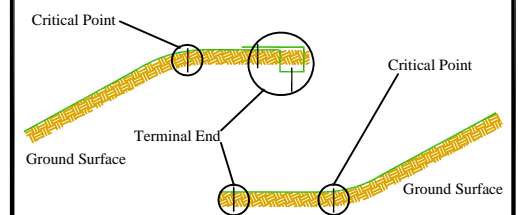


Figure G - Critical Point Securing



Channel Installation

Instructions
PP5-Heavy Duty™

Step 1 - Site Preparation

Prepare site to design profile and grade. Remove debris, rocks, clods, etc.. Ground surface should be smooth prior to installation to ensure blanket remains in contact with slope.

Step 2 - Seeding

Seeding of site should be conducted to design requirements or to follow local or state seeding requirements as necessary.

Step 3 - Staple Selection

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Step 6 - Continue Along Slope - Complete Installation

Overlap adjacent blankets as shown in Figure C and repeat Step 5. Secure toe of slope using stapling pattern shown in Figure E. Secure edges of installation by stapling at 1.0' intervals along the terminal edge, as shown in Figure E.

* Drawings Not to Scale

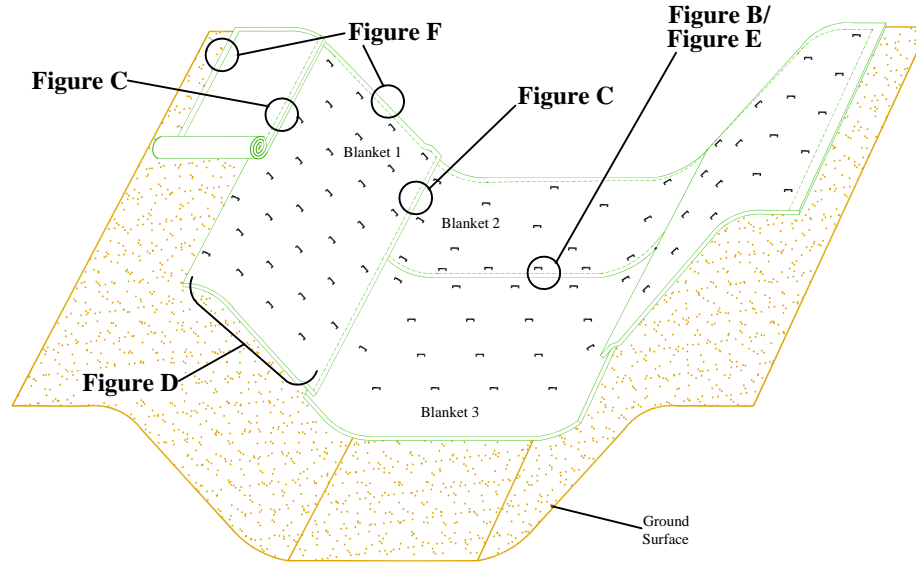


Figure A

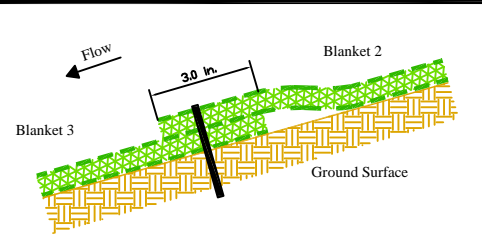


Figure B - Profile View

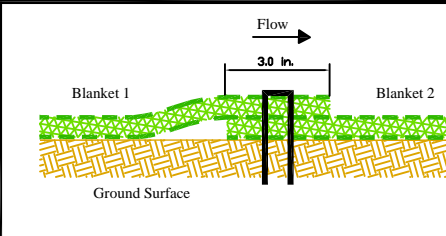


Figure C - Cross Section View

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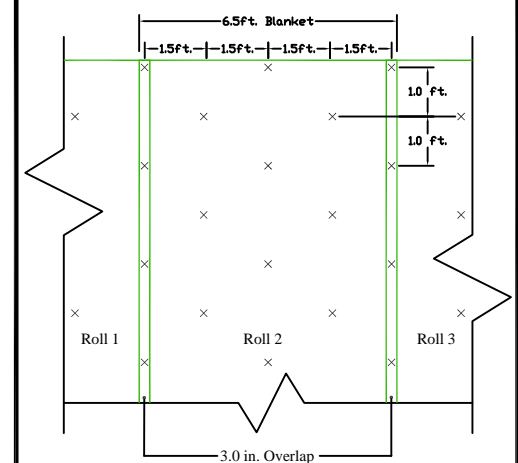


Figure D - Plan View × - Denotes Staple Location

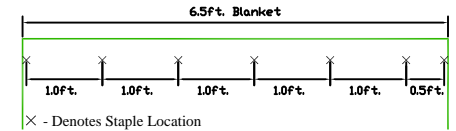


Figure E - Plan View

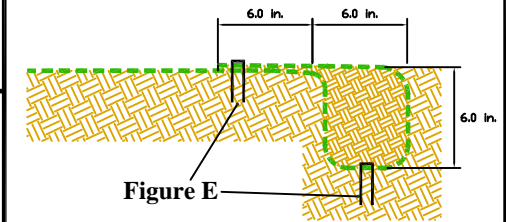


Figure F - Profile View

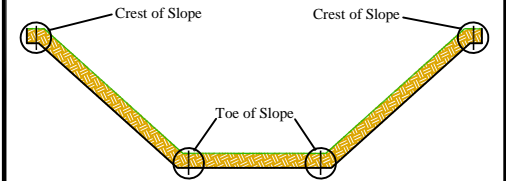


Figure G - Critical Point Securing