Overview

The National Transportation Product Evaluation Program (NTPEP) was developed to provide quality and responsive engineering to the testing and evaluation of products, materials, and/or devices that are commonly used by the AASHTO Member Departments of Transportation. Among the critical objectives of the program is to improve the nation’s transportation system by elevating the quality of available products and encouraging product innovation. NTPEP test reports contain data collected according to laboratory testing protocols developed through a consensus-based decision by AASHTO’s NTPEP Committee. Products are voluntarily submitted by manufacturers for testing by NTPEP. Testing fees are assessed from manufacturers to reimburse AASHTO member departments for conducting testing and reporting results. AASHTO member departments provide a voluntary yearly contribution to support the administrative functions of NTPEP. AASHTO/NTPEP does not endorse any manufacturer’s product over another. Use of certain proprietary products as “test control specimens” does not constitute endorsement of those products. The AASHTO/NTPEP ECP program does not issue product approval or disapproval; rather, test data is furnished for the user to evaluate products for prequalification or approval for their transportation agency.

The Erosion Control Products (ECP) Work Plan was established to minimize the amount of duplicative erosion control product testing conducted/solicited by member state transportation agencies. It has included Index and Bench-Scale testing of Rolled Erosion Control Products (RECPs) since 2003. Index tests conducted include Mass per Unit Area ASTM D 6475 and ASTM D 6566, Thickness ASTM D 6525, Tensile Strength ASTM D 6818, Light Penetration ASTM D6567, Water Absorption ASTM D 1117, and Specific Gravity ASTM D 792 Method A. Bench-Scale tests conducted include Slope Erosion and Runoff Reduction ASTM D 7101-08, Permissible Shear and Channel Erosion ASTM D 7207-07, and Germination/Vegetation Growth ASTM D 7322-07. Products are required to resubmit to NTPEP for Index and Bench-Scale testing every three (3) years for requalification. Optional Large-Scale testing is also available through the ECP program. The tests offered are ASTM D 6459-07, large-scale slope erosion, and ASTM D 6460-07, large-scale channel erosion (both unvegetated and vegetated). Additionally, the ECP Work Plan now includes the Large-Scale evaluation of Hydraulic Erosion Control Products (HECPs) which are an acceptable alternative to RECPs. The user is urged to carefully read the full NTPEP test reports and to consider any special clauses, footnotes or conditions which may apply to any test reported. The user must be sufficiently familiar with the product performance requirements and/or specifications of their agency in order to determine which test data is relevant to meeting those qualifying factors.

Products submitted to NTPEP are sampled according to protocol established to ensure independent random specimens are selected for testing. The specimen selection is overseen and documented by local state transportation agency personnel. Samples are collected directly from the manufacturing plant. Multiple rolls/bales are selected from different lots or production dates and shipped to the laboratory.

NTPEP seeks out independent laboratories offering the standard test methods contained in the ECP Work Plan. ECP Laboratories are audited on an annual basis by the Geosynthetics Accreditation Institute. This independent third party accreditation reviews the laboratory’s quality system, standard operating procedures, training
procedures and all other quality elements, and verifies test apparatus and procedures are in accordance with the standard.

NTPEP is not intended as a tool for a manufacturer’s research and development but rather should be used once a product is being produced under standard operating procedures (SOPs). The manufacturing SOPs should include rigorous quality control procedures. Documentation of quality control procedures and lot specific quality control test results should be available to a transportation agency from the manufacturer upon request. NTPEP results can thus be compared to product literature as well as a manufacturer’s own quality control test results from the lots sampled for NTPEP testing as part of the DOT’s own product approval process. In this way, an agency can determine that a random sampling of a specific product may or may not substantiate that the product is typically manufactured as represented to the public and, therefore, may or may not be acceptable to the agency.

Index Testing
Index tests are standard tests that may be used to compare the relative material properties of several different ECPs. The ECP properties that are evaluated using index tests are typically not appropriate for design. The primary ECP properties that are measured for quality control using index tests are mass per unit area, thickness, tensile strength, water absorption, and light penetration. Specific gravity is measured in lieu of water absorption for permanent (synthetic) mats.

Quality Control tests are index tests which are performed on a production basis to evaluate product integrity, quality and continuity, and to assess the impact of changes in production methodology on product properties. Quality control test results can be reported with statistical relevance when they are run with sufficient frequency.

Mass per Unit Area
The mass per unit area, also known as the “weight” per square yard of a sample, is an important quality control property. The ECB test uses ten 8”x8”. The TRM test uses five larger, typically 12”x14”. Specimens are oven dried overnight prior to testing.

Thickness
Thickness is another important quality control property which is measured after application of a 6-inch diameter presser foot under a 0.029 psi pressure.

Tensile Strength
The ASTM tensile test method is used for all RECPs and uses at least 5 inch-wide grips.
Light Penetration


A light box has commonly been used to quantify the openness of textile materials. It illuminates a light source inside a box on one side of the specimen. On the other side, a calibrated meter measures the amount of light that is able to pass through the specimen. A light box procedure that increases the bulb wattage to 150 watts has been standardized by ASTM specifically for TRMs.

Water Absorption

*ASTM D 1117 Section 5.4 and ECTC-TASC 00197, “Standard Guide for Evaluating Nonwoven Fabrics – Absorptive Capacity Test (for Larger Test Specimens)”*

Water absorption is a measure of a material’s capacity to absorb water and is generally applicable to organic RECPs.

Specific Gravity


Specific gravity is a measure of the unit weight of a material as compared to that of water.

Bench-Scale Testing

Bench-scale “indexed” performance tests are a class of tests that have been developed to focus on testing the ECP/soil system under carefully controlled “standard” conditions. Bench-scale tests have been developed for slope erosion, channel erosion, and vegetation enhancement for ECPs. Variations in the mass per unit area, raw materials, manufacturing processes, and other product and production components are a constant challenge to manufacturers of ECPs. Since performance of ECPs relies on the complex interaction of the ECP structure with the soil and the water impact/flow, it is helpful and beneficial to a quality assurance program to be able to examine the effects of product variability without having to rerun full-scale tests. Bench-scale testing facilitates lower costs and quicker testing for evaluating product conformance. However, it is critical to emphasize that bench-scale testing is not appropriate for use in design models. These tests do not reflect product installation techniques or site conditions to which these materials are typically subjected. Therefore the results of these tests may not be indicative of a RECPs actual field performance.

Slope Erosion and Runoff Reduction

*ASTM D 7101-08, “Standard Index Test Method for Determination of Unvegetated Rolled Erosion Control Product (RECP) Ability to Protect Soil from Rain Splash and Associated Runoff under Bench-Scale Conditions”*

This test method sets forth the procedures for evaluating the ability of RECPs to protect soil from rain splash and immediate runoff-induced erosion. The critical element of this protection is the ability of the RECP to absorb the impact force of raindrops, thereby reducing soil particle loosening through “splash” mechanisms. The test method utilizes containers of both bare and RECP-protected soil that are exposed to simulated rainfall and immediate runoff for 30 minutes in the test apparatus. It is a sloped table enclosed by a curtain. Rainfall is simulated using a laboratory drip-type simulator capable of creating uniform drops with a median diameter of 3.0 to 3.5 mm from a drop height of 2.0±0.1 m and producing rainfall intensities as high as 150 mm/hr. The amount of soil that splashes or is washed out of the containers is collected and weighed. From this data, an appropriate soil loss ratio or associated C-factor can be calculated by comparing the RECP-protected soil loss to

March 2011
the control. However, the C-factor obtained should only be used for initial performance indication, general product comparison and conformance. It should not be used as a factor in estimating RECP soil protection in actual field use with such calculations as the Universal Soil Loss Equation (USLE) or Revised Universal Soil Loss Equation (RUSLE) without verification from qualified large-scale tests.

**Permissible Shear and Channel Erosion**

*ASTM D 7207-05, “Standard Test Method for Determination of Unvegetated Rolled Erosion Control Product (RECP) Ability to Protect Sand from Hydraulically-Induced Shear Stresses under Bench-Scale Conditions”*

This test method sets forth the procedures for evaluating the ability of RECPs to protect soils from flow-induced erosion. The test method utilizes containers of RECP-protected soil that are immersed in water and subjected to shear stresses caused by the rotation of a three-blade impeller for 30 minutes in the test apparatus. The shear stress test apparatus includes a tank, test well, motor, plastic lid, and impeller. The three-blade impeller is mounted in the cylindrical tank so that the lower edge of the blades is slightly above the floor of the tank. The sample test well is a recession in the floor of the tank that holds the pots of soil prepared for testing. When the pots are placed in the well, the test surface is flush with the floor of the tank. Pots holding soil and test specimens are normally 200 mm diameter plastic pipe sections with height of 100 mm. The amount of soil that erodes is found by weighing the containers under water. The results of the testing include the amount of soil lost at various shear stresses. From this data, an appropriate permissible shear can be calculated by assuming a critical amount of soil loss, typically 13 mm. The index limiting shear stress value obtained should only be used for initial performance indication, general product comparison and conformance. It should not be used as a maximum permissible shear stress value for a RECP in actual channel protection design using the Maximum Shear Stress Channel Design Procedure without verification from qualified large-scale tests.

**Germination/Vegetation Growth**


This test method established procedures for evaluating the ability of RECPs to enhance the rate and quantity of seed germination and facilitate subsequent establishment of vegetation. Containers of soil are sown with a single indexed seed mix and then covered with an RECP. Additional containers are left uncovered as controls. Testing is conducted within a growth chamber where the light, water, and temperature are regulated and documented. The rate of germination is measured periodically throughout the test, and the weight of vegetation is calculated at the conclusion of the test. The testing results include the rate and total weight of germination after 21 days. From this data, a percent enhancement can be calculated by comparing results from the RECP-protected soil to the control.

**Large-Scale Testing**

Large-scale performance tests have been developed to simulate expected field conditions to report performance properties of “as installed” ECPs. Large-scale tests have been developed for slope erosion and channel erosion. The channel erosion test is conducted in both a bare soil condition and a vegetated condition. Performance of ECPs relies not only on the product characteristics and the interaction with the soil and water, but also on the installation techniques. Products are installed on the test slope or channel per manufacturer installation recommendations. The results of these tests are more indicative of actual field performance of ECPs and are acceptable for use in design calculations.

March 2011
Slope Erosion


This large-scale test is conducted on one bare soil control and three replicate ECP-protected soil 3:1 slopes. Rainfall is simulated at target intensities of 2, 4, and 6 inches per hour which are applied in sequence for 20 minutes each. Runoff from each slope is collected and soil loss is measured. From this data, an appropriate soil loss ratio and associated C-factor can be calculated by comparing the ECP-protected soil loss to that of the control. A C factor of 1 is the measure of performance of a bare soil test plot or slope. An 80% reduction in soil loss correlates to a C factor of 0.20. The NTPEP report includes a C value at a common point in the storm event, represented by a R factor of 231. The report also includes the equation used in the regression that would allow the individual state member DOTs to tailor a different storm event to local conditions. Users of these reports should pay close attention to the density and configuration of the anchoring devices as these have shown to directly correlate to the performance of the products. In addition, the coverage rate of HECPs also directly correlates to their performance.

Channel Erosion


This large-scale test is conducted in a rectangular flume with at least four sequential increasing flows applied for 30 minutes each. Unvegetated RECP-protected soil is typically tested on a 10% slope flume. Vegetated RECP-protected soil is tested on a 20% slope flume. The limiting or permissible shear stress is defined as the shear stress necessary to cause an average of 0.5 inch of soil loss over the entire channel bottom. Users of these reports should pay close attention to the density and configuration of the anchoring devices as these have shown to directly correlate to the performance of the products.