Prest®

GEOSYSTEMS
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GEOWEB® system

high-performance vegetated solutions

RESEARCH SYNOPSIS

RESEARCH OBJECTIVE

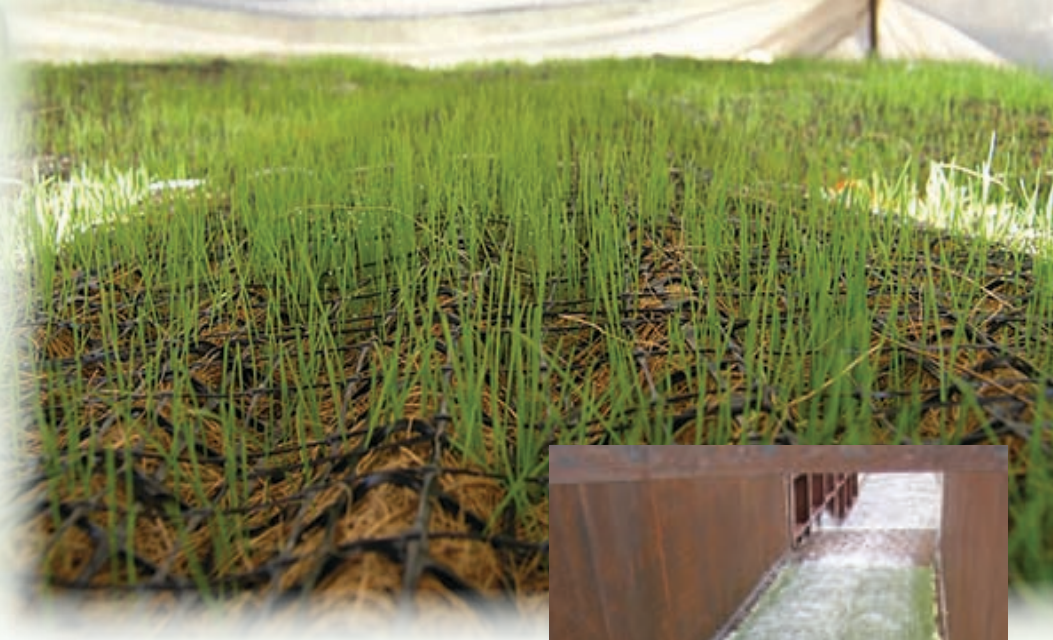
Measure performance of the Geoweb® (GW) material combined with a turf reinforcement mat (TRM) (integrated system) with topsoil infill and vegetation under varying shear stresses and flow rates to quantify both hydraulic forces and corresponding soil loss.

The test consisted of a series of continuous one-hour flows over the GW-TRM system at incrementally increasing discharges. The performance threshold was defined as the point at which 0.5 inch (13 mm) of soil loss occurred.

creating sustainable environments™

GEOWEB®

research scenario



THE RESEARCH FACILITY

Steep-Gradient Overtopping Facility (SGOF) at the Hydraulics Laboratory of the Engineering Research Center (ERCD) at Colorado State University (CSU), Ft. Collins, Colorado

TEST TIMEFRAME

April 2005 – August 2006

TEST MATERIALS

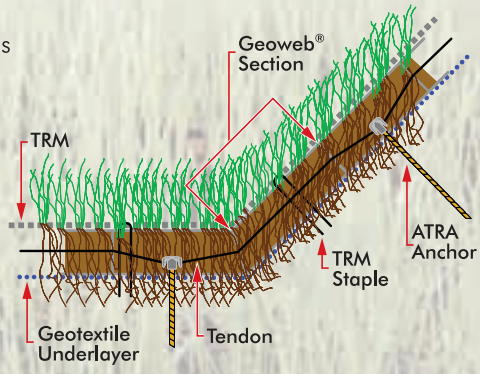
- Presto Geoweb® Cellular Confinement System
- North American Green C350 Turf Reinforcement Mat

scope of test

Hydraulic performance testing was conducted on an integrated system comprised of the GW30V textured/perforated Geoweb system and the North American Green C350 composite turf reinforcement mat. The C350 TRM was chosen for its known performance in the test apparatus. Six tests were conducted under the research program to measure performance of the integrated system, identify stability threshold conditions and to quantify both hydraulic forces and soil loss.

assembling the test components

1. The selected textured/perforated Geoweb section was placed in the test apparatus and topsoil infill added.
2. When the Geoweb cells were completely infilled with topsoil, the soil was lightly tamped.
3. Grass seed and mulch were added to finalize the growing medium.
4. The turf reinforcement mat was secured over the textured/perforated Geoweb section by ground staples at defined intervals in conformance with the manufacturer's recommendations.
5. Vegetation was established over a 14-week period to allow root system integration within the perforated cells of the Geoweb material. Kentucky bluegrass was the chosen vegetation for this series of tests.



test procedures/results

The test apparatus is lifted and positioned in place in the flume with a 2h:1v slope. In an effort to model storm conditions, the soil was saturated prior to the six tests. The integrated system was subjected to flow discharges ranging from 10 ft/sec (3.0 m/sec) to 27 ft/sec (8.2 m/sec). Two sets of water surface elevation data were taken; one at the beginning and one at the end of each hour-long flow to obtain an average depth. Vegetation density counts were also measured prior to and directly after each test at upstream, midstream and downstream locations.

observations

Exposed to the extreme flows, and despite ordinary topsoil infill and typical TRM staple patterns, the system showed no measurable soil loss. It was observed that the vegetation had decreasing stem and blade count during the total testing timeframe, however at a decreasing rate-of-loss for each incremental test.

Chosen vegetation type will influence the stem and blade loss. Typically a hardier grass type or blend would be used for field applications rather than pure Kentucky bluegrass.

At the completion of the test, an extracted soil sample showed vegetative root penetration to a depth of 1.5 inches (38 mm), with larger roots interacting with the cell wall perforations. As future growth occurs, root interaction will increase.

testing summary/conclusions

No system instability was observed for shear stresses up to 15.9 lbf/ft^2 (77.6 kgf/m^2) and for average velocities up to 26.5 ft/sec (8.1 m/sec) with peak velocities over 29 ft/sec (8.8 m/sec). Due to facility constraints that prevented testing higher velocities than those reported, system failure limits were never found. The test results for the integrated system far exceed the limits of separately reported values of the Geoweb cellular confinement system and turf reinforcement mats with topsoil/vegatated soil.

field applicability

The results of this integrated system testing can be applied to highway drainage ditches, spillways, dam and pond overflow systems and other vegetated channels exposed to high shear forces and intermittent, longer-duration velocities. This system replaces rip rap with a less expensive, low maintenance, aesthetically-pleasing green solution.

Stabilized Spillway with Geoweb®/TRM Solution

Stabilized ditch with Geoweb®/TRM solution

Typical Ditch Erosion Problem

EXCLUSIVITY OF RESULTS

The results of the testing are exclusive to the materials utilized in this test. Specifically, no inference shall be drawn from this research review indicating suitability of any cellular confinement system other than the genuine Geoweb® cellular confinement system. Due to the challenging nature of the projects for which this application applies, we strictly warn the reader of the potential for significant infill loss, project failure, and/or loss of property or life if substitutions are made including, but not limited to the Geoweb® cellular confinement product and a properly prepared engineering design analysis.

CERTIFIABLE RESULTS

Results of this testing/research are certifiable and only available through Presto Geosystems.

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