

ScourStop Transition Mat[®] Report 2007 Performance Testing for Erosion Tech, Inc.

Prepared for
Erosion Tech, Inc.



Prepared by
Michael D. Turner
Amanda L. Cox
Christopher I. Thornton

December 2007

Colorado State University
Daryl B. Simons Building *at the*
Engineering Research Center
Fort Collins, Colorado



ScourStop Transition Mat[®] Report 2007 Performance Testing for Erosion Tech, Inc.

Prepared for
Erosion Tech, Inc.

Prepared by
Michael D. Turner
Amanda L. Cox
Christopher I. Thornton

December 2007

Colorado State University
Daryl B. Simons Building *at the*
Engineering Research Center
Fort Collins, Colorado



4 SUMMARY

Beginning in November 2006, vegetated and un-vegetated reinforced plots were tested to examine the performance of the ScourStop Transition Mat[®] system, manufactured by Erosion Tech, Inc. Tests were conducted on six distinct installations, including: ScourStop over Kentucky Blue Grass, ScourStop over Propex Landlok[®] 1051, and ScourStop anchors securing a composite system of Propex Geotex[®] 311 and Propex Pyramat[®]. Between November 2006 and August 2007, the revetment systems were tested in two facilities at CSU's Engineering Research Center: 1) an adjustable-slope overtopping facility and 2) a Steep Gradient Overtopping Facility. The ScourStop Transition Mat[®] over Kentucky Blue Grass demonstrated acceptable performance for shear stresses up to 13.1 psf, while the ScourStop Transition Mat[®] over Propex Landlok[®] 1051 demonstrated acceptable performance for shear stresses up to 8.1 psf. The composite system consisting of ScourStop anchors, Propex Geotex[®] 311, and Propex Pyramat[®] demonstrated acceptable performance up to 6.4 psf. Testing was terminated on each configuration after the industry standard of 0.5 in. of soil loss was exceeded. Table 4.1 presents a summary matrix of the soil-loss analysis for each of the configurations tested under the described test program. This report provides descriptions of the test program, test matrices, database, and analysis of the testing data.

Table 4.1. Soil-loss Analysis Summary Matrix

Configuration Number	Test Number	CSLI	Exceedence of Performance Threshold?
(No.)	(No.)	(in.)	(Yes/No)
1	1	0.000	No
1	2	0.000	No
1	3	0.000	No
1	4	0.000	No
1	5	0.000	No
1	6	0.000	No
1	7	0.000	No
1	8	0.000	No
2	1	0.015	No
2	2	0.031	No
2	3	0.031	No
2	4	0.038	No
2	5	0.038	No
2	6	0.047	No
2	7	0.047	No
2	8	0.084	No
2	9	0.125	No
2	10	0.138	No
2	11	0.153	No
3	1	0.040	No
3	2	0.050	No
3	3	0.090	No
3	4	0.140	No
3	5	0.200	No
3	6	0.290	No
3	7	0.370	No
3	8	0.420	No
3	9	0.570	Yes*
4	1	0.090	No
4	2	0.380	No
4	3	n/a	Yes**
5	1	n/a	Yes**
6	1	n/a	Yes**
*Exceedence of performance threshold determined by evidence of localized scour in addition to CSLI data. ** Exceedence of performance threshold determined by observed system instability during testing.			

Raw hydraulic and scour data from this testing protocol were analyzed to yield performance thresholds for each of the four configurations. A comparative basis for reasonable performance projections was established with current literature regarding permissible velocities for vegetated and unvegetated HPTRM systems. Table 4.2 presents maximum permissible velocities for common materials. The permissible velocity provided for the unvegetated HPTRM was determined from prior CSU performance testing.

Table 4.2. Permissible Velocities for Common Channel Materials

Channel Slope (percent)	Material	Permissible Velocity	
		(m/s)	(ft/s)
0-1	Firm Loam	1.07	3.50
0-1	Kentucky Blue Grass	1.52	5.00
0-1	Bermuda Grass	1.83	6.00
0-1	Unvegetated HPTRM	2.00	5.50
0-1	15.25-cm (6-in.) Riprap*	2.40	8.45
0-1	30.50-cm (12-in.) Riprap*	2.35	10.65

*For the riprap calculations, a critical velocity equation from HEC-18 (Richardson and Davie 2001) was used with a representative depth for testing of 0.23 m (0.75 ft).

The data collected for each configuration were examined by CSU, and hydraulic performance limits were determined. Subsequently, the data obtained from the vegetated test, Configurations No. 1, and 4 through 6, indicated the critical relationship between the presence of vegetation and increased performance thresholds. Relative performance for each of the tested configurations can be established following comparison with the information presented in Table 4.2. Table 4.3 presents the relative performance for each of the tested configurations.

Table 4.3. Relative Performance for Each Tested Configuration

Base Material	Configuration Number (No.)	Permissible Velocity of Base Material and Transition Mat		Velocity Increase Ratio (No.)
		(m/s)	(ft/s)	
Kentucky Blue Grass	1, 4-6	5.9	19.3	3.9
Unvegetated TRM (TM over Propex® 1051)	2	5.9	19.5	3.5*
Unvegetated HPTRM (Propex® Pyramat, Propex® Geotex 311, secured with TM anchors)	3	3.2	10.6	1.9

* Velocity increase ratio for unvegetated TRM derived from comparison of observed maximum velocity with unvegetated HPTRM permissible velocities.

By examining the velocity increase ratio from Table 4.2, it can be concluded that the TM can withstand 3.9 times more velocity than Kentucky Blue Grass alone. Configuration 2 exceeded the velocity threshold by a factor of 3.5, while Configuration 3 performed acceptably for velocities 1.9 times greater than the listed threshold. All configurations exceeded the permissible velocity for riprap up to 15.25 cm (6 in.), and all configuration except Configuration 3 exceeded the permissible velocity for riprap up to 30.5 cm (12 in.). It should be noted that Configurations No. 2 and No. 3 were tested in an unvegetated condition. Once these HPTRM and TM systems become vegetated, an increased performance threshold can be expected. On a final note, the anchor system was identified as a critical component of the erosion control system in securing the mats and enabling them to resist shear stresses.

Colorado State University recommends that Erosion Tech, Inc. contract with a qualified hydraulics consultant for the examination and recommendation of the hydraulic performance of the TM system tested within this test program.