SCOURSTOP TRANSITION MAT DATA REPORT
2005 TESTING

Prepared for

Carpenter Erosion Control

Prepared by

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4 SUMMARY

During the summer of 2005, hydraulic performance testing of the ScourStop TM system was conducted at Colorado State University. The testing program utilized a 33-in. diameter culvert at the base of the Steep Gradient Overtopping Facility at the Hydraulics Laboratory of the Engineering Research Center. The purpose of this report is to provide the test procedure and results from the testing of the ScourStop TM scour prevention system submitted for testing under controlled laboratory conditions. The industry standard with regard to defining the performance threshold for RECPs, which govern HPTRMs, is 0.5 in. of soil loss upon completion of a continuous flow over the test section. Due to the grid formation for data-point acquisition, the post-test data may only indicate an exceedence of the performance threshold at a few isolated areas, however, visual inspection may indicate localized scour surrounding the data point. Using this knowledge in conjunction with the RECP standard, the performance threshold for the TM system was agreed upon by both CSU and CEC, and defined as the point where 0.5 in. of soil loss was evident by post-test survey data in conjunction with decisions made by CSU personnel regarding potential localized scour patterns. Table 4.1 presents a summary matrix of the soil-loss analysis for each of the configurations tested under the described test program.

Table 4.1. Soil-loss Analysis Summary Matrix

Configuration Number (No.)	Test Number (No.)	CSLI (in.)	Exceedence of Performance Threshold? (Yes/No)
1	1	0.07	No
1	2	0.12	No
1	3	0.21	No
2	4	0.06	No
2	5	0.08	No
2	6	0.25	Yes*
3	7	0.09	No
3	9	0.14	Yes*
4	10	0.24	Yes*

*Exceedence of performance threshold determined by evidence of localized scour in addition to CSLI data.

Data from the hydraulic testing of a full-scale scour countermeasure system can be used in determining the hydraulic performance threshold for each of the four test configurations, as testing was started at reasonable performance projections based upon reliable literature regarding permissible velocities of both vegetated and HPTRM-lined channels. As a basis for comparison, 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).

Descriptions of the test facility, test program, and test matrix are presented in this report. The data collected for each configuration were examined by CSU, and hydraulic performance limits were determined for the tests conducted under the aforementioned test program. Subsequently, the data obtained from the vegetated test, Configuration No. 1, proved to indicate the critical nature of vegetation with regard to increased performance levels and lower factors of risk. Given that the sod and TM combination had exceeded industry standards for permissible velocities, a combination of HPTRM and sod with the TM was not tested; however, the utilization of such a HPTRM over the sod should lead to the same, if not increased, performance levels. By examining each of the tested configurations, a quantitative value of relative performance can be determined from the information obtained during testing and 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

Channel Slope (percent)	Base Material	Configuration Number (No.)	Permissible Velocity of Base Material and Transition Mat		Velocity Increase Ratio (No.)
			(m/s)	(ft/s)	
0-1	Kentucky Blue Grass	1	4.88	16.0	3.2
0-1	Unvegetated HPTRM	2	2.80	9.2	1.4
0-1	Unvegetated HPTRM	3	3.57	11.7	1.8
0-1	Unvegetated HPTRM	4	3.57	11.7	1.8

By examining the velocity increase ratio from Table 4.2, it can be concluded that the TM can withstand 3.2 times more velocity than Kentucky Blue Grass alone. In addition, for either Configurations No. 3 or No. 4, the TM can withstand 1.8 times more velocity than the unvegetated HPTRM alone. It was also noted that Configurations No. 1, No. 3, and No. 4, all exceeded the permissible velocity for riprap up to 30.5 cm (12 in.), and Configuration No. 2 exceeded the permissible velocity for riprap up to 15.25 cm (6 in.). It should be noted that