

Performance Testing of Turf Reinforcement Mats

Brian Smith

Hydraulics Program, Civil Engineering Department, CSU, Fort Collins, CO 80523

Turf reinforcement mats (TRM's) have been developed to provide immediate, short term and long-term erosion protection on slopes and channels. TRM's can be comprised of synthetic materials, natural materials, or any combination of the two. An important feature of TRM's is their ability to allow vegetation to grow through their mat matrix, enhancing erosion control. When secured to a soil base, TRM's provide erosion protection, enable vegetation establishment and are applicable where standard mulches would often fail. Various turf reinforcement mats have been developed through the private sector and vary in matrix arrangement, mat thickness, fiber density and fiber composition to provide varied levels of erosion protection.

Critical performance values of turf reinforcement mats cannot be derived theoretically, thus must be found through hydraulic testing. Each of the infinite possibilities and combinations of mat matrices and fill materials must be tested to determine critical performance values. Colorado State University had developed testing procedures to empirically determine critical shear stress values for vegetated and non-vegetated TRM's. Vegetated and non-vegetated tests have been conducted at the Hydraulics Laboratory at Colorado State University. Both outdoor and indoor testing flumes have been utilized to complete testing.

Non-vegetated mats have been tested in the indoor facility at CSU's hydraulics lab. A soil embankment was constructed and each TRM was installed directly upon the soil base, based upon the manufacturer's specifications. Each TRM was then subjected to a series of tests that consisted of various discharges and flume slopes of increasing magnitudes to produce increasing shear stresses upon the mat. Soil losses were calculated for each test using the Clopper Soil Loss Index and an arithmetic mean.

CSU is utilizing planter box technology to conduct vegetated TRM testing more efficiently. The boxes are filled with soil and a TRM is placed upon the soil. After vegetation has been established the planter boxes are placed into a testing flume. Increasing discharges are then conveyed over the mat until structural failure is noticeable.

The presentation will highlight Colorado State University's detailed and thorough testing procedure and some general conclusions attained from TRM testing. The difference in vegetated and non-vegetated mat testing will also be stressed.