RESEARCH NOTES

OREGON DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICES SECTION
2950 STATE STREET
SALEM, OREGON (503) 986-2700

April 1994

RSN 94-1

ARMORFORM® ARTICULATING BLOCK MAT EROSION CONTROL SYSTEM

Salmon Creek Bridge
Oakridge, Oregon

The ARMORFORM® Articulating Block Mat (ABM) was constructed at the Salmon Creek Bridge abutments during the summer of 1991. The bridge is located on the eastside of Oakridge, Oregon. A construction report, prepared in October 1991, details the ABM construction. The Research Unit recently completed an interim report which presents the ABM performance to date based on site visits performed in August 1992, August 1993, and September 1993; and discussions with field personnel.

BACKGROUND

The ABM is one type of fabric formed concrete. The system consists of a series of bags that are connected internally by grout ducts and a series of flexible polyester cables. The bags are filled with a cement rich concrete grout. When set, the concrete forms a solid mat, consisting of a series of connected blocks. The ABM was selected as an alternative to riprap, which has a history of failure at this location, since it is a structurally integrated system that maintains its ability to protect against erosion even when undermined.

PERFORMANCE

The ABM has been evaluated for aesthetics, prevention of embankment erosion, prevention of pier and abutment scour, and performance and maintenance compared to loose riprap. Evaluating the aesthetic value of the ABM is difficult because it is a subjective quality. One opinion of the mat was that it was too white and uniform, so it did not blend in with the natural setting. Another opinion was that the mat looked nice and provided a finished look to the embankment. During the site visits, it was noted that the fabric enclosing the grout is slowing wearing away. As the material degrades, the gray grout will be exposed which may appear more natural looking. An additional visual effect is the staining that occurs on blocks that are submerged during high water. As the water level recedes in the summer months, the blocks are exposed and appear several shades darker than the higher blocks.

In general, the ABM appears to be preventing embankment erosion, and pier and abutment scour. The only concern is the northwest (upstream) corner which is currently exposed with a 1-foot gap between the existing embankment and the edge of the ABM projecting into the creek. During site visits, it was noted that the downstream corner of the mat was also exposed. The corner exposures can be attributed to the design change provided by the manufacturer. As a consequence, the ABM was not buried to full depth on both sides of the pier. Potentially, the creek could flow behind the ABM testing the articulating features of the mat.

The mat appears to be performing better than standard riprap. Since the streambed has a tendency to degrade, riprap could potentially be undermined leaving an exposed slope. This is evident on the northwest side of the mat, where the bank protected by riprap has been undermined and riprap has rolled into the creek. Undermining has not been a problem in areas protected by the mat since the mat is keyed in to a depth of 6 feet. If parts of the mat were undermined, the mat would "articulate" to compensate for the loss in support. An additional advantage of the ABM over riprap is that trees do not seed in on the ABM. Trees may present a site distance obstruction and/or make it difficult for maintenance workers to get access under a bridge.

From a safety standpoint, the ABM may be preferred over riprap in areas where foot traffic is anticipated. As noted during site visits, the mat is very easy to walk on and provides easy access down to the creek.

FUTURE MONITORING

The ABM will be inspected annually and during or immediately after any 25-year flood events. This study is expected to continue until 1996.

For a copy of the Experimental Feature interim report, contact:

Liz Hunt or Scott Nodes
Research Unit
Engineering Services Section
Oregon Department of Transportation
2950 State Street
Salem, OR 97310
(503) 986-2700