EROSION CONTROL MEASURES IN ROADWAY CONSTRUCTION

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INTRODUCTION

Forty years ago the subject of erosion control did not receive much attention in Virginia and other parts of the US. Today, with the increased awareness of environmental protection, a number of initiatives have been developed to improve the skills of personnel associated with the construction and maintenance of transportation facilities. Contractors performing work on Virginia's highways are required to have a person trained in erosion and sediment control to be physically present on a project when land-disturbing activities are taking place. Land under construction generates several orders of magnitude more sediment than a forested land.

SILT FENCE

A silt fence (Figure 1) has become the mainstay of erosion control on highway construction projects, due to its low cost and ease of installation. Virginia regulations require that the silt fence be installed immediately after clearing operations, before the contractor begins grubbing up stumps. The specifications call for a 4-inch by 4-inch trench backfilled to anchor the silt fence (Barrett, 1990). Typically a silt fence consists of a woven geotextile product.

Figure 1. Silt fence placed along the banks of an existing stream.

SEEDING

One of the most effective erosion-control techniques is stage seeding. The contractor is required to seed within 48 hours of reaching a grading increment. Increments of 5 feet must be seeded. Slopes steeper than 2:1 must be grooved horizontally or benched (Figure 2). Slopes flatter than 2:1 must be roughened before the seed is applied.

Figure 2. Slope grooved for seeding.

Temporary seeding is required on material stockpiles within 15 days of placing a stockpile. Temporary seeding is also required if the contractor suspends his grading operations for more than 15 days.

Mulch is applied along with the seeding. The tacking agent typically is wood cellulose fiber mulch applied at a rate 750 lbs/acre. Straw mulch is required on all disturbed areas from May 16 to July 31 and from September 16 to January 31. Wood cellulose fiber or straw mulch may be used during the rest of the year,

STREAM AND WETLAND PROTECTION

With the large amount of wetlands in Virginia, most projects require some mitigation. Every square foot of wetland taken to construct or upgrade a transportation facility must be replaced on site, if possible. When construction is necessary near the streams or wetlands, it is commonly required to leave a 50-feet wide greenbelt at the waterway until construction is actually started at the site.

In slow-moving rivers or lakes turbidity curtains are successfully used to control erosion (Figure 3). Turbidity curtains typically consist of a woven geotextile, with weights at the bottom and a flotation device on the top. This setup allows the curtain to trap sediments while allowing water to flow through. Trapped material is typically left in place to avoid stirring up sediments.

Figure 3. Turbidity curtain.

When the clearing operations are complete and silt fences are installed, the work on drainage structures begins. This work must be done in the dry. Contractors are required to install non-erodible stream diversions around pipes and box culverts. Grass-lined channel or a polyethylene liner at least 6-mils thick are typically used for stream flows up to 2.5 ft/sec. For streams with flows ranging between 2.5 and 9.0 ft/sec, a woven geosynthetic is required (Figure 4). This is commonly known as riprap filter cloth. A riprap stone is required for streams with flows ranging from 9.0 to 13.0 ft/sec. For streams carrying flows greater than 13.0 ft/sec, or where a stream is too large for a diversion, a causeway or a work bridge is required. The contractor is not allowed to work directly in the stream. He must perform his activities within the confines of a cofferdam.

Figure 4. Stream diversion.

Pumping of water is another area where Virginia has very tight specifications. As the trench for the proposed structure is excavated, water may seep in. A contractor may not pump this water back directly into a live stream. A sedimentation basin is constructed for the water to be collected and allowed to filter sediments before re-entering the stream. At a minimum, the size of the basin in cubic feet should equal to 16 times the flow in gallons per minute (Barrett, 1995).

SLOPE AND DITCH EROSION CONTROL

Earthwork construction requires placing berms and slope drains every 500 feet in fill areas, to prevent slope failures. Drains must have a filtering device attached to trap sediments. As the grading is being completed and grass has been established, permanent ditches are installed at the roadside. They can be lined with five categories of materials. Ditches carrying flow velocities of less than 2.5 ft/sec are seeded and mulched. Between 2.5 and 4.0 ft/sec, biodegradable ditch liners are used. These are usually mats with straw or coconut fiber. Lightweight, non-biodegradable geosynthetics are used at flow rates between 4.0 and 7.0 ft/sec. Between 7.0 and 10.0 ft/sec, heavyweight non-biodegradable geosynthetics are used. Finally, for ditches with flows greater than 10.0 ft/sec, riprap or concrete is used.

CONCLUSIONS

Today, with an ever-increasing need to protect our natural resources, erosion control and sedimentation measures are becoming essential construction practices. They can be installed relatively cheaply and maintained with little effort. Ultimately, these measures benefit everyone affected by a transportation project. With the growing awareness of the problems caused by erosion and sedimentation, many Environmental Agencies and local Governments are requiring contractors to have erosion control measures in place.

REFERENCES

Barrett, J. R. (1990). *How to Control Roadside Erosion*. Better Roads, February 1990, p. 24-25.

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