
Greenville County Technical Specification for:
EC-06: RIPRAP OR AGGREGATE

1.0 Riprap or Aggregate

1.1 Description

Riprap is a permanent, erosion-resistant channel lining aggregate consisting of large, loose, angular stone with a filter fabric or granular underlining. The purpose of riprap is to:

- Protect the soil from the erosive force of concentrated runoff; and
- Slow runoff velocities while enhancing the potential for infiltration.

The purpose of the filter fabric or granular underlining is to prevent undermining of the riprap layer by the migration of soil particles under seepage forces through the riprap.

1.2 Design

The preferred method of slope and channel protection is the use of vegetation. If vegetation cannot withstand the design flows, ECBs and TRMs are the preferred and suggested method of protection. When conditions are too severe for vegetation and TRMs, riprap may be used for erosion control and protection. Riprap may be used, as appropriate, at storm drain outlets, on channel banks and/or bottoms, drop structures, at the toe of slopes, and in transitions from concrete channels to vegetated channels.

Riprap sizes can be designed by the diameter or by the weight of the stones. It is often misleading to think of riprap in terms of diameter, since the stones should be angular instead of spherical. Table 1 lists some typical riprap stones and the corresponding dimensions.

Table 1: Weight and Size of Riprap Stones

Channel Lining Riprap Class	Corresponding Size
IA	Limestone with 100 % passing a 5-inch sieve, and no more than 20% passing through square openings 1.5-in. x 1.5-in.
II	Limestone with 100% passing a 9-inch sieve, and no more than 20% through square openings 5-in. x by 5-in.
III	(Cyclopean Riprap) > 80% by volume of individual stones ranging from ¼ to 1-½ cubic feet

1.2.1 Geotextile Underlining

Place a lining of geotextile filter fabric or granular filter material between the riprap and the underlying soil surface to prevent soil movement into or through the riprap.

1.2.2 Riprap for Channel Stabilization

Riprap for channel stabilization should be designed to be stable for the condition of bank-full flow in the reach of channel being stabilized. The Federal Highway Administration (FHWA) design procedure as presented in this section should be used. This method establishes the stability of the rock material relative to the forces exerted upon it.

Riprap should extend up the banks of the channel to a height equal to the maximum 10-year flow depth, or to a point where vegetation can be established to adequately protect the channel.

Riprap placed in channel bends should extend upstream and downstream from the point of curvature at least 5 times the channel bottom width. The riprap should extend across the bottom and up both sides of the channel.

1.2.3 Freeboard and Bank Height

For riprap and other lined channels, the height of channel lining above the water surface should be based on the size of the channel the flow velocity the curvature inflows wind action and flow regulation.

1.2.4 Design of Riprap Channel Linings

Design of erosion protection within the channel should be accomplished using the FHWA Tangent Flow Method presented in *Chapter 8, Section 8.4.2* of the Stormwater Management Design Manual. This method is applicable to both straight and curved channel sections where flows are tangent to channel bank. The Tangent Flow Method determines a stable rock size for straight and curved channel sections using known shape flow depth and channel slope dimensions.

1.3 Inspection and Maintenance

Once a riprap installation has been completed, it should require very little maintenance.

It should, however, be inspected periodically to determine if high flows have caused scour beneath the riprap of filter fabric or dislodged any of the stone.

Care must be taken to properly control sediment-laden construction runoff that may drain to the point of the new installation. If repairs are needed, they should be performed immediately.