



Modified from CASQA Stormwater Best Management Practices - Construction

Riprap consists of a layer of large, angular stones placed on top of or in erodible areas. Generally, this is a permanent erosion control. Riprap protects areas that are subject to concentrated flows and is particularly useful for stabilizing streambanks or lakeshores. When placed inside wire mesh cages, riprap is known as a “gabion.” Gabions may be used if further structural support is needed.

Usage

Riprap should be used where other erosion mitigation measures are not appropriate or where it is difficult to establish vegetation, usually in areas of heavy erosion. It is a versatile BMP and in addition to streambank protection, it may also be used to stabilize cut-and-fill slopes and, protect culvert inlets and outlets, and around bridges, slope drains, grade stabilization structures, and storm drains. Riprap may also be used in channels to retard infiltration where velocities are too high for either the growth of vegetation or geotextile use.

Benefits

- can aid in the establishment of vegetation
- effective at reducing the impacts of velocity induced erosion
- hand-placed riprap can be used as an attractive landscaping device after final site grading
- when properly designed and placed, riprap can prevent nearly all erosion on the area that it protects

Limitations

- requires care to be taken during installation to prevent exacerbating erosion problems
- limited to slopes of 2:1 or less – riprap installed on slopes steeper than 2:1 may result in riprap failure due to erosion and slope slippage
- hand-placed riprap may not be as stable as machine-placed riprap and may be more susceptible to failure

Estimated Cost

Costs vary depending on the project location and the type of riprap material selected. NongROUTED riprap costs \$35 - \$50/yd² and grouted riprap ranges from \$45 - \$60/yd².

Alternatives

- Geotextiles (if flow is less than 5 cfs) (p. 2-6)
- Soil Roughening (if used on a slope) (p. 2-20)
- Fiber Rolls/Sediment Logs (p. 3-5)
- Vegetative Buffer Strip (p. 3-21)

Notes:



Adapted from USEPA, 1993.

Installation Tips

A professional engineer should complete any riprap designs. If possible, several different design methods should be compared and the best should be chosen for the final SWPPP.

Type of stone

- do not use rounded stones or cobbles - angular edges are needed
- riprap is generally clean machined shot rock composed of limestone or granite. It should be free from impurities such as dust, sand, and organic materials, and should be durable enough to withstand freeze/thaw cycles. Reject any riprap with cracks or fissures.
- do not use uniformly-sized riprap: it should be a mixture of sizes (graded riprap) for maximum effectiveness

Other installation considerations

- riprap should be installed immediately after initial land disturbance
- install a geotextile liner so riprap does not come in direct contact with underlying soils. Geotextiles should be installed as per the installation tips for geotextiles in this manual
- the thickness of each riprap layer should be twice the largest stone diameter, but not less than 6 in

Maintenance

If installed properly, riprap does not typically require much maintenance; however, inspect riprap before and after rain events and at least twice a month during dry periods for areas of washout or other types of failure. Repair immediately as minor problems can lead to slope failure.

Vendors

See appendix pages F11-F12

References

Tennessee Department of Environment and Conservation Division of Water Pollution Control. 2002. Erosion and Sediment Control Handbook.

USACE (United States Army Corps of Engineers). 1997. Engineering and Design - Handbook for the Preparation of Storm Water Pollution Prevention Plans for Construction Activities.

USEPA. 1993. Stormwater Management and Technology. Noyes Data Corporation. Park Ridge, New Jersey.

USEPA. 2002. National menu of best management practices.