



DESCRIPTION:

A rock outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble which is placed at the outlet of a pipe to prevent scour of the soil caused by high pipe flow velocities, and to absorb flow energy to produce non-erosive velocities.

APPLICATIONS:

- ▶ Wherever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach.
- ▶ Rock outlet protection is best suited for temporary use during construction because it is usually less expensive and easier to install than concrete aprons or an energy dissipator.
- ▶ A sediment trap below the pipe outlet is recommended if runoff is sediment laden.
- ▶ Permanent rock riprap protection should be designed and sized by the engineer as part of the culvert, conduit or channel design.
- ▶ Grouted riprap should be avoided in areas of freeze and thaw because the grout will break up.

INSTALLATION/APPLICATION CRITERIA:

- ▶ Rock outlet protection is effective when the rock is sized and placed properly. When this is accomplished, rock outlets do much to limit erosion at pipe outlets. Rock size should be increased for high velocity flows. Best results are obtained when sound, durable, angular rock is used.

LIMITATIONS:

- ▶ Large storms often wash away the rock outlet protection and leave the area susceptible to erosion.
- ▶ Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- ▶ Outlet protection may negatively impact the channel habitat.

MAINTENANCE:

- ▶ Inspect after each significant rain for erosion and/or disruption of the rock, and repair immediately.
- ▶ Grouted or wire-tied rock riprap can minimize maintenance requirements.

OBJECTIVES

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



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TARGETED POLLUTANTS

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low