# 6.55 ROCK PIPE INLET PROTECTION

## Definition

A horseshoe shaped rock dam structure at a pipe inlet with a sediment storage area around the outside perimeter of the structure.

## Purpose

To minimize sediment from entering, accumulating in and being transferred by a culvert or storm drainage system prior to stabilization of the disturbed drainage area.

## Conditions Where Practice Applies

Rock pipe inlet protection may be used at pipes with a maximum diameter of 36 inches. This inlet protection may be used to supplement additional sediment traps or basins at the pipe outlet or used in combination with an excavated sediment storage area to serve as a temporary sediment trap. Pipe inlet protection should be provided to protect the storm drainage system and downstream areas from sedimentation until permanent stabilization of the disturbed drainage area.

Do not install this measure in an intermittent or perennial stream.

## Planning Considerations

When construction on a project reaches a stage where culverts are installed and many areas are brought to the desired grade, there is a need to protect the points where runoff can leave the site through culverts or storm drains. Similar to drop and curb inlets, culverts receiving runoff from disturbed areas can convey large amounts of sediment to lakes or streams. Even if the pipe discharges into a sediment trap or basin, the pipe or pipe system itself may clog with sediment.

## Design Criteria

When used in combination with an excavated sediment storage area to serve as a temporary sediment trap, the design criteria for temporary sediment traps must be satisfied. The maximum drainage area should be less than 1 acre. There shall be 3600 cubic feet of sediment storage per acre of disturbed drainage area. Smaller disturbed drainage areas may have proportionally less sediment storage area (e.g., 0.5 acre of disturbed drainage area can have 1800 cubic feet of sediment storage).

The minimum stone height should be 2 feet, with side slopes no steeper than 2:1. The stone "horseshoe" around the pipe inlet should be constructed of NCDOT Class B or Class I riprap, with a minimum crest width of 3 feet. The outside face of the riprap should be covered with a 12-inch-thick layer of NCDOT #5 or #57 stone.

In preparing plans for rock pipe inlet protection, it is important to protect the embankment over the pipe from overtopping. The top of the stone should be a minimum of 1 foot below the top of the fill over the pipe. The stone should tie into the fill on both sides of the pipe. The inside toe of the stone should be no closer than 2 feet from the culvert opening to allow passage of high flows. The sediment storage area should be excavated upstream of the rock pipe inlet protection, with a minimum depth of 18 inches below grade.

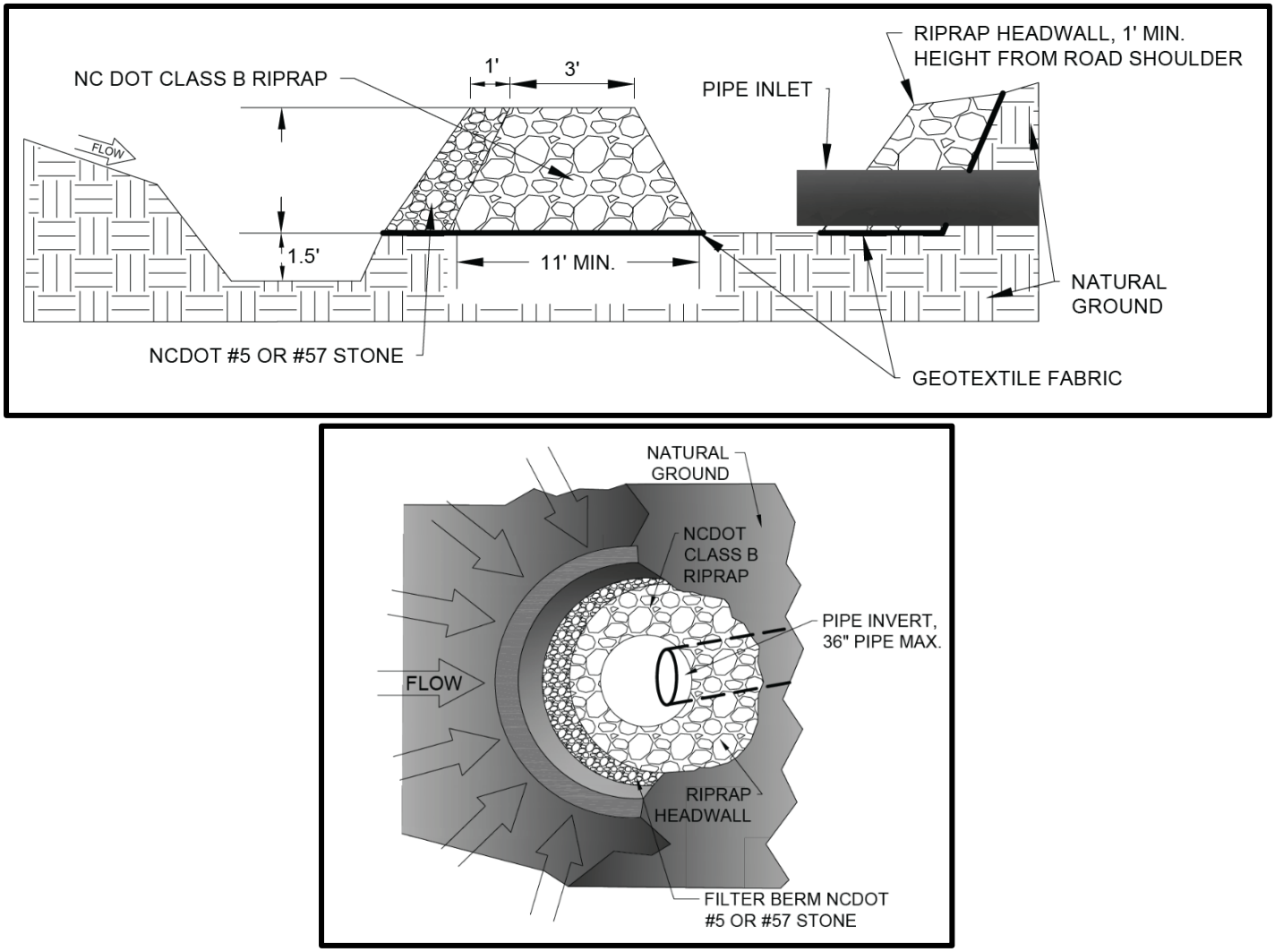


***Figure 6.55a*** *Rock Pipe Inlet Protection plan view and cross-section view*

***Figure 6.55b,*** *Examples of Rock Pipe Inlet Protection*

## Construction Specifications

1. Clear the area of all debris that might hinder excavation and disposal of spoil. Place spoil in a location that does not drain into the device unless immediately stabilized.
2. Install the NCDOT Class B or Class I riprap in a semi-circle around the pipe inlet. A 12-inch-thick layer of NCDOT #5 or #57 stone should be placed on the outside slope of the riprap with a geotextile underlayment. Both stone sizes should be constructed higher on each end where it ties into the embankment. The minimum crest width of the riprap should be 3 feet, with a minimum bottom width of 11 feet.

The minimum height should be 2 feet, but also 1 foot lower than the shoulder of the embankment or diversions. Both ends of the stone structure should tie into the existing embankment around the pipe.

3. Within the horseshoe and prior to the inlet, the ground should be provided with stable cover (e.g., geotextile) and maintained to prevent this space from contributing sediment to the inlet.
4. The sediment storage area should be excavated around the outside of the stone horseshoe 18 inches below natural grade.
5. When the contributing drainage area has been stabilized, fill the depression and establish final grading elevations, compact area properly, and stabilize with anchored ground cover.

## Maintenance

Inspect rock pipe inlet protection at least weekly and after each significant (1 - inch or greater) rainfall event and perform any necessary repairs immediately. Remove collected sediment and restore the sediment storage area to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area and replace any NCDOT #5 or #57 stone removed from outlet as part of that maintenance. If that is not feasible, the excavated material should be stabilized by the end of the working day.

Check the structure for damage. Any riprap displaced from the stone horseshoe must be replaced immediately.

After all the sediment-producing areas have been permanently stabilized, remove the structure and all the unstable sediment. Smooth the area to blend with the adjoining areas and provide permanent ground cover (*Surface Stabilization*).

## References

*Sediment Trap and Barriers*
6.60, Temporary Sediment Trap

*Surface Stabilization*
6.15, Riprap

*North Carolina Department of Transportation*
Standard Specifications for Roads and Structures

*Virginia Erosion and Sediment Control Handbook.* 1992.

STD & SPEC 3.08, Culvert Inlet Protection. pages III-46 - III-51 (Culvert Inlets Sediment Trap).