

BMP 08.00. Culvert Inlet Protection

DESIGN CONSIDERATIONS

Objectives

Culvert Inlet Protection is used to trap sediment and reduce the amount of sediment entering a culvert.

Description

Culvert Inlet Protection is a low barrier, similar to a check dam, placed up-gradient of a culvert inlet to temporarily impound water and trap sediment while still allowing flow to enter the culvert. There are several types of temporary barriers applicable for different conditions:

- Geotextile-wrapped foam barriers
- Sand bags or gravel-filled sand bags
- Fiber rolls
- Geotextile-wrapped wire cage barrier

Other Names

Filter Inlet.

Applicability

Culvert Inlet Protection is applicable when there is potential for sediment to be transported to and through the culvert. Placement in the flowline is applicable for culverts conveying runoff or project drainage that must remain operational before permanent stabilization of the disturbed area. Placement above (all the way around) a culvert inlet is applicable when earth disturbing activities are occurring upslope of the inlet, to prevent sediment and runoff from entering the culvert inlet from above. Culvert Inlet Protection is not generally placed in the flowline of culverts conveying stream flow, since the purpose of the best management practice (BMP) is to treat run-off before it reaches receiving waterbodies such as streams. If placement in the flowline of streams is required, applicable permits must be obtained.

Selection Considerations

- Culvert Inlet Protection should be sited and constructed in a manner that will facilitate cleanout and disposal of trapped sediment.

- Culvert Inlet Protection should be constructed in a manner that will allow flow to pass and minimize ponding after the run-off has ceased.
- Blocking the inlet can cause flooding affecting streets and the construction area. Where flooding would cause a hazard, consider where overflow will go in extreme events and provide emergency overflows with additional treatment.
- Slope Gradient: The slope of the ditch discharging to the culvert inlet should not exceed 5 percent or flow velocity exceeding 2.5 to 3 cubic feet per second. The steeper the slope or the higher the velocity and shear stress, the larger the particle diameter that can be transported. The flatter the slope and the slower the flow, the longer the travel distance and time behind the barrier, allowing for sediment to settle. If Culvert Inlet Protection is required on steeper grades, consider using a series of barriers or a widened channel to provide velocity reduction or barriers of greater depth to lengthen the settling distance.
- Inlet protection should extend all the way around the inlet when upgradient slopes are not stabilized.
- Consider the effects if the barrier were to fail when water is ponded. Provide additional downstream protection if warranted.

Design

Drainage Area: The area of the construction drainage area to the culvert inlet should not exceed 1-acre. The total drainage area to the inlet may be larger than 1-acre, provided that the additional area is vegetated and/or permanently stabilized and that the spillway and ponding area is sized to adequately treat, impound, and convey the runoff from the tributary area.

Depth: Provide a temporary minimum ponding depth of 6 to 8 inches. The design must specify fiber rolls of adequate diameter, foam barriers, or sandbags of adequate thickness to provide the minimum ponding depth, and spillways with minimum elevations and width must be provided to limit the maximum ponding depth.

Relationship to Other Erosion and Sediment Control Measures

Erosion control measures in the contributing areas must be in place to minimize the amount of sediment that must be treated at inlets. Culvert Inlet Protection is installed as a secondary measure to remove residual sediment that was not removed by other measures such as check dams, grassed swales, and sediment traps.

Common Failures or Misuses

- Sediment accumulation resulting in reduced settling capacity.
- Improper installation, resulting in sediment bypassing filter and entering the culvert.
- Tearing, undermining, or collapsing of the barrier, resulting in sediment entering the culvert.

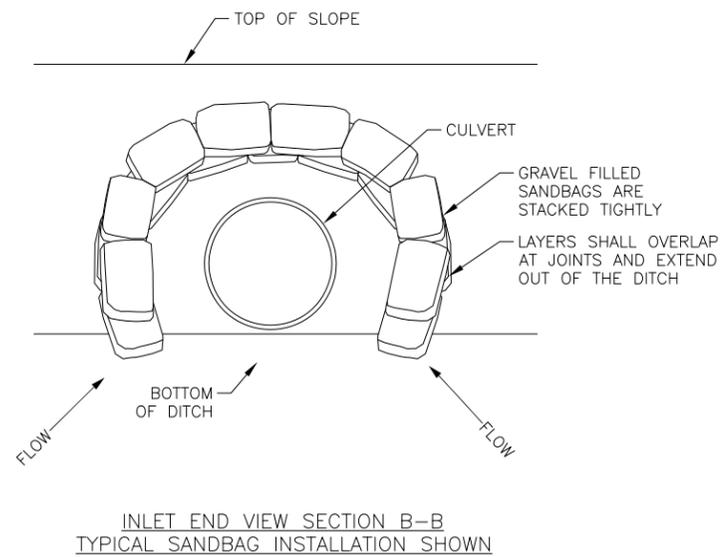
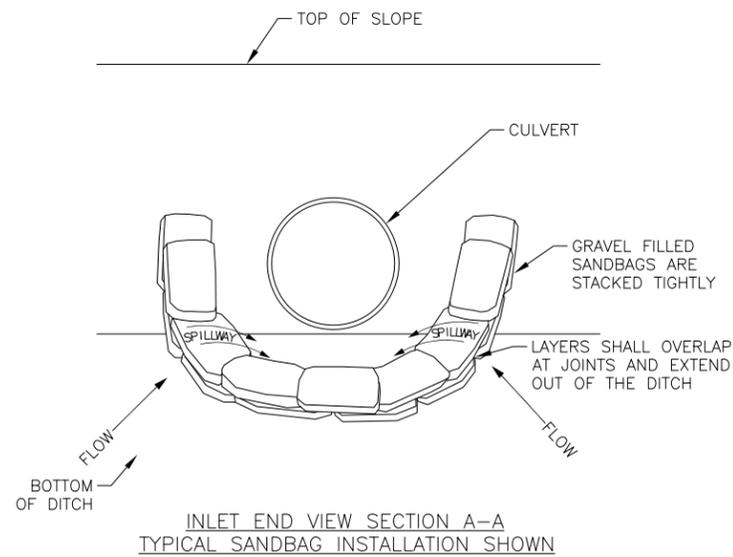
SPECIFICATIONS

Standard Specification

- 667 – Culvert Inlet Protection

Drawing

- BMP – 08.00 Culvert Inlet Protection



CULVERT INLET PROTECTION NOTES:

MATERIALS

BARRIER MATERIALS:

1. PREFABRICATED BARRIER SYSTEM, AS SHOWN ON DRAWING BMP-13.00.
2. SANDBAG BARRIER, CONSISTING OF TIGHTLY WOVEN BURLAP OR WOVEN GEOTEXTILE BAG MATERIAL SUFFICIENTLY DURABLE TO REMAIN INTACT FOR THE TIME INTENDED. BAGS 2/3 FULL OF GRAVEL OR SAND WITH A GRADATION SUCH THAT NO FINE SEDIMENT PASSES THROUGH THE BAG. IF THE SANDBAGS ARE NEEDED FOR MORE THAN ONE SUMMER SEASON, PROVIDE BAG MATERIAL THAT HAS ULTRAVIOLET STABILITY OF AT LEAST 70% IN CONFORMANCE WITH ASTM D4355 REQUIREMENTS. SECURELY CLOSE THE SANDBAGS.

3. FIBER ROLL, AS SHOWN ON DRAWING BMP-10.00, 8 INCHES MINIMUM DIAMETER.
4. COMPOST SOCK, AS SHOWN ON DRAWING BMP-05.00.

INSTALLATION

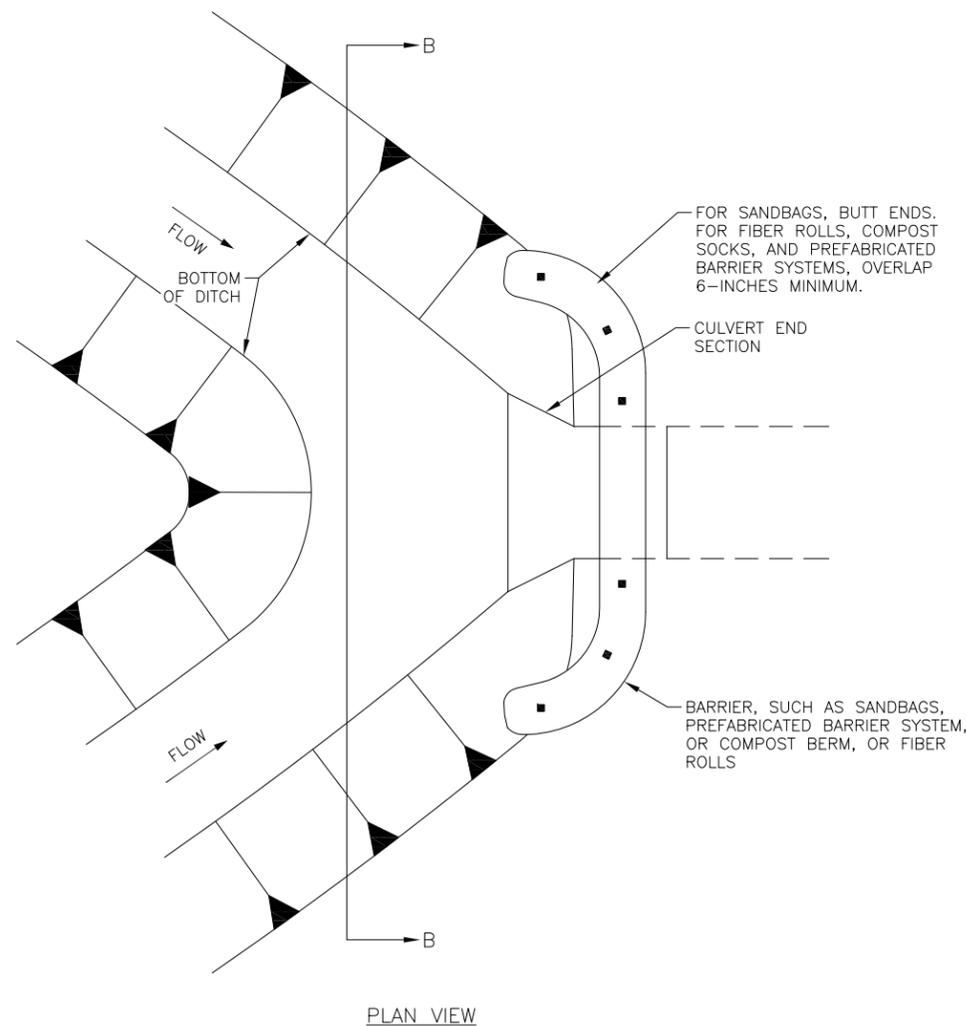
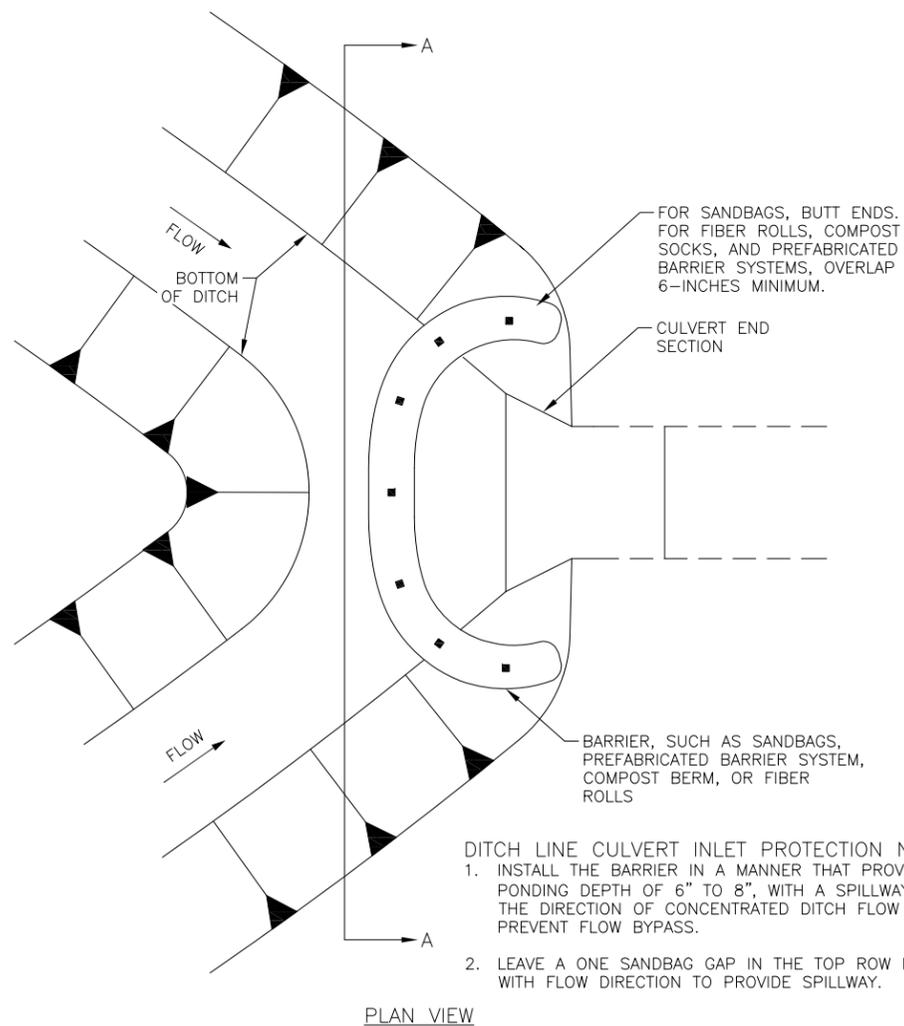
1. INSTALL WHERE INDICATED IN THE PLANS OR WHERE APPROVED BY THE ENGINEER.
2. ASSURE THAT BARRIER MAKES FULL CONTACT WITH SOIL ALL AROUND THE INLET.
3. IF PROTECTING BOTH DITCHLINE AND TOP OF PIPE, THE PROTECTION BARRIER CAN BE A SINGLE CONTINUOUS CIRCLE.
4. IN ADDITION:
 - a. PREFABRICATED BARRIER SYSTEM - ANCHOR WITH WIRE STAPLES ON SOIL, OR ADHESIVE ON PAVEMENT. OVERLAP 6 INCHES.
 - b. SANDBAG BARRIER - LAYER AND OVERLAP AT JOINTS.
 - c. FIBER ROLL - TRENCH A MINIMUM OF 2 INCHES. SEE STAKING REQUIREMENTS ON DRAWING BMP-10.00.
 - d. COMPOST SOCK - SEE STAKING REQUIREMENTS ON DRAWING BMP-05.00. STAKING REQUIRED WHEN PLACED WITHIN FLOWLINE/DITCH.

INSPECTION

1. CONFIRM THAT BARRIERS ARE IN FULL CONTACT WITH THE SOIL AND THAT BYPASS ROUTES ARE NOT PRESENT.
2. INSPECT FOR SEDIMENT ACCUMULATION, DISPLACEMENT, AND STRUCTURAL DAMAGE.

MAINTENANCE

1. REMOVE ACCUMULATED SEDIMENT BEFORE IT REACHES ONE-THIRD OF THE DESIGN DEPTH OF SPILLWAY.
2. RESTORE STRUCTURE TO ITS ORIGINAL DIMENSIONS AND FULL CONTACT WITH SOIL AROUND THE INLET AS SOON AS PRACTICABLE.
3. REPAIR ANY STRUCTURAL DAMAGE, INCLUDING REPLACING DAMAGED SANDBAGS, AS SOON AS PRACTICABLE.



DITCH LINE CULVERT INLET PROTECTION NOTES:

1. INSTALL THE BARRIER IN A MANNER THAT PROVIDES PONDING DEPTH OF 6" TO 8", WITH A SPILLWAY IN THE DIRECTION OF CONCENTRATED DITCH FLOW TO PREVENT FLOW BYPASS.
2. LEAVE A ONE SANDBAG GAP IN THE TOP ROW IN LINE WITH FLOW DIRECTION TO PROVIDE SPILLWAY.

DITCH LINE CULVERT INLET PROTECTION
NOT TO SCALE

TOP OF PIPE CULVERT INLET PROTECTION
NOT TO SCALE

REVISIONS		
Date	Description	By

State of Alaska DOT&PF

CULVERT INLET PROTECTION

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Date 12/2015 X/XX/XX