

PC-15 INLET/OUTLET PROTECTION

Refer to: ITD Standard Specifications, Sections 212, 608, 609, 640, 711.04, and 718.
ITD Standard Drawings D-1-A, D-1-B, P-1-A, P-1-H, and P-2-F.

**BMP Objectives**

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|-------------------------------------|------------------------------|
| <input checked="" type="checkbox"/> | Perimeter Control |
| <input type="checkbox"/> | Slope Protection |
| <input type="checkbox"/> | Borrow and Stockpiles |
| <input checked="" type="checkbox"/> | Drainage Areas |
| <input type="checkbox"/> | Sediment Trapping |
| <input checked="" type="checkbox"/> | Stream Protection |
| <input checked="" type="checkbox"/> | Temporary Stabilizing |
| <input checked="" type="checkbox"/> | Permanent Stabilizing |

Definition and Purpose

Inlet/outlet protection is placed around an inlet to trap sediment and debris and prevent it from entering a storm drain system or water body, or placed at the outlet to reduce the erosive effect of water at the outfall.

Appropriate Applications**Inlet**

- Inlet protection serves to prevent scour, piping, or the silting-in of inlets, storm drainage systems, or receiving channels. Inlet protection may be composed of riprap and erosion control geotextile; masonry block, aggregate, and wire mesh; or permanent vegetation.
- Masonry block, aggregate, and wire mesh filters can be used where velocities are high and may be used with most types of inlets where overflow capability is needed and in areas of heavy flows (0.53 cubic feet/second or greater).
- Permanent vegetation inlet filters are usually used where sediments in the stormwater runoff are low, and provide additional stabilization to the site.
- Inlet protection measures may be used in conjunction with sediment trap basins. The sediment trap basins should be located upstream from the inlet protection measures.

Outlet

- Outlet protection should be installed at the outlets of all pipes or culverts, retention basins, dikes and berms, grassed swales, or channels and ditches where the velocity of flow may cause scouring or erosion.

- Outlet protection should also be used where the velocity of flow may require a basin (plunge pool) to dissipate the water velocity and prevent erosion.

Limitations

- Work involving disturbance of stream channels will require a Section 404 permit (401 Certification) and an Idaho Department of Water Resources Stream Alteration Permit.
- Silt fence inlet protection cannot be used.
- Straw bales are not to be used for inlet protection.
- There may be high maintenance requirements associated with inlet protection.
- Outlet treatment measures require the right size of riprap to be effective, depending on flow velocity, soil conditions, and location.

Design Parameters

Inlet

- The area immediately surrounding the inlet should be flat.
- Where possible, an inlet protection measure should be provided with a sediment trap basin. The sediment trap basin should be constructed upstream from the inlet to assist in ponding the water, allowing sediment to settle.
- Masonry block can be installed upstream to the inlet to provide added strength and stability. The block should be laid on its flat side so water can pass through the openings in the block. Wire mesh with a 0.4- to 0.6-inch opening should be installed between the masonry block and the aggregate. The aggregate should be coarse concrete aggregate or similar material 0.75 to 4 inches in size.

Outlet

- Unless otherwise specified, all riprap used in an outlet should be 6 inches or larger. An erosion control geotextile should be installed prior to the placement of the riprap, with the riprap placed directly on top of the geotextile. A basin on the discharge side of the outlet may be needed to dissipate water velocity and prevent erosion.
- For berm and dike outlets, the minimum length of the crest of the rock outlet structure should be determined by a hydraulic analysis.
- Maximum allowable flow-through rate is 30 liters per second per square meter of the outlet opening.
- The outlet structure should be located so as to discharge onto a stabilized area or into a stable watercourse.

Construction Guidelines

Inlet

- Riprap and erosion control geotextile:
 - Clear area where the desired protection measure is to be installed, making sure that the area is free of rocks and other debris.

- Place erosion control geotextile on the ground. Embed the edges of the geotextile a minimum of 6 inches into the soil.
- Place the riprap on the geotextile.
- Masonry block, aggregate, and woven wire mesh:
 - Use wire mesh with 0.4- to 0.6-inch openings.
 - Use masonry blocks 4 to 12 inches wide.
 - Use coarse concrete aggregate or other similar material 0.75 to 4 inches in size.
 - Remove any obstructions to excavating and grading. Excavate sediment trap basin if required; grade slopes, and properly dispose of excavated material.
 - Secure the inlet grate.
 - Place concrete masonry blocks in a single row lengthwise on their sides along the sides of the inlet. Excavate the foundation a minimum of 2 inches below the crest of the inlet. The bottom row of blocks should be against the edge of the structure for lateral support
 - Place the block barrier such that it is at least 6 inches high and up to a maximum of 18 inches high.
 - Place the open ends of the block such that they face outward, not upward, and the ends of adjacent blocks abut.
 - Place wire mesh against the outside of the masonry blocks so the wire will be flush with the top of the masonry block. The woven wire mesh should also extend over the area where the aggregate will be placed. Overlap the strips of mesh if more than one is necessary.
 - Place the aggregate over the woven wire mesh so the aggregate and woven wire mesh are flush with the top of the masonry block.

Outlet

- Place outlet protection measures in such a manner that the flow from the conveyance is not restricted.
- Construct outlet and outlet protection measures concurrently with pipe, culvert, dike, berms, and inlets before allowing water flows to pass over or through the outlet.

Maintenance and Inspection

- Conduct inspections as required by the NPDES permit or contract specifications during construction.
- Periodic inspection and maintenance will be required based on post-construction site conditions.
- Make any repairs necessary to ensure the measure is operating properly.
- Remove accumulated sediment when it has accumulated to half the design depth of the trap, and restore the sediment trap basin to its original dimensions.

- Properly dispose of all sediments at an approved location.
- On masonry block, aggregate, and woven wire mesh devices, clean the filter if it becomes clogged.