

## SC-6 INLET/OUTLET PROTECTION

Refer to: ITD Standard Specifications, Sections 212, 640, and 718.

ITD Standard Drawings P-1-A and P-1-H.

QPL Category: 212 Inlet Protection



### BMP Objectives

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

### Definition and Purpose

Temporary inlet and outlet treatment of runoff water ensures that the water leaving the construction site has a reduced sediment load.

- **Inlet treatment:** The focus is to capture sediment, that has been suspended in stormwater as a result of ground disturbance, from entering a conveyance system (man-made or natural stream). In this case the disturbed area is the source of the sediment at the point of concentrated flow.
- **Outlet treatment:** The focus is to not cause erosion at the point of concentrated discharge of relatively clean stormwater from a disturbed area. In this case the disturbed area is not the source of the sediment but it is the source of the concentrated flow.

### Appropriate Applications

#### Inlet Protection

- Inlet protection is recommended on any structure that conveys water away from a construction site to a sediment basin or receiving water.
- Storm drain inlet treatment is used where:
  - A permanent storm drain structure is being constructed on-site and there is danger of sediment silting or filling in the structure prior to site stabilization and placement of permanent BMPs, or where ponding around the inlet structure could interfere with traffic within the site.
  - Sediment-laden runoff may enter an inlet.

- Sediment filtering of the runoff used in combination with sediment basins, or other erosion and sediment control BMPs can be effective in reducing the sediment load.
- Recommended inlet controls consist of:
  - Fiber wattles, placed upstream to or around the inlet (see Standard Drawing P-1-H)
  - Riprap or graded aggregate and erosion control geotextile
  - Sediment basin upstream of the inlet
  - Cinder block and graded aggregate (see Standard Drawing P-1-H)
  - Sandbags or gravel bag barriers
  - Framework with silt fence and wire mesh (see Standard Drawing P-1-H)
  - Approved pre manufactured inlet filter devices

### **Outlet Protection**

Outlet protection should be comprised of riprap and riprap/erosion control geotextile that is installed at the outlets of all conveyance systems, sediment trap basins, ditches or channels where the velocity of flow may cause erosion in the receiving area.

### **Limitations**

- **Inlet treatment** measures require constant monitoring and maintenance. Where approaches to inlets are paved, special consideration and practices such as sandbags may be needed to reduce water velocity.
  - Straw bales are not an acceptable application for inlet treatment, except for emergencies.
  - Silt fencing is not an acceptable application for inlet treatment without framework and wire mesh backing.
  - Gravel bag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.5 cubic feet per second, and it is necessary to allow for overtopping to prevent flooding.
  - Fiber rolls and foam barriers are not appropriate for locations where they cannot be properly anchored to the surface.
  - Inlet protection requires an adequate area for water to pond without encroaching upon traveled way and should not present itself to be an obstacle to oncoming traffic.
  - Inlet protection may require other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
  - Sediment removal may be difficult in high-flow conditions or if runoff is heavily sediment-laden. If high-flow conditions are expected, other onsite sediment trapping techniques (e.g., check dams) should be used in conjunction with inlet protection.

- For drainage areas larger than 1 acre, runoff shall be routed to a sediment trapping device designed for larger flows. See SC-9 (Sediment/Desilting Basin) and SC-10 (Sediment Trap).
- Traffic obstruction and durability must be considered when choosing inlet protection in areas with expected traffic.
- **Outlet treatment** measures require the right size and thickness of riprap to be effective, depending on flow volume and velocity, soil conditions, and slope angle.

### Design Considerations

- **Inlet:** The area immediately surrounding the inlet should be as flat as possible.
  - Sediment retention fiber rolls can be effective to filter low-velocity-flow runoff, which in most instances provides a continuous filtering barrier around the inlet. For higher velocity flows, masonry block can be installed between the roll and the inlet to provide added strength and stability. The masonry block shall be laid on its flat side so water can pass through the openings in the block.
  - If graded aggregate is used in lieu of a sediment retention fiber roll, ½” wire mesh shall be installed between the masonry block and the aggregate. The graded aggregate should be washed gravel 0.75 inches in diameter, with less than 5 percent being 4.75 mm (No. 4 sieve) in diameter or smaller..
- **Outlet:** The outlet should be located to discharge onto a stabilized area or into a channel to prevent erosion.
  - Unless otherwise specified, all riprap used in an outlet shall 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.

### Construction Guidelines

- **Inlet:** Leave inlet treatment in place and operational until the drainage area is completely stabilized with a more permanent BMP. The measure may be left in place past final acceptance of the project. Make field adjustments as necessary to assure proper performance.
  - Level the area immediately surrounding the inlet as much as possible.
  - Install a dike or berm on the downstream side of the inlet to avoid bypassing the inlet after the installation of the filtering device.
  - Anchor and stabilize the filtering device properly to avoid washout or undercutting.
  - Construct a sediment basin upstream—the width, size, and depth to be determined by the availability of room.

- Install wire mesh with a 0.4- to 0.6-inch opening over the inlet (grate) to prevent rock from entering the inlet. Extend the wire mesh over the edges of the inlet (grate) by a minimum of 12 inches.
- Install an approved pre manufactured inlet filter devices per the manufacturer's recommendations.
- **Outlet:** Make field adjustments as necessary to assure proper performance.
  - Construct outlets concurrently with pipe, culvert, dikes, berms, and inlets before allowing water flows to pass over or through the outlet.

## Qualified Products List Criteria

**Table 1**  
Pre-manufactured Inlet Protection Devices, Qualified Products List Criteria

Property Minimum Average Roll Value (in weaker principal direction)	Test Method	Geotextile Bag Inlet Insert	Sediment Mat	Other
Grab tensile Strength lb(N)	ASTM D 4632	200 (890)	200 (890)	44
Grab Tensile Elongation (%)	ASTM D 4632	15	N/A	N/A
Puncture Strength lb (N)	ASTM D 4833	80 (355)	80 (355)	N/A
Trapezoidal Tear lb(N)	ASTM D 4533	50 (222)	50 (222)	N/A
Apparent Opening Size (AOS) (Standard Sieve)	ASTM D 4751	#20 or finer (.85 mm)	#20 or finer (.85 mm)	#20 or finer (.85 mm)
Permittivity, $s^{-1}$	ASTM D 4491	0.5 (min)	0.5 (min)	0.5 (min)
Ultraviolet (UV) Radiation Stability	ASTM D 4355	70% Strength Retained @ 150 hrs.	70% Strength Retained @ 150 hrs.	70% Strength Retained @ 150 hrs.

## Maintenance and Inspection

### Inlet

- Conduct inspections as required by the NPDES permit or contract specifications.
- Inlet protection measures can be removed in the event of flood conditions.
- Make any necessary repairs to ensure the measure is in good working order.
- Clean, remove, or replace the protective measure as sediment accumulates, becomes clogged, or performance is compromised.
- Install new or replace fiber wattles if wattles are full of sediment.

- Where evidence of sediment accumulation adjacent to the inlet exists, remove the deposits by the same work day in which it is found or by the end of the following work day if removal the same day is not feasible.
- Remove accumulated sediment in the sediment trap basin when filled to half the depth of the basin.
- Dispose of the sediment properly.
- Remove any rock, leaves, debris or trash that has been deposited on the grate and wire mesh to prevent further clogging of the entrance to the inlet.

### **Outlet**

- Conduct inspections as required by the NPDES permit or contract specifications.
- Make any necessary repairs to ensure the measure is in good working order.
- Remove accumulated sediment from the sediment trap basin.
- Dispose of the sediment as approved.