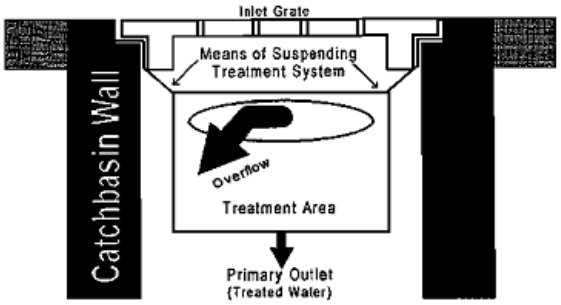
Structural BMP Criteria

BMP #: Water Quality Inserts



Catch basin inserts are commercially available (manufactured) devices and are generally configured to remove one or more of the following contaminants: coarse sediment, oil and grease, and litter and debris.

Key Design Elements

- Choose WQI that (collectively) has the hydraulic capacity to treat the WQ storm
- Regular Maintenance is necessary
- Evaluation of the device chosen should be balanced with cost
- Hydraulic capacity controls effectiveness
- Most useful in small drainage areas (< 1 Acre)
- Ideal in combination with other BMP's

Potential Applications

Residential Subdivision:	**YES**
Commercial:	**YES**
Ultra Urban:	**YES**
Industrial:	**YES**
Retrofit:	**YES**
Highway/Road:	**YES**

Stormwater Functions

Volume Reduction:	**Low**
Recharge:	**Low**
Peak Rate Control:	**Low**
Water Quality:	**Low-High**

Pollutant Removal

Total Suspended Solids:	**x**
Nutrients:	**x**
Metals:	**x**
Pathogens:	**x**

Description

Water Quality Inlets are stormwater inlets that have been fitted with a proprietary product (or the proprietary product replaces the catch basin itself), designed to reduce large sediment, suspended solids, oil and grease, and other pollutants, especially pollutants conveyed with sediment transport. They can provide “hotspot” control and reduce sediments loads to infiltration devices. They are commonly used as pretreatment for other BMP’s. The manufacturer usually provides the mechanical design, construction, and installation instructions. Selection of the most appropriate device and development of a maintenance plan should be carefully considered by the Designer.

The size of a water quality inlet limits the detention time; the hydraulic capacity influences the effectiveness of the water quality insert. Most products are designed for an overflow in large storm events, which is necessary hydraulically and still allows for a “first flush” treatment.

Regular maintenance according to application and manufacturer’s recommendations is essential for continued performance.

Variations

Tray types - allows flow to pass through filter media that is contained in a tray located around the perimeter of the inlet. Runoff enters the tray and leaves via weir flow under design conditions. High flows pass over the tray and into the inlet unimpeded.

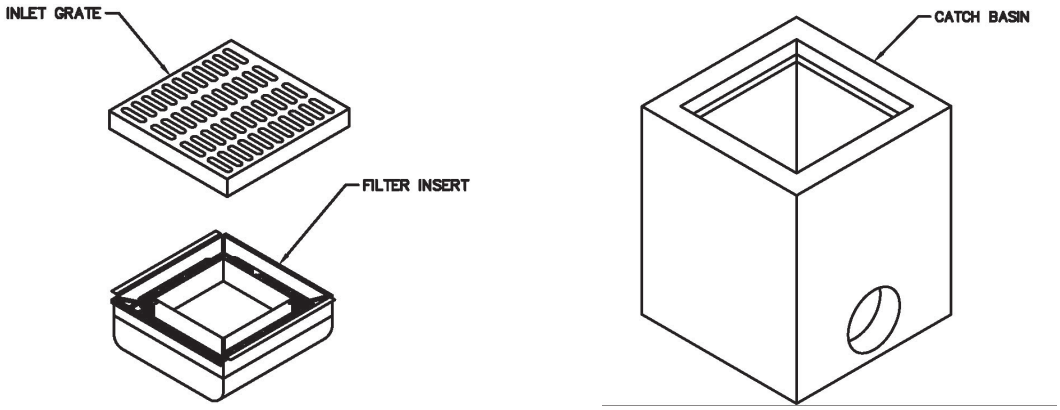


Figure 1. Water Quality Insert Tray

Bag types - insert is made of fabric and is placed in the drain inlet around the perimeter of the grate. Runoff passes through the bag before discharging into the drain outlet pipe. Overflow holes are usually provided to pass larger flows without causing a backwater at the grate. Certain manufactured products include polymers intended to increase pollutant removal effectiveness.

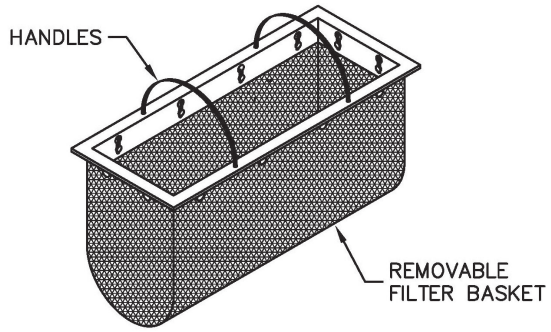


Figure 2. Filter Bag

Figure 3. Filter Bag Installation (Full Circle Ag, Inc., http://www.fullcircleag.com/pages/954364/)

Baskets types – the insert consists of “basket type” insert that sets into the inlet and has a handle to remove basket for maintenance. Small orifices allow small storm event to weep through, larger storms overflow the basket. Primarily useful for debris and larger sediment, and requires consistent maintenance.

Figure 4. German basket-type water quality inlet example.

Simple, “sumps” in inlets – Space created in inlets below the invert of the pipes for sediment and debris to deposit, usually leaving 6-inches to 12-inches at the bottom of an inlet. Small weep holes should be drilled into the bottom of the inlet to prevent standing water for long periods of time. Regular maintenance is required.

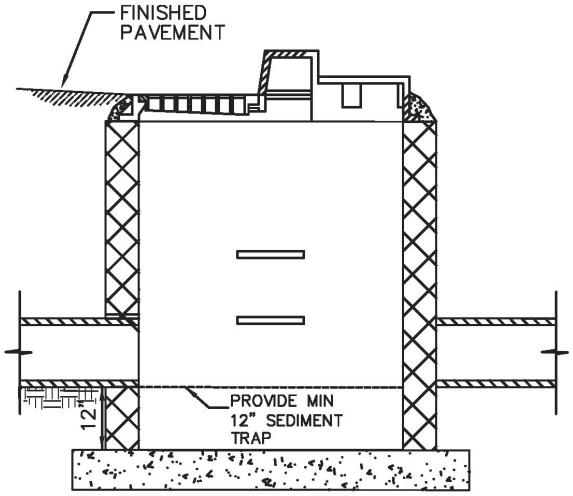
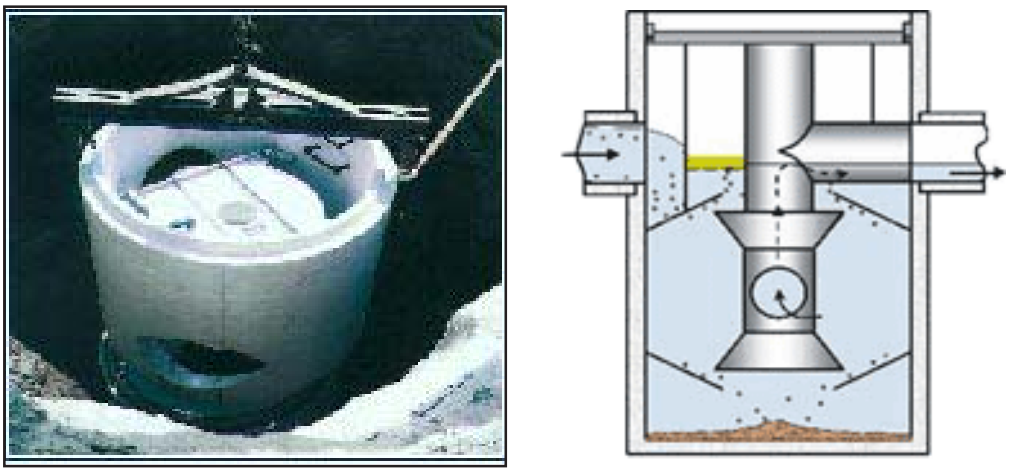


Figure 5. Sediment Sump incorporated with a standard inlet.

Vortex Separators – These units are not truly inserts, but separate devices designed to serve in concert with inlets and storm sewer. A variety of products are available from different manufacturers. The primary purpose is to use centrifugal force to remove sediments and pollutants.



Figures 6. Vortex separator (http://www.hydrointernational.biz/nam/ind_storm.html)

Applications

Any existing or proposed inlet where the contributing runoff may contain significant levels of sediment and debris, for example: parking lots, gas stations, golf courses, streets, driveways, industrial or commercial facilities, and municipal corporation yards. Commonly used as pretreatment before other stormwater BMPs.

Design Considerations

- Match site considerations with manufacturer's guidelines/specifications (i.e. land use will determine specific pollutants to be removed from runoff)
- Prevent re-suspension of particles by using small drainage areas and good maintenance
- Retrofits should be designed to fit existing inlets
- Placement should be accessible to maintenance
- If used as part of Erosion & Sedimentation Control during construction, insert should be reconfigured (if necessary) per manufacture's guidelines
- Overflow should be designed so that storms in excess of the device's hydraulic capacity bypass the treatment and is treated by another quality BMP

Detailed Stormwater Functions

Volume Reduction Calculations: N/A

Peak Rate Mitigation Calculations: N/A

Water Quality Improvement: If sized to treat the WQ storm, removal rates above can be applied to that volume of water.

Construction Sequence

1. Stabilize all contributing areas before installing and connecting pipes to these inlets.
2. Follow manufacturer's guidelines for installation. Do not use water quality inserts during construction unless product is designed for it. (Some products have adsorption components that should be installed post-construction.)

Maintenance Issues

Follow the manufacturer's guidelines for maintenance, also taking into account expected pollutant load and site conditions. Inlets should be inspected weekly during construction. Post-construction, they should be emptied when full of sediment (and trash) and cleaned at least twice a year. They should also be inspected after significant precipitation. Maintenance is crucial to the effectiveness of this BMP. The more frequent a water quality insert is cleaned, the more effective it will be. One study (Pitt, 1985) found that WQI's can store sediment up to 60% of its sump volume, and after that, the inflow re-suspends the sediments into the stormwater. Some sites have found keeping a log of sediment amount date removed helpful in planning a maintenance schedule. The EPA has a monitoring program, Environmental Technology Verification (ETV) Program, (www.epa.gov/etv), that may be available to assist with the development of a monitoring plan.

Figure 7. Maintenance of a bag type water quality insert. (Filter Bag Installation (Full Circle Ag, Inc., http://www.fullcircleag.com/pages/954364/)

Disposal of removed material will depend on the nature of the drainage area and the intent and function of the Water Quality Insert. Material removed from Water Quality Inserts that serve "Hot Spots" such as fueling stations or that receive a large amount of debris should be handling according to DEP regulations for solid waste, such as a landfill that is approved by DEP to accept solid waste. Water quality inserts that primary catch sediment and detritus from areas such as lawns may reuse the waste on site, which is recommended by the DEP.

Vactor trucks may be an efficient cleaning mechanism.

Winter Concerns: There is limited data studying cold weather effects on water quality insert effectiveness. Freezing may result in more runoff bypassing the treatment system and overflowing. Salt stratification may also reduce detention time. Colder temperatures reduce the settling velocity of particles, which can result in fewer particles being “trapped”. Salt and sand and significantly increased in the winter, and may warrant more frequent maintenance, but sometimes freezing makes accessing devices for maintenance difficult

Cost Issues

Inserts range from $400 - $10,000
Pre cast range from $2000 - $3000

Specifications:

See manufacturer’s instructions.

Sources/ Additional Resources

New Hampshire “Innovative Stormwater Treatment Technologies BMP Manual”, Watershed Management Bureau, Watershed Assistance Section, May 2002

Stormwater magazine “Inlet Protection – Strategies for Preserving Water Quality” by Carol Brzozowski, March/April 2003

Stormwater magazine “The Right BMP’s? Another Look at Water Quality” by G. Fred Lee