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# Chapter 15 – Catch Basin Inserts

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## 15.1 Overview of Practice

The following design example provides guidance for the implementation of manufactured water quality inlets and catch basin inserts for purposes of runoff quality management on VDOT facilities projects.

Catch basins are chambers or sumps which provide the entrance point for surface runoff into a stormwater conveyance system. Catch basin inserts are employed to intercept coarse sediments, oils, grease, litter, and debris from the runoff prior to its entrance into the storm sewer. Catch basin inserts are well suited to parking lots, maintenance yards, and other locations where runoff travels directly from an impervious surface into the stormwater conveyance system. (VTRC, 2004)

Water quality inlets encompass a broad spectrum of BMPs designed to remove non point source pollutants from runoff. These structural BMPs vary in size and treatment capacity, but typically employ some form of settling and filtration to remove particulate pollutants. Water quality inlets may exist as hydrodynamic separator systems (see Design Example 15), multi-chambered treatment trains, and a wide array of proprietary products discussed later in this design example.

Many types of catch basin inserts/water quality inlets exist; however, these different configurations generally exhibit similar strengths and shortcomings. The following presents the most common variations of water quality inlet filtering systems.

### 15.1.1 Tray Type

Tray type filters function by passing stormwater through a filter media situated in a tray located around the perimeter of the inlet. Runoff enters the tray and exits via weir flow under design conditions. Runoff from large storms simply passes over the tray into the inlet unobstructed.

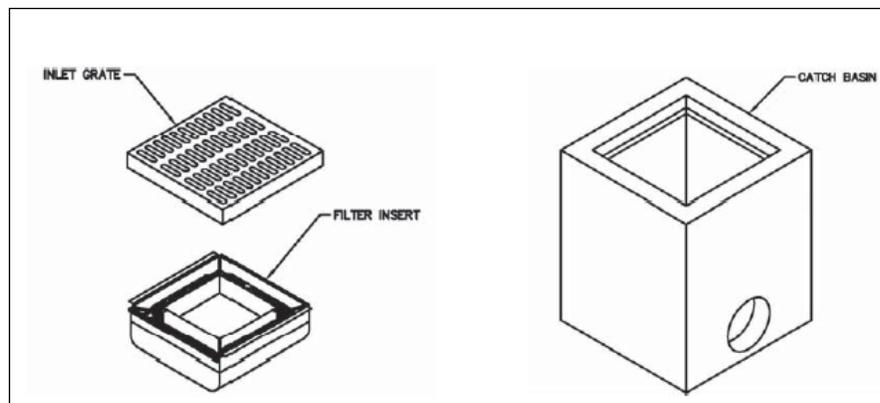


Figure 15.1. Water Quality Inset Tray (PADEP, 2005)

### 15.1.2 Bag Type

Bag type inserts are made of fabric and placed in the drain inlet around the perimeter of the grate. Runoff entering the drain must pass through the bag prior to exiting through the drain pipe outlet. The system is usually equipped with overflow holes to prevent backwater conditions during heavy runoff producing events.

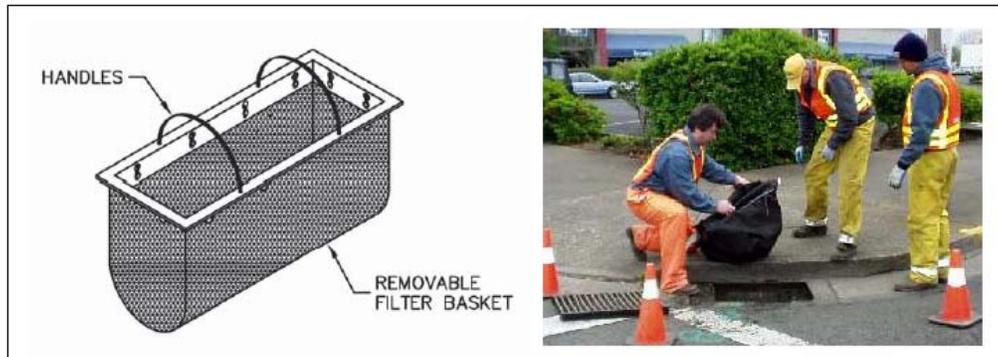


Figure 15.2. Bag Type Inlet Filter and Installation (PADEP, 2005)

### 15.1.3 Basket Type

Basket type inserts set into the inlet and can be removed for periodic maintenance. Small orifices permit small storm events to weep through, while larger storms overflow the basket. Basket type inserts are useful for filtering trash, debris, and large sediment, but require consistent maintenance.



Figure 15.3. Basket Type Inlet Filter (PADEP, 2005)

### 15.1.4 Sumps in Inlets

Inlets can be designed such that space is created below the invert of the outlet pipe(s) for sediment and debris to deposit. Generally, this space will be 6 to 12 inches deep. Small weep holes should be drilled into the bottom of the inlet to prevent standing water for long periods of time. Note that if weep holes are used to drain a sumped inlet, the inlet must conform to applicable design requirements for infiltration facilities. Inlets equipped with a sump require regular maintenance and sediment removal.

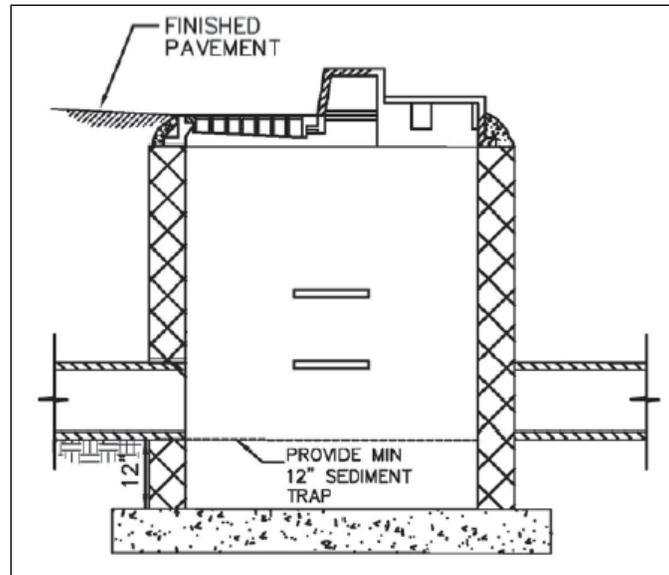


Figure 15.4. Catch Basin Equipped With Sediment Sump (PADEP, 2005)

## 15.2 Design Considerations

The design process for a specific installation of a water quality inlet or catch basin insert usually begins with a review of various vendor publications and use of preliminary sizing guidelines provided by the vendor. The specific design criteria for the proprietary system being considered should be obtained from the manufacturer or vendor to ensure that the latest design and sizing criteria are used. At the very least, the design for a particular site should be reviewed by the manufacturer to ensure that the system is adequately sized and located.

### 15.2.1 Key Considerations Unique to Manufactured Products

- Independent performance data must be available to prove a demonstrated capability of meeting stormwater management goals.
- The chosen system or device must be appropriate for use in the geographic region for which implementation is planned.
- Installation and operations/maintenance requirements must be understood by all parties approving and using the system or device in question.

### 15.2.2 General Design Guidance

- Specific site conditions must be matched with the manufacturer/vendor guidelines and specifications. Geographic location and land use will determine the specific pollutants and their associated loading rates.
- The re-suspension of particles and sediment is of concern. To avoid such re-suspension, the drainage area to each water quality inlet or catch basin should

### **15.3 - Maintenance**

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be restricted to no more than one acre of impervious cover. Regular maintenance and removal of accumulated debris is essential.

- Retrofits should be designed specifically for the existing inlet.
- Location of the water quality inlet or catch basin should provide ease of maintenance, and be at the forefront of the design process.
- If the inlet is used during construction operations for erosion and sedimentation control, the insert should be reconfigured and cleaned per manufacturer guidelines prior to its implementation in the final site design.
- Overflow should be provided such that storms in excess of the device capacity (typically the computed water quality volume) are bypassed.

Source: PADEP, 2005

### **15.3 Maintenance**

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The manufacturer's guidelines for maintenance should be followed for any proprietary system. The expected pollutant type and loading rate for the specific site of interest must also be considered. During construction operations, water quality inlets should be inspected a minimum of once per week, and cleaned as needed. Post-construction, they should be emptied when full of sediment and trash / debris. Thorough cleaning should occur at least twice per year. Water quality inlets and catch basins equipped with filtering devices should also be inspected after all heavy runoff producing events. Regular maintenance is critical to ensuring the continued functioning of water quality inlet systems. Studies have shown that water quality inlets storing in excess of 60 percent of their total sediment capacity may resuspend the stored sediments into the runoff entering the inlet. (PADEP, 2005)

### **15.4 Manufactured Products**

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The following discussion of manufactured water quality filters is intended only to serve as a description of the most widely used proprietary systems. The products discussed in this design example are not intended to constitute an exhaustive list of all catch basin / inlet filtering systems available. Presentation of the following products does not preclude the use of other available systems, nor does it constitute an endorsement of any one system.

The Virginia Transportation Research Council, via contract with University of Virginia, has constructed the following information matrices for the most widely used catch basin inserts and water quality inlets, as of 2004. The user is referred to the following for the originally published matrices:

Virginia Transportation Research Council. [VDOT Manual of Practice for Stormwater Management](#). Charlottesville, Virginia, 2004.

System Type	Manufacturer	Operation	Sizing and/or Area Treated	Maintenance	Cost	General Performance	Comments
<b>Catch Basin Inserts</b>							
Sorbant™	Sorbant Environmental Corp. Aventura, FL.	Flow cascades over 3 tiers of sorbent pads. Primarily for hydrocarbon removal	Structure drops into standard inlets.	ND	ND	Sorbs 16 to 22 times its weight in hydrocarbons. Does not leach in flooded conditions.* (Corcoran and Rich, 1995)	Catch basin or curb inlet design.
BMP Filter "CB" Series Catch Basin Insert	StormWater Compliance International Oroville, CA (www.stormwatercomptintl.com/)	Insert directs flow through mesh screens for sediment removal, then through proprietary media filters.	Applied to catch basins or curb inlets. Overflow allows up to 0.63 cfs through the system.	Hydrocarbon media changes color when saturated. Replacement of other media filters every 6 months. More frequent cleaning of debris.	\$900	Oil and grease removal to less than 5 mg/L. Neutral pH: 6-8, BOD & COD reduced to less than 50 mg/L; TSS removal over 90%.*	Company also manufactures oil/water separators, curb inlet filters, inline filters.
Hydro-Kleen™ Filtration System	Hydro Compliance Management, Inc. Brighton, MI (www.hydrocompliance.com/)	Multi-chambered system. Flow through sedimentation chamber to 2 media filters: proprietary material for hydrocarbon removal then activated carbon for final polishing.	Treats first-flush, with bypass available.	Filter change every 4-6 months. More frequent sediment cleanout by vacuum truck.	\$1,200 - \$2,500 per unit.  Filter change: \$400 including labor.  Low installation cost.	Reduces hydrocarbons, pesticides, herbicides, VOCs to below detection limits.*	Can customize media for site-specific loads. Can be catch basin or curb inlet system. Vendor claims product satisfies structural BMP requirements for NPDES compliance.
Aqua-Guard™	AquaShield, Inc.	Flow through sedimentation chamber and filter media.	ND	Sediment removal by shop-vac or vacuum truck. Filter media changes color to black when replacement is needed.	ND	Effective removal of TSS, soluble and insoluble O&G, phosphorus, nitrogen, VOCs, sulfides, heavy metals. Certified by CA EPA 90-95% removal of dissolved petroleum and oils.*	Standard sizing for drop-in application.
StreamGuard™	Bowhead Manufacturing Co. Address: P.O. Box 80327 Seattle, WA 98108	The insert's universal skirt adapter is installed under a storm drain grate and provides water quality treatment through filtration.	Size based on flow rates from 20 to 40 gpm.	Remove trash and debris when accumulation becomes significant.	\$56 to \$93 each, depending on size.	Independent testing by King County Surface Water Management Division of	Installed at the U.S. Coast Guard Station in Chesapeake, VA.

**Table 15.1. Catch Basin Inserts Information Matrix (VTRC, 2004)**

System Type	Manufacturer	Operation	Sizing and/or Area Treated	Maintenance	Cost	General Performance	Comments
		gravity settling and absorption.				Washington State demonstrated oil removal efficiencies of 88% when tested in a park-and-ride lot catch basin. Catch basin inserts installed at SeaTac International Airport's passenger pick-up area show average removal efficiencies for Total Suspended Solids of 80%, and for oil & grease of 94%.	
The SNOUT™	Best Management Products, Inc.	Simple hood covers outlet structure. Bottom of hood sits below static water level. Keeps floatables (including trash) above outlet.	ND	SNOUT itself does not require maintenance.  Remove trash and debris when accumulation becomes significant.	Low hundreds	Inspections show significant accumulation of gross pollutants.*	Suitable for use with catch basins or water quality inlets. Can be equipped with flow restriction and/or odor control filter.
Filter bag inserts – general	<i>Multiple Vendors:</i> DrainPac™ by Drain Works; Drainguards by Ultra Tech; Ultra-Urban Filters by AbTech Industries.	Heavy filter fabric held in place by inlet grate.	Standard sizes for drop-in installation	Frequent inspection and cleanout	ND	Mainly designed to capture trash and sediment. Some also claim sorption of O&G. Can be effective if frequently maintained.	Improper installation causes leaks/bypass of runoff around filter media.

Table 15.1 Cont'd. – Catch Basin Inserts Information Matrix (VTRC, 2004)

System Type	Manufacturer	Operation	Sizing and/or Area Treated	Maintenance	Cost	General Performance	Comments
<b>Water Quality Inlets</b>							
Oil/Water Separator (OWS)	<i>Multiple Vendors:</i> Areo-Power®; Flo-Trends, Inc.; PSI International, Inc.	Coalescing plate or tube separator. Flow-through system.	Usually designed for specific applications.	ND	ND	Low to negative removal of TSS, TPH, and O&G. (Othmer et al., 2001)	General inability to reduce low levels of hydrocarbons. Not generally recommended.
MCTT (Multi-Chambered Treatment Train)	Developed at the University of Alabama-Birmingham. Specifications are given for cast-in-place construction.	Flow through 3 chambers: screening, tube settling, media filtration. Provides some detention. Customize with aerators, sorbent pads, multi-media filters	Surface area of unit typically 0.5 – 1.5% of the drainage area.	Six-month inspections. Replace sorbent pillows & clean catch basin every 6 – 12 months. Media replacement after 3 – 5 years. Ensure mosquito control.	\$10,000 - \$20,000 per 0.25 acre. (Schueler, 2004)	Treats 95% of annual rainfall. Toxicity reduced by filtration. Flow restrictions can provide up to 24 hrs settling (US EPA, 1999c)	May be able to customize system depending on site pollutant characteristics.
BaffleBox	Multiple Vendors: Suntree Technologies, Inc., or Cast-in-place construction	Large sediment trap comprised of multiple concrete or fiberglass chambers separated by weirs. Usually with trash screens and skimmers.	Usually 10 – 15 ft. long by 6 – 8 ft. wide. (2 ft. wider than inlet pipe)	Monthly during wet season, 2 – 3 months during dry season.	Installation: \$20,000 - \$30,000  Maintenance: \$0.24/kg removed (avg. \$450 per event)	Approx. 2,500 – 3,800 kg/yr sediment removal but highly site-specific. Model performance: removed at least 90% sand or sandy clay, but reduced to only 28% for fly ash. Differences in accumulated material noted between chambers.	Better performance with larger boxes. Systems become septic and odorous without base flow. Many systems installed in Florida. Wash-out can be a problem with larger events.
Oil/Grit Separators (OGS)	Usually cast-in-place construction.	On-line system. Flow through three chambers: sediment & trash, oil containment, energy dissipation. Inverted elbow in oil chamber retains floatables.	Treat 0.1" runoff. Recommended as a last resort for treatment area less than 1 acre.	Quarterly	\$5,000 - \$16,000; average \$8,500 (US EPA, 1999d)	Of 109 systems investigated, the average residence time was less than 30 minutes. Poor retainment of trash and debris. 10 – 40% solids removal with 1	Used mainly at gas stations, fast food restaurants and other small, but highly-developed sites. Hundreds installed in the DC metro area. Better performance

Table 15.2. Water Quality Inlets Information Matrix (VTRC, 2004)

Figures 14.5 through 14.9 are representative of many vendor products which can be viewed at the following EPA Region 1 New England website:

<http://www.epa.gov/NE/assistance/ceitts/stormwater/techs.html>

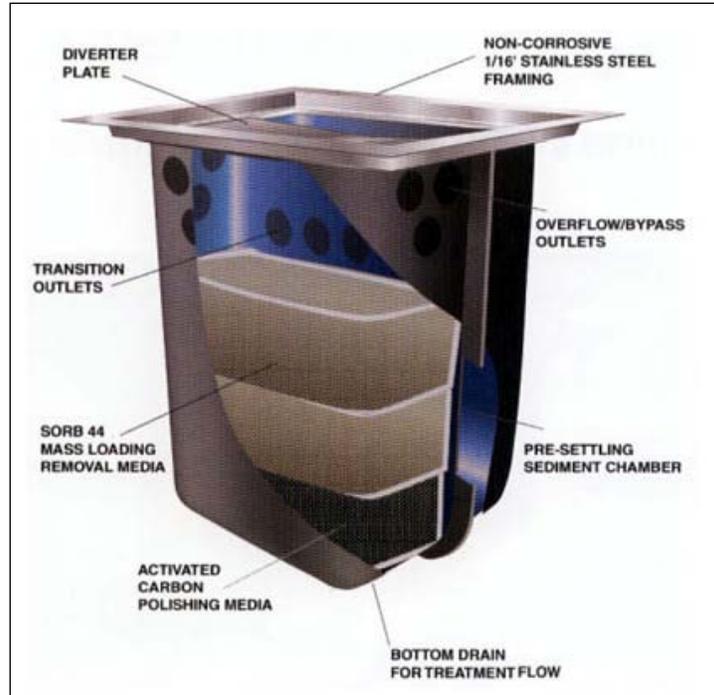
Additional vendor products and preliminary design information can be found at the US EPA NPDES/STORMWATER/BMPMENU website:

[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post\\_7.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post_7.cfm)



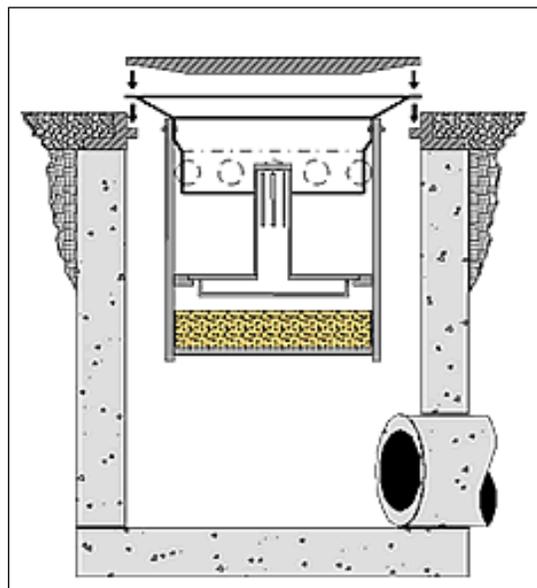
**Figure 15.5. Sorbant Filter Pillow System**

Source: **Sorbant Environmental Corp**  
P.O. Box 80-2505 • Aventura, FL 33280  
305-655-9911 - Fax: 305-655-0470



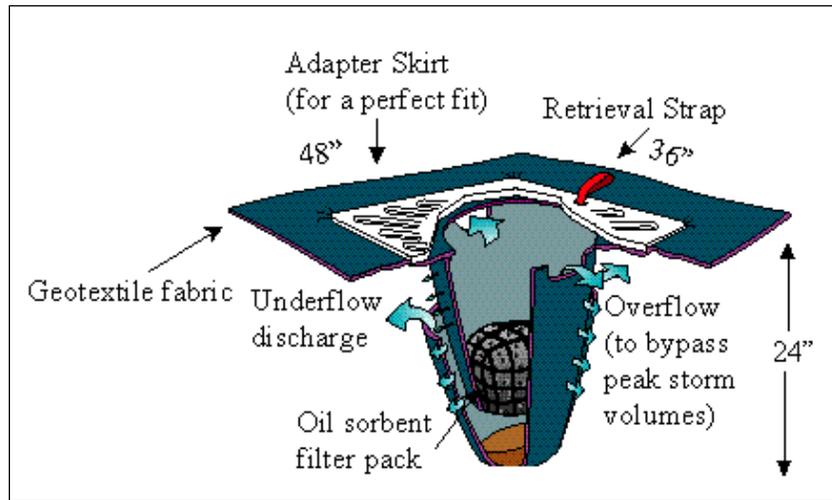
**Figure 15.6. Hydro-Kleen Filtration System**

Source: Hydro Compliance Management, Inc. Brighton, MI



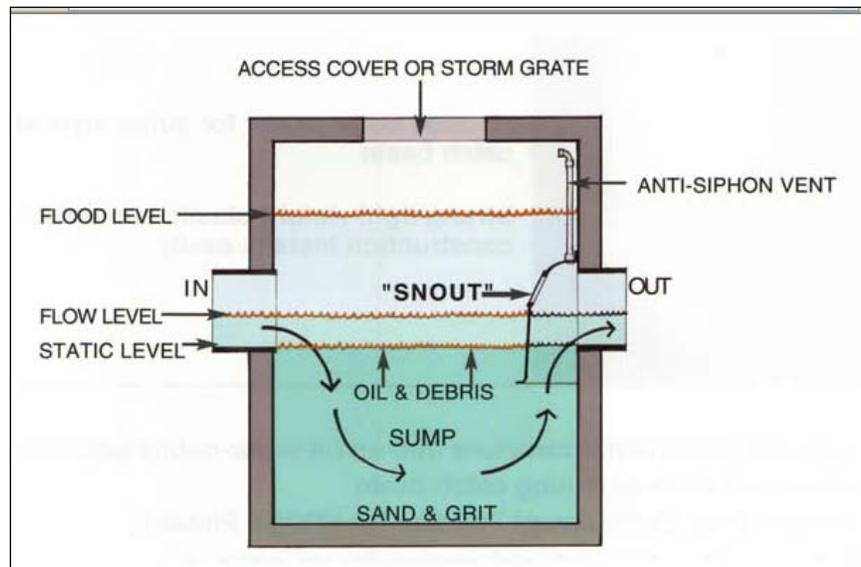
**Figure 15.7. Aqua-Guard Catch Basin Insert**

Source: Aquashield, Inc.; Water Services Inc. 1102 C. Montalona Rd.  
Dunbarton, NH 03046



**Figure 15.8. StreamGuard Catch Basin Insert**

Source: Bowhead Manufacturing Co.  
 P.O. Box 80327  
 Seattle, WA 98108



**Figure 15.9. The SNOUT Catch Basin Insert**

Source: Best Management Products, Inc., 53 Mount Archer Road, Lyme, CT 06371