



DUAL-VORTEX SEPARATOR

Submittal Package

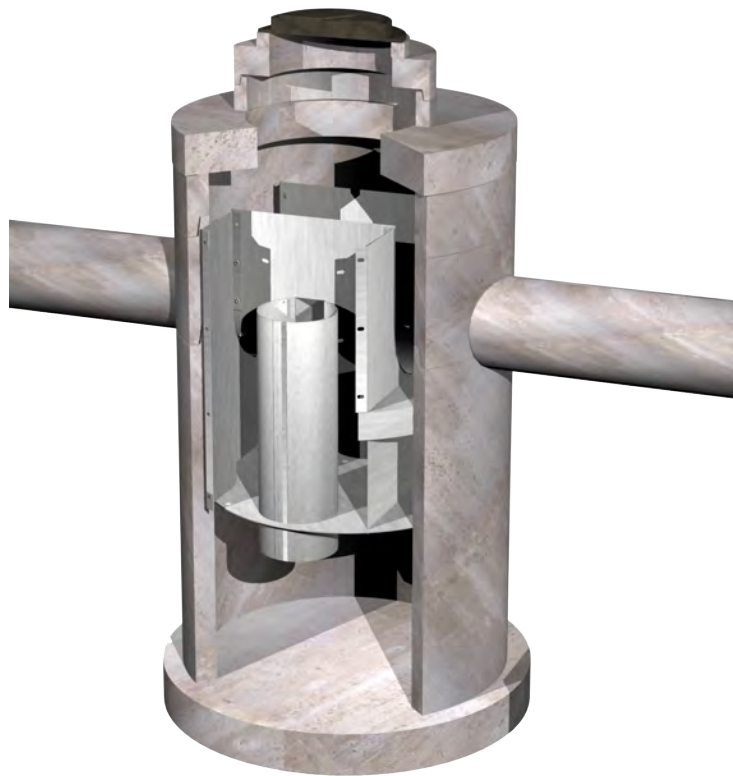


TABLE OF CONTENTS

1 - Submittal Drawing

2 - Features & Benefits

3 - Product Specifications

4 - Inspection & Maintenance

SECTION 1

Submittal Drawing

SECTION 2

Features & Benefits



STORM CYCLONIC WATER Separation

Enhanced Gravity Separation of Stormwater Pollutants in a Compact Configuration

Dual-Vortex Efficiency

Particle settling is enhanced by circular flow patterns and a highly circuitous flow path created by two independent vortex cylinders.

Settled particles are collected in the isolated bottom storage area, while floating trash, debris and petroleum hydrocarbons are retained in the cylinders and upper storage areas.

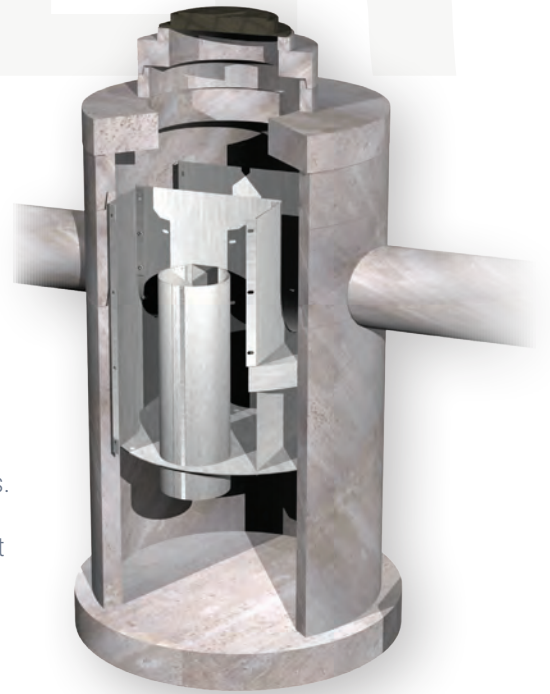
During peak events, flows in excess of design treatment overtop the bypass weir and exit the system without entering the cylinders and lower storage area, thereby eliminating re-entrainment issues.

FEATURES:

- Maintenance Accessible Design
- Economical Installation
- Access Options
- Online System Capability
- Durable Construction
- Proven Performance
- Treatment Train

BENEFITS:

- Open access to accumulated floatables and sediment storage area
- Prepackaged and provided as compact round or square manholes
- Multiple access options (manhole cover or optional hinged lid)
- Internal high-flow bypass weir system provides for online or offline configurations
- Stainless-steel components installed in a reinforced concrete structure
- Third party tested and certified
- Can be installed upstream of infiltration, detention and retention systems or other treatment BMP's



Dual-Vortex Separator Offers an Innovative, Economical Alternative for Removal of Suspended Pollutants from Stormwater Runoff

How it Works

STEP 1

Independent Vortex Cylinders & Control Weir - Flows are directed to the two independent vortex cylinders where particle settling is enhanced by circular flow patterns.

STEP 2

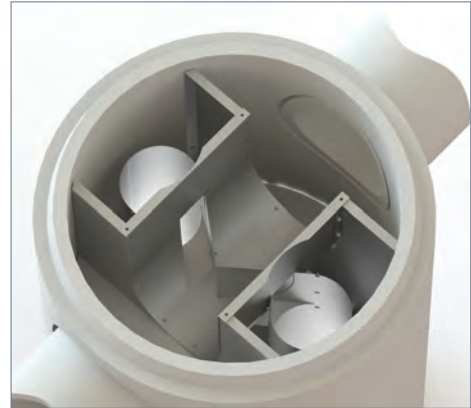
Captured Floatables - Floating trash, debris and petroleum hydrocarbons accumulate at the top of the two cylinders where they are held until transfer into the upper storage area by peak storm events.

STEP 3

Removal of Total Suspended Solids (TSS) - Particle settling is enhanced by the circular flow patterns and a highly circuitous flow path created by two independent vortex cylinders. Sediments are collected and retained in the isolated bottom storage area.

STEP 4

High-Flow Bypass - Flows in excess of the design treatment overtop the bypass weir and exit the system without entering the cylinders and re-entraining captured pollutants.



MODELS AND NOMINAL DIMENSIONS

Model No.	Structure Diameter (ft.)	Standard Sump Depth* (ft.)	Minimum Rim to Invert Depth (ft.)	Sediment Storage* (cubic feet)	Oil and Floatable Storage (cubic feet)	NJCAT Treatment Flow Rate (cfs)	Maximum Treatment Flow Rate (cfs)
DVS-36	3	4.5	2.5	11	6	0.56	0.56
DVS-48	4	5.0	3.0	19	15	1.00	1.25
DVS-60	5	5.5	3.5	29	29	1.56	2.50
DVS-72	6	6.5	4.5	42	49	2.25	4.25
DVS-84	7	7.0	5.0	58	79	3.06	6.50
DVS-96	8	8.0	5.5	75	116	4.00	9.50
DVS-120	10	10.0	7.0	118	226	6.25	16.80
DVS-144	12	11.5	8.0	170	388	9.00	26.40

*Depth of unit can be increased to add storage capacity.

Available Options

Square configurations accept multiple inlet pipes or meet other special site conditions.
 Flume inlet control for grated inlet applications.



(800) 579-8819

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SECTION 3

Product Specifications

PART 1 — GENERAL

1.1 Section Includes

- A. Dual Vortex Separator (DVS) – vortex hydrodynamic separator for stormwater treatment.

1.2 Related Sections

- A. Section 01 33 00 – Submittals: Shop Drawings, Product Data, and Samples
- B. Section 02 30 00 – Earthwork: Excavation, Trenching, Backfill, and Compaction.
- C. Section 31 25 00 – Erosion and Sedimentation Controls

1.3 References

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M105 – Standard Specification for Gray Iron Castings
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A48, CL.30B – Standard Specification for Gray Iron Castings
 - 2. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - 3. ASTM A185 – Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
 - 4. ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - 5. ASTM A496 – Standard Specification for Deformed Steel Wire for Concrete Reinforcement
 - 6. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
 - 7. ASTM A615 – Standard Specification for Deformed and Plain, Carbon-Steel Bars for Concrete Reinforcement
 - 8. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 9. ASTM C32 – Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
 - 10. ASTM C33 – Standard Specification for Concrete Aggregates
 - 11. ASTM C139 – Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

12. ASTM C150 – Standard Specification for Portland Cement
13. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
14. ASTM C595 – Standard Specification for Blended Hydraulic Cements
15. ASTM C890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
16. ASTM C891 – Standard Practice for Installation of Underground Precast Concrete Utility Structures
17. ASTM C913 – Standard Specification for Precast Concrete Water and Wastewater Structures
18. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
19. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink)
20. ASTM C1227 – Standard Specification for Precast Concrete Septic Tanks
21. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
22. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

C. Definitions:

1. BMP: Best Management Practices
2. TSS: Total Suspended Solids

1.4 Submittals

The following shall be submitted by contractor in accordance with Section 01 33 00 Submittal Procedures:

A. Product Data for the Hydrodynamic Separator:

1. Product specifications to include but not limited to specification sheets, brochures, and performance claims.
2. Inspection and maintenance guidelines.
3. Submittal drawings shall be provided and annotated to indicate all materials to be used and applicable material standards, required tests of materials, and all design assumptions for structural analysis. Details of steel reinforcing size and placement shall be submitted if professional

engineering stamp and calculations are required by the customer. It is the responsibility of the project's engineer-of-record to verify that the design assumptions are suitable for the proposed application.

- B. Independent third-party certification or test report demonstrating conformance to applicable local or regional BMP standards before the treatment system is installed for the following, upon request:
 - 1. Removal Efficiency
 - 2. Targeted Pollutants of Concern
 - 3. Hydraulic Capacity
 - 4. Certification of adherence to applicable standard
- C. Products submitted as approved equal must be submitted at least 2 weeks prior to project bid opening and must be approved by project engineer. Submittal for approved equal product must contain a signed letter from an executive officer of the manufacturer stating product is equivalent to all applicable requirements of this specification.

1.5 Quality Assurance

The precast concrete producer shall demonstrate adherence to the standards set forth in the plant Quality Control Manual.

- A. Qualifications, Quality Control and Inspection
 - 1. The precast producer shall maintain a permanent quality control department.
 - 2. The precast concrete producer shall have a quality control program which is audited for compliance annually by persons outside that plant's employee structure.
 - 3. Upon request, the precast concrete producer shall supply a copy of their quality control manual.
- B. Quality Control
 - 1. The precast concrete producer shall perform standard concrete testing and inspection.
 - i. Preplacement Check
 - 1. All non machine-cast products shall be inspected for accuracy prior to placing concrete. Checks shall include, but not be limited to, form condition and cleanliness, form dimensions, joints, release agent, blockouts, inserts and locations, lifting devices, reinforcing steel size, spacing, clearances and proper placement. Machine cast products shall have a minimum 5% of the production checked at random.
 - 2. Preplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above

criteria can be used as documentation.

ii. Postplacement Check

1. All non machine-cast products shall be inspected for accuracy after the concrete forms have been removed. Checks shall include, but not be limited to, dimensional checks, finishing, insert locations, squareness, honeycombing, cracking, marking, coatings, racking, hole size and location. Postplacement checks may require a corrective action report. Machine cast products shall have a minimum of 5% of production checked at random.
2. Postplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above criteria can be used as documentation.

2. Copies of the test results and Inspections above shall be available upon request.

1.6 Delivery, Storage, and Handling

- A. All treatment system components shall be delivered to the site and unloaded with handling that conforms to the manufacturer's instructions for reasonable care. Concrete and internal components shall not be rolled or dragged over gravel or rock during handling. The contractor shall take necessary precautions to ensure the method used in lifting or placing the treatment system does not induce stress fatigue in the concrete.

PART 2 — PRODUCTS

2.1 Description

The contractor, and/or a manufacturer selected by the contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required and install all precast concrete stormwater treatment systems and appurtenances in accordance with the drawings and these specifications. The treatment system is housed in a precast concrete manhole or vault structure. The treatment system shall provide flow partitioned hydrodynamic treatment that removes sediment, free-floating pollutants, and oil particles. The treatment system must include the capability to partition flows, causing treatment flows to be diverted into the treatment chamber. Flows exceeding the treatment capacity of the unit shall divert the bypass flows around the treatment chamber to prevent resuspension and washout of previously trapped pollutants.

2.2 Materials and Design

- A. Concrete for precast stormwater treatment systems shall conform to ASTM A478 or ASTM C890 and C913 and meet the following additional requirements:
 1. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 (MS18) loading requirements as determined by a Licensed Professional Engineer.
 2. Sections shall have tongue and groove or ship-lap joints with a butyl

mastic sealant conforming to ASTM C990.

3. Cement shall be Type I, II, or III Portland cement conforming to ASTM C150.
4. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi (28 MPa) or other designate suitable handling strength.
5. Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the contractor with hydraulic cement conforming to ASTM C595M or ASTM C1107.
6. Aggregates shall conform to ASTM C33, except that the requirement for gradation shall not apply.
7. Reinforcement shall consist of wire conforming to ASTM A82 or A496, of wire mesh conforming to ASTM A185 or A497, or Grade 40 steel bars conforming to ASTM A615.
8. Castings for manhole frames and covers shall be in accordance with ASTM A48, CL.30B and AASHTO M105. The access cover/s shall be designed for HS20-44 traffic loading and shall provide a minimum of 30-inch clear opening.
9. Brick or masonry used to build the manhole frame to grade shall conform to ASTM C32 or ASTM C139 and shall be installed in conformance with all local requirements.
10. Diversion weirs, separation chamber, and oil baffle shall be made from aluminum and/or stainless steel and shall conform to ASTM B209 or ASTM A240
11. All mounting hardware for internal components shall be made of 304SS and shall conform to ASTM A240

2.3 Performance

Each specified stormwater flow based treatment device shall conform to the specifications listed in Table 2.1

Table 2.1 DVS Models, Flow Rates and Capacities.

DVS Model	Diameter or Length/Width (ft)	NJCAT Verified Flow Rate (cfs)	Minimum Sediment Storage Capacity (cu-ft)	Minimum Oil Storage Capacity (cu-ft)
DVS-36	3	0.56	11	5
DVS-48	4	1.00	19	12
DVS-60	5	1.56	29	23
DVS-72	6	2.25	42	37
DVS-84	7	3.06	58	60
DVS-96	8	4.00	75	88
DVS-120	10	6.25	118	184
DVS-144	12	9.00	170	312

Each specified flow-based stormwater treatment system shall be verified by New Jersey Corporation for Advanced Technology (NJCAT) and certified by New Jersey Department of Environmental Protection (NJDEP) according to the 2013 Hydrodynamic Separator Testing Protocol. Each specified flow-based stormwater treatment system shall be capable of removing 50% of the weighted Total Suspended Solids (TSS) load based on a d50 particle size of 47 microns. Annual TSS removal efficiency models shall be based on laboratory performance data, site-specific hydraulics and hydrology, and local rainfall intensity distributions. The stormwater treatment system shall be completely housed within one structure.

2.4 Manufacturer

Each stormwater treatment system shall be a Dual Vortex Separator (DVS) as manufactured by Oldcastle Infrastructure, Inc., 7100 Longe St, Stockton, California 95206. Phone: (800) 579-8819.

PART 3 — EXECUTION

3.1 Survey

- A. The installation area shall be surveyed using the work print and a checklist to identify the work to be done and to determine that the plans are correct.
- B. All underground facilities and structures such as gas, water, sewer, power, telephone cable, and so forth shall be located and identified. Location markings shall be placed by the affected utilities before construction.
- C. The survey shall identify and obstacles such as overhead wires, building structures that will interfere with crane operations, work progress, or create a safety hazard.
- D. The survey shall give consideration to the soil structure so that proper shoring, sloping, or both may be planned in advance of the excavation work.

3.2 Planning

- A. Permits required to do work in accordance with the detail plans shall be secured before starting the job. All permits or a record of the permits shall be retained on the

job for immediate reference.

- B. All utilities and owners of surface and subsurface facilities and structures in the area shall be given advance notification of proposed excavation. Every effort shall be made to avoid damage to the facilities of others. If any damage occurs, the owner of the damaged facility shall be notified immediately.
- C. Planning shall include the coordination of all responsible parties to ensure that arrangements for removal of excess and damaged material have been made.
- D. Should it appear that a structure location will interfere with traffic, review the situation with the engineer and notify appropriate authorities.
- E. Provide for access to call boxes, fire hydrants, etc.

3.3 Safety Requirements

- A. Safety requirements for construction shall be in accordance with all federal, state, and local regulations.

3.4 Excavating

- A. If unforeseen facilities or obstructions are encountered, stop excavation operations immediately. Expose the obstruction with wood handled digging tools and investigate them with caution. If there is any doubt as to the type of obstruction exposed, request positive identification from those suspected of owning the facility and then proceed as circumstances dictate.
- B. Inspect excavations after every rainstorm or other hazard-increasing occurrence, and increase the protection against slides and cave-ins, if necessary.
- C. In dewatering excavations, make certain that the discharge is carried to a suitable runoff point.
- D. Excavation size shall be large enough to allow access around the structure after it is installed.

3.5 Shoring

- A. Shoring for construction shall be in accordance with all federal, state, and local regulations

3.6 Installation

- A. Site Access – The general contractor shall be responsible for providing adequate access to the site to facilitate hauling, storage, and proper handling of the precast concrete units.
- B. Installation – Precast concrete units shall be installed: to the lines and grades shown on the contract documents or otherwise specified; be lifted by suitable lifting devices at points provided by the precast concrete producer; in accordance with applicable industry standards. Upon request, the precast concrete producer shall provide installation instructions. Field modifications to the product shall relieve the precast

producer of liability and warranty regardless if such modifications result in the failure of the precast concrete unit.

- C. Leak Resistance – Where leak resistance is a necessary performance characteristic of the precast concrete unit's end use, joint sealant, pipe-entry connectors and other penetrations shall be sealed according to manufacturer's requirements to ensure the integrity of the system.

3.7 Backfilling and Restoration

- A. Do the backfilling as soon as possible after the structure has been placed.
- B. Backfill material shall be granular and free from large stones, rocks, and pavement. Expansive soil material shall not be used as backfill around the structure.
- C. Backfilling shall be achieved by lifts (layers) to the required compaction.
- D. Follow up inspections for settlements are required. Should settlement occur, the contractor shall be responsible for all necessary repairs.

3.8 Field Quality Control

- A. Job Site Tests – When leak resistance testing is required for a precast concrete structure, one of the following methods may be followed:
 - 1. Vacuum Testing
 - i. Prior to backfill, vacuum test system according to ASTM C1244 for manholes and ASTM C1227 for septic tanks.
 - 2. Hydrostatic Testing
 - i. First Backfill the structure, then fill to the normal water level, let stand for 24 hours. Refill to the original water line and measure the water level change over a 24-hour period. Leak shall not exceed 5% of volume.
- B. Inspection
 - 1. Final field elevations and compaction properties shall be verified and documented.

END OF SECTION

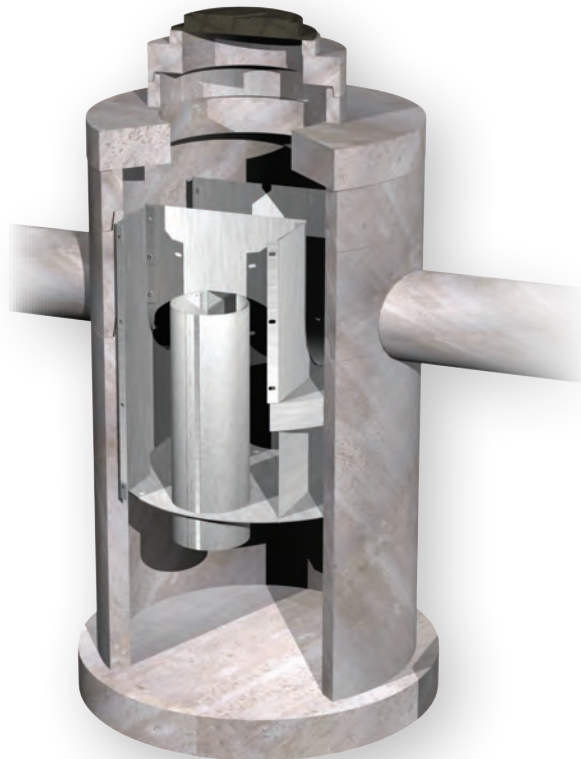
SECTION 4

Inspection & Maintenance



DUAL-VORTEX SEPARATOR

Inspection and Maintenance Guide



Description

The Dual-Vortex Separator (DVS) is a hydrodynamic stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The DVS is designed to capture and retain sediment as well as floating trash, debris and oils. The concentration of metals and other constituents associated with sediment or floating pollutants may also be reduced.

Function

Stormwater runoff enters the DVS unit through an inlet pipe. Influent flow is split evenly between two vortex tubes by a V-shaped weir. The shape and diameter of the vortex tubes promotes circular motion of the incoming stormwater at increased velocities to enhance particle settling through centrifugal force. The system is also designed with an extended flow path to maximize hydraulic residence time which allows increased time to settle out solids. Settled pollutants are collected in an isolated storage area at the bottom of the structure, while floating trash, debris and petroleum hydrocarbons are retained behind baffles that contain the vortex chambers. During peak runoff events, flow in excess of design treatment flow overtops the bypass weir and exits the system without entering the treatment chambers to interrupt the treatment process or re-entrain captured pollutants. Treatment and bypass flows exit the system through an outlet pipe that is plumbed at the same elevation as the inlet pipe.

Configuration

The internal components of the DVS system are fabricated from stainless steel and mounted in a manhole or vault structure. The system is typically delivered as a complete unit for installation by the contractor. Installation includes excavation, preparation of the base rock, setting the unit, plumbing the inlet and outlet piping, backfill and placement of the finished surface at grade. Access to the installed system is allowed through ductile iron casting or hatch covers. The number of access points provided is dependent on the size and configuration of the system.

Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a regular basis and maintained as necessary to ensure performance and protect downstream receiving waters. Without maintenance, excessive pollutant buildup can limit system performance by reducing the operating capacity and increase the potential for scouring of pollutants during periods of high flow.

Inspection Equipment

The following equipment is helpful when conducting DVS inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)
- Replacement sorbent pads

Inspection Procedures

Inspection is essential to consistent system performance and is easily completed. Inspection is typically conducted a minimum of twice per year but since pollutant transport and deposition varies from site to site, a site-specific maintenance frequency should be established during the first two or three years of operation.

DVS inspections are visual and are conducted without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided on page 5) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Infrastructure at (800) 579-8819 to determine appropriate corrective action.
 - Note whether the inlet or outlet pipe is blocked or obstructed.
 - Observe, quantify and record the accumulation of floating trash and debris in the baffled chambers around the vortex tubes. The significance of accumulated floating trash and debris is a matter of judgement. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of oils or sediment is not yet warranted.
 - Observe, quantify and record the accumulation of oils in the baffled chambers around the vortex tubes. If sorbent pads have been used to absorb free oil and grease, observe and record their condition. Unless the sorbent pads are tethered to the internal baffles, spent pads may be netted and replaced at the time of inspection. The significance of accumulated floating oils is a matter of judgement. However, if there is evidence of an oil or fuel spill, immediate maintenance is warranted.
 - Finally, observe, quantify and record the accumulation of sediment in the sediment storage sump. A calibrated dipstick, tape measure or sludge sampler may be used to determine the amount of accumulated sediment. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the DVS to the top of the accumulated sediment and the measurement from the rim of the DVS to the bottom of the DVS structure. Finding the top of the accumulated sediment takes some practice and a light touch, but increasing resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
-

Maintenance

Maintenance should be scheduled if any of the following conditions are identified during inspection:

- Internal components are broken or missing.
- Inlet or outlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the baffled chambers around the vortex tubes is significant.
- Tethered sorbent pads, if used, are dirty or saturated.
- The sediment level in the sediment storage sump is greater than 12 inches. The capacity of the sediment sump is 18 inches of sediment depth for all DVS models. Sediment depths greater than 18 inches will begin to affect the performance of the system.

Maintenance Equipment

The following equipment is helpful when conducting DVS maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Sorbent pads
- Vacuum truck

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. All maintenance, except possibly the attachment of sorbent pads (if required), may be conducted without entering the DVS structure. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the structure through the vortex tubes and evacuate all accumulated sediment from the sediment sump. Some jetting may be required to fully evacuate sediment from the sump. This is easily achieved by inserting a jet hose through the vortex tube opposite the tube used for vacuum hose access.
 - If sorbent pads are required and are tethered to the structure, only personnel that are OSHA Confined Space Entry trained and certified may enter the structure to remove and replace the spent pads.
 - The structure does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
 - All material removed from the DVS during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
-

Dual-Vortex Separator Inspection and Maintenance Log

DVS Model _____

Inspection Date _____

Location _____

Condition of Internal Components

Notes:

Good Damaged Missing

Inlet or Outlet Blockage or Obstruction

Notes:

Yes No

Floating Trash and Debris

Notes:

Significant Not Significant

Floating Oils

Notes:

Significant Not Significant Spill

Sediment Depth

Notes:

Inches of Sediment: _____

Maintenance Requirements

Yes - Schedule Maintenance No - Schedule Re-Inspection

DUAL-VORTEX SEPARATOR

OUR MARKETS



BUILDING
STRUCTURES



COMMUNICATIONS



WATER



ENERGY



TRANSPORTATION