

SECTION (\_\_\_\_)  
STORM WATER TREATMENT DEVICE

1.0 GENERAL

- 1.1 This item shall govern the furnishing and installation of the Vortechs® by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.
- 1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.
- 1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a Vortechs® device manufactured by:

Contech Engineered Solutions LLC  
9100 Centre Pointe Drive  
West Chester, OH, 45069  
Tel: 1 800 338 1122

1.4 Related Sections

- 1.4.1 Section 02240: Dewatering
  - 1.4.2 Section 02260: Excavation Support and Protection
  - 1.4.3 Section 02315: Excavation and Fill
  - 1.4.4 Section 02340: Soil Stabilization
- 1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.
  - 1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.
  - 1.7 The SWTD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certification" certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research

- 1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

## 2.0 MATERIALS

- 2.1 Each stormwater treatment system shall include a circular aluminum “swirl chamber” (or “grit chamber”) with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates.
- 2.2 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Concrete for precast stormwater treatment systems shall conform to ASTM C 857 and C 858 and meet the following additional requirements
  - 2.2.1 The wall thickness shall not be less than 6 inches (152 mm) or as shown on the dimensional drawings. 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.
  - 2.2.2 Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C 990.
  - 2.2.3 Cement shall be Type II Portland cement conforming to ASTM C 150.
  - 2.2.4 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 until 5 days after fabrication and/or repair, whichever is the longer.
  - 2.2.5 Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the Contractor with a hydraulic cement conforming to ASTM C 595M
  - 2.2.6 Brick or masonry used to build the manhole frame to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.
  - 2.2.7 Casting for manhole frames and covers shall be in accordance with ASTM A48, CL.35B and AASHTO M105.
- 2.3 Internal Components and appurtenances shall conform to the following:
  - 2.3.1 Internal aluminum plate components shall be aluminum alloy 5052-H32 in accordance with ASTM B 209.
  - 2.3.2 Sealant to be utilized at the base of the swirl chamber shall be 60 durometer extruded nitrile butadiene rubber (Buna N) and shall be provided to the concrete precaster for installation.

### 3.0 PERFORMANCE

- 3.1 The SWTD shall be capable of achieving an 80 percent average annual reduction of TSS or an 80% reduction of TSS based on a treatment flow rate or calculation as specified by local regulatory requirements unless otherwise stated.
- 3.2 The SWTD shall have completed field tested following TARP Tier II protocol requirements
- 3.3 Annual TSS removal efficiency models shall be based on documented removal efficiency performance from full scale laboratory tests based on a particle size gradation defined in Table 1 unless otherwise stated. Annual TSS removal efficiency models shall only be considered valid if they are corroborated by independent third party field testing. Said field testing shall include influent and effluent composite samples from a minimum of ten storms at one location.
- 3.4 Individual stormwater treatment systems shall have usable sediment storage capacity of not less than the corresponding volume listed in Table 2. The systems shall be designed such that the pump-out volume is less than ½ of the total system volume. The systems shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.
- 3.5 The stormwater treatment system manufacturer shall furnish documentation which supports all product performance claims and features, storage capacities and maintenance requirements.
- 3.6 Stormwater treatment systems shall be completely housed within one rectangular structure.
- 3.7 In order to not restrict the Owner’s ability to maintain the stormwater treatment system, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter

**TABLE 1**  
**Particle Size Gradation**

Percent of Sample	Particle Size Range
27%	>250 micron
11%	150-250 micron
7%	100-150 micron
9%	75-100 micron
4%	63-75 micron
42%	<63 micron

#### 4.0 EXECUTION

- 4.1 Each Stormwater Treatment System shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.
- 4.2 Place the precast base unit on a granular subbase of minimum thickness of six inches (152 mm) after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-leveled.
- 4.3 Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C 990-91 along the construction joint in the section that is already in place.
- 4.4 After setting the base and wall or riser sections, prepare to install the swirl chamber (if not installed prior to delivery). Place the butyl mastic sealant vertically on the outside of the swirl chamber starting one inch above the bottom of the swirl chamber and continuing to a height equal to the elevation of the bottom of the upper aperture of the swirl chamber. The butyl mastic sealant should abut the downstream side of the pre-drilled mounting holes that attach the swirl chamber to the long walls of the concrete vault. Next, install the extruded Buna N seal on the bottom edge of the 180 degree downstream section of the swirl chamber by first applying a bead of Sikaflex-1a polyurethane elastomeric sealant into the extruded slot then slide the seal onto the swirl chamber. The extruded seal should extend 3-inches (76 mm) upstream of the mounting holes, toward the inlet end of the vault. Set the swirl chamber into position and keep the seal approximately ½-inch (13 mm) above the floor of the concrete vault. Apply a continuous bead of Sikaflex-1a sealant under the cupped bottom of the seal. Set the circular swirl chamber on the floor of the vault and anchor it by bolting the swirl chamber to the side walls of the concrete vault at the three (3) tangent points and at the inlet tab using HILTI brand stainless steel drop-in wedge anchors or equivalent 3/8-inch (10 mm) diameter by 2-3/4 inch (70 mm) minimum length at heights of approximately three inches (3") (76 mm) off the floor and at fifteen inch (15") (381 mm) intervals to approximately the same height of the butyl mastic sealant (at locations of pre-drilled holes in aluminum components). Apply a continuous bead of Sikaflex-1a sealant to the intersection of the inside bottom edge of the extruded seal and the vault floor.
- 4.5 If the oil baffle wall (Baffle A) and flow control wall (Baffle B) are not integrally cast-in to riser/wall sections then the Baffle wall panels shall be placed in the formed keyways or between bolted-in-place angle flanges as provided by the manufacturer. Apply non-shrink grout or Sikaflex-1a sealant to each end of Baffle A and Baffle B at the upstream intersection with the side walls of the concrete vault.
- 4.6 Prior to setting the precast roof section, bitumen sealant equal to ASTM C 990 shall be placed along the top of the oil baffle wall (Baffle A), using more than one layer of mastic if necessary, to a thickness at least 1-inch (25 mm) greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. Do not seal the top of Baffle B unless specified on the shop drawings to do so. After placement of the roof section has compressed the butyl mastic sealant in the gap over Baffle A, finish sealing the gap with an approved non-shrink grout on both sides of

the gap using the butyl mastic as a backing material to which to apply the grout. If roof section is “clamshell” or “bathtub” halves, then finish sealing the ends of the Baffle walls by applying non-shrink grout or Sikaflex-1a sealant to each end of Baffle A at the upstream intersection with the side walls of the concrete vault and to each end of Baffle B at the downstream intersection with the side walls of the concrete vault.

- 4.7 After setting the precast roof section of the stormwater treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a ¼-inch (6 mm) maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch (152 mm) lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C 891 “Standard Practice for Installation of Underground Precast Utility Structures”.
- 4.8 Holes made in the concrete sections for handling or other purposes shall be plugged with a nonshrink grout or by using grout in combination with concrete plugs.
- 4.9 Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

**TABLE 2**  
**Stormwater Treatment Device**  
**Storage Capacities**

Vortechs Model	Minimum Sump Storage Capacity (yd <sup>3</sup> )/(m <sup>3</sup> )
1000	0.7(0.54)
2000	1.2(0.91)
3000	1.8(1.38)
4000	2.4(1.84)
5000	3.2(2.45)
7000	4.0(3.06)
9000	4.8(3.67)
11000	5.6(4.28)
16000	7.1(5.43)

**END OF SECTION**