SECTION 33 44 43
VORTEX-TYPE HYDRODYNAMIC SEPARATORS

PART 1 GENERAL

1.1. SECTION INCLUDES

A) Fabrication and installation of hydrodynamic separators for stormwater treatment as indicated on the drawings and as specified herein.

1.2. RELATED REQUIREMENTS

A) Section 01 33 00 – Submittal Procedures
B) Section 01 78 23 – Operation and Maintenance Data
C) Section 02 32 00 – Geotechnical Investigations
D) Section 03 62 00 – Non-Shrink Grouting
E) Section 31 23 00 – Excavation and Fill
F) Section 31 41 00 – Shoring
G) Section 33 05 61 – Concrete Manholes
H) Section 33 08 40 – Commissioning of Stormwater Utilities
I) Section 33 42 00 – Stormwater Conveyance

1.3. REFERENCES

A) ABBREVIATIONS AND ACRONYMS
   1. AHJ: Authority Having Jurisdiction
   2. MTD: Manufactured Treatment Device
B) REFERENCE STANDARDS
   1. American Association of State Highway and Transportation Officials (AASHTO)
      a. Standard Specification for Highway Bridges – Seventh (7th) Edition
   2. American Association of Testing and Materials (ASTM) (Latest Revision Referenced)
      a. ASTM A-48 – Standard Specification for Gray Iron Castings
      b. ASTM A-240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
      c. ASTM A-320 – Standard Specification for Alloy-Steel and Stainless-Steel Bolting for Low-Temperature Service
      d. ASTM A-615 – Standard Specification for Deformed and Plain, Carbon-Steel Bars for Concrete Reinforcement
      e. ASTM A-1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
      f. ASTM C-33 – Standard Specification for Concrete Aggregates
      g. ASTM C-150 – Standard Specification for Portland Cement
      h. ASTM C-478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
      i. ASTM C-990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
      j. ASTM C-1821 – Standard Practice for Installation of Underground Circular Precast Concrete Manhole Structures
      k. ASTM D-2216 – Standard Test Methods for Laboratory Determination of Water Content of Soil and Rock by Mass
      l. ASTM D-3977 – Standard Test Methods for Determining Sediment Concentration in Water Samples

m. ASTM D-6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
n. ASTM D-7928 – Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

3. American Concrete Institute (ACI)
   a. ACI-318 – Building Code Requirements for Structural Concrete

1.4. ADMINISTRATIVE REQUIREMENTS

A) The Contractor shall schedule a preinstallation meeting with the manufacturer no later than five (5) business days prior to delivery.

1.5. ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

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

A) PRODUCT DATA
   1. MTD brochures or specification sheets
   2. Brochures or cut sheets of accessories and related components as indicated on the submittal drawings

B) SUBMITTAL DRAWINGS
   1. Submittal drawings are to detail the MTD's primary dimensions and elevations
   2. Pipe type, locations, provided pipe opening dimensions, and connection details
   3. Access opening locations, dimensions, and connection details
   4. Indicate all materials to be used and applicable material standards
   5. Design assumptions for structural analysis

C) CERTIFICATES
   1. Certification by a Professional Engineer licensed in the State of installation shall be submitted that the MTD meets or exceeds the structural design standards listed in this specification if engineering stamp and calculations are required by the Owner.
      a. It is the responsibility of the Engineer of Record to verify that the design assumptions are acceptable for the proposed application.
   2. Certification letter from the New Jersey Department of Environmental Protection (NJDEP) stating that the MTD has met or exceeded the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 1, 2021 for online and offline use.

D) MANUFACTURERS' INSTRUCTIONS:
   1. Installation Manual
   2. Inspection and Maintenance Manual
   3. Inspection Checklist

1.6. QUALITY ASSURANCE

A) The manufacturer of the MTD shall be one that is acceptable to the Engineer of Record, regularly engaged in the engineering, design, and production of systems developed for the treatment of stormwater runoff for at least five (5) years and which have a history of successful production.

B) The manufacturer of the MTD shall have undertaken independent, verified, third-party physical modeling hydraulic studies to substantiate head loss requirements. Documented test results shall be available for review by the engineer or Owner.

C) Upon request, the MTD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Report" stating that each MTD can achieve the specified removal efficiencies listed in these specifications. The certification shall be supported by

independent, third-party research that has been verified by a nationally recognized entity such as the New Jersey Center for Advanced Technologies (NJCAT).

1.7. DELIVERY, STORAGE, AND HANDLING

A) The MTD components shall be delivered to the jobsite by the manufacturer.
B) The contractor shall provide all labor, equipment, and materials necessary to install the MTD as specified in the Drawings and the specifications herein.
C) The contractor shall ensure the methods used to offload, store, and install the MTD components is done in a safe manner and does not damage the MTD.
D) Any repair or replacement costs associated with events occurring after delivery is accepted shall be the responsibility of the contractor.
E) Components shall be handled and stored in accordance with the manufacturer's recommendations.

1.8. WARRANTY

A) The MTD manufacturer shall guarantee the components against all manufacturer originated defects in materials or workmanship for a period of five (5) years from the date of delivery.
B) The manufacturer shall be notified of warranty claims in writing within the referenced warranty period. The manufacturer, upon its determination, shall repair, correct, or replace any manufacturing defects identified by the written notice.
C) The use of MTD components shall be limited to the application for which it was specifically designed.

PART 2 : PRODUCTS

2.1. MANUFACTURERS

A) The indicated manufacturer is the basis of design.
B) The MTD shall be a StormSettler as manufactured by StormTrap LLC, 1287 Windham Parkway, Romeoville, IL 60446. Phone (815) 941-4663. Fax (331) 318-5347. Website www.stormtrap.com.
C) SUBSTITUTION LIMITATIONS
    1. Any other manufacturers shall submit substitution request in accordance with Section 01 25 00 – Substitution Procedures.
    2. Alternate MTDs must demonstrate compliance with the specifications herein and 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 modifications that would be required by the approving jurisdictions/agencies.
    3. No product substitutions shall be accepted unless submitted ten (10) business days prior to the project bid date, or as directed by the Engineer of Record.
    4. Contractor to coordinate with the Engineer of Record on 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.
        a. Costs for reviewing submittals for alternative MTDs shall be the Contractor's or Manufacturer's responsibility.

2.2. DESCRIPTION

A) A stormwater MTD that is housed in a precast concrete manhole or vault structure. The MTD shall capture trash, debris, sediment, particulate bound nutrients and metals, and hydrocarbon particles, as appropriate.
B) Capacities shall not be less than the values listed in section 2.3.B.

C) The MTD must include the capability to partition flows, causing treatment flows to be diverted thru the internal components and flows exceeding the treatment capacity of the MTD (bypass flows) shall divert over the internal components to prevent resuspension and washout of previously retained pollutants.

D) The inlet pipe and outlet pipe shall be the same size and at the same elevation.
   1. The use of tangential inlet pipes shall not be permitted.

E) The primary mechanism for hydrodynamic treatment shall utilize inclined channels that provide an effective settling area greater than the system footprint.
   1. The use of rotational or "swirling" flow as the mechanism for hydrodynamic treatment shall not be permitted.

F) The clear opening of the access frames and covers that provide access for inspection and maintenance activities shall be 24 inches in diameter or greater.
   1. Two access openings shall be provided for systems larger than 5 feet in diameter.
   2. Removal of pollutants from the MTD shall be possible without confined space entry.

2.3. PERFORMANCE / DESIGN CRITERIA

A) PERFORMANCE CRITERIA
   1. Performance of the MTD shall be based on independent, third-party, commercial scale laboratory testing.
      a. The laboratory protocol used as the basis of product performance shall be per the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 1, 2021.
      b. The laboratory testing shall be verified by a nationally recognized entity such as the New Jersey Center for Advanced Technologies (NJCAT).
      c. The MTD shall be certified by the New Jersey Department of Environmental Protection (NJDEP) for online and offline use.
   2. The MTD shall be designed such that the maximum head loss throughout the device does not exceed six and a half inches (6.5") at the maximum treatment flow rate (MTFR).
   3. The MTD shall be sized to achieve a pollutant reduction as required by applicable AHJs.
      a. Product performance claims shall not be based upon event based average annual reduction methodologies.
   4. The MTD shall have a surface hydraulic loading rate not to exceed 50.2 gpm/ft^2.

B) CAPACITIES

1.	Water quality flow	___ CFS	(as indicated on drawings)
2.	Peak flow	___ CFS	(as indicated on drawings)
3.	Hydrocarbon capacity	___ Gallons	(as indicated on drawings)
4.	Sediment capacity	___ Ft^3	(as indicated on drawings)
5.	Effective settling area	___ Ft^2	(as indicated on drawings)

2.4. MATERIALS

A) Housing Unit
   1. Housing unit of stormwater treatment device shall be constructed of precast concrete. Precast components shall conform to applicable sections of ACI-318, ASTM C-478, and the following:
      a. Concrete shall achieve a minimum twenty-eight (28) day compressive strength of four-thousand (4000) pounds per square-inch (psi);
      b. Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO HS-20 traffic loads;

c. Cement shall be Portland Cement conforming to ASTM C-150;
d. Aggregates shall conform to ASTM C-33, except that the requirements for gradation shall not apply;
e. Reinforcing steel shall consist of wire and welded steel wire conforming to ASTM A-1064 or of bars conforming to ASTM A-615;
f. Concrete clear cover for reinforcing steel shall conform to ACI-318.

2. Sections shall have tongue and groove or ship-lap joints with a sealing compound conforming to ASTM C-990.
3. Pipe openings shall be sized to accept pipes of the specified sizes and materials and shall be sealed by the contractor.
4. Manhole castings for system access shall be made of cast-iron conforming to ASTM A-48 Class 30 and designed to withstand AASHTO HS-20 loadings.
   a. Access covers shall provide a minimum of twenty-four (24) inch clear opening.

B) Internal Components
1. All internal components (baffle, vortex disruptor, flow modifiers, settling pack, and outlet control diverter) shall be designed and constructed to withstand all anticipated loadings associated with the fabrication, shipping, installation, and operation of the equipment.
   a. Anticipated operational loadings shall be based upon the values as indicated on the drawings and the values listed in in section 2.3.B.

C) Mounting Hardware
1. All mounting hardware for internal components shall be made of 304SS or 316SS conforming to ASTM A-240 or ASTM A-320.

2.5. ACCESSORIES
A) Use of accessories as indicated on submittal drawings.
B) Refer to accessory manufacturers as indicated on submittal drawings for specific product details.

2.6. INSPECTION
A) The MTD shall be subject to inspection by the Engineer of Record or the Owner's Representative at either the place of manufacture or the jobsite. All components are subject to be 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. Final acceptance of the component is at the discretion of the Engineer of Record.

PART 3 EXECUTION

3.1. EXAMINATION
A) Review installation procedures and coordinate installation with preparation and adjacent work, including but not limited to grading, excavation, utilities, or erosion control.
B) Do not permit loads greater than the design loads over completed MTD installation.

3.2. PREPARATION
A) Verify in field before installation pertinent dimensions and soil conditions are satisfactory, including but not limited to, groundwater conditions and soil bearing capacity.
1. If field conditions are unsatisfactory, or an obstruction is present, notify the Engineer of Record of observed conditions. Do not commence system installation until conditions have been corrected and are deemed satisfactory.

3.3. INSTALLATION

A) The contractor shall inspect and accept the MTD components prior to unloading the components. Commencement of installation constitutes acceptance of the MTD components.
   1. If any components are damaged prior to unloading, the contractor shall notify the manufacturer immediately. Failure to notify the manufacturer prior to unloading or any field modifications may void all associated warranties and manufacturer liability.

B) The MTD shall be installed by the contractor in accordance with ASTM C-1821, the site plans, the manufacturer's recommendations, the specifications herein, and per the approved submittal drawings.

C) Backfill the MTD as soon as possible and in accordance with ASTM C-1821, the site plans, the manufacturer's recommendations, the specifications herein, and per the approved submittal drawings.

D) Any damage during delivery or installation shall be repaired or replaced at the discretion of the manufacturer.

3.4. FIELD QUALITY CONTROL

A) MANUFACTURER SERVICES
   1. At the time and place of the MTD installation, the manufacturer shall offer to provide a Product Liaison onsite to offer installation guidance and delivery coordination to the installing contractor at no additional expense.
   2. Contractor shall notify the manufacturer a minimum of five (5) business days prior to the installation date to allow performance of the services included in this subsection.

3.5. PROTECTION

A) Prior to site stabilization, the MTD shall be reasonably protected from construction debris and excessive sediment runoff entering the device.

B) Prior to transfer of operational responsibility to the Owner, the contractor shall remove all loose material from the MTD.

3.6. MAINTENANCE

A) The maintenance of the MTD is the responsibility of the Owner. Each site has unique site conditions. It is the responsibility of the Owner to establish a maintenance schedule according to the conditions of the specific location and AHJ requirements.
   1. Failure to maintain the device can lead to reduced flow capacities and blockage due to collected pollutants.
   2. It is strongly recommended that the Owner follow the prescribed maintenance specifications and procedures provided by the MTD manufacturer.

B) It is the responsibility of the Owner to keep a record of any inspection and maintenance activities performed, amount and description of all materials collected, and the condition of the MTD.

C) All materials collected within the MTD shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements.

END OF SECTION