SECTION 33 44 33
STORMWATER TRASH AND DEBRIS GUARDS

PART 1 GENERAL

1.1. SECTION INCLUDES

A) Fabrication and installation of stormwater trash and debris guards 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 63 – Concrete Vaults and Chambers
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. TCD: Trash Capture Device
B) REFERENCE STANDARDS
   1. American Association of State Highway and Transportation Officials (AASHTO)
      a. Standard Specification for Highway Bridges – 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-857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
      i. ASTM C-858 – Standard Specification for Underground Precast Concrete Utility Structures
      j. ASTM C-891 – Standard Practice for Installation of Underground Precast Concrete Utility Structures

k. ASTM C-990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
l. ASTM D-3776 – Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
m. ASTM D-3787 – Standard Test Method for Bursting Strength of Textiles – Constant-Rate-of-Traverse (CRT) Ball Burst Test
n. ASTM D-4886 – Standard Test Method for Abrasion Resistance of Geotextiles (Sandpaper/Sliding Block Method)
o. ASTM D-3887 – Standard Specification for Tolerances for Knitted Fabrics
p. ASTM D-4595 – Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
q. ASTM E-3332 – Standard Test Method for Determining Trash and/or Debris Capture Performance of Stormwater Control Measures

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. TCD 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 TCD’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 TCD 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 by a Professional Engineer licensed in the State of installation shall be submitted that the TCD meets or exceeds the hydraulic 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.

D) MANUFACTURERS’ INSTRUCTIONS
1. Installation Manual
2. Inspection and Maintenance Manual

3. Inspection Checklist

1.6. QUALITY ASSURANCE

A) Regional Regulatory Agency Approvals/Certifications, IF APPLICABLE

B) The manufacturer of the TCD 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.

C) Upon request, the TCD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Report" stating that each TCD can achieve the specified performance criteria listed in these specifications.

1.7. DELIVERY, STORAGE, AND HANDLING

A) The TCD components shall be delivered to the jobsite by the manufacturer.

B) The contractor shall provide all labor, equipment, and materials necessary to install the TCD as specified in the Drawings and the specifications herein.

C) The contractor shall ensure the methods used to offload, store, and install the TCD components are done in a safe manner and do not damage the TCD.

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 TCD 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 TCD 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 TCD shall be a TrashTrap 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 TCDs 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 TCDs shall be the Contractor's or substituting Manufacturer's responsibility.

2.2. DESCRIPTION

A) A stormwater TCD that is housed in a precast concrete vault or structure unless noted otherwise on drawings. The TCD shall use the passive energy of the influent flow to capture trash and debris within a netting bag or screening device and shall drain dry during dry weather conditions.

B) The TCD shall be designed to span the entire open cross-sectional area of the inlet pipe and shall be designed to convey all flows associated up to and including the design flow rate through a netting bag or screening device. Bypass prior to the design flow rate, in a clean condition, is not permitted.
    1. The use of a net physically attached, mechanically connected, or tethered to a pipe is not permitted.

C) TCD capacities shall not be less than the values listed in Section 2.3.B.

D) The TCD must include the capability to partition flows, causing treatment flows to be diverted thru the netting bag or screening device and flows exceeding the treatment capacity of the TCD (bypass flows) shall divert over the netting bag or screening device to prevent washout of previously retained trash and debris.

E) The use of rotational or "swirling" flow as the mechanism for trash and debris removal shall not be permitted.
    1. The use of tangential inlet pipes 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 or greater in the shortest dimension.
    1. Removal of pollutants from the TCD shall be possible without confined space entry.

2.3. PERFORMANCE / DESIGN CRITERIA

1. The TCD shall be designed such that the maximum head loss throughout the device in a clean condition does not exceed six (6") at the design flow rate.
2. The TCD 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.
    b. The netting or screening device of the TCD shall have a surface hydraulic loading rate not to exceed XX gpm/ft^2.

B) CAPACITIES

1.	Design Flow Rate	___CFS	(as indicated on drawings)
2.	Peak Flow Rate	___CFS	(as indicated on drawings)
3.	TCD Peak Design Velocity	_5_ ft/sec	
4.	Trash/Debris Capacity	___C.F.	(as indicated on drawings)
5.	Net/Screen Opening Size	___Inch	(as indicated on drawings)

6. Net/Screen Dimensions (W”xH”xL”) ___x___x___ (as indicated on drawings)

2.4. MATERIALS

A) Housing Unit

1. The housing unit of the TCD shall be constructed of precast concrete unless noted otherwise on drawings. Precast components shall conform to applicable sections of ACI-318, ASTM C-857, ASTM C-858, and the following:
   a. Concrete shall achieve a minimum twenty-eight (28) day compressive strength of six-thousand (6000) 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;
      1) Minimum/Maximum Cover: As indicated on drawings.
      2) Minimum Soil Pressure: As indicated on drawings.
      3) Groundwater: At or below invert of system.
      4) Lateral soil pressures shall be determined using:
         a) Equivalent Unsaturated Lateral Active Earth Pressure: 35 psf/ft
         b) Equivalent Saturated Lateral Active Earth Pressure: 80 psf/ft when groundwater is above invert.
      5) Vertical soil pressures shall be determined using:
         a) Live Load: AASHTO HS-20
         b) Dead Load: 120 pcf cover fill unit weight.
      6) Engineer of Record to verify geotechnical requirements.
      7) Lateral Seismic Surcharge loading provided by project Engineer of Record. Housing unit shall be designed without seismic surcharge loading if seismic information is not provided by the Engineer of Record.
   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.

B) Access Openings

1. Sizes: as indicated on drawings.
2. Hatches intended for net maintenance (if applicable) shall be provided with a lockable latch and lift springs or comparable prop up mechanisms to hold the hatch doors in an opened position.
   a. Minimum net maintenance hatch clear opening: as indicated on drawings.
   b. Minimum clear opening shall be the width of the net frame plus six inches or greater.
3. Manhole castings for system access shall be bolt down lids made of cast-iron conforming to ASTM A-48 Class 30 and designed to withstand AASHTO HS-20 loadings.

a. Minimum cover clear opening: as indicated on drawings.
b. Access covers shall provide a minimum of twenty-four (24) inch clear opening.

4. Size and location of access openings shall be determined by the manufacturer.
5. Manhole steps shall be installed as shown on the drawings and in conformance with OSHA requirements.

C) Internal Components

1. All internal components [mounting and support system, guide rails, lifting units, and bypass grating (applicable if indicated on drawings)] 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 Section 2.3.B.
2. The guide rails at a minimum shall extend from the base of the unit to the top of the netting assembly frame.
3. The lifting unit shall enclose the disposable netting assembly in a manner that minimizes the potential of the netting material being cut or abraded.
4. The lifting unit shall be equipped with devices that prevents the netting assembly from dislodging during all anticipated loadings.
5. The lifting unit shall be designed to allow for the removal of the netting assemblies with or without removing the lifting unit from the system. Products that do not allow this operating and maintenance flexibility are not acceptable.
6. Bypass grating (applicable if indicated on drawings) shall be constructed to withstand anticipated loadings with a minimum deflection of ¼ inch or less under a uniform live load of 100 pounds and a deflection of ¼ or less under a concentrated live load of 300 pounds applied at mid span.

D) Screening Basket (applicable if indicated on drawings)

1. The screening basket 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 Section 2.3.B.
2. The opening size and dimensions of the screening baskets shall be sized as indicated on the drawings and the values listed in Section 2.3.B.

E) Disposable Netting Assemblies (applicable if indicated on drawings)

1. The disposable netting assemblies shall be constructed of a knotless, knitted, synthetic mesh material mounted on a frame constructed of wood or a single piece molded polyethylene plastic frame. The netting material shall be secured to the frame in a manner that exceeds the yield strength of the netting material.
2. The netting assemblies shall be of adequate size and shape to withstand the values listed in Section 2.3.B.
3. The netting and frame shall be sized as indicated on drawings and Section 2.3.B.
4. The composition, denier, and the method of knitting the netting material shall be such that the finished material meets or exceeds the following parameters:

a. The material testing shall be determined by an independent, third-party, testing laboratory accredited to perform the test contained within this section. The manufacturer shall provide copies of these test results at the request of the Engineer or Owner.

	SD-0.375"	HD-0.375"	SD-1.00"	HD-1.00"	HD-5mm
Mass/Unit Area of Fabric (ASTM D 3776, Option C)					
Mass/Unit Area (oz/yd^2)	15.91	21.55	7.63	7.26	14.58
Tolerances for Knitted Fabrics (ASTM D 3887)					
Whales per Inch	1.34	1.20	0.66	0.51	2.77
Counts per Inch	2.32	1.89	0.90	0.94	4.75
Bursting Strength of Textiles: CRT Test (ASTM D 3787)					
Puncture Resistance (lbs)	584	654	288	377	435
Abrasion Resistance of Geotextiles (ASTM D 4886)					
Tensile Strength (ppi) - Baseline	152	222	100	115	101
Tensile Strength (ppi) - Abraded	198	252	89	105	119
Tensile Properties of Geotextiles (ASTM D 4595)					
Ultimate Strength (lbs)	1059	1566	440	809	766
Ultimate Strength (ppi)	132	196	55	101	96
Break Elongation (%)	59	75	67	88	76

*SD denotes Standard Duty. HD denotes Heavy Duty.

F) Mounting Hardware
1. All mounting hardware shall be made of 304SS or 316SS conforming to ASTM A-240 or ASTM A-320 unless indicated otherwise on the drawings.
2. Internal components shall be secured together using mounting hardware comprised of bolts, nuts, and washers of adequate size and numbers to withstand the anticipated loadings.
3. Internal components shall be secured to the housing unit using “drill-in” type anchors.
4. The manufacturer shall supply all necessary hardware required to install the supplied components.

2.5. ACCESSORIES

A) Use of accessories shall be as indicated on submittal drawings.

B) Refer to accessory manufacturers as indicated on submittal drawings for specific product details.

2.6. INSPECTION

A) The TCD 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 TCD installation.

3.2. PREPARATION

A) Verify in field, before installation, that 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 TCD components prior to unloading the components. Commencement of installation constitutes acceptance of the TCD 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 TCD shall be installed by the contractor in accordance with ASTM C-891, the site plans, the manufacturer's recommendations, the specifications herein, and per the approved submittal drawings.

C) Backfill the TCD as soon as possible and in accordance with ASTM C-891, 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 TCD 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 TCD 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 TCD.

3.6. MAINTENANCE

A) The maintenance of the TCD 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 TCD 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 TCD.

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

END OF SECTION