

SECTION (_____)
HIGH CAPACITY KRAKEN® MEMBRANE FILTRATION SYSTEM
STORMWATER QUALITY – MEMBRANE FILTRATION SYSTEM STANDARD SPECIFICATION

1.0 GENERAL

- 1.1. The Contractor shall furnish and install the High Capacity (HC) Kraken, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents. The water quality treatment flow shall be as determined and approved by the Engineer of Record. The HC Kraken system removes pollutants from stormwater runoff through the unit operations of sedimentation and membrane filtration.
- 1.2. The manufacturer of the HC Kraken shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of record and/or approving Jurisdiction. The manufacturer of the HC Kraken shall be, without exception:

Contech Engineered Solutions LLC
9100 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122
<https://www.conteches.com/>

- 1.3. Submittals: Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the Engineer of Record for approval. Shop drawings are to detail the precast concrete structure and call out or note the internals/components.
- 1.4. Product Substitutions: Any proposed product substitution to this specification must be submitted for review and approved 10 days prior to project bid date by the Engineer of Record. Review package should include third party reviewed performance data for both flow rate and pollutant removal. 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.
- 1.5. American Society for Testing and Materials (ASTM) Reference Specifications:
- 1.5.1. ASTM C891: Standard Specification for Installation of Underground Precast Concrete Utility Structures
 - 1.5.2. ASTM C478: Standard Specification for Precast Reinforced Concrete Manhole Sections
 - 1.5.3. ASTM C990: Standard Specification for Joints for Concrete Manholes Using Preformed Flexible Joint Sealants

- 1.5.4. ASTM D4101: Standard Specification for Polypropylene Injection and Extrusion Materials
- 1.5.5. ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures
- 1.5.6. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
- 1.5.7. ASTM A615/A615M: Standard Specification for Deformed or Plain Carbon-Steel Bars for Concrete Reinforcement
- 1.5.8. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

2.0 MATERIALS

- 2.1. Precast Concrete Structure: The device shall be an all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s). Precast concrete vault shall be provided according to ASTM C857 and C858 and manholes shall be provided according to ASTM C478. Both structure types shall be installed to conform to ASTM C891 and to any required state highway, municipal or local specifications; whichever is more stringent. All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer.
- 2.2. Gaskets: Gaskets and/or sealants shall be used to seal between concrete joints. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C990.
- 2.3. Internal Components:
 - 2.3.1. Separation and weir walls shall be constructed of plastic. Plastic walls shall be constructed of copolymer polypropylene and shall be a minimum of 1/2" thick with 3" wide reinforcement.
 - 2.3.2. Filter cartridges shall be comprised of cylindrical, pleated paper membrane material. The diameter of each cartridge is approximately 8", consisting of a 3" perforated core tubing surrounded by 2.5" pleated membranes to maximize surface area. One in every four cartridges will include a drain down orifice at the bottom of the perforated core tubing. Each filter cartridge shall also contain an integrated top handle and quarter turn bottom coupler. The length of each filter element shall be a minimum of 10" with a maximum length of 30". The maximum flux rate determined by the maximum treatment flow rate per unit of filtration membrane surface area shall be 0.101 gpm/ft². The filter cartridges shall be located in the filtration treatment chamber containing at grade frames and covers and/or hatches to allow access for maintenance. The filter cartridges shall be removable and installed by hand.

Cartridge Length (in)	Pleated Media Area (ft ²)	Design Treatment Flow Rate (gpm) (1 filter)
10	49	4.9
20	104.5	10.6
30	168.2	17

- 2.3.3. Underdrain assembly will be a copolymer polypropylene false floor with quarter turn connectors secured to it for the cartridges. The underdrain assembly shall convey flow to the outlet bay of the structure.
- 2.3.4. Steps shall be constructed of copolymer polypropylene conforming to ASTM D4101. Steps shall be driven into preformed or drilled holes once concrete is cured. Steps shall meet the requirements of ASTM C478 and AASHTO M199. The ½" Grade 60 deformed reinforcing bar shall meet ASTM A615, where required.
- 2.4. Frame and Cover: Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the local regulatory body.
- 2.5. Doors and Hatches: If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

3.0 PERFORMANCE

- 3.1. Function: The HC Kraken filter functions to remove pollutants by sedimentation and membrane filtration.
- 3.2. Pollutants: The HC Kraken filter removes debris, trash, coarse and fine particulates, and particulate- bound pollutants from stormwater during runoff events.
- 3.3. Treatment Flux Rate (Surface Loading Rate): The HC Kraken filter shall treat 100% of the required water quality treatment flow based on a maximum treatment flux rate (surface loading rate) across the membrane filter cartridges not to exceed 0.101 gpm/ft².
- 3.4. Lab Testing: At a minimum, the HC Kraken filter must meet all of these testing performance standards:
 - 3.4.1. The HC Kraken filter must be tested under a nationally recognized lab protocol and verified independently by a third-party public agency:
 - Must be capable of removing greater than 80% TSS
 - Verified by NJCAT and certified by NJDEP
 - Must use a particle size distribution with d50 of 65 microns
 - Approval must be current and not expired.
 - 3.4.2. The HC Kraken filter shall be certified for online use by NJDEP, able to internally bypass higher flows without scouring.

- 3.5. Suspended Solids Removal: The HC Kraken filter shall have demonstrated a minimum median TSS removal efficiency of greater than 80%.
- 3.6. Fine Particle Removal: The HC Kraken filter must be proven to have the ability to load 19 lbs./cartridge, while still maintaining an overall 80% removal efficiency.

4.0 EXECUTION

- 4.1. Precast Concrete Structure: Set precast structure on crushed rock base material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/-2% of optimum water content.
- 4.2. Structure floor shall slope 1/4 inch maximum across the width and slope downstream 1 inch per 12 feet of length. For manholes "Length" is defined by a line running from the invert of the outlet through the center of the manhole and "width" is the perpendicular to the "length". Structure top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.
- 4.3. Inlet and outlet pipes shall be stubbed in and connected to precast concrete structure according to Engineer's requirements and specifications. All connections to be sealed to minimize water intrusion. If grout is used, Contractor to grout all inlet and outlet pipes flush with or protruding up to 2 inches into interior of structure.
- 4.4. When required, ballast shall be placed to the dimensions specified by the engineer and noted on the data block. Ballast shall not encase the inlet and/or outlet piping. Provide 12" clearance from outside diameter of pipes.
- 4.5. Backfill shall be placed according to a registered professional soils engineer's recommendations and per governing agencies standards.
- 4.6. Clean Up:
 - 4.6.1. Remove all excess materials, rocks, roots, or foreign material, leaving the site in a clean, complete condition approved by the engineer. The project site shall be clean and free of dirt and debris and the inlet/outlet chamber(s) and filter chamber(s) shall be free of construction debris and sediment before the allowing runoff to enter and place the system in operation. All filter components shall be free of any foreign materials including concrete and excess sealant.
 - 4.6.2. Where applicable, Contractor shall remove the temporary filter fabric around the inlet grate to place the system in operation.

4.7. Filter Cartridges:

4.7.1. Filter cartridges shall be delivered installed in the structure, unless otherwise agreed upon with Contech. Contractor shall take appropriate action to protect the cartridges from sediment and other debris during construction. The method ultimately selected shall be at Contractor's discretion and Contractor's risk. Some methods for protecting the cartridges include, but are not limited to:

4.7.1.1. Remove cartridges from the structure and store in a clean, dry location. Cartridges shall be reinstalled to operate according to 4.7.2. (see below).

4.7.1.2. Leave cartridges in the structure and plug inlet and outlet pipe to prevent stormwater from entering the vault and provide means for stormwater to bypass the filtration treatment bay.

4.7.2. Filter cartridges shall not be placed in operation until the structure is clean and the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the HC Kraken filter. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediments. Refer to instructions on the transfer cover opening to activate the system.

4.7.3. Filter Cartridges with ¼-Turn Connector Fittings: ¼-turn connectors shall be secured into HC Kraken false floor openings to be equipped with a filter cartridge. Filter cartridges shall be turned onto the connector until they reach the hard stop on the connector – approximately ¼ revolution, with care to not “over turn” the cartridge, or turn with such force to damage the hard stop mechanism. Plugs shall be secured over the ¼ turn connectors for connectors not equipped with a filter cartridge.

4.8. Shipping, Storage and Handling

4.8.1. Shipping – The HC Kraken filter shall be shipped to the contractor's address or job site and it is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

4.8.2. Storage and Handling – The contractor shall exercise care in the storage and handling of the HC Kraken filter and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted, and unloading has commenced, shall be borne by the contractor. The HC Kraken filter shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

5. INSPECTION AND MAINTENANCE

- 5.1. Maintenance and Inspection shall be in performed in accordance with Contech's recommendations for maintenance and inspection.
- 5.2. Maintenance and inspection intervals shall be per Contech's recommendations, or per the approving/local jurisdiction/agency requirements; whichever is more frequent.
- 5.3. Surface access for personnel and equipment for inspection and maintenance activities shall be provided.

END OF SECTION