

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

1.0 GENERAL

- 1.1. The Contractor shall furnish and install the 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 Kraken system removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.
- 1.2. The manufacturer of the Kraken shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of storm water 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 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 structure precast concrete 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 D638: Standard Test Method for Tensile Properties of Plastics
- 1.5.8. ASTM D56: Standard Method for Determining the Izod Pendulum Impact Resistance of Plastics
- 1.5.9. ASTM D50: Standard Test Method for Water Absorption of Plastic
- 1.5.10. ASTM D92: Standard Test Methods for Density and Specific Gravity of Plastics by Displacement
- 1.5.11. ASTM 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- 1.5.12. ASTM 648: Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

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. Baffle Walls shall be constructed of concrete or plastic. Plastic baffle walls shall be constructed of high-density polyethylene conforming to a tensile strength of 4,400 psi (ASTM D638), and Izod impact value of 2.75 (ASTM D256), water absorption of 0.01% (ASTM D570), a density of 0.96 (ASTM D792), a flexural modulus of 190,000 (ASTM D790), and a heat deflection temperature at 66 psi of 167 °F (ASTM D648). Plastic walls shall be a minimum of ¼" thick.

2.3.2. Filter cartridges shall be comprised of pleated paper cylindrical 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. Each filter cartridge shall also contain an integrated top handle and threaded bottom coupler. The length of each filter element shall be a minimum of 9.62", with a maximum length of 30.75". The maximum flux rate determined by the maximum treatment flow rate per unit of filtration membrane surface area shall be 0.05 gpm/ft². The filter cartridges shall be located below the access hatches to allow access for maintenance. The filter cartridges shall have handles to facilitate ease of 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)
9.62	40	2
19.5	90	4.5
30.75	170	8.5

2.3.3. Riser Tube: A PVC riser will be installed inside each cartridge to control the flow rate and evenly distribute sediment loading along the full height of the cartridge. One in every eight cartridges will include a riser with a drain down orifice at the bottom of the riser.

2.3.4. Underdrain Assembly shall be either a false floor or tubing which has integrated threaded or quarter turn connection points for the cartridges. The underdrain assembly shall be open on the effluent end located inside the discharge chamber.

2.3.5. Steps: Steps shall be constructed according to ASTM D4101 of copolymer polypropylene and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

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 Kraken Filter functions to remove pollutants by the following unit treatment processes; sedimentation, floatation and membrane filtration.

3.2. Pollutants: The Kraken Filter removes oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

- 3.3. Treatment Flux Rate (Surface Loading Rate):The 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 0.05 gpm/ft² (0.034 lps/m²).
- 3.4. Lab Testing: At a minimum, the Kraken filter must meet all of these testing performance standards:
- 3.4.1. The 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 approved by NJDEP
 - Must use a particle size distribution with d50 of 52 microns
 - Approval must be current and not expired.
- 3.4.2 The Kraken Filter shall be approved for online use by NJDEP, able to internally bypass higher flows without scouring.
- 3.5. Suspended Solids Removal: The Kraken filter shall have demonstrated a minimum median TSS removal efficiency of greater than 80%.
- 3.6. Fine Particle Removal: The Kraken Filter must be proven to have the ability to load 27 lbs/cartridge and/or 37 lbs/sf of effective treatment/sedimentation area, while still maintaining an overall 89% removal efficiency.

4.0 EXECUTION

- 4.1. The installation of the Kraken filter shall conform to all applicable national, state, state highway, municipal and local specifications.
- 4.2. The Contractor shall furnish all labor, equipment, materials and incidentals required to install the Kraken filter device(s) and appurtenances in accordance with the drawings and these specifications.
- 4.2.1. Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.
- 4.2.2. Compaction – All soil shall be compacted per registered professional soils engineer’s recommendations and per governing agencies standards, prior to installation of Kraken unit(s).

- 4.2.3. Backfill shall be placed according to a registered professional soils engineer's recommendations and per governing agencies standards, and with a minimum of 6" of gravel under all concrete structures.
- 4.2.4. Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

4.3. Shipping, Storage and Handling

- 4.3.1. Shipping – The Kraken filter shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.
- 4.3.2. Storage and Handling – The contractor shall exercise care in the storage and handling of the 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 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.

4.4. Activation, Maintenance, and Inspection

- 4.4.1 Filter cartridges shall be installed in the underdrain assembly in accordance with the manufacturer's guidelines and recommendations. Contractor to review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.
- 4.4.2 Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be installed after site is stabilized and/or unit is isolated from construction influent and ready to accept cartridges. Unit is ready to accept cartridges after it has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization, the contractor shall plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs are to be removed once the site is stabilized and unit is ready to receive stormwater runoff.
- 4.4.3 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site-specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with Contech's recommendations.
- 4.4.4 Inspection: which includes trash and floatables collection, and sediment depth determination; shall be easily conducted from grade (outside the structure).

- 4.4.5 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.
- 4.4.6 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus
- 4.4.7 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on Contech's recommended inspection and maintenance guidelines and the local regulatory agency/body.
- 4.4.8 When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by Contech for use with the Kraken filter shall be installed.

END OF SECTION