

SECTION (____)
JELLYFISH® MEMBRANE FILTRATION SYSTEM
STORMWATER QUALITY – MEMBRANE FILTRATION SYSTEM STANDARD SPECIFICATION

1. GENERAL

1.1. The Contractor shall furnish and install the Jellyfish, 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 Jellyfish system removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2. The Jellyfish shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The manufacturer of the Jellyfish shall be, without exception:

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

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 consulting engineer 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 specifications 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 C858: Standard Specification of Underground Precast Concrete Utility Structures

1.5.4.ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

1.5.5.ASTM C990: Standard Specification for Joints for Concrete Manholes Using Preformed Flexible Joint Sealants

1.5.6.ASTM D4101: Standard Specification for Copolymer steps construction

1.5.7.ASTM D4097: Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant

2. 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. Cartridge Deck: The deck insert shall be bolted and sealed inside the precast concrete chamber. The insert shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges; (c) a conduit for conveyance of treated water to the effluent pipe.

2.3.1.1. Fiberglass: In cylindrical configurations, the fiberglass portions of the filter device shall be constructed in accordance with the following standard: ASTM D4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.3.1.2. Aluminum: In rectangular configurations, the aluminum cartridge deck shall be ¼" thick, 5052-H32 Aluminum with all welds to be 100% continuous waterproof weld using 5356 filler.

2.3.2. Membrane Filter Cartridges: Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) or greater diameter elements. The length of each filter element

shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

- 2.3.3. Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall contain no less than 7 ft² of surface area per inch of length and have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

| Filter Cartridge Length (in) | Minimum Filtration Membrane Surface Area (ft ² / m ²) | Maximum Filter Cartridge Dry Weight (lbs / kg) |
|------------------------------|--|--|
| 15 / 381 | 106 / 9.8 | 10.0 / 4.5 |
| 27 / 686 | 190 / 17.7 | 14.5 / 6.6 |
| 40 / 1016 | 282 / 26.2 | 19.5 / 8.9 |
| 54 / 1372 | 381 / 35.4 | 25.0 / 11.4 |

- 2.3.4. Backwashing Cartridges: The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

- 2.3.5. Maintenance Access to Captured Pollutants: The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear height over all of the filter cartridges (length of cartridge + 6 inches), or be accessible by a hatch or other mechanism that provides vertical clear space over all of the filter cartridges such that the cartridges can be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

- 2.3.6. Baffle: The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from

contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.3.7.Sump: The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.3.8.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.

2.3.9.Double-Wall Containment of Hydrocarbons: The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.4.Bend Structure: The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.5.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. Frames and covers must be embossed with the Contech or the Jellyfish brand name.

2.6.Doors and Hatches: If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

3. PERFORMANCE

3.1.Function: The Jellyfish filter shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.2.Pollutants: The Jellyfish filter shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.3.Bypass: The Jellyfish filter shall typically utilize an external bypass to divert excessive flows. Where an internal bypass is utilized, systems shall be equipped with a floatables baffle, and bypass water shall not pass through the treatment sump or cartridge filtration zone.

3.4.Treatment Flux Rate (Surface Loading Rate): The Jellyfish filter shall treat 100% of the required water quality treatment flow based on a maximum design flux rate (surface

loading rate) across the membrane filter cartridges not to exceed 0.21 gpm/ft² (0.142 lps/m²).

3.5. Field Testing: At a minimum, the Jellyfish filter shall have been field tested and verified with a minimum 25 qualifying storm events and field monitoring conducted according to the TARP Tier II or TAPE field test protocol, and have received NJCAT verification.

3.6. Suspended Solids Removal: The Jellyfish filter shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.7. Fine Particle Removal: The Jellyfish filter shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d₅₀ of 15 microns or lower for all monitored storm events, and an effluent turbidity of 15 NTUs or lower.

3.8. Nutrient (Total Phosphorus & Total Nitrogen) Removal: The Jellyfish filter shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.9. Metals (Total Zinc & Total Copper) Removal: The Jellyfish filter shall have demonstrated a minimum median Total Zinc removal of 50%, and a minimum median Total Copper removal of 75%.

4. EXECUTION

4.1. Handling and Storage: Prevent damage to materials during storage and handling.

4.2. Precast Concrete Structure: The installation of the precast concrete device should conform to ASTM C891 and to any state highway, municipal or local specification for the installation of underground precast concrete structures, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.2.1. The precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.2.2. The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with Contech's recommendations.

- 4.2.3. Adjustment of the Jellyfish filter can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and seals. Once the Jellyfish filter has been constructed, any/all lift holes must be plugged with mortar or non-shrink grout.
- 4.3. Inlet and Outlet Pipes: Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable), and such that any pipe intrusion into the device does not impact the device functionality.
- 4.4. Frame and Cover Installation: Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by Contech. Frames for the cover should be set in a full bed of mortar at the elevation specified.
- 4.5. In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by Contech.

5. ACTIVATION, INSPECTION AND MAINTENANCE

- 5.1. Filter cartridges shall be installed in the cartridge deck in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.
- 5.2. 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.
- 5.3. 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.

- 5.4. Inspection; which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth; shall be easily conducted from grade (outside the structure).
- 5.5. 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.
- 5.6. The filter device shall have a minimum 12 inches (610 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.
- 5.7. Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.
- 5.8. Maintenance access shall have a minimum clear height over all of the filter cartridges (length of cartridge + 6 inches), or be accessible by a hatch or other mechanism that provides vertical clear space over all of the filter cartridges such that the cartridges can be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.
- 5.9. 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.
- 5.10. When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by Contech for use with the Jellyfish filter shall be installed.
- 5.11. Filter cartridges shall be able to be maintained without the use of additional lifting equipment.
- 5.12. Contech shall provide an Owner's Manual upon request.

END OF SECTION