MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**RECIRCULATING SAND FILTER**

UTL:CJD 1 of 4 APPR:DMG:NJM:04-01-22

**a. Description.** This work consists of furnishing and installing a recirculating sand filter for sanitary waste treatment, complete and ready for operation, as specified herein and as shown on the plans.

**b. Materials.** Furnish 2 inch diameter PVC manifold pipe and 1½-inch diameter perforated PVC pipe for the laterals. Ensure the manifold and distribution piping is Schedule 40 PVC and is in accordance with *ASTM D2665*. Glue all PVC joints in accordance with the manufacturer’s instructions. Ensure all joints are watertight. Ensure perforations are 1/8-inch diameter and as specified in *ASTM D2729*. Drill perforations 2 feet on center on the bottom of the laterals and protect with slotted orifice shields. Furnish Orenco, GAG-SIM/TECH, Zabel ZOS-150, or Engineer approved equal orifice shields. Drill the 1/8-inch diameter orifices with a drill press or drill guide using a new 1/8-inch drill bit. Ensure orifices do not have any visible burrs.

Furnish 6-inch and 8-inch Schedule 40 slotted PVC underdrains for the final discharge line and return line to the recirculating tank, respectively. The slots must be 1/4-inch wide, 4-inches on center, cut halfway through the pipe, oriented up and in accordance with *ASTM D2729*.

Furnish granular material Class IIIA for the leveling layer, open-graded aggregate 34G, modified (1 percent loss by wash) for the sand filter media and coarse aggregate 6A for the lateral layer in accordance with section 902 of the Standard Specifications for Construction.

Ensure the sand media support layer is washed gravel in accordance with the following gradation and has less than 1.0 percent loss by wash.

Sieve Size Percent Passing

3/8 inch 100

No. 4 6.0 to 84

No. 8 0.0 to 24

No. 16 0.0 to 1.0

No. 30 0.0 to 1.0

No. 100 0.0 to 1.0

Ensure the 34G modified sand media for the Recirculating Sand Filter (RSF) is approved by EGLE before delivery to the site. Ensure the media is well washed sand with an effective size (D10) of 0.4 to 0.9 mm and a uniformity coefficient (Cu) of 1.0 to 4.0. Ensure the in-place media is in accordance with the following gradation and must have less than 1.0 percent loss by wash.

Sieve Size Percent Passing

3/8 inch 100

No. 4 70 to 100

No. 8 5 to 78

No. 16 0.0 to 4

No. 30 0.0 to 2

No. 50 0.0 to 1.0

No. 100 0.0 to 1.0

No. 200 0.0 to 1.0

Submit the Supplier’s certified gradation analysis of the washed gravel (sand media support) and the sand media to the Engineer for review and approval prior to installation. Forward copies of the certified gradation analysis to EGLE.

Ensure the 30-mil flexible membrane liner (FML) is PVC or polyethylene (PE) in accordance with *ASTM D792*, *ASTM D882*, *ASTM D1004*, *ASTM D1203*, *ASTM D1204*, *ASTM D1239,* *ASTM D1790, ASTM D5199,* and *ASTM D7408.*. Ensure all liner seams are in accordance with the manufacturer's recommendations for the material furnished to ensure a water-tight installation. Install PVC boots where the inlet and outlet pipes perforate the liner, in accordance with the manufacturer’s installation specifications, orienting the boot so the clamp is outside the sand filter.

Ensure flushing valves are quarter-turn PVC Schedule 80 Full-Bore design Utility Ball valves rated for a working pressure of 150 psi. Ensure O-rings are ethylene propylene diene monomer (EPDM). Ensure valves are approved by the Engineer.

Ensure valve boxes and lids are high-density polyethylene (HDPE). Ensure lids are a twist to secure, pest-free style. Ensure valve boxes and lids are approved by the Engineer.

Furnish plywood perimeter framing, wooden bracing, and timber to anchor the liner fabric in accordance with section 912 of the Standard Specifications for Construction. Ensure the lumber is pressure treated in accordance with *AWPA Standard U1* and suitable for ground contact. Ensure hardware for timber construction is galvanized in accordance with subsection 908.10 of the Standard Specifications for Construction.

**c. Construction.** Ensure the Contractor is licensed to conduct work in Kent County and secure all necessary permits to perform this work. Direct questions regarding the construction to the EGLE Grand Rapids District Office Water Resources Division:

Leslie N. Sorensen, P.E.

Senior Environmental Engineer

Grand Rapids District Office, Water Resources Division

Michigan Department of Environment, Great Lakes, and Energy

616-204-7334

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Minimize disturbance of the existing ground and avoid damage to existing vegetation when excavating and installing the sand filter.

Remove the limits of unsuitable material as shown on the plans. Obtain approval for the limits of removal and the bottom of the excavation from the Engineer before the granular material Class IIIA for the leveling layer is placed.

Dispose of material in accordance with section 205 of the Standard Specifications for Construction.

Ensure the bottom of the excavation is clean and free of any traces of surface wash or other debris. Protect the open excavation from surface runoff to prevent the washing of silt and debris into the trenches. If "smearing", compaction, or silting does occur, rake, loosen, or re-excavate the soil face of the excavation before leveling layer is placed.

Place a level six-inch lift of granular material Class IIIA, sloped as detailed on the plans and construct a 10-inch to 12-inch-high internal earth berm to provide for manual recirculation of four-fifths of the effluent to the recirculation tank. Lay the 30-mil liner on top of the berm and granular material Class IIIA.

Anchor the 30-mil FML between 2-inch by 4-inch and 4-inch by 4-inch pressure treated lumber using a minimum of two galvanized 16D twist spikes spaced at 12 inches. Stagger the lumber a minimum of 2 feet apart. Backfill the sand filter with uniform compaction between the liner and the existing ground and in-between the liner and the embankment. Use pressure treated plywood to form the sides of the sand filter as necessary.

Lay the 4-inch and 8-inch underdrain return pipes to drain back to the recirculating tank within approximately 8 feet of the sand filer, then use 45-degree bends to raise pipe to the necessary elevation to connect to the sand filter manifold. Ensure piping outside the sand filter is non-perforated and extends one foot into the sand filter bed.

Level the 34G modified sand media prior to installation of the manifolds, laterals, 6A aggregate, and as shown on the plans.

Set the manifolds and laterals to drain back to the recirculating tank when the pump is off. Contact EGLE to witness a squirt test and inspect and approve the final placement of the 6A aggregate.

Place flushing valves and 10-inch diameter valve boxes at the end of each lateral as shown on the plans. Connect laterals to the flushing valves utilizing a 45-degree PVC sweep fitting as shown on the plans. The use of 90 degree or 45-degree elbows is prohibited.

Construct inspection ports as shown on the plans.

Submit shop drawings in PDF for all components associated with the Recirculating Sand Filter. Ensure shop drawings are reviewed and approved prior to beginning work on the Recirculating Sand Filter.

Complete the slope restoration in accordance with section 816 of the Standard Specifications for Construction as soon as possible following completion of the backfill but no longer than the time limitations specified in section 208 of the Standard Specifications for Construction. Slope the finished grade as shown on the plans to divert surface water.

**d. Measurement and Payment.** The completed work, as described, will be measured as a lump sum and paid for at the contract price using the following pay item:

**Pay Item Pay Unit**

Recirculating Sand Filter Lump Sum

**Embankment, Spec, CIP** will be paid for separately in accordance with the Special Provision

for Alterations to Septic System and slope restoration will be paid for separately in accordance with section 816 of the Standard Specifications for Construction.