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## PART 1 GENERAL

### 1.01 SUMMARY

A. These specifications technically describe the materials for storm pipe, manholes, catch basins, inlets, stubs, foundation drains and manufactured treatment units.

## PART 2 PRODUCTS

### 2.01 CONCRETE PIPE

A. Reinforced Concrete Pipe (ASTM C 76), as specified on the plans.

1. Modified groove tongue joint or profile shaped joint with approved rubber gasket (meeting ASTM C 443 or C 361, except as such specifications relate to infiltration limitations).

2. Lubricant, as supplied by the pipe manufacturer, shall be used on the groove and on the tongue in making up joints. The joints shall be assembled in accordance with the pipe manufacturer's requirements.

3. Reinforced Concrete Elliptical Culvert Storm Drain, ASTM Designation C 507, Class HE-1 through HE-IV or VE-II through VE-VI, as specified on the plans.

(a) Tongue and groove joint with external sealing bands in accordance with ASTM C 877.

(b) Modified groove tongue joint or profile shaped joint with approved rubber gasket (meeting ASTM C 443 or C 361, except as such specifications relate to infiltration limitations).

### 2.02 PLASTIC PIPE

A. Truss and Solid Wall ABS Pipe for foundation drains, storm water sump pump outlets, and four inch (4") to ten inch (10") diameter stubs.

1. ABS Composite (Truss) Pipe - ASTM D 2680

2. ABS Solid Plastic Pipe - ASTM D 2751, SDR 23.5

3. Joints for ABS Truss Pipe and ABS Solid Wall Pipe and fittings shall be sleeve coupling type "SC" chemically welded joint as specified in ASTM Standard D 2680.

B. Polyvinyl Chloride (PVC) Pipe for foundation drains, storm water sump pump outlets, and four inch (4") to ten inch (10") diameter stubs.

1. PVC Composite (Contech Truss) Pipe - ASTM D 2680

2. PVC Solid Plastic Pipe - ASTM D 3034, SDR 35, SDR 26 or SDR 23.5

3. PVC (Contech A2000) Pipe - ASTM F 949

4. Joints for PVC pipe and fittings shall be of the elastomeric type. Gasket joints shall be installed in accordance with procedures specified by the pipe manufacturer. Care should be taken to insure all joints being pushed to the full home position and held tightly in home position during any grade or line adjustments.

C. Corrugated High Density Polyethylene Pipe (HDPE) for foundation drains, storm water sump pump outlets, and four inch (4") to ten inch (10") diameter stubs.

1. ADS N-12 WT (watertight joints).

## 2.03 MANHOLES, CATCH BASINS AND INLETS BLOCK AND BRICK

A. Brick shall be made of clay or shale, and shall be whole, thoroughly and evenly burned, of close and uniform texture, free from cracks and warps, with true even faces and uniform in shape and size. Brick shall show a minimum average compressive strength of 2,000 pounds per square inch and an average absorption of water in twenty-four (24) hours of not more than 25% of the dry weight.

B. Concrete brick shall conform to the requirements for concrete building brick of ASTM C 55 Grade, normal weight.

C. Concrete block for manholes, catch basins, and inlets shall conform to ASTM C 139 with the following exceptions:

1. **Shape**

The blocks shall be solid curved blocks with the inside and outside surfaces curved to the required radii. The blocks shall have tongue and groove or other approved type of joint at the ends so that the units interlock to form a strong, rigid structure. Curved blocks shall have the inside and outside surfaces parallel.

2. **Size**

The nominal dimensions of the block shall be 18 inches maximum for length, 8" maximum for depth (height), and 6 inches minimum for width (thickness) or as shown on the plans. The length shall be measured along the chord on the outside face of the block. The tolerances of ASTM C 139 shall apply. Where the specified wall thickness on the standard plans is 12 inches, a multiple block wall of two 6-inch wide blocks is permitted. All blocks in one structure shall be of the same height dimension. The blocks shall be designed for length so that only full length or half-length blocks are required to lay the circular wall of any one course. Blocks intended for use in the cones or tops of manholes or other structures shall have such

shape as may be required to form the structure as shown on the plans with inside and outside joints not to exceed 1/4 inch in thickness.

3. **Mortar**

The mortar shall be composed of one (1) part of a combination of Portland Cement and hydrated lime and three (3) parts of fine aggregate, by volume. The combination of cement and lime shall consist of 90% of Portland Cement and 10% of hydrated lime, by volume. In lieu of the above combination of cement and lime, standard brick mortar cement may be used if approved by the Engineer.

4. **Steps**

All Manhole, Catch Basin or Inlet Structure Steps shall be M.A. Industries, Inc., Numbers PS-1-B or PS-2-PFS or approved equal.

## 2.04 PRECAST MANHOLES, CATCH BASINS AND INLETS

A. All precast manhole sections and bases shall be 4,000 lb. per square inch concrete as determined by core test or cylinders.

B. Unless otherwise noted on the drawings or in the supplemental specifications, precast reinforced concrete manhole sections shall meet the requirements of current ASTM C 478, with C 443 joints.

C. Precast manhole tees for 48" and larger storm drains shall be the same class of pipe as that specified on the plans, but shall be a minimum ASTM C 76 Class IV. The manhole riser shall meet the requirements of ASTM C 478.

## 2.05 STORM DRAIN STUBS

A. Four inch (4") to ten inch (10") diameter stubs shall be ABS or PVC Composite (Contech Truss) Pipe, or ABS or PVC Solid Plastic Pipe, or Corrugated High Density Polyethylene Pipe (HDPE), as specified under Section 2.02 of this specification, or as otherwise noted.

B. Stubs twelve inches (12") and larger shall be ASTM C76 Class IV Reinforced Concrete Pipe or as otherwise noted. Concrete stubs 12” or larger shall be assembled in the factory if possible.

C. Taps into an existing RCP line shall be done by coring a hole into the existing pipe, or saw cutting if large enough core bits are not available. Jack hammering holes is not permitted. Kor-N-Tee flexible connections (or approved equal) shall be used to connect small diameter plastic pipe to concrete pipe when possible. Factory fittings shall be used to connect pipe of similar materials, if possible.

## 2.06 STORM WATER MANUFACTURED TREATMENT SYSTEMS

### A. General

Manufactured treatment systems are devices used to remove sediment and other pollutants from storm water runoff.

### B. Performance and Design

1. Manufactured treatment systems must be installed upstream of the storm water detention system. If the site is not required to provide storm water detention, a manufactured treatment system must be installed upstream of the connection to a County Drain.

2. The storm drain system shall be designed with an external bypass at the manufactured treatment system location to allow continuance of flow in the event the manufactured treatment system becomes obstructed.

3. The system shall conform to the standards set forth by the New Jersey Department of Environmental Protection (NJDEP) for manufactured treatment systems, as defined at http://www.njstormwater.org/treatment.html, including, manhole diameter size and custom or multiple units.

4. Calculations for designing mechanical treatment devices shall be based on the Rational Method. The following criteria shall be used for determining the peak discharge at the mechanical treatment device:

   (a) Frequency shall be a 1-year, 24-hour storm event

   (b) Rainfall shall be 2.13 inches (NOAA Atlas 14)

   (c) Rainfall intensity I, shall be calculated using the upstream drainage area's time of concentration T, with

   $$I = 97/ (T + 30)$$ (NOAA Atlas 14)

   (d) Peak discharge, $Q = C \times A \times I$

5. The NJDEP Certified Treatment Flow rate (cfs) for a manufacturer and model shall be greater than or equal to the calculated peak discharge (Q) for a particular site.

6. The minimum total suspended solids (TSS) to be removed shall be 50% as certified by NJDEP.

7. Manufactured treatment systems are designed for post-construction runoff conditions and are not an acceptable alternative for controlling soil erosion during construction.

C. **Concrete Chamber Manufactured Treatment Systems**

1. Manufactured treatment systems shall be constructed from pre-cast or cast-in-place concrete. Concrete for pre-cast storm water treatment systems must conform to ASTM 857 and C 858.

2. The minimum wall thickness shall be no less than the minimum thickness to sustain HS25 loading requirements as determined by a licensed Professional Engineer.

3. Sections must have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C 990. The assembled structure shall be watertight.

4. Cement must be Type II Portland cement conforming to ASTM C 150.

5. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000-psi at the end of seven days or 5000-psi at the end of 28 days after fabrication.

6. Pipe openings shall be sized to accept pipes of the specified size and material, and shall be sealed by the contractor with hydraulic cement conforming to ASTM C595M.

7. Concrete and reinforced concrete for cast-in-place manufactured treatment systems must conform to current Oakland County specifications for structural concrete.

8. Internal aluminum plate components shall be alloy 5052-H32 in accordance with ASTM B 209.

9. A bitumen sealant in conformance with ASTM C 990 must be utilized in affixing the aluminum swirl chamber to the concrete vault.

D. **High-Density Polyethylene Chamber Manufactured Treatment Systems**

1. Treatment chamber shall be watertight and constructed from solid wall high-density polyethylene (HDPE) conforming to ASTM F 714, cell class 345464C per ASTM D 3350 or walls greater than 63” in diameter (OD) shall be fabricated from profile wall HDPE ASTM F 894 RSC 250 or solid wall HDPE.

2. HDPE stub outs and internal components shall be extrusion welded using accepted welding practices. Stud outs shall be supplied by the manufacturer and welded on the inside and outside.

3. Connections to the HDPE stub outs shall be performed using Fernco, Mar-Mac or Mission style flexible boot with stainless steel tension bands and shear guard. Couplings are supplied by the contractor. Stub outs shall extend a minimum of 12” beyond the chamber exterior wall.

4. Manufacturer shall supply direct access to the manufactured treatment system via

a 30-inch internal diameter (ID) riser(s) that can be field cut to finished grade by the contractor. Access riser(s) shall be located over the treatment chamber such that a confined space entry is not required to inspect and maintain the unit.

5. Manufacturer shall supply East Jordan Iron Works No. 1040 solid cover and frame per WRC storm detail sheet. The frame and cover shall have a HS-25 traffic rating.

6. Baffle wall shall be constructed of HDPE and extrusion welded to the inside of the chamber.

7. Lifting supports shall be provided on the exterior of the chamber and located to prevent undue stress while lifting the mechanical treatment unit.

8. A 12" thick cast-in-place reinforced concrete pad shall be installed around the mechanical treatment device's access riser to support the manhole frame and cover. The concrete pad shall extend a minimum of 12" beyond the unit in all directions, but in no case be smaller than 6.5' x 6.5'. The top of the access riser must be wrapped with compressible expansion joint material to a minimum thickness of 1" to allow transfer of loads from the manhole frame to the concrete slab without applying loads to the riser. The manhole cover shall bear on the concrete slab and not the riser pipe. The concrete slab shall be constructed of 3,500 psi concrete and reinforced to withstand HS-25 loads. The top of the manhole frame and cover shall be flush with the concrete slab. Concrete pads must be installed for all HDPE mechanical treatment devices, including units installed in greenbelt areas. Precast concrete rings are not an acceptable alternative. Concrete pads shall be designed by a Licensed Professional Engineer.

9. Where high groundwater is present or anticipated, the Contractor shall install engineer-designed concrete anti-floatation ballast over the octagonal base plate to prevent uplift due to buoyancy.

E. **Acceptable Manufacturers:**

(a) Aqua-Swirl by AquaShield, Inc., tel. (888) 344-9044

(b) Nutrient Separating Baffle Box by Suntree Technologies, Inc. tel: (321) 637-7552

(c) Dual Vortex Separator by Oldcastle Stormwater Solutions, tel. (800) 579-8819

(d) Continuous Deflective Separator (CDS) by Contect Stormwater Solutions, Inc., tel: (800) 925-5240

(e) or approved equal

F. **Installation**

1. The manufactured treatment system must be constructed to serve the capacity shown on the drawings and as specified in the approved plans. The system must be installed at elevations and locations shown on the Drawings, or as otherwise directed by the Engineer.

2. In general, the manufactured treatment system shall be installed per the manufacturer's recommendations, except where more stringent requirements are specified herein.

3. After excavation is completed, a crushed stone base, equivalent to MDOT 6A stone, shall be installed in mechanically-compacted 6" maximum layers having a total minimum thickness of 12-inches or greater after compaction. Compaction shall be to 95% of the Maximum Unit Weight, per ASTM D 1557.

4. The stone base shall be checked for level prior to setting the manufactured treatment unit and the unit checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5%, the unit must be removed and the base material re-leveled.

5. Backfill shall be mechanically-compacted MDOT Granular Material Class II sand or MDOT 6A stone, placed in six (6) inch layers, loose measure, with each layer compacted to 95% of the Maximum Unit Weight, per by ASTM D 1557. Backfill shall extend laterally to the undisturbed soils of the excavation, and extend vertically for the full height of the unit, including the access riser. If the trench is wet or unstable or an undercut is required, sand bedding/backfill will not be allowed.

6. For concrete chamber units, prior to setting subsequent sections, place bitumen sealant in conformance with ASTM C 990 along the construction joint in the section that is already in place. Pre-cast sections shall be set in the manner that will result in a watertight joint. Installation of concrete chamber manufactured treatment units shall conform to ASTM specifications C 891 "Standard Practice for Installation of Underground Pre-cast Utility Structures".

7. Holes made in the concrete sections for handling or other purposes shall be plugged with non-shrink grout or by using grout in combination with concrete plugs.

8. Where holes must be cored in the pre-cast sections to accommodate pipes, all coring shall be performed before setting the sections in place.

G. **Maintenance**

1. Manufactured treatment systems shall be maintained in accordance with the manufacturers recommended schedule.

2. Manufactured treatment systems shall be cleaned prior to final acceptance.

## 2.07 TEST OF PIPE

### A. Concrete Pipe

1. All pipe and pipe joints material shall meet the current American Society for Testing and Materials (ASTM) specifications as called for on the plans or elsewhere in these contract documents.

2. The manufacturer or seller shall furnish specimens for testing equal to 0.5% of order, but not less than 2 specimens of each size and type. The specimens may be selected from the job by the testing laboratory or by the Engineer if he so chooses.

3. Pipe 54" in diameter and over may be tested by taking suitable core samples and subjecting the cores to strength tests.

4. When approved by the owner, tests may be conducted at the pipe manufacturer's yard by the independent testing laboratory. The Engineer may choose to witness the tests.

5. Pipe shall be tested at the expense of the manufacturer by an independent testing laboratory approved by the Owner. Copies of the tests shall be furnished to the Owner, Manufacturer, Inspector and the Engineer. The signature of the representative of the independent testing laboratory must appear on the test reports.

6. The Engineer reserves the right to visually inspect and reject any pipe at the site of the work that appears to have defects or imperfections.

### B. Plastic Pipe

1. All pipe shall be certified by the manufacturer to meet applicable ASTM specification requirements. Certification forms, together with a report of the test results, shall be provided to the inspector with pipe deliveries and copies shall be forwarded to the Engineer or Owner.

2. Certification forms shall include project name, location, contractor and test lot number. Lot sizes shall be acceptable to the Engineer.

3. All pipe fittings shall be suitably marked to provide manufacturer's name, lot or production number, ASTM Designation, pipe material, nominal diameter, and SDR number, where applicable. Fittings, however, need not contain lot or production number. Pipe shall have a "home" mark. Truss Pipe with an absence of filler material at the ends greater than one-fourth (1/4) inch deep shall be subject to rejection or acceptable repair.

4. The completed installation shall at no point have out-of-round pipe deflections greater than 5% of normal diameter of pipe. Deflectometer or go non-go gauging tests shall be required prior to acceptance of pipelines. Deflection testing shall be

done with a nine point mandrel, a minimum of 30 days after installation. A proving ring to verify mandrel dimensions must be provided to the Engineer prior to testing.