January 8, 2018

ADDENDUM NO. ONE to the plans and specifications for the MELVINDALE – NORTHERN ALLEN PARK PUBLIC SCHOOLS, STADIUM RENOVATION at MELVINDALE HIGH SCHOOL, Melvindale, MI, Architect's Project No. 171739, dated December 18, 2017.

The above plans and specifications are modified, supplemented or augmented as follows, and this ADDENDUM NO. ONE, is hereby made a part of the contract documents.

Revised Drawings C1.1, C1.2, C1.3, C1.4, C1.5, L1.01, L1.02, L1.03, L1.04, L1.05, L1.06, and Specification Sections 221113, 221313 and 329304 are being issued with this Addendum.

SPECIFICATION ITEMS:

ITEM NO. SP1: Refer to Specification Section 221113 Facility Water Distribution Piping (issued):
a. Refer the added Specification Section 221113 Facility Water Distribution Piping.

ITEM NO. SP2: Refer to Specification Section 221313 Facility Sanitary Sewer (issued):
a. Refer the added Specification Section 221313 Facility Sanitary Sewer.

ITEM NO. SP3: Refer to Specification Section 329304 Bioswale Areas (issued):
a. Refer the added Specification Section 329304 Bioswale Areas

CIVIL DRAWING ITEMS:

ITEM NO. C1: Refer to Drawings C1.1 thru C1.5 (issued):
a. Refer to Civil drawings C1.2 thru C1.5 for complete civil scope of work.

LANDSCAPE DRAWING ITEMS:

ITEM NO. LD-1: Refer to Sheet L1.01 Existing Conditions and Demolition Plan: (Reissued):
A. Re-issued sheet includes demolition of additional trees, concrete, and fencing near the new team room building.

ITEM NO. LD-2: Refer to Sheet L1.02 Site Plan: (Reissued):

A. Re-issued sheet includes revised team room building layout, revised fencing and concrete.
B. Re-issued sheet includes new brick paver area near ticket booth. Brick pavers to be furnished and installed by Owner.

ITEM NO. LD-3: Refer to Sheet L1.03 Dimension Plan: (Reissued):

A. Re-issued sheet includes revisions to concrete and dimensions around team room building.

ITEM NO. LD-4: Refer to Sheet L1.04 Fencing Plan: (Reissued):

A. Re-issued sheet includes revisions to fencing around team room building.

ITEM NO. LD-5: Refer to Sheet L1.05 Grading Plan: (Reissued):

A. Re-issued sheet includes revisions to grading around team room building and near ticket booth.

ITEM NO. LD-6: Refer to Sheet L1.06 Drainage and Utility Plan: (Reissued):

A. Re-issued sheet includes revisions to storm design, direction of flat drain tile, and connection points of new 8” collector pipe.
B. Provide (4) new turf access boxes over new structures associated with storm detention system.

END OF ADDENDUM NO. 1

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SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Where these specifications differ from the standard details or specifications of the governing agency, the agency standards shall apply.

B. Materials and installation requirements are generally indicated on the plans. Materials indicated in these specifications only apply if indicated on the plans and allowed by the regulating authority. Contractor is responsible for confirming allowable materials and installation requirements with the regulating authority and including these requirements in their bid.

C. CAD files will be made available for use in construction staking. Contact the engineer regarding applicable fee and requirements for signing of the CAD File Transfer Agreement.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for the water supply system (for both fire protection and domestic water systems).

B. Water meters may be provided by the regulating authority. Contractor shall confirm with the regulating authority and pay the required fees for the meter.

1.3 DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.

B. HDPE: High density polyethylene plastic

C. PVC: Polyvinyl chloride plastic.

D. DI – Ductile Iron .

1.4 SUBMITTALS

A. Product Data and shop drawing submittals are not required. Contractor shall confirm that the materials provided meet the requirements of the regulating authority, and provide material certification to the engineer. Material certification shall state that the products meet or exceed the requirements indicated on the plans and the requirements of the regulating authority. **Shop drawings will not be reviewed**.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water, including materials, installation, tapping of water mains, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify construction manager (or architect if there is no construction manager) no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without construction manager’s or architect’s written permission.

1.8 COORDINATION

A. Coordinate connection to water main with utility company and make connection per their requirements.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Copper, Pressure-Seal Fittings:

a. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
b. NPS 2-1/2 (DN 65) Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

B. Hard Copper Tube: ASTM B 88, Type K, water tube, drawn temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

a. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
b. NPS 2-1/2 (DN 65): Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances:

a. Available Manufacturers: Subject to compliance with requirements of regulating authority.

b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
c. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.3 PE PIPE AND FITTINGS (use only if indicated on the drawings and allowed by the regulating authority)

A. PE, ASTM Pipe: ASTM D 2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 160 psig.

1. Insert Fittings for PE Pipe: ASTM D 2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
2. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 160 psig.

1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 160 psig.

2.4 PVC PIPE AND FITTINGS (use only if indicated on the drawings and allowed by the regulating authority)

A. PVC, Schedule 80 Pipe: ASTM D 1785.

1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.

B. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.5 CORROSION-PROTECTION PIPING ENCASEMENT (use only if specified on the plans or required by the regulating authority)

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Sheet or tube.
3. Material: LLDPE film of 0.008-inch (0.20-mm) minimum thickness.
4. Color: Black

2.6 GATE VALVES

A. AWWA, Gate Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Stem (rising or non-rising), and Gate Valve seating (metal seated or resilient seated) to meet requirements of the regulating authority and/or as shown on the standard detail sheets included with the plan:

2.7 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: per requirements of regulating authority.

B. Valve Boxes: If requirements are not indicated on the plans or standard detail sheets, comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts (only if indicated on the plan or required by the regulating authority): UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.8 CHECK VALVES

A. AWWA Check Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Description: If not indicated in the plans or specified by the regulating authority, use swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

   a. Standard: AWWA C508.
   b. Pressure Rating: 175 psig (1207 kPa).

B. UL/FMG, Check Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Description: If not indicated in the plans or specified by the regulating authority, swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.

   a. Standards: UL 312 and FMG approved.
   b. Pressure Rating: [**175 psig (1207 kPa)**] [**250 psig (1725 kPa)**].

2.9 DETECTOR CHECK VALVES

A. Detector Check Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Description: If not indicated in the plans or specified by the regulating authority use galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.

   a. Standards: UL 312 and FMG approved.
   b. Pressure Rating: 175 psig (1207 kPa).
   c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

2.10 BUTTERFLY VALVES

A. AWWA Butterfly Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2. Description: If not indicated in the plans or specified by the regulating authority use Rubber seated valve.

   a. Standard: AWWA C504.
   b. Body: Cast or ductile iron.
   c. Body Type: Wafer or flanged.
   d. Pressure Rating: 150 psig (1035 kPa).

B. UL Butterfly Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

2. Description: If not indicated in the plans or specified by the regulating authority, use metal on resilient material seating.

   a. Standards: UL 1091 and FMG approved.
   b. Body: Cast or ductile iron.
   c. Body Type: Wafer or flanged.
   d. Pressure Rating: 175 psig (1207 kPa).

2.11 WATER METERS

A. Water meters will be furnished by utility company. Contractor is responsible for paying the cost of the water meter.

2.12 PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

B. Water Control Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

2.13 RELIEF VALVES

A. Air-Release Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

B. Air/Vacuum Valves:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

2.14 FIRE HYDRANTS

A. Fire Hydrants:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority or as indicated on the standard detail sheets.

2.15 FIRE DEPARTMENT CONNECTIONS

A. General – this section only applies if free standing fire department connections (FDC) are indicated on the plans. All building mounted FDC will be part of the plumbing specifications.

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority:

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications and in accordance with the regulating authority. Where these specifications differ from the requirements of the regulating authority, those requirements shall govern.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping [NPS 3/4 to NPS 2 1/2] shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings.

F. Underground watermain piping [NPS 4 to NPS 16] shall be as indicated in the plans and standard detail sheets, and as allowed by the regulating authority:

3.3 VALVE APPLICATIONS

A. General Application: As indicated in the plans and standard detail sheets, and as allowed by the regulating authority.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Division 22 Section "Common Work Results for Plumbing" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated. Coordinate with the water utility company to provide necessary inspection of watermain installation.

B. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105 if indicated on the plans or if required by the regulating authority. Contractor is responsible for confirming this requirement and including this cost as necessary.

C. Install PE pipe according to ASTM D 2774 and ASTM F 645.

D. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

E. Install fiberglass AWWA pipe according to AWWA M45.

F. Bury piping with depth of cover over top at least 60 inches but not less than the minimum required by the regulating authority.

G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed. These locations will be indicated on the plans, however, the contractor can propose this installation method in areas where it would be beneficial to minimize disturbance to existing conditions.

H. Extend water-service piping inside building wall and stub at 12” above floor elevation at the location dictated on the mechanical plans. Coordinate with the interior plumbing plans and the construction manager, owner, or general contractor to confirm this location.

1. Terminate piping with caps, plugs, or flanges as required for piping material. Connections to building-water-piping systems will be done by the interior plumbing contractor.

I. Sleeves are specified in Division 22 Section "Common Work Results for Plumbing."

J. Mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

K. Install underground piping with restrained joints and/or thrust blocks at horizontal and vertical changes in direction (as indicated on the standard detail sheets or as required by the regulating

authority). Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
3. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
4. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
5. Fiberglass Piping Bonded Joints: Use adhesive and procedure recommended by piping manufacturer.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 22 Section "Common Work Results for Plumbing" for joining piping of dissimilar metals.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following (as long as the regulating authority approves of their use):

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for all piping systems:

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box unless gate well is indicated on the plan.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

3.9 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position. Follow the standard details included with the plans and/or the requirements of the regulating authority.

3.10 FIRE DEPARTMENT CONNECTION INSTALLATION

A. For external FDC, install protective pipe bollards on three sides of each fire department connection if located closer than 5’ from a driveway.

3.11 CONNECTIONS

A. Connect water-distribution piping to existing water main. Use connection method indicated on the plan and as dictated by the regulating authority.

3.12 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests according to requirements of the regulating authority. If testing methods are not dictated by the regulating authority, test as follows: Conduct tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.13 IDENTIFICATION

A. If required by the regulating authority, install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.14 CLEANING

A. Clean and disinfect water-distribution piping in accordance with the requirements of the regulating authority. When requirements are not given clean and disinfect as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Where these specifications differ from the standard details or specifications of the governing agency, the agency standards shall apply.

B. Materials and installation requirements are generally indicated on the plans. Materials indicated in these specifications only apply if indicated on the plans and allowed by the regulating authority. Contractor is responsible for confirming allowable materials and installation requirements with the regulating authority and including these requirements in their bid.

C. CAD files will be made available for use in construction staking. Contact the engineer regarding applicable fee and requirements for signing of the CAD File Transfer Agreement.

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure sanitary sewerage outside the building, with the following components:
1. Cleanouts.
2. Corrosion-protection piping encasement.
3. Precast concrete manholes.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data and shop drawing submittals are not required. Contractor shall confirm that the materials provided meet the requirements of the regulating authority, and provide material certification to the engineer. Material certification shall state that the products meet or exceed the requirements indicated on the plans and the requirements of the regulating authority. **Shop drawings will not be reviewed**.

B. Field quality-control test reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements of the regulating authority.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

B. Materials are generally indicated on the plans. Materials indicated in these specifications only apply if indicated on the plans and allowed by the regulating authority. Contractor is responsible for confirming allowable materials and installation requirements with the regulating authority and including these requirements in their bid

2.3 ABS PIPE AND FITTINGS

A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.

1. NPS 3 to NPS 6: SDR 23.5.
2. NPS 8 to NPS 12: SDR 35.
3. Gaskets: ASTM F 477, elastomeric seals.

2.4 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-2 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

C. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794 pipe, with bell-and-spigot ends; ASTM D 3034 fittings, with bell ends; and ASTM F 477, elastomeric seals.

2.5 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class IV, with groove and tongue ends for gasketed joints with ASTM C 443, rubber gaskets.

2.6 CLEANOUTS

A. Gray-Iron Cleanouts: Use in pavement areas. ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Top-Loading Classification: Heavy duty.
2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.7 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints. Refer to plans for standard detail.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 1 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 8 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.9 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Manufacturers:

a. Josam Company.
b. MIFAB Manufacturing Inc.
c. Smith, Jay R. Mfg. Co.
d. Wade Div.; Tyler Pipe.
e. Watts Industries, Inc.
f. Watts Industries, Inc.; Enpoco, Inc. Div.
g. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Top-Loading Classification: Heavy duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

1. Manufacturers:

a. Canplas Inc.
b. IPS Corporation.
c. NDS Inc.
d. Plastic Oddities, Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Light Commercial Specialty Plumbing Products; Zurn Plumbing Products Group.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

A. Gravity-Flow, Nonpressure Sewer Piping: Pipe material is indicated on the plans. Use only pipe materials indicated on the plans and acceptable to the regulating authority.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.

F. Install gravity-flow, nonpressure, sewer piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated on the drawings.
2. Install piping at depths indicated on the plans.
3. Install piping below frost line.
4. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
6. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.4 PIPE JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 22 Section "Common Work Results for Plumbing" Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure, piping according to the following:
   1. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
   2. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
   3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   4. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
   5. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
   6. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

3.5 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops of manholes in lawn areas to the rim elevations indicated on the plan.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

3.7 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade.

   1. Use light-duty, top-loading classification cleanouts in earth areas.
   2. Use heavy-duty, top-loading classification cleanouts in paved areas.

B. Set with tops one inch above surrounding grade in nonpaved areas.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.8 CONNECTIONS

A. Extend sewer piping to within 5’ of building. Connection to building piping will be made by the plumbing contractor.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Fill with flowable grout prior to enclosing if indicated on the plans. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use procedure indicated on the plans:

C. Backfill to grade according to Division 31 Section "Earth Moving."

3.10 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes only if required by the regulating authority.
1. Use detectable warning tape over piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Test new piping system according to requirements of regulating authority and provide test reports as required. If a testing method is not specified, test as follows:

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.
    f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
    b. Option: Test concrete gravity sewer piping according to ASTM C 924.

D. Leaks and loss in test pressure constitute defects that must be repaired.

E. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean interior of piping of dirt and superfluous material. Flush with potable water.

END OF SECTION 221313

PART 1 - GENERAL

1.1 SUMMARY

A. This Section is a part of the entire set of Contract Documents and shall be coordinated with the applicable provisions of the other parts.

B. Related Sections:

1. Section 32 9119 Topsoil

1.2 SCOPE

A. This work under this section specifications shall consist of furnishing all labor, materials, and equipment necessary for the installation of bioretention areas for the purposes of storing, filtering, and infiltrating storm water into the ground.

1.3 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than sizes indicated; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

B. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

C. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for kind and size of exterior plant required.

D. Container-Grown Stock; healthy, ‘vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

E. Fabric Bag-Grown Stock Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60. 1 for type and size of exterior plant.

F. Finish Grade: Elevation of finished surface of planting soil.

G. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

H. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

I. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.4 SUBMITTALS

A. Nursery Source: For all nursery stock indicated on Plans.

1. Submit list of growers for each plant species to be installed within 30 days following award of contract. Include substitution requests based on plant unavailability at that time. Substitution requests after this period will not be accepted.

B. Submit material samples to Landscape Architect: sand, draintile, shredded hardwood bark mulch, planting accessories, pre-emergent herbicides, and plant fertilizers.

C. Submit materials certification to Landscape Architect: Topsoil source and pH value, peat moss and plant fertilizer.

D. Material Test Reports: For existing native surface topsoil and imported topsoil. Contractor shall be responsible to provide and pay for material testing. Testing agency shall be acceptable to the Landscape Architect.

E. Planting Schedule: Indicating anticipated planting dates for exterior plants.

F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

1.5 QUALITY ASSURANCE

A. All work shall be in accordance with local City/County Stormwater Standards.

B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of bioretention areas.

1. The Contractor, and its Subcontractors, shall provide a staff adequate to coordinate and expedite the work properly and shall maintain competent supervision of its own work to insure compliance with contract requirements.
2. Installer Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

C. Soil shall be a uniform mix, free of stones, stumps, roots or other debris larger than 2 inches. No other materials or substances should be mixed or dumped within the bioretention area that may be harmful to plant growth.

D. Planting Soil shall be free of Bermuda Grass, Quack Grass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearthub, or any other noxious weeds.

E. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

F. Comply with sizing and grading standards of the latest edition of ‘American Standard for Nursery

Stock". A plant shall be dimensioned as it stands in its natural position. Stock furnished shall be at least the minimum size indicated. Larger size is acceptable, at no additional charge. Larger plants shall not be cut back to size indicated.

G. Evaluation: Landscape Architect may evaluate flowers. grasses and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected planting or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

B. Do not prune shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Plants transported on open vehicles shall be covered to prevent wind burn.

D. Inspection certificates required by law shall accompany each shipment invoice or order to stock on arrival. The certificate shall be filed with the General Contractor's representative.

E. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

F. Deliver seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.

1.7 COORDINATION

A. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

C. Coordination with Lawns & Irrigation: Plant trees and shrubs after finish grades are established and irrigation has been installed, and before planting lawns.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of: adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond the Contractor's control.

1. Warranty Period: One year from date of Substantial Completion.
2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

1.9 MAINTENANCE

A. Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

1. Maintenance Period: Six (6) months from date of Substantial Completion.

B. Ground Cover, Flowers, and Grasses: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: Three (3) months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

A. The planting soil shall have sufficient depth to provide adequate moisture capacity and create space for plant rootzones.

B. Planting soil shall be installed 4 inches deeper than the bottom of largest root ball.

C. Material Specifications:

1. Planting Soil:

a. Shall have a sandy loam, loamy sand, or loam texture per USDA textural triangle. Maximum clay content is < 5%.
b. Soil mixture shall have pH between 5.5 and 6.5 with an organic content of 1.5 – 3.0%.
c. Soil mixture should have an infiltration rate greater than 0.5 in/hr.

2.2 SAND

A. Shall be clean and free of deleterious materials.

B. MDOT Class II sand is recommended.

2.3 MULCH

A. Mulch shall consist of raw hardwood, MDOT Quality Product List.

B. Grass clippings are not suitable alternative for mulch due to high nitrogen content.

2.4 GEOTEXTILE FABRIC

A. Geotextile fabric shall maintain a flow rate of 125 GPM per foot.

B. Geotextile fabric shall comply with MDOT specifications (Table 910-1)

2.5 PEA GRAVEL

A. Pea gravel shall be washed, river-run, and round in diameter, ¼ - ½ inches in size.

2.6 UNDERDRAIN PIPING

A. Refer to Drawings and Division 33 Specifications for underdrain piping requirements.

2.7 VEGETATION

A. Selected plants shall be native to Michigan and suitable for use in bioretention areas. Selected plants shall be suitable for moist organic gardens but also tolerate periodic dry conditions.

B. Seed Mix can be obtained from the following companies (or approved alternate):

1. Nativescape LLC
P.O. Box 122
Manchester, MI 48158
Phone: (517) 456-9696

C. Vegetation Varieties:

Common Name	Scientific Name	Color	Bloom Time
40% Native Wildflowers: will contain at least ten of following species			
Beardtongue	Penstemon digitalis	P, R	May-July
Bergamot (Bee Balm)	Monarda fistulosa	P, L	July-Aug
Black-Eyed Susan	Rudbeckia hirta	Y	June-Sept
Blue Flag Iris	Iris Vigincia	Pr	May-July
Blue Vervain	Verbena hostata	L	June-July
Boneset	Eupatorium perfoliatum	W	Aug-Sept
Canada Anemone	Anemone canadensis	W	June-Sept
Columbine	Aquilegia canadensis	Pr,Y,R	May-July
Culver's Root	Veronicastrum virginicum	W, Pr	June-Sept
Joe-Pye Weed	Eupatorium maculatum	W, Pr	July-Oct
Marsh Blazing Star	Liatris spicate	W, Pr	June-July
Missouri Ironweed	Vernonica missurica	Pr	July-Oct
New England Aster	Aster novae-angliae	Pr	Aug-Oct
Sneezeweed	Helenium autumnale	O,Y	July-Sept
Spiderwort	Tradescantia ohiensis	Pr,W	May-Sept
Swamp Goldenrod	Solidago patula	Y	May-Aug
Swamp Milkweed	Asclepias incarnate	P,W	May-June
Tall-Green Headed Coneflower	Rudbeckia trilobum	Y	June-Sept
Tall Tickseed	Coreopsis verticillate	L	June-July
White Turtlehead	Chelone glabra	W,L	June-Aug
30% Native Grasses, Rushes, Sedges: will contain at least four of following species			
Indian Grass	Sorgastrum nutans		
Old-Field Cinquefoil	Potentilla simplex		
Porcupine Sedge	Carex hystericina		
White Vervain	Verbena urticiforia		
Wild Strawberry	Fragaria virginiana		
30% Native Shrubs: will contain at least six of following species			
American Cranberry Viburnum	Viburnum trilobum		
Black Chokeberry	Aronia prunifolia		
Common Buttonbush	Cephalanthus occidentalis		
Meadowsweet	Spiraea alba		
Ninebark	Physocarpus opulifolius		
Redosier Dogwood	Cornus stolonifera		
Shrubby Cinquefoil	Potentilla fruticose		
Shrubby St. John's Wort	Hypericum prolificum		
Spicebush	Lindera benzoin		
Steeplebush	Spiraea tomentosa		

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. The area surrounding the bioretention areas should be stabilized prior to construction of the bioretention areas to minimize compaction and contamination of the bioretention site.

3.3 INSTALLATION

A. Filter fabric may be placed along “walls” of bioretention area to help direct water flow downward and to reduce lateral flow.

B. Take care of placing gravel over underdrain pipe to prevent compaction of pipe.

C. Install planting soil in lifts of 12 to 18 inches and lightly compacted.

D. Grade bioretention materials with light equipment such as a compact loader or dozer with marsh tracks. Do not use heavy equipment within the bioretention area.

E. Mulch shall be uniformly applied approximately 2 to 3 inches in depth. Piling mulch around base of the tree is not recommended.

3.5 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.

1. Place stock on setting layer of compacted planting soil.
2. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

B. Set container grown stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
3. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.
4. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral

cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.6 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured or dead branches from flowering frees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.13 CLEANUP AND PROTECTION

A. During exterior planting, keep. adjacent paving's and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.14 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property

END OF SECTION 32 9300