SECTION 333313 – SITE SANITARY SEWER CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Division 31 Section - "Earthwork"

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure sanitary sewerage outside the building as indicated on the Civil Drawings, with the following components:

1. Cleanouts.
2. Precast Concrete manholes.
3. Ductile Iron Sewer Pipe & Fittings.

B. The Contractor shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

C. The Contractor shall pay all costs for sewer tap fees.

1.3 DEFINITIONS

A. DIP: Ductile Iron Pipe

B. PVC: Polyvinyl Chloride

1.4 GENERAL

A. Applicable Standards: Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the Owner, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

B. Substitutions: Whenever a product is identified in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the Contractor may freely choose from those referenced products which ones he wishes to provide.

C. Construction Drawings: The term construction drawings shall mean drawings, prints, descriptive literature, test reports, samples, calculations, schedules, materials lists and information and items of similar meaning.

D. Submittals Required: The Contractor shall furnish to the Utility Owner, Engineer, and Owner for review in accordance with the procedure outlined below, drawings and descriptive literature for all manufactured or fabricated products. Additional information such as special drawings, schedules, calculations and curves, shall be provided as specifically requested by the Utility Owner, Engineer, and/or Owner.

E. Utility Owner's Review: The Contractor shall furnish to the Utility Owner all required shop drawings, submittals, reports and inspections as deemed necessary by the Utility Owner to complete the project in accordance with the standards set forth by the Utility Owner.

F. Contractor's Review: The Contractor shall review and check drawings and submittals. He shall indicate his review by initials and date. The Contractor shall furnish the Engineer with a minimum of five copies of all submittals. A transmittal form shall accompany each submittal or group of submittals.

G. Engineer's Review: All submittals will be reviewed, stamped, and dated by the Engineer before they are returned to the Contractor.

H. One copy of reviewed submittals will be returned to the Contractor and the remaining copies retained by the Engineer.

I. Submittals requiring minor corrections will be so noted. Drawings must be resubmitted for review prior to installation or use of products.

J. Drawings for Construction: Drawings or other submittals not bearing the Engineer's review notation shall not be issued to subcontractors or utilized for construction purposes. The Contractor shall maintain at the job site a complete set of construction drawings bearing the Engineer's review.

K. As Builts: Furnish as-built drawings, indicating pipe lengths, manhole rim and invert elevations and in accordance with City of McDonough requirements.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Special pipe fittings.

B. Shop Drawings: For the following:

1. Manholes: Include plans, elevations, sections, details, and frames and covers.

2. Pipe: Include manufacturer's data for each type of pipe to be provided including joining materials.

C. Field quality-control test reports shall be submitted to the Architect, Engineer and Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 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 and Utility Owner no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Architect's and Utility Owner's 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 listed for each product listed. Where specific manufacturers are listed, Contractor may freely choose from the referenced products. Otherwise, products shall meet the criteria set forth in the specifications for each product.

2.2 PIPING MATERIALS

A. GENERAL: Refer to Drawings for the required piping materials. Pipe and fittings shall be the type listed below.

1. DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS
   a. Pipe: 4-8 inches DIP shall conform to AWWA C151 and shall be a minimum of Class 51 for 4 inch pipe and Class 50 for 6-8 inch pipe. Sizes will be as shown on the Drawings.
   b. Pipe Joints: AWWA C151, for push-on joints.
   c. Compact Fittings: AWWA C153, for push-on joints.
   d. Gaskets: AWWA C111, rubber.
   e. All pipe shall be furnished in lengths of at least 18 feet.
   f. Pipe and fittings shall be cement lined in accordance with AWWA C104.
   g. Pipe and fittings shall be furnished with a bituminous outside coating.

2. POLYVINYL CHLORIDE (PVC), GRAVITY SEWER PIPE AND FITTINGS
   a. Polyvinyl chloride (PVC) plastic pipe: PVC plastic sewer pipe shall be unplasturized polyvinyl chloride with integral wall bell and spigot joints with a rubber ring gasket. Pipe and fittings shall meet all the requirements of ASTM-D-3034, SDR 26, or ASTM F679 for use as a gravity sewer conduit. Standard lengths shall not exceed 13 feet.
   b. Minimum "pipe stiffness" (F/Y) at 5% deflection shall be 46 for all sizes when tested in accordance with ASTM Designation D-2412.
   c. External loading properties of plastic pipe by Parallel Plate loading.

d. Installation of PVC sewer pipe shall be in accordance with the provisions of ASTM-2321, "Underground Installation of Flexible Thermoplastic Sewer Pipe" with additional bedding as required in these specifications.
e. Detection Tape: Detectable mylar encased aluminum foil marking tape will be installed over all PVC sewer pipe. Tape will be at least 1½ inches wide, and shall bear the printed identification "Caution: Buried Sewer Line Below" (reverse printed), so as to be readable through the mylar. Surface printing on the tape shall be equal to Lineguard Type II Detectable. Detection tape shall be buried 2'-0" below the ground surface above the sewer.

2.3 PIPE COUPLINGS

A. Reducing or transition, metal, bolted, sleeve-type, reducing or transition coupling, for joining underground piping. Include ends of same sizes as piping to be joined.

B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.

1. Manufacturers:
   a. Cascade Waterworks Mfg.
   b. Dresser, Inc.; DMD Div.
   c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
2. Center-Sleeve Material: Manufacturer's standard.
3. Gasket Material: Natural or synthetic rubber.
4. Metal Component Finish: Corrosion-resistant coating or material.

2.4 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints, H-20 load rating for traffic areas.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
4. Riser Sections: 5-inch minimum thickness, and of length to provide depth indicated.
5. Top Section: Eccentric-cone type. Top of cone of size that matches grade rings.
6. Joint Sealant: As indicated on the drawings.

7. Resilient Pipe Connectors: As indicated on the drawings, shall be provided at each pipe connection to a manhole. Boots shall be integrally cast or provided for cored manholes.
8. Steps: As indicated on the drawings.

9. Manhole Frames and Covers: Ferrous manhole cover of the type, size and weight required by the local Utility Owner. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."

   a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.

b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 10-mil minimum thickness applied to all surfaces, unless otherwise indicated.
c. Precast manholes shall be furnished and set with the proper allowance for the cast iron frame and cover to be set at the correct finished grade.

2.5 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. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 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: 1/4" per foot minimum through manhole.

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

a. Slope: 3:1 slope.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use couplings where required to join gravity-flow, sewer piping, unless otherwise indicated.

a. Rigid couplings for same or minor difference OD pipes.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Location and arrangement of piping layout take design considerations into account. Install piping as indicated, making connections to work indicated on Plumbing Plans, as required.

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.

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, drainage piping according to the following:

1. Install piping pitched down in direction of flow, as indicated.
2. Install piping at depth indicated on the drawings.
3. Install PVC , gravity sewer piping and fittings according to ASTM D2321.

4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
5. Install ductile-iron and special fittings according to AWWA C600 or AWWA M41.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

H. Bed and haunch pipes with crushed stone. Refer to Drawings for details.

3.4 PIPE JOINT CONSTRUCTION

A. Basic piping joint construction is specified below. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC ,gravity sewer piping and fittings according to ASTM D2321.
2. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
3. Join ductile-iron and special fittings according to AWWA C600 or AWWA M41.

3.5 MANHOLE INSTALLATION

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

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

C. Construct cast-in-place manholes as indicated on drawings.

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

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops flush with finished lawn areas, unless otherwise indicated on the Drawings.

1. Set manhole tops and frames in full bed of mortar and secure frame to manhole.

3.6 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. See drawings for cleanout details.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block. Set with tops flush with surrounding grade.

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

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Install wye fittings on sewer main as pipe laying progresses.

2. 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.

C. Connect to grease interceptors shown on Plumbing Plans.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installation of green warning tapes directly over piping.

1. Use warning tape over ferrous and nonferrous piping.

3.9 FIELD QUALITY CONTROL

A. 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. Crushed, broken, cracked, or otherwise damaged piping.
    c. Infiltration: Water leakage into piping or manholes.
    d. 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.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects. All testing shall be done by an independent testing agency paid for by the Contractor. Reports of all inspections shall be copied to the Architect and Engineer.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to the following requirements:

    a. Clean and flush lines prior to testing. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the sewers by means of rods, swabs or other instruments. Flush out lines and manholes before final inspection.

        Water used to flush out and clean sewer lines will not be permitted to enter the existing sewer system. Contractor shall plug and pump line as necessary to perform clean-up work.

    b. Gravity Sewers: Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection. Televising of the sewer lines is required by the Owner and Engineer prior to final acceptance after other tests are completed.

        1) Infiltration Tests: Not included, leakage to be determined during televising.
        2) Exfiltration tests:
            a) Low-Pressure Air Test:

            1. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in according with ASTM C 828 is as follows:

Nominal Pipe Size, Inches	T (Time Min/100) Feet

6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6

2. Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of ± two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.
3. The Contractor shall keep records of all tests made. Copy of such records will be given to the Owner and/or Engineer. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Owner and/or Engineer.
4. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

c. Closed Circuit Television: Televise and provide 3 copies of tape of televised line to Architect. Coordinate televising with City of McDonough. Report of all areas questioned by televising firm shall be furnished to Architect and Engineer.

3. Manholes: Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between Precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass the following tests:

a. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc. or Cherne Industries.

4. Submit separate report for each test.

5. Contractor shall clean, pump out, open, close and make personnel available, as necessary, to accommodate inspection of sewer system.

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

D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified. Seal all leaks in manholes with hydraulic grout.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous material.

END OF SECTION 333313