SECTION 02530 - SANITARY SEWERAGE

PART 1 GENERAL

1.01 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. City of Columbia standard specifications. In the event of conflict between these specifications and the City specifications, the City of Columbia specifications shall govern.

1.02 SUMMARY

A. This Section includes sanitary sewerage outside the building.

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. PVC piping and fittings.
   2. Manhole frame & cover.
   3. Shop Drawings: Include plans, elevations, details, and attachments for the following:
      a. Precast concrete manholes, including frames and covers.
      b. Cast-in-place concrete manholes and other structures, including frames and covers.
   4. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
   5. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
   6. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect/Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect/Engineer's written permission.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. PVC Fittings Cleanouts:
      a. Canplas, Inc.
      b. IPS Corp.
      c. NDS, Inc.
      d. Manhole Cover Inserts:
         1) FRW Industries, Inc.
         2) Knutson Manufacturing Co.
         3) Parson Environmental Products, Inc.

2.02 PIPING MATERIALS

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

2.03 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray iron, for gasketed joints.
   1. Gaskets: ASTM C 564, rubber, compression type, thickness to match class of pipe.
   2. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
      a. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
      b. Gaskets: AWWA C111, rubber.
   3. PVC Sewer Pipe and Fittings: According to the following:
      a. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
         1) Gaskets: ASTM F 477, elastomeric seals.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
   1. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
   2. Bands: Stainless steel, at least one at each pipe insert.

2.05 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
   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 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.

4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 48 inches deep.
10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
11. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

2.06 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Course Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.
   5. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
      a. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
   6. Structure 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.
      a. 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.
         1) Invert Slope: 2.5 percent through manhole.
      b. Benches: Concrete, sloped to drain into channel.
         1) Slope: 8 percent.
   7. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
      a. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2.07 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
   1. Manhole Frames and Covers: On surfaces that will be exposed to sewer gases.

2.08 CLEANOUTS

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

PART 3 EXECUTION

3.01 EARTHWORK

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

3.02 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.03 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

3.04 Gravity-Flow Piping: Use the following:

A. PVC SDR 35 sewer pipe and fittings, gaskets and gasketed joints.

3.05 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for nonpressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.06 INSTALLATION, GENERAL

A. 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. Maintain swab or drag in line, and pull past each joint as it is completed.

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

C. Use 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.

D. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
   2. Install piping with 36-inch minimum cover.
   3. Extend sanitary sewerage service lines to locations indicated. Terminate piping as indicated.

3.07 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
   2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
   3. Install according to ASTM D 2321.
   4. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
   5. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.08 MANHOLE INSTALLATION

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

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

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.09 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to clean out at grade. Use PVC SDR 35 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.

B. Protect cleanout with a precast concrete “donut” 18 in diameter, 3 inches thick. Set with tops flush with surrounding grade.

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

3.11 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. 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.

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

3.12 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use procedure below. Where piping connects to a manhole structure which is to remain in place, remove at least 10 feet of line to isolate the abandoned line from the manhole. Grout the opening in the manhole and cap abandoned line as described below:
   1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.

2. Abandoned Structures: Excavate around structure as required and use procedure below:
    a. Remove top of structure down to at least 24 inches below final grade. Fill to within 12 inches of top with compacted dirt.
    b. Backfill to grade according to Division 2 Section "Earthwork."

3.13 REHABILITATION OF EXISTING SANITARY SEWER MANHOLES

A. Bench and Gutter: Existing bench and gutter shall be repaired and/or removed and replaced as necessary to provide a smooth, rounded channel for flow through the manhole.

B. Manhole Walls: Clean and grout interior joints of the existing manhole. Any damaged bricks in the walls shall be removed and replaced. When complete, manhole shall be waterproof, and no leakage shall be evident.

C. Frame and Cover: Frame and cover shall be inspected for damage and replaced as necessary. Grout shall be installed at the base of the frame to provide a water tight joint.

D. Pipe Entry and Exit: The joints between the manhole walls and the pipes entering and leaving the manhole shall be grouted to be water tight, with no visible leakage.

3.14 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
    1. Place plug in end of incomplete piping at end of day and when work stops.
    2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
    3. 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.
        a. Submit separate reports for each system inspection.
        b. Defects requiring correction include the following:
            1) Alignment: Less than full diameter of inside of pipe is visible between structures.
            2) Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
            3) Crushed, broken, cracked, or otherwise damaged piping.
            4) Infiltration: Water leakage into piping.
            5) Exfiltration: Water leakage from or around piping.
        c. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
        d. Reinspect and repeat procedure until results are satisfactory.
    4. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
        a. Do not enclose, cover, or put into service before inspection and approval.
        b. Test completed piping systems according to authorities having jurisdiction.

c. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
d. Submit separate reports for each test.
e. If authorities having jurisdiction do not have published procedures, perform tests as follows:
    1) Sanitary Sewerage: Perform hydrostatic test.
        (a) Allowable leakage maximum of 50 gal. per 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, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.
f. Manholes: Perform hydraulic test according to ASTM C 969.
g. Leaks and loss in test pressure constitute defects that must be repaired.
h. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 02530