SECTION 02535

GRAVITY FLOW SANITARY SEWERS

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. The work covered under this section includes furnishing all labor, equipment, and materials required to install, inspect, and test full length sections (manhole to manhole) and external point repairs on gravity flow sanitary sewers.

1. External Point repair is the method for correcting a defect on a mainline requiring excavation.

    a. This type of repair shall include:

        1) Excavation, shoring, removal and disposal of debris and spoil materials, dewatering, required surface demolition including but not limited to the cutting and removal of asphalt or concrete pavement, sub-pavement, curb and gutter, sidewalk, etc., removal and reinstallation of all obstructing surface features, complete.

        2) Replacing a section of pipe up to twenty (20) linear feet in length as required for structural defect repair

        3) Replacing service connections as required

        4) Installing flexible repair couplings, collars or boots as applicable, and approved

        5) Connections to manholes according to DWM Standard Detail S-011

        6) Backfilling complete

        7) Disposal removed pipe and used or unused materials

        8) Site restoration

2. The pipe material shall be as directed by the Owner's Representative.

B. It is the Contractor's sole responsibility to establish elevation and/or survey controls necessary to attain true line and grade for the replacement pipe section for all External Point Repairs. No abrupt deflections in line or grade will be allowed.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO): T99 (ASTM 698), Standard Method of Test for the Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

B. American Society for Testing Materials International (ASTM)

1. A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.

2. C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

3. C425 – Standard Specification for compression Joints for Vitrified Clay Pipe and Fittings

4. D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3 (600 kN-m/m3)).

5. D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort (56,000 ft-lb/ft3 (2,700 kN-m/m3)

6. D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

7. D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. American Water Works Association (AWWA), Latest Revisions.

1.03 SUBMITTALS

A. Submittals shall conform to the requirements of Section 01300 - Submittals.

B. Action Submittals

1. Materials to be obtained and installed,

   a. Pipe material, diameter (inside and outside), stick length, joint make up, bedding and backfill.

2. Surface operations plan, proposed:

   a. Temporary lay down area(s) as needed

   b. Temporary installation staging area(s) as needed

      1) Points of ingress and egress.

      2) Waste storage, disposal

3. The Contractor shall submit Record Documents per Section 01720 – Record Documents.

C. Test reports.

D. Complete and submit a daily report detailing the work carried out and any small items of Work incidental to the Work. The Contractor shall include in his daily

report the above and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To and from the Owner's Representative.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.

9. Visitors: On site.

E. Disposals: Type and quantity of debris (including liquids).

F. For projects entering a Georgia Department of Transportation (GDOT) controlled Right-of-Way shall conform to the requirements outlined in Section 01060 – Regulatory Requirements

1.04 QUALITY ASSURANCE

A. Provide the Owner's Representative with the product manufacturers' written certification indicating all products furnished comply with applicable provisions of these Specifications.

1. Unless modified herein, materials used in the manufacture of pipe, linings, manholes, and castings shall be new and shall be tested in accordance with the referenced standards.

2. Perform and pay for sampling and testing as necessary for the certifications.

   a. The Owner's Representative shall have the right to witness testing of the materials.

B. Test and inspect the sewer pipe at the place of manufacture:

1. Pipe shall meet all requirements of the latest applicable ASTM standards,

   a. Certified copies of the test report covering each shipment shall be submitted to the Owner's Representative prior to laying.

2. All pipes shall be subject to inspection by the Owner's Representative at the place of manufacture.

3. Notify the Owner's Representative in writing of the manufacturing start date at least fourteen (14) days prior to the start of manufacturing.

    a. The Contractor shall be responsible for all inspection costs.

C. After delivery, pipe and fittings will be subject to inspection by and approval of the Owner's Representative.

a. No broken, cracked, misshaped, or otherwise damaged or unsatisfactory pipe, fittings, or damaged concrete lining, or coatings shall be used,

b. Remove and properly dispose of unsatisfactory materials from the job site at no cost to the Owner.

D. Check each pipe stick prior to lowering into trench:

a. Pipe interior shall be clean

b. Check for joint scratches, chipped ends, damaged linings and coatings, and imperfect gasket seats.

E. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting without additional cost to the owner.

F. Each pipe shall be clearly marked as required by the applicable ASTM standard specifications to show pipe class, date of manufacture, date coated, type of coating, and manufacturer's trademark.

G. All pipe, accessories, and specials shall be new material. When directed by the Owner's Representative:

1. Pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe.

2. Service shall be furnished for a minimum of five (5) days during initial pipe installation.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Inspect pipe materials and fittings upon arrival at the Work Site.

B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear, or free fall.

1. Do not drag pipe and fittings along the ground.

2. Do not roll pipe unrestrained from delivery trucks.

3. Do not insert forks inside pipe or fittings without suitable effective protection that prohibits damage to linings or coatings.

C. Employ acceptable mechanical means to move or handle pipe.

D. Comply with the storage and handling requirements per manufacturer's recommendations.

1.06 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

Reference Specification 01030 – Special Project Procedures.

1.07 SAFETY

A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, entry permit and safety equipment.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. All materials shall be in strict compliance with the required standards and specifications including, but not limited to ASTM, ANSI, and AWWA.

B. At points of the sewer where a change in pipe classification (pressure rating, etc.) is shown on the Plans,

a. Begin new classification at the next joint of pipe rather than cutting the pipe and constructing a collar unless there is a change in horizontal or vertical alignment.

b. In the event the pipe is cut, there shall be no torch cutting, only saw cutting will be allowed.

C. Ductile Iron Pipe and fittings shall conform to the requirements of Section 02537 – Ductile Iron Sanitary Sewer Pipe and Fittings.

2.02 TRANSITION COUPLINGS

A. The same Pipe Material shall be used when installing pipe from manhole to manhole. For point repairs, approved transition joints shall be used if that matching materials are not approved for use or it is not possible to match.

1. Use of concrete collar walls for transition joints between sewer pipes of different materials shall be only used only as approved by the Owner's Representative on a case by case basis.

2. Use of transition couplings or gaskets shall require approval by the Owner's Representative before use.

2.03 PIPE TO PIPE CONNECTIONS

A. Pipe to pipe connections shall be made using flexible banded couplings or adapters, should couplings with compression joints be required then they shall be in accordance with ASTM C425.

2.04 PIPE TO MANHOLE CONNECTIONS

A. Shall conform to the requirements of Section 02641 – Precast Concrete Manholes

2.05 APPURTENANCES

A. Service connections shall conform to requirements of this specification.

B. Manholes shall conform to the requirements of Section 02641 – Precast Concrete Manholes.

2.06 BACKFILL AND SITE RESTORATION

A. Pipe backfill materials shall conform to the requirements of Section 02324 – Trenching and Trench Backfilling.

B. Site Restoration shall conform to the requirements of Section 02276 – Site Restoration and Erosion Control.

PART 3 - EXECUTION

3.01 GENERAL

A. Identify the location of all existing underground and overhead utilities prior to commencing excavation activities.

1. The Contractor shall consult with the local Call before You Dig and utility companies, to verify the locations of existing underground utilities.

B. Immediately notify the Owner (agency or company) of any utility line, appurtenance, cathodic protection system, etc. damaged, broken, or disturbed during installation.

1. Obtain approval from the:

   a. Owner's Representative and the utility owner prior to performing any temporary or permanent repairs or relocating utilities.

C. Install and operate a dewatering system in accordance with the requirements of Section 02205 – Dewatering (when required).

D. Provide wastewater flow diversion in accordance with the Section 01520 – Sewer Flow Control (when required).

3.02 MANUFACTURER CERTIFICATION

A. The manufacturer shall certify the Contractor is properly trained in the method or system being used.

3.03 PIPE LAYING

A. Accurately place pipe to the exact line and grade shown on the Plans.

1. Control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument.

    a. When a laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod:

        1) Every fifty (50) feet for pipe smaller than thirty (30) inches

        2) Every joint for pipe thirty (30) inches and larger.

        3) Other methods of controlling vertical and horizontal alignments may be used if specifically authorized by the Owner's Representative.

2. The pipe section may be adjusted by the use of "come-along" of approved design and anchorage.

    a. Bumping or snatching (with backhoe or crane, etc.) to adjust pipe after placement in the trench, will not be permitted.

3. The Contractor shall furnish all labor and materials necessary for controlling and documenting the line and grade.

B. External point repair:

1. Lines shall be laid straight and depth of cover shall be maintained uniform with respect to finish grade, whether grading is completed or proposed at time of pipe installation.

2. No abrupt changes in direction or grade will be allowed.

C. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be laid in the trench.

1. Before a sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared.

2. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill.

3. Trench inverts (bottoms) found to be unsuitable for foundations:

    a. Over-excavate to remove unsuitable material,

    b. Bring back to exact line and grade with foundation backfill as recommended in Section 02324 – Trenching and Trench Backfilling.

    c. Or as directed by the Owner's Representative.

D. Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints.

1. Cut bell holes no more than five (5) joints ahead of pipe laying.

2. Carefully grade the bottom of the trench between bell holes so the pipe barrel will rest on pipe bedding laid on a solid foundation for its entire length.

3. Each joint shall be laid so it will form a close concentric joint with adjoining pipe and avoid sudden offsets or inequalities in the flow line.

E. Water shall not be allowed to run or stand in the trench while pipe-laying is in progress or before the trench has been backfilled.

1. At no time shall the Contractor open up at more trench than the available dewatering system is able to dewater.

2. Movement of water (no matter what the cause) tending to erode or affect the trench walls or trench bottom will not be allowed.

F. Thoroughly inspect each pipe after it has been laid and joined.

1. Clean the interior of each pipe removing all earth, trash, rags and other foreign matter.

G. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed, inspected, and approved by the Owner's Representative.

H. Each night or at other times when work has been suspended:

1. Securely seal off open ends of pipe and fittings to the satisfaction of the Owner's Representative using approved commercially manufactured plugs or caps,

2. Prevent entry of water, earth or other substances and animals.

3.04 JOINT CONSTRUCTION

A. Bell and spigot pipe:

1. Clean the inside of all bells and the outside of all spigots to remove all dirt, water, or other foreign matter so their surfaces are clean and dry when the pipes are joined.

2. The use of manufacturer recommended joint lubricant is required.

B. Rubber ring gasket joints for sewer pipe shall be installed in accordance with the pipe manufacturer's specifications and recommendations.

1. Extreme care shall be used in joining pipe to avoid damaging the rubber ring or displacing it from the proper operating position.

C. Joints on bell and spigot ductile iron pipe sewers shall be compression joints,

1. Mechanical or flanged joints shall be installed in accordance with the pipe manufacturers' specifications and recommendations.

B. Completed joints shall be inspected by the Owner's Representative before they are covered.

1. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately at the Contractor's sole expense.

2. Testing of new gravity sewers shall be performed in accordance with the requirements of Section 02650 – Testing for Acceptance of Sanitary Sewers.

3. All pipes and appurtenances in place shall be carefully protected from damage until the backfilling operations have been completed.

4. Any pipe disturbed after jointing shall be removed, the joint cleaned and remade and the pipe re-laid at the Contractor's expense.

3.05 LATERAL TEE CONNECTIONS

A. Tee branches shall be installed in sanitary sewer lines at points shown on the Plans or as directed by the Owner's Representative.

1. If such branches are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained.

B. Tees shall be installed in sanitary sewers to:

1. Properly connect each existing customer.

2. Serve each vacant lot facing or abutting on the street or alley in which the sewer is being laid

3. At such other locations as may be designated by the Owner's Representative.

4. The exact location of each connection shall be recorded by the Contractor, on the record drawings, utilizing conventional GPS survey, before backfilling and said records delivered to the Owner's Representative.

3.06 CONNECTING RISERS

A. Where the depth of cut is over eight (8) feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and at such other locations as may be designated by the Owner's Representative:

1. Install risers to connect each existing house and to serve each vacant lot facing or abutting on the street on which the sewer is being laid.

B. Connecting risers shall be sized in accordance with the plumbing code in effect at

the time of construction, but shall not be smaller in size than shown on the Plans.

1. Risers shall be installed from a tee connection to the elevation needed to connect house services, the elevations shown on the Plans, or as directed by the Owner's Representative.

2. The tee connection shall be installed at the location shown on the Plans, and in accordance with the Detail Drawings.

3. Open ends of connecting risers shall be closed with approved stoppers and be physically restrained.

4. Backfilling shall be carefully done around risers using materials specified in Section 02324 – Trenching and Trench Backfilling, and compacted to the equivalent density of the surrounding undisturbed material.

3.07 CONNECTING EXISTING SANITARY SEWERS TO NEW SANITARY SEWERS

A. All new sanitary sewers shall be connected to existing sanitary sewers as shown on the Plans or as directed by the Owner's Representative.

1. Connections shall be made by constructing a manhole or utilizing an existing manhole.

B. Connecting lateral collector sewers to large diameter trunk sewers shall be made at existing manholes or new manholes.

1. Connecting to existing manholes shall be made by:
   a. Coring a hole in the wall of the existing manhole,

   b. Installing a boot,

   c. Inserting one end of a minimum length of eighteen (18) feet of pipe through the boot into the manhole,

   d. Filling around same with non-shrinking grout

   e. Troweling the inside and outside surfaces of the joint to a neat finish.

3.08 TOLERANCES

A. Invert Elevations:

1. The invert elevations shown on the Plans shall be for the invert at the centerline of the precast concrete manhole.

   a. Verify the elevation of the sewer installed at the manhole prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole.

b. Should the elevation differ from what is shown on the Plans, the Contractor shall take the following corrective action:

1) If the sewer is laid at negative grade: remove and reinstall the sewer at the correct grade at no additional cost to the Owner.

2) If the sewer is laid at a grade less than shown on the Plans (reducing the sewer's capacity):

a) Owner's Representative may require the sewer to be removed and re-laid at the correct grade at no additional cost to the Owner.

b) As a minimum, the grade to the next upstream manhole shall be adjusted so the next upstream manhole shall be set at the correct elevation.

3) If this causes no conflicts with upstream existing utilities or obstructions:

3.09 PIPE PROTECTION

A. Adjust the grade of the next upstream manhole so the next upstream manhole shall be set at the correct elevation.

1. If such an adjustment, in the Owner's opinion, is substantial,

a. The grade adjustment shall be spread over multiple sections of the sewer.

2. If such an adjustment, in the Owner's Representative opinion, significantly reduces the sewer's capacity,

B. The Owner's Representative may require the Contractor to remove and relay that portion of the sewer laid at the improper grade.

C. Trench Cut-Off Walls are required on steep slopes in excess of 20 percent and other locations as shown on the plans to prevent erosion of the backfilled trench.

3.10 CONCRETE ENCASEMENT

A. Provide concrete encasement of pipe where shown on the plans, or as required of the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version. If required by the Owner's Representative, provide calculations verifying that the encased pipe will not surpass the capacity of the unsuitable foundation material and cause a sag in the new line.

B. Submit mix designs for concrete to the Owner's Representative for approval.

3.11 FLOWABLE FILL

A. Furnish and place flowable fill where shown in the plans, or as directed by the Owner's Representative.

1. Potential applications include:

    a. Abandonment of pipe.

    b. General backfill for trenches.

B. Conform to the requirements of the Georgia Department of Transportation Specifications, current edition, Section 600 for controlled low strength flowable fill and requirements set forth in Section 02324 – Trenching and Trench Backfilling.

C. Submit mix designs for flowable fill to the Owner's Representative for approval.

3.12 ABANDONMENT OF GRAVITY SEWER LINES

A. Do not begin cut, plug and abandonment operations until replacement sewer has been constructed and tested, and all service connections have been installed.

B. Sewer pipelines specifically identified to be abandoned in-place shall be slurry filled with flowable fill and the ends plugged.

1. Grout Plugs shall be cement-based dry-pack grout conforming to ASTM C 1107, Grade B or C.

    a. Plugs will be a minimum of 12 inches thick in mains 15-inches and larger and a minimum of 6 inches thick in mains smaller than 15-inches.

2. Manufactured Plugs shall be a commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned. Wing nut type 'plumber's plugs are not acceptable for use.

3. Plugging method and materials to be approved by the Owner's Representative.

C. Sewer laterals shall be cut and capped at the main or property line, as directed by the Owner's Representative.

D. Trowel smooth abandoned main lines inside the manhole that they connect to.

1. Eliminate pockets in the areas of the abandoned pipes potentially trapping debris and sewer solids.

2. Any grout in the main sewers and/or manholes remaining in service shall be removed by the Contractor at no cost to the Owner.

3.13 TESTING

A. New manholes shall be vacuum tested in accordance with the requirements Section 02650 – Testing for Acceptance of Gravity Sanitary Sewers.

B. New gravity flow sanitary sewer and joints shall be low pressure tested in accordance with the requirements of Section 02650 – Testing for Acceptance of Gravity Sanitary Sewers.

C. Testing shall be performed in the presence of the Owner's Representative.

D. Testing for external point repairs after the joints have been completed that shall be inspected using CCTV inspection per Section 01510 - Sanitary Sewer Main Television and Sonar Inspection.

1. Post-installation CCTV inspection shall take place as quickly after completion of each section as feasible, but in no case more than forty-eight (48) hours thereafter.

    a. Submit the post-installation inspection within forty-eight (48) hours after the completion of the CCTV inspection.

    b. Repairs shall demonstrate the full and effective rectification of the extant defect and/or obstruction, including infiltration etc., to the complete satisfaction of the Owner's Representative.

2. The post construction CCTV inspection is not required for repairs performed prior to pipe-bursting or pipe replacement.

3.14 CLEANUP

A. Remove all debris and construction materials and equipment from the Work Site after completion of each section of sewer line;

1. Grade and smooth over the surface on both sides of the line;

2. Leave the entire construction area in a clean, neat, and serviceable condition.

B. Dispose of debris and liquids properly in accordance with all applicable laws.

1. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.

2. Debris and liquids type and quantities are to be tracked in the daily Contractor diary.

3. Hauling and disposal costs will be borne by the Contractor.

4. Restore the Work Site to the original or better condition in accordance with requirements of Section 02276 – Site Restoration and Erosion Control.

C. Prior to requesting a final inspection, the Contractor shall remove and dispose of all shipping timbers, shipping bands, boxes, and other like debris brought to the Work Site.

D. Repair or replace lawns, fences, drainage culverts, or property damaged by the sewer construction to equal or better condition than existing prior to commencement of the Work.

E. All shoulders, ditches, culverts, and other areas affected by the sewer construction shall be at the proper grades and smooth in appearance to provide positive drainage of the Work Site.

F. All manhole covers shall be brought to grade, as shown on the Plans, or as directed by the Owner's Representative.

1. Manholes in the unpaved area shall be above grade according to the local municipal Design Standards.

3.15 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of final acceptance. For point repairs, the warranty period shall be one additional year for a total of two (2) years from the date of final acceptance.

B. Within the warranty period, the Owner's Representative may inspect the work, and, if repairs are needed, the repairs shall be made on a case by case basis at no cost to the Owner.

C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION