

SECTION 02561**GRAVITY SANITARY SEWERS AND SANITARY HOUSE
CONNECTIONS****02561.01 GENERAL****A. Description**

Sanitary sewer and sanitary house connection installations shall include, but not necessarily be limited to furnishing and installing gravity pipe, fittings, and appurtenances of the size and type shown on the Plans, installed on firm foundation true to line and grade and in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Protection of the environment; Section 01500.
2. Trench excavation, backfill, and compaction; Section 02250.
3. Sanitary sewer manhole installation; Section 02562.
4. Connection to existing sanitary sewer facilities; Section 02564.
5. Tracer Wire and Metallic Detection Tape; Section 02570.

C. Quality Assurance

1. Materials
 - a. The Engineer will inspect all materials before and after installation to ensure compliance with the Contract Documents. When specific materials tests are called for in the referenced standards and specifications, the Engineer will have the option of requiring that any or all of these tests be performed for materials furnished for a specific project. When testing is required, it will be specified in the "Special Provisions".
 - b. Polyvinyl chloride (PVC) pipe and fittings shall be homogeneous throughout and free from visible cracks, bubbles, blisters, holes, foreign inclusions, cuts, or scrapes on inside or outside surfaces or imperfections which may impair the performance or life of the pipe. Each pipe shall be straight to within 1/16 inch per foot of length when uniformly supported along its entire length and shall have a true circular cross-section to within $\pm 1/64$ -inch.
 - c. Ductile iron pipe (DIP), and ductile iron fittings shall be sound and without defects that might impair its service. Defective or damaged lining areas shall

be repaired in accordance with the lining manufacturer's recommendations. Cut ends of pipe shall be also be recoated with an approved material. DIP shall only be allowed with DPW approval.

2. Field Tests

a. General

- 1) After installation, sanitary sewers and sanitary house connections will be initially inspected for conditional acceptance by the Engineer and Contractor and tested for compliance with these Specifications. Initial inspections and tests will not be conducted until at least 15 days after the section of pipeline being inspected and tested has been backfilled in accordance with Section 02250.03 and any dewatering pumps removed from the area.
- 2) The Contractor shall schedule all tests with the Engineer at least 48 hours in advance of the test and shall conduct all acceptance testing in the presence of the Engineer. On County Capital Projects, the County will witness one test at no cost to the Contractor. If the project is released for service following conditional acceptance tests, the County will perform a final inspection if required at no cost to the Contractor. Should the pipeline fail the first County witnessed test, the Contractor shall reimburse the County for all costs resulting from such additional tests as required until the pipeline passes the test(s). The Contractor shall also reimburse the County for the cost of inspection if the Contractor is not prepared for any test, or for additional tests required following the final inspection of released projects.

b. Visual Inspection

All equipment necessary for the visual inspection will be furnished by the Contractor as may be required to enable the County to perform the inspection.

The Engineer will inspect all sanitary sewers for alignment, grade, leakage, and condition. All sanitary sewers shall be videoed and recorded using closed circuit television equipment performed by the Contractor. The inspection may be conducted by crawling or walking through the pipeline, using mirrors to reflect light through the pipeline as needed or as required by the Engineer.

- 1) If a mirror test is used, the pipe alignment will be acceptable if it is sufficiently true and straight to allow passage of the reflected light with an image of a "full moon".
- 2) The pipeline shall be installed on a continuous grade, so it does not pond or trap water anywhere along the line.

- 3) No visible infiltration will be allowed. Any water leakage into the system sufficient to constitute any noticeable trickle or dribble shall be corrected and eliminated.
- 4) The pipeline shall not contain any debris, silt, earth, gravel, rock, or other foreign material. Should the pipeline require flushing, it shall be done in a manner to prevent debris or flushing water from entering the existing sewer and before inspection by the Engineer.

c. Acceptance Testing

1) General

- a) The Contractor shall furnish all labor, tools, materials, and equipment (except timers which will be furnished by the County) necessary to perform the specified tests. Testing shall be conducted only after the section of sewer in question has passed the visual inspection.
- b) Generally, sewers will be tested from manhole to manhole or from manhole to terminus of the pipeline if there is no manhole at the other extremity. Testing shall be by low- pressure air and/or infiltration/exfiltration as specified herein and/or as determined by the Engineer.
- c) If the sanitary sewer or sanitary house connection fails any test specified herein, the Contractor shall, at his own expense, repair or replace any defective component and retest the failed section or component until all requirements are met. Repairs to defective material are to be made in accordance with the manufacturer's recommendation.

2) Low Pressure Air Test

Sanitary sewers 24-inch diameter and smaller and attached sanitary house connections shall be tested with low-pressure air in accordance with the air test tables in the Standard Details and the following procedures:

- a) Test plugs shall be supplied and installed by the Contractor within the pipeline at each manhole. Each plug shall be securely braced.
- b) Sewer mains shall be tested at 4 psig for 4 minutes with no drops in pressure.
- c) The Contractor shall not allow personnel in manholes after the air pressure is increased in the sewer. If the test plug is suspected

of leaking, the Contractor shall first relieve the pressure before any adjustments are made to eliminate air leakage at the plug. The Contractor may precoat the plug with a soap solution to check for leakage.

3) Infiltration/Exfiltration Tests

Sanitary sewers 27-inch diameter and larger and sewers which cannot be air tested as specified above shall be subjected to either infiltration or exfiltration tests as determined by the Engineer. Testing may be conducted from manhole to manhole, or between more than two manholes, however, the length to be tested shall not exceed 700 feet. Minimum test duration shall be 24 hours. Testing shall be conducted in accordance with ASTM C 969 as modified herein.

a) Infiltration test shall be made by measuring the amount of water infiltrating into the pipeline section at the lower end of the section being tested by means of a weir installed in the pipe or by other measurement method approved by the Engineer.

b) Exfiltration test shall be made by plugging the lower manhole, filling the pipeline section with water to a level of at least 2 feet above the crown of the pipe at the upstream end of the section being tested or 2 feet above groundwater level whichever is greater and measuring the quantity of water added to maintain the prescribed level during the test period.

c) Test Criteria

Unless otherwise noted, no leakage shall be allowed in the completed sewer.

4) Deflection Testing

In addition to other tests detailed in this Section, all PVC sanitary sewers shall be tested for deflection (reduction in vertical inside diameter). Testing shall be performed by passing a 5% undersized GO/NO-GO mandrel or sewer ball through the pipeline or measuring deflection continuously by using a deflectometer. Maximum allowable deflection shall be 5%. Mandrel testing shall be performed at the direction of the Engineer.

D. Submittals

1. Shop Drawings

Shop drawings shall be submitted as specified in the "General Provisions" for the following materials, and shall include the following information:

- a. Polyvinyl chloride (PVC) pipe and fittings: product information and dimensions; storage, handling, installation recommendations, and recommendations for field repairs.
 - b. Ductile iron pipe and fittings: product information and dimensions; lining data; storage, handling, and installation recommendations.
 - c. Pipeline plugs and adapters: product information and installation guides.
2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for the following materials stating the item supplied is in accordance with the requirements specified herein:

- a. Polyvinyl chloride (PVC) pipe and fittings
 - b. Ductile iron pipe and fittings
3. Certified Test Results

Certified test results shall be submitted as specified in the "General Provisions" for the following:

- a. Polyvinyl chloride (PVC) pipe and fittings
- b. Ductile iron pipe and fittings

02561.02 MATERIALS

A. Materials Furnished by the County

1. The County will not furnish any materials for sanitary sewers and sanitary house connections.
2. The Contractor may obtain potable water from the County's potable system for flushing the pipelines and exfiltration testing. The Contractor shall contact the Bureau of Utilities, Meter Section, for requirements.

B. Contractor's Options

1. The Contractor may furnish polyvinyl chloride (PVC) or ductile iron pipe (DIP), with DPW approval.
2. Contractor may furnish polyvinyl chloride (PVC) fittings for sanitary house connections within the public right-of-way, unless otherwise noted. Sanitary house connections are to be constructed of PVC regardless of sewer main pipe material.

C. Detailed Material Requirements

1. Portland cement concrete for pipe cradle and encasement shall be Mix No. 1 as specified in Section 03310.02.
2. Polyvinyl Chloride (PVC) Pipe and Fittings
 - a. For pipe depths less than 20 feet from top of pipe: Polyvinyl chloride (PVC) pipe and fittings 4-inch through 15-inch diameter shall meet the material requirements of ASTM D3034, wall thickness classification SDR-35 or SDR 26. Pipe 18-inch through 27-inch diameter shall meet the material requirements of ASTM F679, Stiffness Class PS46, minimum.
 - b. For pipe depths with greater than or equal to 20 feet of cover, the use of DIP for deep gravity sewers is at the discretion of DPW. Typically, DIP is used for deep gravity sewers, however, PVC SDR-26 or PS46 may also be acceptable with prior approval from DPW.
 - c. Joints shall be elastomeric gasketed.
3. Ductile Iron Pipe (DIP) and Fittings
 - a. Ductile iron pipe (DIP) shall be manufactured in accordance with AWWA C150 and C151 with push-on gasketed joints in accordance with AWWA C111. Fittings shall be ductile iron manufactured in accordance with AWWA C110. Pipe class to be as shown on the Plans, Class 52 minimum. DIP shall only be allowed with DPW approval.
 - b. DIP and fittings shall be furnished with an arc-spray applied zinc per ISO 8179 with a mass of 200g/m² of pipe surface. Zinc coating shall be finished with an asphaltic topcoat.
 - 1) Damaged coating or ends of cut pipe shall be solvent cleaned and coated with a zinc-rich paint and finished with an asphaltic paint in accordance with the manufacturer's recommendations.
 - c. DIP Lining for Sewer Applications
DIP shall be factory lined with material suited for sewer applications. Surfaces shall be prepared and coatings applied in accordance with coating manufacturer's recommendations. Lining shall only be applied by a manufacturer-certified applicator. Standard cement mortar lining is not acceptable.
 - 1) Protecto 401 Ceramic Epoxy
 - a) Amine-cured Novolac epoxy containing minimum 20% ceramic quartz, 40 mil DFT, minimum
 - b) Pipe shall be marked with date of lining application. Pipes lined more than one year prior to delivery shall not be accepted.

2) Or approved equal.

4. Pipeline Plugs

Pipeline plugs shall be rubber gasketed or ribbed, watertight, airtight to the extent required by air testing requirements of this Section, cannot be dislodged by hydrostatic pressure (internal or external), and of an approved design.

5. Controlled Settlement Joint for cleanout

Construct per County standard details. Manufactured by Westlake Pipe/Plastic Trends, Inc. Model T6304 or equal, SDR 26 meeting ASTM D3034 and ASTM F1336.

Tracer Wire and Metallic Detection Tape - Per Section 02570.

02561.03 EXECUTION

A. Preparation

1. Trench excavation, backfill, and compaction, and pipe bedding and haunching shall be as specified in Section 02250 and Standard Detail S/1 or S/2 as applicable.
2. The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joint shall be made underwater.
3. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe has been installed.
4. Any trench subgrade deemed to be soft, excessively wet, unstable or unsuitable shall be removed at least 6" below subgrade or as directed by the inspector, and replaced with AASHTO M-43 No. 57 stone to original subgrade.
5. Each pipe shall be bedded on a solid foundation acceptable to the Engineer. Bell holes shall be dug sufficiently large to ensure that joints are properly made and the pipe is firmly bedded for the full length of the barrel.
6. Pipe shall be bedded with AASHTO M-43 size No.57 stone to the spring line of pipe, minimum, in accordance with Standard Details.
7. Marker tape shall be installed over all pipes being installed. Marker tape and tracer wire shall be installed with all house connections.

B. Pipe Installation

1. All pipes shall be installed in accordance with the recommendations of the pipe manufacturer and as specified herein. These recommendations shall include maximum trench width, if more restrictive than that shown in the Standard Details; bedding requirements; backfill material and compaction, where applicable. In addition, the following shall apply unless otherwise noted:
 - a. Polyvinyl chloride (PVC) pipe shall be installed in accordance with the Standard Details and ASTM 2361.
 - b. Ductile iron pipe (DIP) shall be installed in accordance with the Standard Details and the recommendations of the Ductile Iron Pipe Research Association.
2. Proper and suitable tools and appliances for safe and convenient handling and joining of pipes shall be used.
3. Pipe shall be carefully handled and lowered into the trench. Pipe shall be installed with special care to ensure that each length abuts against the next to produce no shoulder or unevenness of any kind along the inside bottom half of the pipeline. No wedging or blocking will be permitted in installing any pipe unless directed by written order or permission in writing is obtained from the Engineer.
4. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to assure watertightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 2 feet over the top of the pipe.
5. The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall be kept in the end of the pipeline at all times when installation is not in progress.
6. Whenever a pipe requires cutting, to fit into the line or bring it to the required location, the work shall be done in a manner that leaves a smooth, square end. Cut PVC pipe ends shall have burrs removed and the end beveled to match factory bevel. Field spigots shall be stop-marked with a felt tip marker or wax crayon for the proper length of assembly insertion.
7. Jointing Pipe
 - a. Before any joints are made in the trench, the Contractor shall demonstrate to the Engineer by making a sample joint that methods he will employ conform with the Specifications, will secure a watertight joint, and that the

workmen whom he intends to use for this work are familiar with the requirements for making proper joints.

- b. Other methods of jointing pipe will be given consideration by the Engineer, provided the Contractor furnishes evidence that the proposed method is equal to or better than the specified methods, and further, provided that the proposed method has been successfully used and that the joint has previously been manufactured by the company from whom the Contractor proposes to purchase pipe.
8. Point Repairs:
 - a. Replacement of existing sewer from 5 linear feet to 10 linear feet to correct identified problems with sewer main.
 9. Metallic Detection Tape
 - a. Metallic detection tape shall be provided for all buried sewer pipe. The tape shall be located a minimum of 8 inches below the surface to a maximum depth of 18 inches. In paved areas metallic detection tape shall be buried beneath stone pavement base in compacted soil.
 10. The Contractor shall submit electronic copies of all sewer pipeline inspection video files to the Engineer for approval upon completion of the construction. Files shall be submitted on flash drive or portable hard drive.

C. Sanitary Sewer Abandonment

Sanitary sewers will be abandoned according to Anne Arundel County Standard Details for Sewer Construction.

D. Sanitary House Connections

1. Sanitary house connection pipes shall be SDR-26, fittings may be SDR 35. Sanitary house connection branch fittings shall be located where designated by the Engineer. Short pieces of sewer pipe shall be field cut to meet this condition. The Contractor shall have available at the construction site factory approved equipment to machine and adapt the field-cut end to standard couplings and jointing materials.
2. Concrete or stone for the support of wye-branches and bends shall be placed as shown in the Standard Details, or as directed.
3. All sewer connections installed using a saddle must have a bentonite collar installed around the entirety of the connection.
4. All sewer connections shall have tracer wire and marker tape installed from the sewer mainline to the cleanout. Tracer wire shall be continuous and shall be taped to the pipe at 10-foot intervals. Terminate tracer wire at cleanout.

5. All sewer house connections shall be installed at a 2% grade unless otherwise directed.
6. Sewer house connections shall be constructed to terminate at a right angle to the property line unless otherwise noted on the Plans. Ends at lots shall terminate in a standard cleanout as shown on the Standard Detail and shall be plugged, braced, and marked at ground surface by a board extending from the house connection pipe to 3 feet, more or less, above finished grade in accordance with the Standard Detail. Cleanouts at undeveloped lots shall be protected with orange safety fencing (1.5 feet in all directions, with cleanout in center of square) and provided with a watertight plug. The location shall be marked at the ground surface by a 2" x 6" board extending 3 feet, more or less, above finished grade in accordance with the Standard Detail. Plugs shall be watertight and braced so as not to be dislodged.
7. Abandonment of Existing Sanitary Service Connections
 - a. Sewer connections not used must be abandoned at wye possible to avoid future damage. Dig down at lateral connection, cut lateral, cap end at main and encase cap with 6-inches of concrete. Form a box around the concrete and embed in bentonite. Refer to Standard Details for abandonment details.
 - b. Cut cleanout 2-feet below grade and place a concrete plug.
8. Renewal of SHC by open cut trenching or rehabilitation and lining of lateral
 - a. Install following Standard Details and Contract Documents.
 - b. Service connections to DIP, or PVC AWWA C900:
 - 1) ASTM 3034, PVC SDR 26.
 - 2) Install transition adapter from mechanical joint tee to gasket pipe.
 - c. Tapping Existing Main:
 - 1) Tap existing sewer with motor driven tapping machine utilizing diamond core bit.
 - d. Sewer Service Connection Renewal.
 - 1) Before connection to mainline, take necessary steps to assure minimum 2 percent grade. Remand to Engineer for resolution when 2 percent grade cannot be obtained.
 - 2) Utilize existing tee at main line unless otherwise directed by Engineer.
 - 3) When not utilizing existing tee remove existing pipe and replace with PVC pipe and tee, wye, or tap with approved saddle.
 - 4) Reconnect and restore service by end of work day.

- 5) Abandon existing tap, tee, wye, or thimble not utilized for renewal as described herein.
 - 6) Where sewer service connection is same size as existing sewer, cut in PVC tee or wye branch with adapters.
 - 7) Where existing tap with double connection requires replacement, install 2 single connections.
 - 8) Where indicated or directed by Engineer, tap directly into manholes for sewer service connections specified herein.
 - 9) Maintain existing sewage flows during connection to existing sewer.
 - a) Take precautions and employ methods required to prevent sewage backup.
 - b) Bypass pumping may be used as an option for flow diversion.
 - c) Return diverted sewage to the sanitary system and do not discharge on surfaces or into streams or storm drains.
 - d) Use enclosed bypass flumes equivalent in size to existing sewer being diverted, when required.
 - e) Immediately clean and disinfect raw sewage spills and overflows caused by operation.
- e. Post Lining Installation of New Service Lateral.
- 1) Preparation.
 - a) Excavate to host pipe elevation.
 - b) Remove host pipe material from area of new connection, so tap saddle will fit onto outside of liner without damaging it.
 - c) Clean off liner's exterior and prepare surface for seating saddle.
 - d) May require saddle to sit on bed of resin to smooth out surface.
 - e) Grinding to smooth the surface is not permitted.
 - 2) Installation
 - a) Cut hole into liner using liner manufacturer's approved cutter, leaving no burrs or damage to mainline liner.
 - b) Center saddle over hole in the liner's exterior.
 - c) Install strapping bands to hold saddle onto liner without crushing or distorting the liner shape.
 - d) Connect lateral to saddle tap as noted herein and following Standard Details.
 - e) Install lateral-mainline interface seal at no additional cost to the Commission.
 - f) Internal CCTV inspect new service lateral for defects or distortion to main liner.
 - g) Perform lateral-mainline interface testing as described herein.

- h) Repair any defect to lateral, main, or interface seal at no cost to the Commission.
- i) For lined mains, install lateral—mainline interface seal following Section (to be updated/added to sewer rehab spec).

02561.04 METHOD OF MEASUREMENT

A. Sanitary Sewers

Measurement for furnishing and installing sanitary sewers will be made horizontally along the centerline of the pipe for each size and type of pipe without deduction for wye or drop connections. The inside lengths of manholes and junction chambers will be deducted.

B. Sanitary House Connections

Measurement for furnishing and installing sanitary house connections will be made horizontally along the centerline of pipe for each size and type of pipe from the centerline of the sewer to the end of the house connection without deduction for wyes, bends, cleanouts, tracer wire, detection tape, plugs, or other fittings.

02561.05 BASIS OF PAYMENT

A. General

1. Payment will be made at the unit and/or lump sum prices bid. The prices bid shall include furnishing all labor, tools, equipment, and materials necessary to complete the work as shown, and specified, in strict accordance with the Contract Documents, and accepted by the Engineer.
2. The price(s) bid for furnishing and installing sanitary sewers and sanitary house connections shall include trench excavation, backfill, compaction, and incidental items as specified in Section 02250.
3. Payment will be made for contingent items when ordered by the Engineer. Payment will be as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. Sanitary Sewers

Payment for furnishing and installing sanitary sewers, complete and operational, will be made per linear foot of the size and type of pipe installed. The price(s) bid shall include furnishing and installing of all pipe, fittings, marker tape, plugs, stoppers, and jointing materials; connection to existing pipelines, structures, or manholes; testing; and all other incidental items of work necessary to satisfactorily complete and make the sanitary sewers operational.

C. Sanitary House Connections

Payment for furnishing and installing sanitary house connections, complete and operational, will be made per linear foot of the size and type of pipe installed. The price(s) bid shall include furnishing and installing all pipe, fittings, cleanouts, tracer wire, marker tape, plugs, and safety fencing; connection to sewer branch fittings; testing; and all other incidental items of work necessary to satisfactorily complete and make the sanitary house connection operational.

END OF SECTION