

SECTION 33 31 00.00
FACILITY SANITARY SEWERS (Sanitary Sewer Pipe)

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes, but is not limited to:
1. Sanitary sewer gravity pipelines
 2. Sanitary sewer pressure pipelines and valves
 3. Laterals/service connections
- B. Related Work Specified Elsewhere:
1. Earth Moving (Trenching, Backfilling and Compacting): Section 31 20 00.02
 2. Erosion and Sedimentation Controls: Section 31 25 00
 3. Concrete (Trench Paving and Restoration): Section 32 13 13.02
 4. Manholes and Structures: Section 33 05 13
 5. Facility Sanitary Sewer (Sewer Pipeline Testing): Section 33 31 00.01
 6. Concrete (Cement Concrete for Utility Construction): Section 32 13 13.03
- C. Definitions:
1. Clearing is Dimension Ratio (DR) - Constant ratio between outside pipe diameter and wall thickness.
 2. Standard Dimension Ratio (SDR) - Constant ratio based on Renard numbers and rated for pressure.
- D. Applicable Standard Details: NONE

1.2 QUALITY ASSURANCE

- A. Reference Standards:
1. American National Standards Institute (ANSI):
 - A21.4 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings
 - A21.10 Gray-Iron and Ductile-Iron Fittings
 - A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
 - A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids
 2. American Society for Testing and Materials (ASTM):
 - A53 Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
 - A74 Specification for Cast Iron Soil Pipe and Fittings
 - C14 Specification for Concrete Sewer, Storm Drain and Culvert Pipe
 - C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - C425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings
 - C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
 - C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
 - D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - D1869 Specification for Rubber Rings for Asbestos-Cement Pipe
 - D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR series)
 - D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
 - D2564 Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

- D2855 Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F679 Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- 3. American Water Works Association (AWWA):
 - C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
 - C504 Rubber Seated Butterfly Valves
 - C507 Ball Valves, 6" through 48"
 - C900 Poly (Vinyl Chloride) PVC Chloride (PVC) Pressure Pipe, 4" through 12" for Water Distribution
- B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.3 SUBMITTALS

- A. Certificates:
 - 1. Submit 2 copies of each manufacturer's certification attesting that the pipe, pipe fittings, valves, joints, joint gaskets and lubricants and detectable warning tape meet or exceed specification requirements.
- B. Manufacturer's Literature:
 - 1. Submit 2 copies of the manufacturer's recommendations on installation, handling and storage of materials.
- C. Details of bypass pumping operation and pump curves. The CONTRACTOR shall analyze the existing flow rate and provide pumps with enough capacity to handle daily fluctuations.

1.4 JOB CONDITIONS: Section not utilized.**1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Delivery and Handling:
 - 1. Do not place materials on private property without written permission of the property OWNER.
 - 2. During loading, transporting and unloading, exercise care to prevent damage to materials.
 - 3. Do not drop pipe or fittings. Avoid shock or damage at all times.
 - 4. Take measures to prevent damage to the exterior surface or internal lining of the pipe.
- B. Storage:
 - 1. Do not stack pipe higher than recommended by the pipe manufacturer.
 - 2. Store PVC pipe and gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.
Place on flat surface with proper support.

PART 2 PRODUCTS**2.1 POLY (VINYL CHLORIDE) (PVC) SEWER PIPE**

- A. Sewer Pipe, Fittings and Couplings:
 - 1. Pipe 15" diameter and smaller: ASTM D3034, SDR-26.
 - 2. Flexible Elastomeric Seals: ASTM D3212
Seal Material: ASTM F477

3. Where specifically approved by OWNER, pipe 15" and smaller: ASTM F789 may be substituted.

2.2 FLEXIBLE COUPLINGS: Leak proof, PVC compound with stainless steel shield and clamps suitable for the pipe materials as manufactured by Fernco, Inc., Davison, MI, or approved equal, as approved by ENGINEER.

2.3 CLEANOUTS

- A. Cleanout riser pipe and fitting shall be PVC SDR 35.
- B. Cleanout caps:
 - 1. All cleanout PLUGS shall be brass, counter sunk, designed for 4" riser pipe and meeting Southern Code service weight standards. Use General Engineering Company (GENECO), Frederick, MD or approved equal.

2.4 DETECTABLE WARNING TAPE

- A. Detectable warning tape shall consist of a minimum thickness of 0.5 mils solid aluminum foil core running the full length and width encased in a protective, high visibility, green color coded inert plastic jacket that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil. Foil to be visible on unprinted side. Minimum overall thickness shall be 5.5 mils. Minimum tensile strength shall be 5000 psi. Minimum weight of 2 ½ pounds per 1" x 100' unit. Tape width shall be a minimum of 6 inches and have the words "Caution Buried Sewer Line Below" imprinted on the color side. Tape shall meet Office of Pipeline Safety regulations, U.S. Department of Transportation, USAS Code B31.8.

PART 3 EXECUTION

3.1 PREPARATION

- A. Perform trench excavation as specified in Section 31 20 00.02.
- B. Unless otherwise required by the ENGINEER, provide for a minimum cover of 4 feet above the top of pipe laid in trenches in non-traffic areas, and 5 feet in traffic areas.
- C. Provide bedding as specified in Section 31 20 00.02. Place so that the pipe can be laid to the required tolerances in accordance with ASTM D2321.

3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations, minimum seventy-two hours.
- B. Maintain no less than three batter boards, at 25' maximum interval, or their equivalent between adjoining manholes during pipe laying operations, or use laser alignment instruments.
- C. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe or fittings.
- D. Lay pipe proceeding up-grade with the bell or groove pointing upstream, unless approved by the ENGINEER.
- E. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- G. Clean and inspect each section of pipe before joining to mark on pipe. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Use lubricant recommended by the pipe and fitting manufacturer for making joints. If unusual joining

resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.

H. Assemble joints in accordance with recommendations of the manufacturer.

1. Push-on joints:

- a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
- b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- c. Insert the spigot ends of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket using reference mark at the spigot end of the pipe as a guide. Mark Pipe that is not furnished with a reference mark before assembly to assure that the spigot is fully inserted.
- d. Pipe gaps in excess of $\frac{1}{4}$ " in length will not be accepted.

I. Disassemble and remake improperly assembled joints using a new gasket.

J. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the Contract Drawings, or deflection of pipe joints, will be cause for rejection.

K. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place.

L. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.

M. Keep trenches and excavations free of water during construction.

N. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.

O. Joint Deflection:

1. When it is approved by the ENGINEER to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the following limits:

- a. PVC Pipe: 4 degree maximum deflection per joint.

P. Make connections in accordance with the Contract Drawings, and perform any adjustments and ensure a watertight installation. Connections to the existing sewers shall be made under the direct observation of the ENGINEER or his authorized representative. Do not permit any water, earth, debris or other materials to enter the existing sewer system.

Q. As soon as connections are completed, install an adequately sized screw-in plug in the existing manhole, tie-off with rope and brace to prevent a "blowout". The stopper is to prevent flow from the new line from entering the existing system and it shall not be removed until authorization to do so is given by the ENGINEER. Routinely remove any accumulated ground and surface water from the line upstream and dispose of properly.

3.3 WYE BRANCHES AND TEES

A. Install wye branches or pipe tee wye at locations designated concurrent with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.

B. For connections into an existing pipeline, where permitted by the ENGINEER, install a wye or tee wye with Smith Blair or JCM Industries couplings if connecting to vitrified clay or ductile iron pipe. Use PVC solid wall sleeve with gasket if connecting to PVC pipe.

- C. Where specifically approved by the OWNER, for taps into an existing pipeline, use a saddle wye or tee with stainless steel clamps or core drill pipe and install watertight resilient boot. Mount saddles with gasket and secure with metal bands. Lay out holes with a template and cut holes with a mechanical hole cutter.
- D. Where lateral is not to be installed, install an approved water-tight plug, braced to withstand pipeline test pressure thrust.

3.4 LATERALS

- A. Construct laterals from the wye branch to a terminal point in accordance with Contract Drawings. Vertical risers are not permitted unless approved by the ENGINEER.
- B. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install a temporary marker stake (minimum 2" x 2") extending from the end of the lateral to 1 foot above finished grade.
- C. Laterals shall be installed at a slope of 1/8"/ft. (6" diameter) from the main to the cleanout or plug. The minimum depth under streets shall be 5'. Any deviations must be approved by the ENGINEER prior to installation.
- D. Lateral lengths to extend 5' past right of way line, unless approved by ENGINEER.
- E. Drop cleanouts are not permitted.
- F. Cleanouts in driveways are not permitted.

3.5 CAST-IN-PLACE CONCRETE CONSTRUCTION

- A. Conform to the applicable requirements of Section 32 13 13.03.

3.6 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the ENGINEER.
- B. Backfill trenches as specified in Section 31 20 00.02.
- C. Install the detectable warning tape along the entire length of PVC force main on top of the pipe bedding but no deeper than 48 inches below finished grade. The pipe bedding (12" cover) shall maintain sufficient separation between the tape and the line.

3.7 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 31 20 00.02.
- B. Restore other areas in accordance with Section 32 13 13.02.

3.8 BYPASS PUMPING

- A. Provide one (1) reliable pump capable of handling the existing wastewater flows and daily fluctuations and enough discharge piping to bypass pump from upstream manhole to downstream manhole. Provide one (1) backup pump on-site or provide evidence of ability to obtain backup pump within 15 minutes in case of pump failure. Bypass pumping system shall not allow backup in collection system. Bypass piping shall be watertight and not allow any discharge to the surface. Any leaks in the system will be just cause to discontinue bypass operation and pipe installation and tie piping back into gravity flow.
- B. At the end of each workday, the bypass pumping shall stop and the new PVC piping shall be connected to the existing piping with a watertight flexible coupling. All trenches shall be properly backfilled and compacted except in the immediate area of the tie-in. Open trenches in traffic areas shall be protected with jersey barriers and steel plating and all trenches shall be protected with construction fencing.

- C. The CONTRACTOR shall supply necessary equipment for bypassing operations; and inform the ENGINEER of such. Bypassing of service connections to be reconnected is not necessary, however; the CONTRACTOR will be responsible for notifying customers that their services will be interrupted. Service shall be restored at the end of each working day.
- D. CONTRACTOR is responsible for design, installation and operation of all bypass pumping. CONTRACTOR's plan for proposed bypass pumping system shall include, but not be limited to the staging area for pumps, pump sizes and number to be used; power source and standby power source and schedule for installation and maintaining of bypass pumping lines. CONTRACTOR shall size pumps for wastewater flow bypass according to normal flows in the system. CONTRACTOR shall reconnect the sanitary sewer pipe at the end of each workday to prevent system overload caused by potential storm events.
- E. Plugging the upstairs pipe to prevent flow into the construction area is not acceptable in lieu of bypass pumping.

END OF SECTION