

SECTION 33 3000

SANITARY SEWERAGE UTILITIES

PART 1 GENERAL

1.1. SUMMARY

- A. Provide all equipment and materials, and do all work necessary to construct the complete sanitary sewerage system, including connections to existing structures and testing, as indicated on the Drawings.
- B. The Contractor shall pay for all costs and fees related to connecting sanitary sewerage system to existing services and shall file all Applications, Details, and Drawings required by the local authority having jurisdiction.
- C. Related Documents  
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1.2. REFERENCES

- A. American Society for Testing and Materials (ASTM) Publications
  - 1. D. 3034, Specification for Type PSM Poly (vinyl chloride) (PVC) Sewer Pipe and Fittings.
  - 2. D 3212, Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible ElastoMetric-Seals.
  - 3. F477, Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe.
  - 4. F679, Specification for Poly (vinyl chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.

1.3. SUBMITTALS

- A. Shop Drawings
  - 1. Submit all Shop Drawings in accordance with Specification Section 01 3300 – Shop Drawings, Product Data and Samples.
  - 2. Provide shop drawings, details, manufacturers' data and catalog cuts for all elements of the sewer system including, but not limited to, pipes, fittings, manholes, castings, joint gaskets, and connections to existing pipes and structures.
  - 3. Provide Certificates of Compliance to the Specifications and referenced Standards for all piping and precast structures. Include certified copies of all required test reports.

4. Manufacturer's Recommendations: The Contractor shall, as a part of the shop drawings, submit, as indicated in Specification Section 013300, the manufacturer's recommendations for each material or procedure to be utilized which is required to be in accordance with such recommendations. The Contractor shall have a copy of the manufacturers' instructions available at the construction site at all times and shall follow these instructions unless otherwise directed by the Engineer.
5. All pipe furnished under the contract shall be manufactured only in accordance with the Specifications and the reviewed Drawings.

B. Samples

1. Submit samples of products if requested by the Engineer.

1.4. QUALITY ASSURANCE

A. Certifications

1. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the herein-mentioned ASTM specifications.
2. Pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such tests as he deems necessary.
3. All tests shall be made in accordance with the methods prescribed by the herein-mentioned ASTM specifications, and the acceptance or rejection shall be based on the test results.
4. Assist the Engineer in inspecting the pipe upon delivery.
5. Pipe not conforming to the requirements of this contract will be rejected and shall be immediately removed from the site by the Contractor.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. All pipe shall be stored at the site until installation in accordance with the manufactures recommendations.
2. Care shall be taken in loading, transporting, unloading and storing to prevent injury to the pipes or coatings. Pipe or fittings shall not be dropped. All pipe and fitting shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe shall be repaired in accordance with the pipe manufacturer's instructions.

1.6. SITE VISIT

- A. Before submitting the Bid, visit and carefully examine the site to identify existing conditions and difficulties that will affect the work of this Document. No extra payment will be allowed for additional work caused by unfamiliarity with the site conditions that are

visible or readily construed by an experienced observer.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### A. Pipe, Fittings, And Specials

1. Diameters 4-inch through 15-inch; in conformance with ASTM D3034
2. The pipe shall have pipe diameter to wall thickness ratio (SDR) of a maximum of 35, unless otherwise indicated and/or approved by the Engineer.

#### B. Straight Pipe

1. Lengths of not more than 13 ft.

#### C. Y-branches

1. Lengths of not more than 3 ft., unless otherwise permitted by the Engineer.
2. Saddle Y-branches will not be allowed.

#### D. Specials

1. Conform to the specifications for straight pipe as applicable and to the details indicated on the drawings or bound into the back of the specifications.

#### E. Joints

1. Conforming to ASTM D3212.
2. Push-on bell and spigot joints using elastomeric ring gaskets.

#### F. Gaskets

1. Conforming to ASTM F477.
2. Securely fixed into place in the bells so that they cannot be dislodged during joint assembly.
3. Composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and groundwater, and which will endure permanently under the conditions of the proposed use.

#### G. Brick

1. Brick for support of cast iron cover and frame shall be any of the following types:
  - a. Common brick meeting the physical requirements of ASTM C 62, Grade SW.

- b. Clay brick meeting the physical requirements of ASTM C 32, Grade MS.
- c. Concrete brick meeting the physical requirements of ASTM C 55, Grade N-II.
- 2. Brick for sewer manhole invert channel shall conform to ASTM C 270, Type SS.
- H. Mortar
  - 1. Mortar shall conform to ASTM C 270, Type M.
  - 2. Mortar shall contain a waterproofing admixture. Waterproofing admixture shall be one of the following:

<u>Admixture</u>	<u>Manufacturer</u>
Hydratite Plus	W.R. Grace and Company
Medusa Waterproofing	Medusa Portland Cement Company
Omicron Mortarproofing	Master Builders Company
Mortaron	The Aquabar Company
Hydrocide Power	Sonneborn Building Products, Inc.
- I. Grout
  - 1. Grout shall be non-shrink cement-based type as shown in the Details on the Drawings.
- J. Castings
  - 1. Manhole Frames and Covers shall be in cast iron, conforming to ASTM A 48, Class 30 Gray Iron.
  - 2. Castings shall be manufactured by East Jordan Iron Works or approved equal.
- K. Embedment Materials
  - 1. Embedment and fill material shall meet the requirements stated in Specification Section 31 23 00 – Excavation and Fill.
- L. Lubricant
  - 1. In accordance with manufacturers requirements.

PART 3 - EXECUTION

3.1. PREPARATION

- A. Inspection of Pipe
  - 1. Inspect each pipe unit before being installed.

2. No single piece of pipe shall be laid unless it is generally straight and undamaged.
3. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 in. per ft. of length.
4. If a piece of pipe fails to meet this required check for straightness, it shall be rejected and removed from the site.
5. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. Handling of Pipe

1. Each pipe unit shall be handled into its position in the trench, by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings

3.2. INSTALLATION

A. Placement

1. Except as otherwise indicated on the Drawings, support pipe with compacted Crushed Stone in accordance with Section 31 23 00, Excavation and Fill. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
2. Provide suitable depressions in screened gravel to accept pipe bells, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material.
3. Clear pipe and fittings of debris, dirt, etc., before being installed; keep clean until accepted in the completed work.
4. Install pipe and fittings to the lines and grades indicated on the, Drawings or as required by the Engineer. Care shall be taken to ensure true alignments and gradients.

B. Joining Pipe

1. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade.
2. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
3. All joint surfaces shall be cleaned. Immediately before joining the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation.
4. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket.

5. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints.
6. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
7. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.
8. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units.
9. Gasket installation and joint assembly shall follow the directions of the manufacturers of the joint material and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.
10. Open ends of pipe and branches shall be closed with polyvinylchloride stoppers secured in place in an acceptable manner.

C. Rejecting Pipe

1. Pipe of a particular manufacturer maybe rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

D. Bedding Pipe

1. After each pipe has been properly placed, enough gravel shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment.
2. Bell holes (depressions), provided for jointing, shall lie filled with screened gravel and compacted, and then screened gravel shall be placed and compacted to complete the pipe bedding, as indicated on the drawings.

E. Protecting Pipe

1. Take all necessary precautions to prevent flotation of the pipe in the trench.
2. Close the open ends of the pipe with temporary watertight plugs, at all times pipe installation is not in progress.
3. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.
4. Pipelines shall not be used as conductors for trench drainage during construction.

F. Backfilling Pipelines

1. In accordance with Section 31 23 00 Excavation and Fill.

3.3. ALLOWABLE PIPE DEFLECTION

- A. Pipe provided under this specification shall be installed not exceeding a maximum deflection of 3.5 percent. Deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
- B. Upon completion of a section of sewer, including placement and compaction of backfill, the Contractor shall measure the amount of deflection by pulling a specially designed gauge assembly through the completed section. The gauge assembly shall be in accordance with the recommendations of the pipe manufacturer, and be acceptable to the Engineer.
- C. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Engineer may require without additional compensation.

3.4. CLEANING

- A. Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, clean out the pipeline and manholes, being careful to prevent soil, water, and debris from entering any existing sewer.

3.5. FIELD QUALITY CONTROL

- A. Pipeline Flushing
- B. Care shall be taken to prevent earth, water, and other materials from entering the pipe. As soon as possible after the pipe and manholes are completed on any street, flush out the new pipeline, using a rubber ball ahead of the water, flushing water or debris will not be permitted to enter, any existing sewer.
- C. Inspection By Light
  1. The alignment of the pipe will be checked by shining a flashlight through the pipe from one manhole to the adjacent manhole. The inspector must be able to see the full circumference of the lighted pipe for its entire length when looking through the pipe from the adjacent manhole towards, the manhole from which the light is being emitted.
- D. Leakage Tests
  1. The pipeline shall be made as nearly watertight as practicable, and leakage tests and measurements shall be made after the pipeline has been backfilled.
  2. Where the groundwater level is more than 1 ft. above the top of the pipe at its upper end, the Contractor shall conduct either infiltration tests or low pressure air tests.
  3. Where the groundwater level is less than 1 ft. above the top of the pipe at its

upper end, conduct either exfiltration tests or low-pressure air tests.

4. At the time of the test, determine the groundwater elevation from observation wells, excavations or other means, all subject to review by the Engineer.
5. For making the infiltration and exfiltration tests, furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the tests on sections of acceptable length.
6. The sewers shall be tested before any connections are made to buildings.
7. Provide all instruments, weirs, bulkheads, water and equipment required to test the sewer.
8. Should the sections under test fail to meet the requirements, the Contractor shall do all Work of locating and repairing leaks and retesting as the Engineer may require without additional compensation.
9. If, in the judgment of the Engineer, it is impracticable to follow the procedures specified in this Specification for any reason, acceptable modifications in the procedures shall be made as required, but in any event, the Contractor shall be responsible for the ultimate tightness of the line.

E. Low Pressure Air Test

1. For making the low-pressure air tests, use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low-pressure air. The equipment shall be provided with an air regulator valve, or air safety so set that the internal air pressure in the pipeline cannot exceed 8 psig.
2. The leakage test using low pressure air shall be made on each manhole-to - manhole section of pipeline after placement of the backfill.
3. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
4. All air used shall pass through a single control panel.
5. Low-pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the maximum pressure exerted by the groundwater that may be above the invert of the pipe at the time of the test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8 psig. When the maximum pressure exerted by the groundwater is greater than 4 psig, conduct only an infiltration test.
6. At least two minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period, the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the Section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe) shall not be less than that shown in the following table:



Pipe diameter in inches	Minutes	Pipe diameter in inches	Minutes
6	3.0	18	9.0
8	4.0	21	10.0
10	5.0	24	11.5
12	5.5	27	13.0
15	7.5		

F. Infiltration Test

1. For making the infiltration tests, underdrains, if used, shall be plugged and other groundwater drainage shall be stopped to permit the groundwater to return to its normal level insofar as practicable.
2. Upon completion of a section of the sewer, dewater it and conduct a satisfactory test to measure the infiltration for at least 24 hours. The amount of infiltration, including manholes, tees, and connections, shall not exceed 200 gal. per inch diameter per mile of sewer per 24 hours.

G. Exfiltration Test

1. For making the exfiltration tests, the sewers shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and manholes with clean water to a height of ft. above the top of the sewer at its upper end. Where conditions between manholes, may result in test pressures which would cause leakage at the stoppers in branches, provisions shall be made by suitable ties, braces, and wedges to secure the stoppers against leakage resulting from the test pressure.
2. The rate of leakage from the sewers shall be determined by measuring the amount of water required to maintain the level 2 ft. above the top of the pipe.
3. Leakage from the sewers under test shall not exceed the requirements for leakage into sewers as hereinbefore specified.

3.6. SEWER MANHOLE RECONSTRUCTION

- A. The existing sewer manhole shall be cut into at the grade shown on the Drawings.
- B. Overbreakage shall be restricted to not more than 2 inches beyond the outside circumference of the connecting pipe.
- C. Brick shall be laid as headers on edge around the pipe and mortared in place.

END OF SECTION 33 3000