

**ITEM #1400101A 6" PVC PIPE (SANITARY SEWER)**

**ITEM #1400102A 8" PVC PIPE (SANITARY SEWER)**

**ITEM #1400103A 10" PVC PIPE (SANITARY SEWER)**

**ITEM #1400123A CONCRETE ENCASED 10" PVC PIPE (SANITARY SEWER)**

**Description**

- A. The work required this specification consists of furnishing all pipe, labor, equipment, appliances and materials in performing all operations in connection with the construction of sanitary sewer pipe and concrete encased sanitary sewer pipe at the locations and to the lines and grades indicated and/or as directed, including all pipe, pipe fittings and accessories, connections to other piping and structures, testing of pipelines and material tests, jointing and jointing materials, installation, bedding materials, services of manufacturer's representatives and all other related and appurtenant work, complete in place and accepted, in accordance with the drawings and specifications and as directed by the Owner.
- B. Quality Assurance - The Contractor shall furnish to the Owner notarized test reports from the pipe and gasket manufacturers including methods of tests by an approved independent testing laboratory to show compliance of all materials furnished under this section of the specifications with all specification requirements. A copy of each test report is to be attached to the shipping list of each shipment itemizing by size; class and wall type, serial number and date of manufacture. All required testing of pipe materials furnished under this section of the specifications shall be provided by the contractor at no additional expense to the Owner.
- C. The Contractor shall furnish, at no additional expense to the Owner, the services of pipe manufacturer's representatives for such lengths of time as may be necessary to properly instruct the Contractor's personnel in the proper handling, installation and jointing of the piping in accordance with the printed recommendations of the manufacturer of the pipe.
- D. Guarantee - The Contractor shall furnish to the Owner a written guarantee signed by the manufacturer of the pipe, pipe fittings and gaskets which he proposes to furnish, which shall warrant and guarantee that the pipe, fittings and gaskets shall not fail or be injured as a result of conveying sewage, industrial wastes or groundwater. The form of guarantee respects be satisfactory to the Owner.

**Materials**

- A. Polyvinyl Chloride Pipe (PVC)

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1. The material required by this section of the specifications shall be new and unused type PSM, SDR-35 Polyvinyl Chloride (PVC) sewer pipe with integral bell-and-spigot joints. Pipe and fittings shall meet and/or exceed all of the requirements of ASTM Specification D 3034, latest revision.
2. Standard pipe lengths shall be 20 feet, with a tolerance of one inch. PVC sewer pipe shall meet the following dimensional tolerances given in inches.

<u>Nominal Size (inches)</u>	<u>Outside Diameter</u>		<u>Min. Wall</u>	<u>Wgt/lbs</u>
	<u>Average</u>	<u>Tolerance</u>	<u>Thickness</u>	<u>20' Length</u>
6	6.275	+/- 0.011	0.180	43.6
8	8.400	+/- 0.012	0.240	82.5
10				
12				

3. Each length of pipe and each fitting shall be provided with integral bell-and-spigot ends and accurate joint surfaces. The joint shall be sealed by a round neoprene gasket so that the joint will remain watertight under all conditions of service, including movement due to expansion, contraction and normal settlement. PVC pipe and fitting joints shall meet or exceed the requirements of ASTM Specification D3212, latest revision.
4. Elastomeric gaskets for sealing joints shall meet or exceed ASTM Specification F 477, latest revision.
5. A suitable watertight system shall be used for connection of sewer pipe to manhole walls. The system shall achieve adequate bond with both the manhole and the pipe to prevent failure or leakage due to settlement or pullout of the pipe at the manhole. The Contractor shall furnish details of his proposed system of connection of pipe to manholes prior to shipment of pipe or manholes to the project for review and approval by the Owner.

B. Concrete for concrete encasement of the pipe shall be Class "A" concrete and shall conform to Section M.03 of Form 816.

## **Construction Methods**

### **A. Inspection**

1. All pipe, fittings, and accessories shall be carefully inspected by the Contractor for defects before installation and all defective, unsound or damaged materials shall be rejected. The Owner will make such additional inspection he deems necessary, and the Contractor shall furnish all necessary assistance for such inspection.
2. No pipe joints shall be covered in any way until the joints have been inspected.

### **B. Preparation**

1. Proper implements, tools and facilities shall be provided by the Contractor for the proper and satisfactory execution of the work.
2. The interior of pipe and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.
3. The trench bottom and bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower quarter of pipe along the entire length of each pipe. Bell holes shall be excavated so that after placement only the barrel of the pipe receives bearing pressure from the trench bottom.
4. Pipe, pipe fittings and accessories shall be handled, stored, installed, jointed and protected by the Contractor in strict accordance with the printed recommendations of the manufacturer of the pipe materials.

### **C. Installation**

1. PVC sewer pipe shall be installed in conformance with ASTM Specification D 2321, latest revision.
2. The Contractor shall furnish to the Owner for his use, copies of the printed recommendations of the pipe manufacturer for the handling, storing, protection and installation of pipe and fittings.
3. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of flow.

4. Each pipe shall be laid true to line and grade, and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line. No spalls, shims or lumps shall be used to raise the pipe to grade. All pipe shall be maintained accurately to the required line and grade. Any pipe that has the grade or joint disturbed after laying shall be re-laid.
5. Trenches shall be kept free from water to prevent flotation of the pipes. Pipelines shall be constructed in dry trenches and shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fittings. Pipes shall not be used as conductors for trench drainage during construction.
6. All materials found to be defective during the progress of the work will be rejected by the Owner and the Contractor shall promptly remove such defective material from the job site. All defective material shall be replaced by the contractor with new sound material at no additional expense to the Owner. The Contractor shall be responsible for the safe storage of all material.
7. Joint surfaces shall be protected from damage and shall be kept free from dirt or other foreign material at all times; all joint surfaces shall be free from any defects or materials which would impair the proper joining and watertightness of joints. Pipe and fittings on which, in the opinion of the Owner, the joint materials or joint surfaces have been damaged, deformed, indented, marred or otherwise defective will be rejected and shall be removed from the site and the contractor shall replace the rejected material with the new sound material, at no additional expense to the Owner.
8. The installation of lateral sanitary sewer service pipe to the street right of way shall be completed. All stub openings of sewer pipe shall be capped and marked, using end caps with gaskets. A house connection marker shall be provided at the end of each lateral at the location indicated or directed. Unless otherwise directed, markers shall be accurately placed as the backfilling progresses. The contractor shall record all house connections installed by station, along with ties to fixed points. A duplicate set of the location records shall be furnished to the Engineer.
9. Pipe stoppers or temporary plug shall be installed, sealed and blocked in such a manner as to prevent any leakage and to withstand an internal hydrostatic pressure of not less than 15 psi; timber blocking shall be of adequate size and

arrangement to prevent the stopper from being blown off the line and timber bracing shall extend back to the undisturbed end of trench.

10. Leakage Tests for PVC Pipe

A. The sewers and appurtenant structures connected thereto shall be made as nearly watertight as practicable. Leakage tests will be required for all sanitary sewers and manholes. Leakage into or from the sewers and structures will be determined by low pressure air tests as specified herein and as directed by the Owner. The Contractor shall furnish the Owner/Engineer with certified copies of the leakage tests results for review and approval.

B. Low pressure air testing shall be undertaken in conformance with the following requirements, procedures and criteria.

1. Equipment shall be Cherne Air-Loc Equipment as manufactured by Cherne Industrial, Inc., Edina, Minnesota, Sewer Air Test System as manufactured by United Surveys, Inc., Cleveland, Ohio or equal. Equipment shall meet the following minimum requirements:

a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.

b. Pneumatic plugs shall be able to resist internal test pressures without requiring external bracing or blocking.

c. All air used shall pass through a single control panel.

d. Three individual hoses shall be used for the following connections:

(1) From control panel to pneumatic plugs for inflation.

(2) Front control panel to sealed line for introducing the low pressure air.

(3) From sealed line to control panel for continually monitoring the air pressure rise in the sealed state.

- e. The following procedure shall be used in air testing:
- (1) All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be used in the testing. Air shall be introduced into the plugs to be used in the testing. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 10 psig. The plugs shall hold against the 10 psig pressure without bracing and without movement of the plugs.
  - (2) After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 3.5 psig minimum greater than the average back pressure of any groundwater that may be over the pipe. Groundwater backpressure shall be determined by measuring the average height of the groundwater table in feet above the invert of the section of pipe being tested. The height in feet shall be divided by 2.3 to determine the pounds of pressure that shall be added to all test pressures. For example, if the average height of groundwater over the pipe invert is 11.5 feet, the pressure to be added would be 5 psig ( $11.5/2.3 = 5.0$ ). The prescribed pressure drop shall not exceed 0.5 psig from 3.5 psig to 3.0 psig in excess of the groundwater pressure above the top of the sewer. At least two minutes shall be allowed for the air pressure to stabilize. Any necessary adjustments in air pressure shall be made to the internal pressure and an additional two minute stabilization period shall be allowed. After the stabilization period, the air hose from the control panel to the air supply shall be disconnected. The

portion of line being tested shall be termed "Acceptable" if the time required in minutes is less than the time shown for the given diameters in the following table:

MINIMUM DURATION FOR AIR TEST PRESSURE DROP

<u>Pipe Diameter In Inches</u>	<u>Minutes (Minimum)</u>
6	4.0
8	5.0
10	4.0

3. Should the low pressure air tests on any section of the sewers, including manholes, show an air pressure drop, exceeding the acceptable limits specified herein, the Contractor shall locate, repair or replace defective joints and work in a manner satisfactory to the Owner, and retest, at no additional expense to the Owner, until the air pressure drop for each section of the sewers being tested does not exceed the rate specified herein.
4. If, in the judgment of the Owner, it is impracticable to follow any of the foregoing procedures exactly for any reason, modifications in the procedures shall be made as required or approved, but in any event, the Contractor shall be responsible for the ultimate tightness of all pipelines within the respective leakage requirements specified herein. Any modifications to the procedures, as directed, shall be performed by the contractor at no additional expense to the Owner.

D. Connections and Provisions for Connections

1. Outlets, laterals, stubs, connection chimneys, etc. required to connect existing sewers to the new sewer or to provide for future connections shall be furnished and set where and as indicated on the contract drawings or as ordered by the Engineer.

2. When noted on the engineering drawings, a "cored" connection shall be used when connecting a proposed sanitary sewer main to an existing manhole, the "cored" connection shall be made by coring an opening in the wall of the manhole at the existing invert and inserting a flexible connection into the cored opening. After the flexible coupling is sealed at the manhole wall, the proposed sanitary sewer pipe shall be inserted into the coupling and sealed with a pipe clamp.

E. Displacement and Alignment Tests

1. Sewers will be checked by the Owner to determine whether any displacement or deflection of the pipe has occurred after the trench has been backfilled. If the illuminated interior of the pipeline shows poor alignment, displaced or deflected pipe or any other defects, the defects designated by the Owner shall be corrected to the satisfaction of the Owner, at no additional expense to the Owner.

- F. Concrete encasement shall be placed after the pipe is installed in accordance to the details shown on the plans.

**Method of Measurement**

- A. Sewer Pipe and Concrete Encased Sewer Pipe will be measured for payment by the number of linear feet of the various sizes measured in place along the invert of the piping, complete in place and accepted. In measuring the lengths of pipe for payment, the spaces occupied by manholes will not be included, and wye or tee branches will be included.
- B. Sanitary sewer house connection laterals shall be measured for payment by the number of linear feet along the centerline of the pipe from the end of the tee/wye provided on the mainline to the pipe stops.
- C. Manhole coring and connections made to existing stubs or pipes shall not be measured for payment.

**Basis of Payment**

- A. The quantity of Sewer Pipe and Concrete Encased Sewer Pipe measured in place as provided in the preceding paragraph will be paid for at the contract unit price per linear foot for “\_\_\_”, as listed in the bid, which price and payment shall constitute

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full compensation for furnishing all materials, trench excavation and backfill, gravel fill, temporary pavement, concrete, the hauling, handling, and laying of the pipe, leakage tests, testing of all materials, furnishing services of manufacturer's representatives and all labor, equipment, tools, materials and all other costs incidental and necessary to complete the item as specified, as indicated and as directed by the Owner.

- B. The quantity of new sanitary sewer laterals measured in place will be paid for at the contract unit price per linear foot, as listed in the bid; which price and payment shall constitute full compensation for furnishing all materials, bedding, pipe laying, jointing, leakage tests and appurtenant work, complete in place and accepted and all other work incidental and necessary to complete the work as indicated and directed by the Owner. Trench excavation and pavement replacement to be paid for elsewhere in these Specifications.
- C. Manhole "coring" and connections to existing stubs or pipes shall not be paid and aer incidental to this work.

<u>Pay Item</u>	<u>Pay Unit</u>
6" PVC Pipe (Sanitary Sewer)	L.F.
8" PVC Pipe (Sanitary Sewer)	L.F.
10" PVC Pipe (Sanitary Sewer)	L.F.
Concrete Encased 10" PVC Pipe (Sanitary Sewer)	L.F.