

ADDENDUM NO. 1

April 12, 2019

SEWER INSPECTION & MATERIAL TESTING

PROJECT NO. SEWER-11002

PARISH OF ASCENSION  
OWNER

**NOTICE TO BIDDERS:**

This Addendum shall be considered part of the Contract Documents for the same above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original Contract Documents, this Addendum shall govern and take precedence.

Bidders are hereby notified that they shall make any necessary adjustments in their estimates on account of this Addendum. It will be construed that each Bidder's proposal is submitted with full knowledge of all modifications and supplemental data specified herein.

The general bidders are required to acknowledge receipt of this Addendum by noting the number in the space provided on the Bid Proposal Form. Failure to do so may cause rejection of Bid. General Contractors are requested to call attention to all subcontractors, the changes that may affect their work.

- AD1.1 Project Invitation: Proposals will be received by Ascension Parish Purchasing Department, 615 E. Worthey, Gonzales, Louisiana (mailing address P.O. Box 2392, Gonzales, Louisiana 70707-2392) on April 18, 2019 until 4:00 P.M. No Proposals are accepted after 4:00 P.M.
- AD1.2 Request for Technical Specifications: Project specifications Section 02650 attached as part of this addendum.
- AD1.3 Project Clarification: Unit Price form items 1, 2 & 3 test will be contractor performed and witnessed by the testing and inspection company.

**SECTION 02650  
GRAVITY  
SEWER**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

This Work shall consist of furnishing all labor, materials, equipment, and incidentals required to remove and dispose of existing gravity sewer pipe if required and install new gravity sanitary sewer lines and fittings.

**1.02 SUBMITTALS**

- A. The Contractor shall submit to the Owner prior to receiving the Notice to Proceed at the pre-construction meeting, a list of materials to be furnished and the names of the suppliers.
- B. The Contractor shall submit and shall comply with the pipe manufacturer's recommendations for handling, storing and installing pipe and fittings.
- C. The Contractor shall submit pipe manufacturer's certification of compliance with these Contract Documents.

**PART 2 – PRODUCTS**

**2.01 MATERIALS APPROVED:**

Materials shall be:

- A. Plastic Pipe: Solid Wall PVC
  - 1. Pipe shall be of solid-wall construction and be available in laying lengths not exceeding 20 feet.
  - 2. Pipe 15" diameter or smaller shall conform to ASTM D 3034.
  - 3. Material for PVC pipe from 4" to 15" shall conform to the requirements of ASTM D 1784 for cell classifications 12454-B or 12545-C. Maximum filler content shall be 10 percent.
  - 4. All pipe shall have an SDR of 35 and a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D 2414. Where pipe depth is greater than 20 ft., provide pipe in SDR 26 with minimum pipe stiffness of 115 psi.
  - 5. Joints shall be an integral bell and spigot-type with solid cross section elastomeric or rubber gasket ring conforming to ASTM D 3212. Gaskets shall meet the requirements of ASTM F 477. Use elastomeric factory installed gaskets to make joints flexible and watertight. Lubricant for rubber-gasketed joints shall be water soluble, non-toxic, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets. The manufacturer shall test a sample from each batch conforming to the requirements of ASTM D 2444.

6. All sewer fittings and accessories shall conform to the requirements of ASTM D 3034 or ASTM F 679 and be furnished by the pipe supplier and shall have bell and/or spigot compatible with pipe. The stiffness of the fittings shall not be less than the stiffness of the adjoining pipe.

When a foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory located in the United States. Certification from any other source is not acceptable. Furnish copies of test reports to the Engineer for review. Cost of testing shall be borne by the Contractor.

Contractor shall provide sewer pipes with the inside diameter shown on the Contract Documents. Diameters shown on the Drawings and listed in the pay items represent the required inside diameters, regardless of pipe material.

### **PART 3 – EXECUTION**

#### **3.01 CONSTRUCTION**

- A. **Open Trench** Trenching construction consists of trench excavation, bedding, laying of pipe on grade, backfill, compaction, grading and incidentals in accordance with Section 02220.
- B. **Pipe Laying** Pipe shall be laid in accordance with the manufacturer's instructions and as specified as follows:
  1. During pipe laying, trenches shall be kept dry. After each day's operations, and at other times when pipe laying is discontinued for more than one (1) hour, ends of the pipe shall be capped or plugged until pipe laying is resumed.
  2. Pipe laying shall not advance backfilling by more than 100 feet without approval by the Engineer.
  3. Pipe laying shall begin at downstream end of line. Bell or groove ends of pipe shall be placed facing upstream. Bell holes shall be excavated to assure that only the pipe barrel shall bear upon the trench bedding material. No blocking under the pipe will be permitted.
  4. Extreme care shall be used when handling and installing pipe and fittings. Under no circumstances shall pipe or fittings be dropped either into the trench or during unloading. The interior of the pipe shall be kept clean of oil, dirt, and foreign matter.
  5. When necessary to cut and machine all pipe in the field, the appropriate tools as recommended by the pipe manufacturer, shall be used. A "full insertion mark" shall be provided on each field cut pipe end. Field-cut pipe shall be beveled with a beveling tool specifically made for the pipe material.
- C. **Pipe Jointing** The jointing of the pipe shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench. Joints and gaskets shall comply with Subsection 2.01A and the relative pipe material. Workmen who are certified by the pipe manufacturer to join the pipe shall only perform pipe jointing. They should perform the work as follows:

1. Expend extreme care to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells.
2. Provide lubricant, place and drive home newly laid sections. Use of backhoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by the Engineer.
3. Install pipe to "full insertion mark" where provided.

### **3.02 NEW PIPE-EXISTING PIPE CONNECTIONS**

Connections between existing and new pipe shall be jointed with non-shear repair couplings conforming to ASTM C425 and ASTM C1173. The stainless steel shear rings and clamping bands used in conjunction with the molded rubber sleeve shall conform to ASTM A 240 Series. When using the non-shear repair coupling, the gap between the two pipes shall be no more than ¼".

When non-shear repair couplings are not available for a particular size or material, connections between existing and new pipe shall be jointed using flexible elastomer couplings with a 300 stainless steel band for each end and adjusting screws capable of sustaining an applied torque in excess of 80 inch-pounds. When dissimilar pipe materials are joined, the Contractor shall use flexible couplings that are resistant to the corrosive action of the soils and sewage, and that provide a permanent watertight joint.

### **3.03 PIPE-MANHOLE CONNECTIONS**

Pipe shall be connected to new manholes with either flexible rubber boot connectors or integrally cast flexible connectors installed in accordance with the manufacturer's instructions. Then the opening on the inside and outside of the manhole shall be grouted if necessary, to achieve a watertight seal.

For existing manhole connections, pipe shall be connected with a hydraulic cement material having a set time of no more than two (2) minutes; compressive strength of 600 psi at one (1) hour, 1,000 psi at twenty-four (24) hours; bond of 40 psi at one (1) hour, 80 psi at twenty-four (24) hours.

### **3.04 SERVICE LATERAL CONNECTIONS**

Connections between the existing service lateral and the new/rehabilitated sewer main line shall be in accordance with the Contract Documents. Existing sewer service lateral and house connections shall be adjusted as required avoiding conflicts with the new Work. New pipe and fittings shall be furnished and installed as necessary and in accordance with the Contract Documents.

- A. Service lateral connections located within the limit of a rehabilitation method or repair are required to be replaced (regardless of construction method) in both directions up to the property line. Construction shall be in accordance with the appropriate typical drawings in the Contract Documents.
- B. Service lateral vertical connection stacks shall be required in accordance with the Contract Documents.
- C. New service lateral terminations, required prior to private service connection and cleanout installation, shall be required in accordance with the Contract Documents.

### 3.05 ACCEPTANCE TESTS FOR NEW PIPE

Installed sewer lines shall pass one or more of the following tests performed by the Contractor as directed by the Engineer. Contractor shall perform the test in the presence of the Engineer or his representative.

A. **Leakage Tests** Sewer lines shall be tested for leakage as follows:

*Air Pressure Test* - for sewer pipe 24" in diameter and smaller

B. **Air Pressure Test** This practice defines the proper procedures for acceptance testing of installed gravity sewer pipe using low-pressure air, to provide assurance that the pipe, as installed, is free from significant leaks. Included are requirements for equipment accuracy, safety precautions, line preparation, test method, and minimum holding times. Applicable sections of ASTM F1417 shall also apply.

1. Only lines tested after backfilling to final grade will be considered for acceptability. Acceptance will be dependent on a passing test. However, the installer as a presumptive test to determine the condition of the line prior to backfilling may also use this test. During sewer construction, all service laterals, stubs and fittings into the sewer test section shall be properly capped or plugged to prevent air loss that could cause an erroneous air test result. It may be necessary and is always advisable for the Contractor to restrain gasketed caps, plugs, or short pipe lengths with bracing stakes, clamps, and tie-rods or wire harnesses over the pipe bells.
2. Unless otherwise specified, the Contractor shall furnish all the necessary equipment and be responsible for conducting all low-pressure air tests. In addition, the Contractor shall be responsible for any necessary repair work on sections that do not pass the test.
3. The Engineer shall witness all low-pressure air tests and verify the accuracy and acceptability of the equipment utilized. The Engineer will inform the Contractor regarding acceptable methods of repair in the event one or more sections fail to pass the low-pressure air test.
4. Ensure that all plugs are installed and braced to prevent blowouts. As an example of the hazard, a force of 250 pounds is exerted on an 8-inch plug by an internal pipe pressure of 5 psig, and a force of 2,250 pounds is exerted on a 24-inch plug by an internal pressure of 5 psig. The Contractor must realize that sudden expulsion of a poorly installed plug, or of a plug that is partially deflated before the pipe pressure is released, can be very dangerous. For this reason, it is recommended that every plug be positively braced against the manhole walls, and that no one be allowed in the manhole adjoining a line being tested while as pressure is maintained in the line.
5. It is further recommended that internal pressure of more than 9 psig not be permitted except for leak location equipment where the plugs are firmly tied together.
6. Use either mechanical or pneumatic plugs. All plugs shall be designed to resist internal testing pressures without the aid of external bracing or blocking. However, the Contractor shall internally restrain or brace the plugs to the manhole wall as an added safety precaution throughout the test.

7. All pressurizing equipment used for low-pressure air testing shall include a regulator or relief valve set no higher than 9 psig to avoid over-pressurizing and displacing temporary or permanent plugs. As an added safety precaution, the pressure in the test section should be continuously monitored to make certain that it does not, at any time, exceed 9 psig. (It may be necessary to apply higher pressure at the control panel to overcome friction in the air supply hose during pressurization.)
8. To facilitate test verification by the Engineer, all air used shall pass through a single, above ground control panel. The aboveground air control equipment shall include a shut-off valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psi. The continuous monitoring gauge shall be no less than 4 inches in diameter with minimum divisions of 0.10 psi and an accuracy of plus or minus 0.04 psi. Two separate hoses shall be used to:
  - a. Connect the control panel to the sealed line for introducing low-pressure air, and
  - b. A separate hose connection for constant monitoring of air pressure build-up in the line. This requirement greatly diminishes any chance for over-pressurizing the line.
9. If pneumatic plugs are utilized, a separate hose shall also be required to inflate the pneumatic plugs from the above ground control panel.
10. After a manhole-to-manhole reach of pipe has been backfilled to final grade and compacted, prepared for testing, and a 24-hour waiting period has elapsed, the plugs shall be placed in the line at each manhole and secured.
11. The Contractor is advised to seal test all plugs before use. Seal testing may be accomplished by laying one length of pipe on the ground and sealing it at both ends with the plugs to be checked. The sealed pipe should be pressurized to 9 psig. The plugs shall hold against this pressure without bracing and without any movement of the plugs out of the pipe. No persons shall be allowed in the alignment of the pipe during plug testing. It is advisable to plug the upstream end of the line first to prevent any upstream water from collecting in the test line. This is particularly important in high groundwater situations.
12. When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, and this fault may be covered by the pipe plug, and thus not revealed by the air test.
13. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig. If the groundwater table is above the sewer being tested, the air pressure shall be increased 0.43 psi for each foot that the water table is above the invert of the sewer, up to a maximum of 9.0 psig. After a constant pressure of 4.0 psig (greater than the average groundwater back pressure) is reached, the air supply shall be throttled to maintain that internal pressure for at least 2 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall.

14. When temperatures have been equalized and the pressure stabilized at 4.0 psig (greater than the average groundwater backpressure), the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than the average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, timing shall commence with a stopwatch.
15. If the time shown for the designated pipe size and length (see Table 02650-1 1.0 PSIG Air Test Pressure Drop) elapses before the air pressure drops 0.5 psig, the section undergoing test shall have passed. The test may be discontinued once the prescribed time has elapsed even though the 0.5 psig drop has not occurred. If the pressure drops 0.5 psig before the appropriate time shown in Table I has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
16. If the section fails to meet these requirements, the Contractor shall determine at their own expense the source, or sources, of leakage, and shall repair or replace all defective materials or workmanship to the satisfaction of the Engineer. The extent and type of repair, which may be allowed, as well as results, shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the requirements of this test.

**TABLE 02650-  
1  
1.0 PSIG Air Test Pressure  
Drop**

Pipe Diameter <i>Inch</i>	Minimum Time Lapse (min:sec)							
	<i>100ft</i>	<i>150ft</i>	<i>200ft</i>	<i>250ft</i>	<i>300ft</i>	<i>350ft</i>	<i>400ft</i>	<i>450ft</i>
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

- C. **Mandrel Test (Plastic Pipe)** Pipe shall not exceed a deflection of more than 5%. Unless otherwise directed by the Engineer, after pipe has been backfilled for at least 7 days, a mandrel sized at 95% of the inside pipe diameter shall be pulled through pipe.

#### D. Smoke Test

- a. All new house connections shall be smoke tested prior to backfilling.
- b. At the discretion of the Owner, a final smoke test shall be performed a minimum of nine (9) months after final acceptance up to the end of the twelve (12) month warranty period.
- c. Leaks detected during smoke testing must be repaired as part of the Work and shall be considered incidental to and included in the cost of Work.

### 3.06 SANITARY SEWER PIPE REPAIRS

- A. **Remove and Replace** Remove and Replace is the task of excavating to a pipe and performing a corrective measure to repair a defect on a length of sewer pipe as designated on the Contract Documents. Remove and Replace operations shall address, but not be limited to, cracked pipe, broken pipe, faulty tap, protruding tap, sheared joint, dropped joint, or other similar conditions.
- B. **Smoke Testing** Smoke Testing shall be performed on each mainline or service lateral repair once all repairs are complete on a segment and prior to backfill according to Section 02220.

## PART 4 – MEASUREMENT

### 4.01 MEASUREMENT

- A. **Sewer Pipe** Measurement of new pipe shall be made from center of manhole to center of manhole as identified on the Contract Documents. Quantities of pipe for payment will be the contract quantities, adjusted as required due to plan errors or plan changes. Excavation, bedding, backfill, compaction, testing, and bypass flow are included in the measurement of new pipe.
- B. **Connections to Existing Manholes** Connections to existing manholes will be measured each for the connections required.
- C. **Adjusted Sanitary Sewer Service Lateral Connections** Adjusting existing services will be measured each for the service adjustments required and includes up to twenty (20) feet of adjusted sewer service lateral to avoid conflict with new utility. Excavation, bedding, backfill, compaction, testing, and bypass flow are included in the measurement of new pipe.
- D. **Sewer Service Lateral** Measurement of new service lateral shall be made from the nearest outside edge of the mainline or lateral connection stack to the limits of the sanitary sewer clean-out as identified on the Contract Documents. Quantities of service lateral for payment will be the contract quantities, adjusted as required due to plan errors or plan changes. Measurement for sewer service laterals shall be made to the nearest linear foot of pipe installed.
- E. **Sewer Service Lateral Connection Stack** Measurement of new service lateral connection stack shall be made from top outside edge of the mainline to the top of the stack as identified on the Contract Documents. Quantities of service lateral connection stack for payment will be the contract quantities, adjusted as required due to plan errors or plan changes. Measurement for sewer service

lateral connection stacks shall be made to the nearest vertical foot of pipe installed.

- F. **Sewer Service Lateral Termination** Measurement for the sewer service lateral termination shall be the actual count of termination assemblies installed and accepted.
- G. **Sanitary Sewer Clean-out** Measurement for the sanitary sewer clean-out shall be the actual count of clean-outs installed and accepted.
- H. **Abandon Sewer Pipe** Abandonment of gravity sewer pipe will be measured on a lump sum basis upon completion of all work indicated on the Contract Documents. Abandonment shall include any equipment, cleaning, flowable fill throughout the full length of pipe, and disposal in accordance with the plans and specifications.
- I. **Plug and Abandon Sewer Pipe** Plug and abandonment of gravity sewer pipe will be measured on a lump sum basis upon completion of all work indicated on the Contract Documents. Plug and abandonment shall include any equipment, cleaning, disposal and flowable fill required to cap the pipe ends in accordance with the plans and specifications.
- J. **Remove Sewer Pipe** Removal of gravity sewer pipe will be measured on a lump sum basis upon completion of all removal work indicated on the Contract Documents including appurtenances. Removal work shall include any equipment, cleaning, disposal, trenching, and backfilling required to remove the existing gravity sewer pipe in accordance with the plans and specifications.

## **PART 5 – PAYMENT**

### **5.01 PAYMENT**

- A. **Sewer Pipe** Payment for this Item will be full compensation for equipment, excavation, bedding, backfill, compaction, pipe, fittings, removal and disposal of existing sewer pipe if necessary, plugging, sewer flow control, traffic control, connections to new manholes, connections to service lateral, laying, jointing, cleaning new pipe, and testing, in accordance with the Contract Documents. Sand-aggregate bedding material, initial backfill and suitable excavated material for final backfill as shown on Contract Documents shall be included in this pay item. When required, special bedding and backfill material such as Limestone Bedding and Backfill, final Sand Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 02220.
- B. **Connections to Existing Manholes** Payment for this Item will be full compensation for all equipment, labor, materials required to connect the pipe to an existing manhole.
- C. **Adjusted Sanitary Sewer Service Lateral Connections** Payment for this item shall be full compensation for all equipment, labor, excavation, bedding, backfill, compaction, pipe, fittings, removal and disposal of existing sewer pipe if necessary, plugging, sewer flow control, traffic control, materials, and testing required to adjust up to twenty (20) feet of sanitary sewer service connections in accordance with the Contract Documents.
- D. **Sewer Service Lateral** Payment for this Item will be full compensation for

equipment, excavation, bedding, backfill, compaction, pipe, fittings, removal and disposal of existing sewer pipe if necessary, plugging, bypass pumping, traffic control, laying, jointing, cleaning new pipe, and testing, in accordance with the Contract Documents. Sand-aggregate bedding material, initial backfill and suitable excavated material for final backfill as shown on Contract Documents shall be included in this pay item. When required, special bedding and backfill material such as Limestone Bedding and Backfill, final Sand Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 02220 5.01.

- E. **Sewer Service Lateral Connection Stack** Payment for this item shall include all material, labor, pipe, fittings, bedding material.
- F. **Sewer Service Lateral Termination** Payment for this Item will be full compensation for SDR 35 PVC pipe, PVC fittings, and PVC cap.
- G. **Sanitary Sewer Clean-out** Payment for this Item will be full compensation for SDR 35 PVC pipe, PVC fittings, PVC clean-out fittings, cast iron frame and cover, and 24" square concrete pad surrounding the top of the clean-out.
- H. **Abandon Sewer Pipe** Payment for this Item will be full compensation for equipment, bypass pumping, connections, cleaning, disposal and flowable fill, in accordance with the Contract Document.
- I. **Plug and Abandon Sewer Pipe** Payment for this Item will be full compensation for equipment, bypass pumping, connections, cleaning, disposal and flowable fill at the pipe ends (18 inches min.), in accordance with the Contract Document.
- J. **Remove Sewer Pipe** Payment for this Item will be a lump sum full compensation for equipment, bypass pumping, connections, cleaning, excavation, backfill and delivery/disposal, in accordance with the Contract Document. Payment will be made for removed pipe.

**5.02 PAY ITEMS**

<u>Item No.</u>	<u>Item</u>	<u>Unit</u>
XXXXXX	PVC Sewer Pipe (depth) (diameter)	Linear Feet
XXXXXX	Connections to Existing Manholes	Each
XXXXXX	Sewer Service Lateral	Linear Feet
XXXXXX	Sewer Service Lateral Connection Stack	Vert. Feet
XXXXXX	Sewer Service Lateral Termination	Each
XXXXXX	Sanitary Sewer Clean-Out	Each



**SECTION 02660**  
**SANITARY SEWER MANHOLES**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

This Work consists of removal and disposal of existing manholes, if necessary, and furnishing and constructing new precast concrete sanitary sewer manholes, drop lines, and adjusting existing manholes. Manholes shall be constructed of specified material to the sizes, shapes and dimensions and at the locations and elevations shown on the Drawings. The expectation is that all new manholes will be completely sealed, thereby, eliminating infiltration and exfiltration from the manhole.

**1.02 SUBMITTALS**

- A. Complete product data on all standard manhole bottoms, riser sections (concrete and steel), cone sections, frames and covers, concrete and steel riser rings, rubber boots and external seal wrap shall be submitted.
- B. If required by the Contract Documents, the manhole epoxy liner system manufacturer's literature (cut sheets) describing the system, material/chemical properties, material handling and storage requirements, mixing and proportioning requirements, maximum pot life, MSDS sheets, environmental requirements for application and worker safety requirements shall be submitted.
- C. Written certification by the manhole liner system manufacturer stating the installation Contractor is approved to install the liner system specified shall be submitted.
- D. Written certification from the liner product manufacturer that each of the proposed liner and patching products are compatible with each other shall be submitted.
- E. Epoxy liner and vacuum test results shall be submitted to Engineer.

**PART 2 – PRODUCTS**

**2.01 MATERIALS**

- A. Manhole walls, transitions, conical sections, and base shall conform to the requirements of ASTM C 478 for the depths indicated on the Contract Documents. Conical sections shall be designed to support cast iron frames and covers under an AASHTO HS-20 loading. Axial length of sections shall be selected to provide the correct total height required with the fewest joints.
- B. Riser rings shall be precast concrete or cast iron.
  - 1. Concrete riser rings shall be free from cracks, voids and other defects and shall conform to ASTM C478. Concrete riser rings shall be of a nominal thickness of not less than four (4) inches and not more than six (6) inches for reconstruction and/or adjustment of the manhole frame and cover. Joints shall also be externally wrapped with an external seal wrap as specified in Subsection 3.01.

2. Cast iron riser rings shall conform to the latest edition of AASHTO M306.  
Cast iron riser rings shall be used for adjustment of the manhole frame and cover of less than four (4) inches. Joints shall also be externally wrapped with an external seal wrap as specified in Section 3-4.6.
- C. Manhole joints shall be sealed with flexible watertight rubber gaskets conforming to ASTM C 990 or C 443.
- D. Prior to backfilling, rubber external seal wraps shall be applied to each manhole section joint, riser rings and frame in accordance with Subsection 3.01.
- E. Conical sections shall be concentric, unless otherwise specified. Where the manhole barrel diameter is greater than 48 inches, a flat slab transition, concentric unless otherwise specified, may be used to transition to 48 inch diameter riser sections. Underside of the transition shall be at least 7 feet above the top of the bench.
- F. Sewer pipe to manhole barrel section connections shall be sealed with resilient connectors complying with ASTM C 923. Mechanical devices shall be stainless steel.
- G. Concrete manholes, wet wells, valve vaults and top slabs shall include the following protective admixtures:
  1. Crystalline Waterproofing Additive:
    - a. Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.
    - b. Product must include an approved coloring that will tint the finished concrete as proof of additive. Coloring must be provided by the additive manufacturer.
    - c. Installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
    - d. Waterproofing additive must be added to concrete mix at time of batching, and dosage rates and installation shall be in accordance with manufacturer's recommendations.
    - e. Crystalline waterproofing additive shall be as manufactured by Xypex Chemical Corporation or approved equal.
  2. Anti-Microbial Additive:
    - a. Antimicrobial additive shall provide long term prevention of bacteria in Microbial Induced Corrosive (MIC) sanitary corrosion in concrete sewer environments. It shall render the concrete uninhabitable for bacteria growth.
    - b. The liquid antibacterial additive shall be an EPA registered material. Product must include an approved coloring that will tint the finished concrete as proof of additive. Coloring must be provided by the additive manufacturer.

- c. Installer of anti-microbial additive shall be certified by the manufacturer or manufacturer's representative in writing.
- d. The additive shall be added into the concrete mix water to insure even distribution throughout the concrete mixture. The amount to be used shall be as recommended by the manufacturer of the antibacterial additive. This amount shall be included in the total water content of the concrete mix design.
- e. The anti-microbial additive shall have been successfully demonstrated as an anti-microbial additive and shall be as manufactured by Conshield Technologies or approved equal.

## **2.02 PROTECTIVE COATING**

- A. All interior surfaces of new wet wells, valve vaults, pump station top slabs, and sanitary sewer manholes that receive a force main discharge shall be given an interior protective coating. If invert is precast prior to shipping, precast concrete manufacturer will apply coating. Manholes that receive a force main discharge and wet wells and valve vault shall receive an interior coating of per specification 02660 paragraph 2.02. Sanitary sewer manholes that do not receive a force main discharge do not require an interior coating.
- B. Carboline Semstone 140 Epoxy, or equal, allowed for interior surfaces of manholes.
- C. Surface Prep:
  - 1. Products shall be cured to a minimum of 4000 PSI or 7 days in age that has not been subjected to weather for more than 24 hours to ensure products are SSD (saturated, surface dry) or better.
  - 2. Ensure that all dust, dirt and other contaminants are removed from surface prior to priming.
  - 3. Interior of product is to be rubbed down with grout to fill any bug holes or minor imperfections.
  - 4. Coating must be mixed to the coating manufacturer's specifications.
  - 5. Coating must be trowel applied to a thickness of 60-80 mils. This application technique provides continuous coating and minimizes pinholes.

## **2.03 PROTECTIVE COATING APPLIED IN FIELD**

- A. Grout
  - 1. Contractor to grout all internal and external joints prior to coating in the field.
  - 2. Only shrinkage compensated grout to be used on interior and exterior manhole surfaces.
  - 3. Grout shall be free of cracks and defects for no less than 1 year from date of installation.
- B. Coating
  - 1. Contractor must be qualified to apply coating in field including but not limited to proper material storage, mixing, and application.
  - 2. Any damage to the protective coating during shipping or installation shall be repaired by the contractor in accordance with the coating manufacturer's recommendations at

no additional cost to the owner.

## **PART 3 – EXECUTION**

### **3.01 CONSTRUCTION**

- A. Excavation, Bedding, and Backfill** Excavation, bedding, backfill, and compaction required for the installation of manholes shall be in accordance with Section 02220 and as shown in the Contract Documents.
- B. Precast Concrete Manholes**
1. Precast reinforced concrete manhole sections, transitions, conical sections, and base shall conform to ASTM C 478 and shall be designed for an AASHTO HS-20 loading. Frames and covers shall conform to Section 3.01 E. Lifting inserts shall be embedded in manhole walls; through-wall holes will not be permitted.
  2. Pipe connection openings shall be 4"±1/2" larger than pipe O.D.
  3. Sewer manhole bases shall have paved inverts, and sewer manhole sections shall have rubber gasket joints conforming to ASTM C 990 or C 443.
  4. Sewer manholes shall be externally sealed with rubber seal wraps conforming to ASTM C 877 (Type III – Chemically-Bonded Adhesive Butyl Bands).
  5. Base for precast manholes may be either precast or cast-in-place. Cast-in-place bases shall be used for manholes built over existing sewer lines only. If base is cast-in-place, lowermost precast unit shall be set in place at the time base is poured; additional precast units shall not be placed until 24 hours after base is poured. Concrete for base and required for the manhole, interior of cast-in-place base must field coated in accordance with Section 09800.
  6. For manholes requiring an epoxy protective coating on the interior surface preparation and protective coating shall be in accordance with Section 02660 2.02 and 2.03. Manholes may be coated "in the shop" prior to delivery to project site. Any damage to the protective coating during shipping or installation shall be repaired by the Contractor in accordance with the manufacturer's recommendations at no additional cost to the Owner. Upon completion of manhole and pipe installation the protective coating shall be free of bugholes, pinholes, and continuous across the section joints. Coating shall extend over the top rim of the cone opening by one inch.
  7. Manholes shall be constructed such that their walls are plumb. The spigot end of the precast sections shall be set at the top of each section.
  8. Gaskets and gasket seats shall be cleaned of dirt and debris just prior to placing precast units.
  9. If holes must be cut in precast units, they shall be cored or drilled for proposed mains 18 inches in diameter or smaller. Manholes requiring larger pipe connections may be enlarged using a jack hammer, but must be neatly grouted to provide an airtight seal.
  10. There shall be at least 12" horizontal clearance between adjacent pipes.

11. All inverts shall be of 4,000 psi concrete meeting the requirements of Section 02660 of these specifications. The invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the inlet shall be made to a true curve with as large a radius as the size of the inlet will permit.

- C. **Manhole Drop Connections** If inlet pipe enters the manhole 2 feet above the manhole invert or higher, an external drop line is required and shall comply with details in the Contract Documents. The drop line shall be of the same size and material as that of the inlet pipe. Backfill drop assembly with sanitary sewer bedding material. Extend the bedding material a minimum of 4 inches outside bells.
- D. **Adjusting Sewer Manholes** If grade adjustments of existing manholes are required, frames and covers shall be removed and manhole shall be adjusted to new grade as specified for new Work. Adjustment shall be made using precast concrete riser rings or cast iron riser rings in accordance with Section 3.01 E. Frames and covers shall be handled in accordance with Section 3.01 E.

After removal of existing manhole cover, a suitable temporary cover shall be placed over manhole to prevent debris from entering manhole and to provide for safety of workmen and the public until new manhole cover is in place. If rubble or debris falls into a "live" manhole during adjustment operations, the Contractor shall remove and dispose of debris at no cost to the Owner. Upon completion of the manhole adjustment an external seal wrap shall be installed in accordance with Section 3.01 F.

E. **Riser Rings, Frames and Covers**

1. The top of the manhole frame will be at the finished grade of the pavement or 3 inches above the ground surface in accordance with the details of the Contract Documents.
2. In paved areas the frame and cover should match the slope and crown of the finished pavement.
3. Concrete riser rings shall be set in a full bed of mortar. Mortar shall be struck smooth on the inside of the manhole using a hard trowel followed by a sponge float. An epoxy system designed for metal-to-metal adhesion shall be used to connect individual cast iron riser rings and the cast iron riser rings to the frame.

F. **External Seal Wrap**

1. Riser Rings and Frame: The sewer manhole riser rings and frame shall be externally sealed with rubber seal wraps or mechanically locked corrugated rubber seals.
  - a. Rubber seal wraps:
    - i. Rubber seal wraps and required band widths shall conform to ASTM C 877 (Type III-Chemically-Bonded Adhesive Butyl Bands).
    - ii. The number of bands required will depend on the number of adjusting rings needed. A minimum 3 inch overlap below the cone-riser ring joint shall be required. A 2 inch overlap shall be required to fold over the frame base to seal the frame-riser ring joint. If there are more adjusting rings per installation there will be a requirement for an additional band. Each

additional band will overlap the upper band by two inches.

- b. Mechanically locked corrugated rubber seals:
  - i. The frame seal shall remain flexible throughout a 25 year design life. The sleeve portion of the seal shall be corrugated with a minimum unexpanded vertical height of 10 inches and be capable of being mechanically locked to the base flange of the manhole frame casting.
  - ii. The sleeve and any extension shall be made from high quality EPDM rubber suitable for both above and below grade applications. Minimum thickness of rubber sleeve and extension shall be 0.085 inches. Rubber material shall conform to the applicable material requirements of ASTM C 923 and have a hardness (durometer) of 45±5.
  - iii. The sealing area that compresses against the base flange of the manhole frame casting and the chimney or cone shall have a series of sealing fins to facilitate a watertight seal. The top compression band shall be "C" shaped to uniformly compress and mechanically lock the sleeve into the base flange of the manhole frame casting. Both the top and bottom compression bands shall have a take-up mechanism capable of developing a minimum of 400 lbs. of torque.
- c. The external seal shall be installed after the adjusting rings are set.

2. Riser Section Joints:

- a. Each manhole section joint shall be sealed with an external rubber seal wrap conforming to ASTM C 877 (Type II-Plastic Film and Mesh Reinforced Mastic Bands or Type III- Chemically-Bonded Adhesive Butyl Bands).
  - b. The seal shall be designed to prevent leakage of water through the joint sections of a manhole.
3. The external seal wrap shall be installed in accordance with the details of the Contract Documents and the manufacturer's recommendations.

G. **Abandoning Manholes** The Contractor shall clean the manhole to be abandoned in accordance with the Contract Documents to remove and dispose of all sewage and debris. Contractor shall permanently plug both upstream and downstream pipes at the manhole, and thoroughly crack or drill holes in the manhole bottom to allow any water to drain out. Plug shall consist of concrete or flowable fill extending a minimum of 18" into the pipe end. Finally the Contractor shall completely remove the manhole structure down to a minimum three (3) feet below natural ground and fill and compact with an approved backfill sand. Removed material shall become property of the Contractor and shall be disposed of at no additional cost to the Owner.

### 3.02 ACCEPTANCE TESTING

- A. **Air Vacuum Test** After completion of manhole construction, wall sealing, and backfilling, the Contractor shall conduct a vacuum test as follows:
- 1. All manholes are to be vacuum tested following backfill and compaction. The ring and lid casting assembly shall be installed prior to testing. The testing equipment

shall consist of a gasoline-powered vacuum pump with sufficient vacuum hose length and a test head of proper size to fit the inside opening of the manhole. The test head shall be equipped with an inflatable rubber bladder to affect the seal to the manhole, an air pressure gauge, and a safety valve for filling the bladder, a 30-inch Hg liquid-filled vacuum gauge, a double air exhaust manifold with quarter turn ball valves, three bolt-on feet, and a bridge assembly with height adjustment rod.

2. Contractor shall plug all pipe openings, taking care to securely brace the plugs and the pipe. The plugs shall be placed a minimum of 6 inches beyond the manhole wall.
3. With the vacuum tester in place, inflate the compression to affect a seal between the vacuum base and the structure. Connect the vacuum pump to the outlet port with the valve open and evacuate the manhole to 10 inches Hg (0.3 bar) for 48-inch diameter manholes and 5 inches Hg (0.15 bar) for 60-inch and greater diameter manholes.
  - b. Close vacuum inlet/outlet ball valve, disconnect the vacuum pump, and monitor the vacuum for the specified time period. If the vacuum does not drop in excess of 1-inch Hg over the specified time period, the manhole is considered acceptable passes the test. If the manhole fails the test, identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Once the leaks have been identified, complete all necessary repairs by sealing the leaks of the manhole to the satisfaction of the Engineer, and repeat test procedures until satisfactory results are obtained.

Vacuum Test Timetable			
Depth (Feet)	Manhole Diameter (Inches)		
	48"	60"	72"
4'	10 sec.	13 sec.	16 sec.
8'	20 sec.	26 sec.	32 sec.
12'	30 sec.	39 sec.	48 sec.
16'	40 sec.	52 sec.	64 sec.
20'	50 sec.	65 sec.	80 sec.
24'	60 sec.	78 sec.	96 sec.
*T	5.0 sec.	6.5 sec.	8.0 sec.

\*Add extra testing time "T", for each additional 2-foot depth. (The values listed above have been extrapolated for ATM designation C924-85.)

- c. The Owner reserves the right to reject any and all manholes that do not pass vacuum testing requirements, and replacement shall be at the Contractor's expense. A significant number of leaks on a single manhole or significant number of manholes leaking shall be considered as a basis for rejection and replacement of manholes.

## B. Epoxy Liner Test

1. Wet Film Thickness Gage: During application a wet film thickness gage, meeting ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to check coating thickness.

2. **Holiday Detection:** After a minimum of 24 hours following completion, the lining system shall be spark tested to assure a pinhole-free lining. Defects shall be marked and repaired per the manufacturer's instructions. The holiday detector shall be a Tinker Razor Model AP/W or an approved equal. Reference NACE RPO 188-99 for performing holiday detection. Manhole repair shall not be measured for payment when required as surface preparation for a manhole lining rehabilitation operation.
3. **Adhesion Test:** A minimum of 10% of the manholes coated shall be tested for adhesion/bond of the coating to the substrate. Testing shall be conducted in accordance with ASTM D7342-05.

## **PART 4 – MEASUREMENT**

### **4.01 MEASUREMENT**

- A. **Sanitary Sewer Manholes:** Manholes constructed will be measured as a unit by manhole diameter and depth.
- B. **Adjusting Sewer Manholes:** This item will be measured as a unit.
- C. **Manhole Drop Lines:** Drop lines will be measured by line diameter per vertical foot of drop from the invert of the main line entering the manhole.
- D. **Abandon Sewer Manholes:** Manholes to be abandoned shall be measured as a unit.

## **PART 5 – PAYMENT**

### **5.01 PAYMENT**

- A. **Sanitary Sewer Manholes** Payment for new manholes include materials, labor, excavation, bedding, backfill, compaction, removal and disposal of existing manhole (if required), external seals, concrete additives, protective coating, connections with pipe, and testing
- B. **Adjusting Sewer Manholes** Payment for adjusted sewer manholes shall include materials, labor, excavation, bedding, backfill, compaction, riser rings, removal and replacement of existing frame and cover, and testing.
- C. **Manhole Drop Lines** Payment for drop lines shall include all material, labor, pipe, fittings, hardware, removal and disposal of existing manhole drop line (if required), and bedding material.
- D. **Abandon Sewer Manholes** Payment for abandoned manholes include materials, labor, excavation, backfill, compaction, pipe plug(s), drilling of manhole base, removal and disposal of existing manhole, manhole frame and cover 3 foot minimum below grade.

**5.02 PAY ITEMS:**

<u>Item No.</u>	<u>Item</u>	<u>Unit</u>
XXXXX	48" Sanitary Sewer Manhole (depth)	Each
XXXXX	60" Sanitary Sewer Manhole (depth)	Each
XXXXX	72" Sanitary Sewer Manhole (depth)	Each
XXXXX	Sanitary Sewer Drop Line (diameter)	Vertical Foot
XXXXX	Adjusting Sewer Manhole	Each
XXXXX	Abandon Sewer Manhole	Each



**SECTION 02670**  
**SANITARY SEWER FORCE MAINS**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

This Work shall consist of furnishing all labor, materials, equipment, and incidentals required to remove and dispose of existing sewer force mains if required, and install new sanitary sewer force main pipelines, fittings and taps of existing lines. The Contractor shall be responsible for safely storing materials needed for the Work until they have been incorporated into the completed Project. Contractor shall keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

When an item for "Sewer Force Main" is included in the contract, the Contractor has the option of furnishing either ductile iron pipe or PVC pipe, unless otherwise noted.

**1.02 SUBMITTALS**

**A. Action Submittals:**

1. Traffic Control Plan (if required)

2. Pipe:

- a. Information on gasket polymer properties.
- b. Application methods, application requirements, and chemical resistance data for coating and lining products.
- c. Fitting data sheets.
- d. Joint and fitting restraints.

3. Air Release/Vacuum Valves:

- a. Product data sheets for make and model.
- b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
- c. Maximum recommended test pressure; maximum and minimum recommended working pressures of air release/vacuum valves, isolation valves, flanges, connecting piping, and fittings.
- d. Recommended seating materials for specified operating pressures.

4. Valves:

- a. Shop Drawings.
- b. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number, and facility name/number or service where used.
- c. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
- d. Sizing calculations for open-close/throttle and modulating valves.

**PART 2 - MATERIALS**

**2.01 FORCE MAIN SEWER PIPE**

- A. Contractor shall provide sewer force main pipes with Ductile Iron Pipe (DIPS) diameters shown on the Contract Documents. Diameters shown on the Drawings and listed in the pay items represent the required DIPS diameters, regardless of pipe material, unless otherwise noted.
- B. All products used may be visually inspected by the Engineer at the Site for conformance to the Specifications. At Engineer's discretion, Contractor may be required to supply certified mill tests, samples, or other suitable form of verification that the material meets the required specifications.
- C. Provide sewer force main pipes with Ductile Iron Pipe (DIPS) diameters shown on the Contract Documents. Diameters shown on the Drawings and listed in the pay items represent the required DIPS diameters, regardless of pipe material, unless otherwise noted.
- D. The Work shall not begin until all submittals have been reviewed and approved. Also, the Work shall not begin until all of the equipment and materials required to perform the Work are in the possession of the Contractor.

**2.02 POLYVINYLCHLORIDE (PVC) PIPE AND FITTINGS**

- A. PVC pressure pipe (4-inch through 12-inch) and large PVC pressure pipe (14-inch through 48-inch) shall conform to the applicable requirements of AWWA C900 and AWWA C905, respectively, and the additional requirements herein.
- B. The pipe shall be of the diameter and pressure class indicated, shall be furnished complete with rubber gaskets, shall be provided as required in the Contract Documents.
- C. Materials used in manufacture of the pipe shall be tested in accordance with the requirements of this Section and the applicable ASTM and AWWA standards.
- D. Joints for the buried PVC pipe shall be an integral bell manufactured on the pipe employing a rubber ring joint. The bell shall be the same thickness as of the pipe barrel, or greater thickness. Where indicated, restrained joint pipe shall be ductile iron pipe or PVC pipe with approved Mechanical Joint (MJ) restrainer glands.
- E. Joint deflection at the joint shall not exceed 75 percent of the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints that are over-belled or not belled to the stop mark.
- F. PVC pipe shall be in accordance with the following table:

<u>WALL</u> <u>CONSTRUCTION</u>	<u>AWWA</u> <u>DESIGNATION</u>	<u>SDR (MAX)</u>	<u>SIZE</u>
Solid	AWWA C900 (235 psi)	DR 18	4" to 12"

- G. Fittings shall be ductile iron conforming to the requirements of AWWA C153 or AWWA C110 and shall have a minimum pressure rating of 250 psi. Bends, tees and other ductile iron fittings shall be restrained with the use of an approved Mechanical Joint restrainer gland or other means as indicated in the Contract Documents. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

- H. All ductile iron fittings shall be lined and coated with Ceramic Epoxy: Protecto-401 by Induron Protective Coatings or approved equal.
- I. Each fitting shall be clearly labeled to identify its size and pressure class.
- J. Gaskets shall meet the requirements of ASTM F477. Use elastomeric factory-installed gaskets to make joints flexible and watertight. Lubricant for rubber-gasketed joints shall be water soluble, non-toxic, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.
- K. Polyvinyl chloride sewer force main pipe shall be green in color.

### **PART 3 – EXECUTION**

#### **3.01 CONSTRUCTION**

- A. All Work shall be performed in compliance with L.R.S. 40:1749.11-22, "Louisiana Underground Utilities and Facilities Damage Prevention Law", OSHA regulations and applicable codes, ordinances, and standards of governing authorities having jurisdiction. All such work shall be adequately described in the Traffic Control Plan.
- B. Open excavations shall be barricaded and posted with warning lights in accordance with State and local requirements. Structures, utilities, sidewalks, pavements, and other facilities shall be protected from damage caused by settlement, lateral movement, undermining washout, and other hazards created by earthwork operations.
- C. Sewer flow bypassing required for construction shall comply with the Contract Documents.

#### **3.02 TRENCHING, BEDDING AND BACKFILL**

- A. Trenching, bedding and backfill shall be as specified in Section 02220.

#### **3.03 INSTALLATION**

- A. Pipe: Force mains shall be installed at the lines and grades required by the Contract Documents. All fittings shall be at the required locations and the spigots well centered in the bells and fully engaged as evidenced by pipe witness marks.
  - 1. Pipe laying shall begin at downstream end of line. Bell ends of pipe shall face upstream. Bell holes shall be provided at each joint to permit the joint to be constructed properly and supported along its full length of the pipe by the trench bedding. Allowing the pipe to be "bridged" by the bell is not acceptable.
  - 2. Pipe laying shall not advance backfilling by more than 100 feet without approval by the Engineer.
  - 3. Restrained joints shall be used at canal crossings, horizontal and vertical bends, tees, crosses, valves and other specified locations.
  - 4. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means. This provision shall apply during lunch as well as overnight. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry.

5. In all cases walking or working on the completed pipelines, except as may be necessary in tamping or backfilling will not be permitted until the trench has been backfilled to a point one foot above the top of the pipe. The backfilling of the trench and tamping of the backfill shall be carried on simultaneously on both sides of the pipe to ensure the completed pipeline will not be disturbed and injurious side pressures do not occur.
6. All PVC, Ductile Iron and HOPE pipe shall be installed with a 12-gauge copper wire attached to the pipe for tracing purposes and polyethylene utility marking tape one foot above the pipe. Utility marking tape shall be green in color with black lettering and read "CAUTION — BURIED SEWER LINE BELOW". Approved mechanical copper connectors shall be used for all splicing.
7. Unless otherwise indicated by the Contract Documents, all force mains shall have at least 36 inches of cover. The Engineer shall approve any exceptions.
8. Contractor shall provide and use tools and facilities that are satisfactory and that will allow the Work to be done in a safe and convenient manner. Suitable equipment shall be used to lower all pipe and fittings into the trench one piece at a time. Each piece shall be lowered carefully so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances shall force main materials be dumped or dropped.
9. Pipes and fittings shall not be lowered into the trench until they have been swabbed to remove any mud, debris, etc., which may have accumulated within them. After the pipe has been lowered, all unnecessary materials shall be removed from it. Before any pipe is laid, the outside of its spigot end and the inside of its bell shall be cleaned and left dry and oil-free.
10. Pipe shall be cut so fittings can be inserted in a workmanlike manner and without any damage to the pipe. The manufacturer's recommendations shall be followed concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis. A "chop" saw shall be used for ductile iron pipe, PVC and HDPE pipe. The Engineer may consider other methods for 12-inch diameter and larger pipe. After cutting ductile iron pipe, the Contractor shall touch up the epoxy lining to the satisfaction of the Engineer.
11. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor more than 75 percent of that recommended by the pipe manufacturer, and shall be approved by Engineer. Bend fittings shall only be used when the pipe deflections are inadequate, according to manufacturer's recommendations, or as directed by Engineer. Pipe bending of PVC pipe shall not be allowed, fittings or joint deflections shall be utilized.
12. Except for HDPE pipe, joint restraints shall be installed wherever the force main changes direction (at tees and bends), at dead ends, or at any other point recommended by the manufacturer or required by Engineer. Restrained joints for ductile iron and PVC force main shall be in accordance with Contract Documents.
13. All pipe shall be jointed in the exact manner specified by the manufacturer of the pipe and jointing materials.
14. Air release/vacuum valves shall be located at all high points on the pipeline as shown on the Contract Documents or as directed by Engineer.
15. Force main outlets shall be installed in manholes as shown on the Contract Documents.

16. Under no circumstance shall pipe laid on blocks be permitted.
17. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat workmanlike manner, using pipe wrap, without damage to the pipe or components to leave a smooth end at right angles to the axis of the pipe. Flame cutting of pipe will NOT be allowed.

B. Air Release/Vacuum Valve Installation shall:

1. Be in accordance with manufacturer's printed instructions.
2. Orient valve in vault for easy access.
3. Replace valves that drip or do not function properly.
4. Valve shall be placed inside a valve manhole as shown on the Contract Documents.

C. Valve Vault:

1. Place operator access as shown on the Contract Documents.
2. Install finished grade at top of vault to conform to slopes and elevations of adjacent ground and grade to drain away from vault.

D. Valves:

Valves used shall comply with the requirements of the Contract Documents.

The Contractor shall not substitute size, type, manufacturer, or material without the approval of the Engineer. The Contractor shall record GPS coordinates (+/- 1 meter accuracy) based on the La. State Plane Coordinate System (south), for each valve installed and submit to the Engineer. All information below only applies if the specified type or criteria is identified in the Contract Documents.

1. Flange Ends:

- a. Flanged valve bolt holes shall straddle vertical centerline of pipe.
- b. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

2. Screwed Ends:

- a. Clean threads by wire brushing or swabbing.
- b. Apply joint compound.

3. Extension Stem for Valve Operator: Where the depth of the valve is such that its centerline is more than 3 feet below grade, furnish an operating extension stem with 2-inch operating nut to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover. Extension stem shall be pinned to the operating nut; set screws are not acceptable.

4. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of the valve.

5. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box. Warranty: Should defects appear under proper use within a period of 1 year after the sewer force main has been accepted by the Owner, caused solely by faulty manufactured, material or workmanship, the Contractor shall repair or replace the sewer force main at no additional cost to the Owner.

#### **3.04 BACKFILL AND RESTORATION OF THE SITE**

Excavation, backfill and associated functions shall be performed as per the Contract Documents and in accordance with the direction outlined in the relevant portion of the Contract Documents.

#### **3.05 REMOVAL AND/OR ABANDONMENT OF EXISTING FORCE MAIN**

This section addresses the removal and/or abandonment of the existing force main and all appurtenances which are being removed (or abandoned) as detailed on the Contract Documents.

- A. Abandon Force Main: If certain portions of the existing force main are shown to be abandoned in place on the Contract Documents, the Contractor shall be responsible for evacuating or "swabbing" the existing force main pipe of all sewage before it is abandoned. This sewage shall be treated as hazardous material and disposed of using the proper criteria from the La. Department of Environmental Quality. Subsequently, either the entire length of the pipe shall be completely filled with flowable fill and capped as noted on the Contract Documents or as directed by the Engineer.
- B. Plug and Abandon Force Main: If an existing sewer force main is shown to be plugged and abandoned in place on the Contract Documents, the Contractor shall be responsible for evacuating or "swabbing" the existing sewer pipe of all sewage before it is abandoned. This sewage shall be treated as hazardous material and disposed of using the proper criteria from the La. Department of Environmental Quality. Subsequently, the pipe shall be plugged approximately 18 inches into each end of the pipe and capped as noted on the Drawings or as directed by the Engineer.
- C. Remove Force Main: If certain portions of the existing force main are shown to be removed on the Contract Documents, the Contractor shall completely remove the force main and appurtenances. The removal trench shall be backfilled in accordance with the provisions of Section 02220 or as directed by the Engineer. The Contractor shall be responsible for evacuating or "swabbing" the existing force main pipe of all sewage before it is removed. This sewage shall be treated as hazardous material and disposed of using the proper criteria from the La. Department of Environmental Quality.
- D. Remove and/or Abandon Force Main:
  1. If certain portions of the existing force main are shown as remove and/or abandon in place on the Contract Documents, the Contractor has the option to either completely remove the force main and appurtenances or abandon the force main. The Contractor shall be responsible for evacuating the existing force main pipe of all sewage before it is abandoned or removed. This sewage shall be treated as hazardous material and disposed of using the proper criteria from the La. Department of Environmental Quality.
  2. If removed, the removal trench shall be backfilled in accordance with the provisions of Section 02220 or as directed by the Engineer.
  3. If abandoned, the entire length of the pipe shall be completely filled with flowable fill.

- E. The force main appurtenances which are removed shall be delivered to the Department of Public Works or otherwise properly disposed of as directed the Engineer.

### 3.06 ACCEPTANCE TEST

Upon completion of backfilling, pipelines shall pass the following tests.

A. Pipe:

1. All newly installed and backfilled pipe shall be subjected to a leakage test, conducted in the presence of Engineer.
2. Test pressure shall be 150 percent of system operating pressure based on pressure as measured at the most elevated point in pipeline.
3. The force main shall be slowly filled with water, and the specified test pressure shall be applied (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to Engineer. The Contractor shall furnish the pump, pipe, connections, gauges, and all necessary apparatus.
4. Before applying the specified test pressure, all air shall be expelled from the pipe. If necessary, Contractor shall make taps at the points of highest elevation before testing, and shall insert plugs after the test has been completed.
5. The leakage test shall be conducted by measuring, through a calibrated meter, the amount of water which enters the test section for a period of at least 2 hours. No installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

For PVC Pipe:

$$L = \frac{ND/P}{7,400}$$

L = allowable leakage, gallons/hour

N = number of joints in length of pipe tested

D = nominal diameter of the pipe, inches

P = average test pressure during the leakage test, psig

6. The following table has been developed for the commonly used sizes of ductile iron pipe and PVC pipe with nominal laying lengths of 20 feet, under a test pressure of 150 psi. The leakage formulas above may be used when conditions differ from those stated parameters.

Allowable Leakage Per 100 Feet (gallons/hour)		
Pipe Diameter (Inches)	Ductile Iron Pipe	PVC Pipe
4	0.033	0.033
6	0.050	0.050
8	0.066	0.066
12	0.099	0.099
16	0.132	0.132
Greater than 16	Use formula above.	Use formula above.

7. For HDPE Pipe:

- a. Make-up Water Allowance: Maximum allowable make-up water at conclusion of test phase shall not exceed recommended amounts stated in the following table. The table is based on test pressure equal to 1.5 times pressure class of pipe. If lower pressure is used for test, allowances shall be reduced by ratio of test pressure to pressure class of pipe.

Make-Up Water Allowance for Test Phase (U.S. Gallons per 100 feet of Pipe)		
Nominal Pipe Size (inches)	1-Hour Test (gallons)	2-Hour Test (gallons)
3	0.10	0.15
4	0.13	0.25
6	0.30	0.60
8	0.50	1.0
10	0.75	1.3
12	1.1	2.3
14	1.4	2.8
16	1.7	3.3
18	2.2	4.3
20	2.8	5.5
24	4.5	8.9
28	5.5	11.1
32	7.0	14.3
36	9.0	18.0

- b. Note: No observed leaks.
- c. Any cracked or defective pipes or fittings discovered in consequence of this leakage test shall be replaced with sound material in the manner specified at no cost to Owner. The test shall be repeated until the results are satisfactory to the Engineer.

B. Valves:

1. Air Release Valve:

- a. May be either tested while testing pipelines, or as a separate step.
- b. Isolation valves shall be in open position during pipeline test.

2. Isolation Valves: Test that valves open and close smoothly with operating pressure on

one side and atmospheric pressure on the other.

3. **Air Release/Vacuum Valves:** Inspect valves as pipe is being filled to verify venting and seating is fully functional.
4. **Verify leak-free performance during testing.**
5. **Valve Test and Inspection:**
  - a. Valve may be either tested while testing pipelines, or as a separate step.
  - b. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.
  - c. Count and record number of turns to open and close valve; account for any discrepancies with manufacturer's data.
  - d. **Tap Testing:** No testing other than the pressure test is required. However, the testing requirements for the connection pipeline shall include testing of the restrained joint section, including the connection to the tapping valve. The entire tapped connection shall be visually inspected and any visible leaks repaired. Testing shall be in accordance with the requirements described as noted above.
  - e. Demolish and remove existing concrete structures to three feet minimum below surrounding grade. Fill remainder of structure with sand using care to ensure that all voids are filled.

## **PART 4 – MEASUREMENT**

### **4.01 MEASUREMENT**

- A. **Sewer Force Main** Sewer force main pipe for payment will be the contract quantities, adjusted as required due to plan errors or plan changes. Measurement for new sewer force main pipe shall be made by type and diameter of pipe to the nearest linear foot installed.
- B. **Restrained Joint Sewer Force Main** Restrained joint sewer force main pipe for payment will be the contract quantities, adjusted as required due to plan errors or plan changes. Measurement for restrained joint sewer force main pipe shall be made by type and diameter of pipe to the nearest linear foot installed.
- C. **Valves** Valves will be measured per each including the valve box and fittings. Air Release/Vacuum valves will be measured per each according to its size as detailed in the drawings, including all appurtenances described herein and the air release/vacuum valve manhole.
- D. **Abandon Force Main** Abandonment of force main will be measured on a lump sum basis upon completion of all work indicated on the Contract Documents. Abandonment shall include any equipment, cleaning, and flowable fill throughout the full length of pipe in accordance with the plans and specifications.
- E. **Plug and Abandon Force Main** Plug and abandonment of force main will be measured on a lump sum basis upon completion of all work indicated on the Contract Documents. Plug and abandonment shall include any equipment, cleaning, and flowable fill required to cap the pipe ends (18 inches min.) in accordance with the plans and specifications.
- F. **Remove Force Main** Removal of force mains will be measured on a lump sum basis upon

completion of all removal work indicated on the Contract Documents including appurtenances. Removal work shall include any equipment, trenching, and backfilling required to remove the existing force main in accordance with the plans and specifications.

- G. **Remove or Abandon Force Main** Removal or abandonment of force mains will be measured on a lump sum basis upon completion of all removal work indicated on the Contract Documents including appurtenances. Removal work shall include any equipment, trenching, and backfilling required to remove the existing force main in accordance with the plans and specifications. Abandonment in-place with this item shall include insertion of flowable fill throughout the full length of pipe.
- H. **Force Main Tap** Force main taps will be measured per each tap and diameter as indicated on the Contract Documents.
- I. **Fittings** Fittings will be measured by published fitting weights, minus accessories, (in pounds or tons as specified in the Bid Item) in accordance with AWWA C110 published fitting weights.

## **PART 5 - PAYMENT**

### **5.01 PAYMENT**

- A. **Sewer Force Main** Payment for this Item will be full compensation for equipment, excavation, bedding, pipe, connections, testing and backfill, in accordance with the Contract Document. Sand-aggregate bedding material, initial backfill and suitable excavated material for final backfill as shown on Construction Plans shall be included in this pay item. When required, special bedding and backfill material such as Limestone Bedding and Backfill, final Sand Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 02220 5.01.
- B. **Restrained Joint Sewer Force Main** Payment for this Item will be full compensation for equipment, excavation, bedding, restrained joint pipe, connections, restrainer glands, testing and backfill, in accordance with the Contract Document. Sand- aggregate bedding material, initial backfill and suitable excavated material for final backfill as shown on Construction Plans shall be included in this pay item. When required, special bedding and backfill material such as Limestone Bedding and Backfill, final Sand Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 02220 5.01.
- C. **Valves** Payment for this Item will be made at the contract unit prices for equipment, excavation, valve box, connections, testing, and backfill when no separate payment is made under another Bid Item), in accordance with the Contract Document. In the case of air release/vacuum valves, the valve manhole and tee connection are also included. Payment will be made at the contract unit prices for each complete valve assembly.
- D. **Abandon Force Main** Payment for this Item will be full compensation for equipment, bypass pumping, connections, cleaning, and flowable fill throughout the full length of pipe, in accordance with the Contract Document. Payment will be made for completely filled pipe only.
- E. **Plug and Abandon Force Main** Payment for this Item will be full compensation for equipment, bypass pumping, connections, cleaning, and flowable fill at the pipe ends (18 inches min.), in accordance with the Contract Document.
- F. **Remove Force Main** Payment for this Item will be a lump sum full compensation for equipment, bypass pumping, connections, cleaning, excavation, backfill and delivery/disposal, in accordance with the Contract Document. Payment will be made for completely removed

pipe and appurtenances.

- G. **Removal or Abandon Force Main** Payment for this Item will be a lump sum full compensation for equipment, bypass pumping, connections, cleaning, excavation, backfill, delivery/disposal, and flowable fill throughout the full length of pipe, in accordance with the Contract Document. Payment will be made for removed pipe and/or completely filled abandoned pipe.
- H. **Force Main Tie-in** Payment for this Item will be full compensation for equipment, labor, excavation, bedding, pipe, fittings, connections, testing and backfill, in accordance with the Contract Document.
- I. **Fittings** Payment for this Item will be full compensation for all fittings, and accessory kits, in accordance with the Contract Document.

**5.02 PAY ITEMS:**

<u>Item No.</u>	<u>Item</u>	<u>Unit</u>
XXXXXX	Unrestrained Joint PVC Sewer Force Main (diameter)	Linear Foot
XXXXXX	Restrained Joint PVC Sewer Force Main (diameter)	Linear Foot
XXXXXX	Abandon Force Main (w/ flowable fill in-place)	Lump Sum
XXXXXX	Remove Force Main	Lump Sum
XXXXXX	Fittings	Tons
XXXXXX	Air Release/Vacuum Valve (diameter)	Each
XXXXXX	Force Main Tie-In (diameter)	Each