

**SECTION 802
GRAVITY SEWER PIPE**

802-1 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, perform point repairs, remove and replace repairs and install new gravity sanitary sewer lines and fittings.

802-2 MATERIALS: Materials shall conform to the following Sections and Subsections:

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|---------------------------------------|----------|
| a. Plastic Pipe | 1016-1.1 |
| b. Ductile Iron Pipe | 1016-1.2 |
| c. Steel Pipe | 1016-1.3 |
| d. Fiberglass Reinforced Polymer Pipe | 1016-1.4 |

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.

When an item for gravity "Sewer Pipe" is included in the contract, the Contractor has the choice to select from the following list of pipe materials in accordance with the specified inside diameters:

- Less than 18" (inside diameter) – PVC, HDPE and Ductile Iron
- 18" up to but not including 21" (inside diameter) – PVC, HDPE, Ductile Iron, or FRP
- 21" up to and including 24" (inside diameter) – PVC, HDPE, FRP, Ductile Iron, or Large Diameter Closed Profile PVC
- 27" up to and including 54" (inside diameter) – HDPE, FRP, Large Diameter Closed Profile PVC, or Ductile Iron
- Greater than 54" (inside diameter) – FRP or Ductile Iron

802-3 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 for approval, complete, detailed shop drawings of all pipe and fittings.
- c. The Contractor shall submit and shall comply with the pipe manufacturer's recommendations for handling, storing and installing pipe and fittings.
- d. The Contractor shall submit pipe manufacturer's certification of compliance with these Contract Documents.

802-4 CONSTRUCTION:

802-4.1 Open Trench: Trenching construction consists of trench excavation, bedding, laying of pipe on grade, backfill, compaction, grading and incidentals in accordance with Section 801.

802-4.1.1 Pipe Laying: Pipe shall be handled, stored, and laid in accordance with the manufacturer's instructions and as specified as follows:

- a. 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.
- b. Pipe laying shall not advance backfilling by more than 100 feet without approval by the Engineer.
- c. The pipes and fittings shall be so laid in the trench that after the sewer is completed, the interior surface of the bottom thereof shall conform accurately to the line and grade shown in the Contract Documents. 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.
- d. 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 thoroughly cleaned of oil, dirt, and foreign matter, then closely inspected for damage to coatings, walls, bells, gaskets, and ovality, prior to installation. Nonconforming or damaged pipe, gaskets, or coatings shall not be installed.
- e. 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.
- f. The Contractor shall make every effort to conform to the line and grade of the plans. The grade shown on the Plans is that of the invert to which the Work must conform. The Owner reserves the right to make adjustments to the grades and slopes to fit actual field conditions.
- g. After completion of pipe installation, no sag in the line greater than the maximum allowed sag tolerances noted in the Standard Plan 802-01 shall be acceptable. Any section of pipe that does not conform to these specifications shall be replaced or re-laid at the contractor's expense.

802-4.1.2 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 802-2 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:

- a. 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.
- b. 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.
- c. Install pipe to "full insertion mark" where provided.

802-4.2 Trenchless: Trenchless construction consists of technologies and methods utilized for

installing sewer pipelines and services with minimal surface disruption and destruction resulting from excavation. Trenchless Construction shall conform to the following sections:

Pipe Bursting	811
Jacked & Bored Pipe / Casing	817
Horizontal Directional Drilling	818
Microtunneling & Pipe-Jacked Tunnels	819

802-4.3 Remove and/or Abandonment of Existing Gravity Sewer Pipe: This section addresses the removal and/or abandonment of the existing gravity sewer pipe and all appurtenances which are being removed (or abandoned) as detailed on the Contract Documents.

- a. **Abandon Sewer Pipe:** If an existing sewer pipe is shown to be 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 entire length of the pipe shall be filled with flowable fill and capped as noted on the Drawings or as directed by the Engineer.
- b. **Plug and Abandon Sewer Pipe:** If an existing sewer pipe 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 Sewer Pipe:** If an existing sewer pipe is shown to be removed on the Contract Documents, the Contractor shall completely remove the sewer pipe. The removal trench shall be backfilled in accordance with the provisions of Section 801 or as directed by the Engineer. The Contractor shall be responsible for evacuating or “swabbing” the existing sewer 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 Sewer Pipe:**
 1. If an existing sewer pipe is shown as remove and/or abandon in place on the Contract Documents, the Contractor has the option to either completely remove the sewer pipe or abandon the sewer pipe. The Contractor shall be responsible for evacuating or “swabbing” the existing sewer 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 801 or as directed by the Engineer.
 3. If abandoned, the entire length of the pipe shall be completely filled with flowable fill.

802-5 NEW PIPE-EXISTING PIPE CONNECTIONS: Connections between existing and new pipe, with the exception of HDPE 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.

Connections between existing and new HDPE pipe shall be jointed with HDPE electrofusion couplings in accordance with subsection 1016-1.1.2. Prior to ordering materials, Contractor shall check existing pipe diameters and take care to provide matching pipe and coupling to make proper connection.

802-6 PIPE-MANHOLE CONNECTIONS: All sewer 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 (non-shrink) 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. These requirements apply whether it is a connection to an existing sanitary sewer manhole or connections through a storm water conflict manhole, junction box, or inlet.

In the case of HDPE pipe, in addition to the flexible manhole connectors and non-shrink grout, electrofusion flex restraints shall be permanently attached to the pipe to prevent movement. HDPE flex restraints shall be in conformance with subsection 1016-1.1.2.

802-7 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 with a clean-out and pad installed at the property line. Construction shall be in accordance with the appropriate typical drawings in the Contract Documents. The exception to this is with service lateral connections on mainlines to be rehabilitated with CIPP lining. In this case, unless a point repair or remove and replace repair is shown on the plans, service lateral connections on mainlines to be CIPP lined will receive a lateral connection sealing and repair product (top hat) in accordance with Sections 808 and 809.
- 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 and stubbed a minimum of 3 feet above ground and capped.
- d. In association with mainlines previously rehabilitated with CIPP lining:

1. Connections between the service lateral and a main line, which has previously been repaired by a CIPP lining process, shall be made with six (6)-inch Flexible saddle wyes with corrosion resistant series 300 stainless steel clamps capable of sustaining an applied torque of 60 inch-pounds. In cases where a vertical stack is repaired, the PVC saddle wye shall be used in place of the flexible wye.
 2. Host pipe shall be removed to expose the full circumference of the CIPP liner around the wye connection, to allow for installation of the saddle with a sealant product such as Hydrophilic Water Stop. The interface between pipe and CIPP liner shall be sealed around the entire circumference of the wye connection with an approved non-shrink grout.
- e. In association with Slip Lining:
1. After the liner pipe has been inserted in the host pipe, given the appropriate relaxation period, and secured in the upstream and downstream manhole, all existing services shall be reconnected. A portion of the host pipe, at the liner pipe around each service connection shall be removed to expose the liner pipe to provide adequate working space for making the new service connection. The Contractor shall reconnect the services to the liner pipe using compressive-fit service connections such as Inserta-Tee or approved equal.
 2. Prior to backfilling, the portion of the host pipe removed for service reconnection shall be sealed to preclude migration of the backfill material into the annular space or loss of grout material during grouting of the annular space between the liner pipe and host pipe. This area may be sealed with an approved non-shrink grout or the portion of host pipe removed may be replaced and grouted.
- f. In association with HDPE (HDPE Pipe or Lining Material):
1. The method of saddle connection to the main line shall be by Gasketed Electrofusion Branch Saddles by Central Plastics, or approved equal in conformance with subsection 1016-1.1.2. Personnel certified by a manufacturer of polyethylene pipe in the proper methods of installing electrofusion fittings shall carry out installation of electrofusion saddles in strict conformance with the manufacturer's printed instructions. Installation shall include all equipment, labor, materials, and incidentals. Saddle material shall be compatible with the main line pipe or lining material.

802-8 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. Contractor shall coordinate testing with surface restoration requirements of Section 4-5. Any removal or replacement of temporary or final surface restoration by the Contractor to investigate leaks shall be done so at no additional cost to the Owner.

802-8.1 Leakage Tests: Sewer lines shall be tested for leakage as follows:

Low Air Pressure Test - manhole to manhole reach of pipe for sewer pipe 36" in diameter and smaller; individual joints for sewer pipe larger than 36" in diameter

Infiltration Test - for sewer pipe greater than 36" in diameter with groundwater equal to or greater than 2 feet above top of pipe (with approval of Engineer)

Exfiltration Test - for sewer pipe greater than 36" in diameter with groundwater less than 2 feet above top of pipe (with approval of Engineer)

802-8.1.1 Low 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.

- a. For Pipes 36" in Diameter and less (Manhole to Manhole Reach)
 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 at no additional cost to the Owner.
 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. Internal pressure of more than 9 psig shall not be permitted except for leak location equipment where the plugs are firmly tied together. Contractor should verify maximum allowable pressure recommended by pipe manufacturer.
 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. Air test gauges shall be laboratory-calibrated test gauges, and if required by the Engineer, shall be recalibrated by a certified laboratory prior to the leakage test.

Air gauges shall have a size and pressure range appropriate for the pipe being tested.

8. 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.)
9. 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: 1) connect the control panel to the sealed line for introducing low-pressure air, and 2) 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.
10. If pneumatic plugs are utilized, a separate hose shall also be required to inflate the pneumatic plugs from the above ground control panel.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.

16. If the time shown for the designated pipe size and length (see Table 8-1 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.

17. 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 8-1
1.0 PSIG Air Test Pressure Drop**

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

b. For Pipes Larger than 36” in Diameter (Individual Joint Testing):

1. Individually test each sewer pipe joint with an approved joint air testing apparatus to an air pressure of 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 unless otherwise restricted by pipe manufacturer’s recommendation.
2. The testing apparatus shall be positioned within the pipe in such a manner as to straddle the joint to be tested.
3. The apparatus packer ends shall be expanded so as to isolate the joint from the remainder of the pipe and create a void area between the packer and the pipe joint. The ends of the testing device shall be expanded against the pipe in

accordance with the manufacturer's recommendations.

4. After void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure drops by more than 1.0 psi within 15 seconds, the joint will have failed the test.
5. Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display void pressure. Contractor shall note and record the pressure display reading before each joint test. Should the void pressure meter fail to drop to 0.0 (± 0.5) psig, Contractor shall make necessary equipment repairs to provide for an accurate void pressure reading.

802-8.1.2 Infiltration Test: Where the natural groundwater is 24 inches or more above the top of a section of pipe, the Contractor shall measure the flow of water in the pipe and the rates of seepage and infiltration. Contractor shall measure the flow rate by using a calibrated weir. The Contractor shall leave the weir in the line until the flow rate has stabilized. The Contractor is responsible for verifying the groundwater level by providing sight gauges in manholes or digging test holes at suitable locations.

- a. The total seepage and infiltration of groundwater as determined by the test shall in no case exceed 50 gallons per 24 hours per inch-mile of pipe.
- b. Make infiltration tests on all sewer construction before placing the lines in service and before making any connections to other sewers.
- c. If the amount of infiltration into the sewer(s) is in excess of the maximum quantity specified above, then repair the joints, relay the sewer (if necessary), or perform other remedial construction, at the Contractor's expense, in order to reduce groundwater infiltration to within the specified limits.

802-8.1.3 Exfiltration Test: Where the groundwater is not 24 inches or more above the top of the pipe section being tested, the Contractor shall perform an exfiltration test.

- a. The Contractor shall bulkhead the pipe below the lower manhole of the section being tested with a pneumatic plug or other device. Insert a vent pipe 48 inches long in the stopper of the upper end of that section. Then fill the lower manhole with water, or add water until there is a minimum of 4 feet over the upper end; make certain that all air is forced out through the vent tube.
- b. Contractor will measure the drop in the level of the water in the manhole due to exfiltration over a specific time, and calculate the water loss due to exfiltration. The total exfiltration shall not exceed that specified above for infiltration.

802-8.2 Mandrel Test (Plastic & Fiberglass 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 30 days, a mandrel sized at 95% of the inside pipe diameter shall be pulled through pipe.

802-8.3 Smoke Test:

- a. All new sewer lines including service laterals with diameters up to & including 15 inches shall be smoke tested prior to backfilling in accordance with Section 814.
- 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.

802-9 SANITARY SEWER PIPE REPAIRS:

802-9.1 Point Repair: A Point Repair is the task of excavating to a pipe and performing a corrective measure to repair a defect on a length of sewer pipe less than or equal to twenty (20) feet long. Point repairs shall address, but not be limited to, cracked pipe, broken pipe, faulty tap, protruding tap, sheared joint, dropped joint, or other similar conditions.

802-9.2 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.

802-9.3 Trenchless Point Repair: A Trenchless Point Repair is the task of providing a localized trenchless sealing and structural repair to a defect on a length of sewer pipe less than or equal to three (3) feet long with an internally installed stainless steel repair sleeve. Trenchless Point repairs shall address, but not be limited to, leaking joints, cracked pipe, broken pipe, deformed pipe, or other similar conditions where excavation is not practical due to surface conflicts.

802-9.3.1 Design: The design of the stainless steel repair sleeves shall be in accordance with AWWA Manual 11 standards for design of Flexible Tunnel Liners. The repair sleeve shall be structurally designed to carry 5psi uniformly distributed hydraulic working load having a minimum factor of safety of 2.5 after 100-year chemical erosion of stainless steel material has been subtracted. Corrosion tables based on Stainless Steel Industry reports shall be used for calculating general surface erosion of the stainless steel plate thickness over the required 100-year service life due to corrosion. Calculations prepared by a Licensed Professional Engineer shall be submitted containing structural design, calculated effect of ovality and calculated structural effect of a 100-year chemical erosion of the structural element.

Where repair sleeve is fully enclosed in the damaged host pipe, the structural element of the sleeve shall be designed for 5psi hydraulic load with a minimum 2.5 factor of safety.

Where repair sleeve is expected to come in direct contact with the surrounding soil in excess of one third of the sleeve length, the structural element of the sleeve shall be designed for a hydraulic load of 10psi using a minimum 2.5 factor of safety. In lieu of a single sleeve, it is permissible to use a double sleeve assembly consisting of two single sleeves with 5psi capacity each joined together by a manufacturer approved resin matrix as a load transfer medium.

In case the host pipe has become oval, not exceeding 10 percent out of round, the repair sleeve with wall thickness of next thicker gauge from the one specified for standard repair sleeves shall be used.

802-9.3.2 Materials:

- a. Sleeve: The structural component of the repair device shall be 316 stainless steel in the form of sleeves of the required length to cover the repair. The inner diameter reduction of the host pipe shall not exceed one (1) inch.
- b. Sealant: Only manufacturer specified resin with physical properties set out by the requirements of the structural design shall be used. The sealant must be appropriate for transmitting all external loads to the stainless steel structural core, providing adequate support for the structural core against buckling and bonding the device in place.

1. Sealing Grout: The sealant used shall be as specified by the manufacturer for sealing infiltration.
2. Structural Grout: The sealant used shall be as specified by the manufacturer and shall be capable of transmitting all external loads to the structural core of the repair sleeve. If any infiltrating water is present, infiltration shall be sealed prior to installation of sleeve using structural grout.

802-9.3.3 Preparation:

- a. Contractor shall notify the Engineer prior to beginning cleaning activities and pre-construction CCTV inspection. Contractor shall plan cleaning and pre-construction CCTV inspection activities far enough in advance of Trenchless Point Repair activities to allow Engineer time to review any Critical Damage Reports that may develop from the CCTV inspection results.
- b. Experienced personnel trained in locating breaks, obstacles, and service connections by CCTV will perform CCTV of pipe in accordance with Section 815. The interior of the pipe should be carefully inspected to determine the location of any conditions that may prevent proper installation of the repair sleeve, such as protruding service taps, collapsed or crushed pipe, and reductions in the cross-sectional pipe area of more than 10%. The Contractor will notify the Engineer immediately if the inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment or that will interfere with the proper installation an acceptable repair. This should be submitted to the Engineer as a Critical Damage Report (CDR). The CDR shall include all adverse conditions for each pipe segment from manhole to manhole. The CDR shall include:
 1. Two letters of transmittal.
 2. A CDR standard form including screen capture of adverse condition and location footage.
 3. A hardcopy printout of the video cut sheet (video report).
 4. A DVD containing:
 - i. Electronic pdf files of the video cut sheets
 - ii. Digital copy of the pipe video
 5. Recommendation from the Contractor for each adverse condition.
- c. It shall be the responsibility of the Contractor to remove all loose debris that is located within the sewer pipe in accordance with Section 812. This cleaning will be incidental to the cost of the Trenchless Point Repair. If an obstruction is encountered that cannot be cleared with conventional sewer cleaning equipment, the Engineer should be notified immediately.
 - a. Any roots, protruding gaskets, or protruding laterals in the existing sewer pipe shall be cut and removed from the sewer pipe prior to the sewer liner installation. With the approval of the Engineer, this removal work associated with Trenchless Point Repairs will be paid for under the relative pay items in Section 808.

802-9.3.4 Installation:

- a. The entire process of transporting and installing the sleeve shall be recorded on digital media and a copy provided to the Engineer at the completion of each sewer section.
- b. The sewer must remain in full operation during the repair process allowing for a maximum of 5 minutes of flow interruption.
- c. In case of offset joints, bells, and deformed or irregular pipe with disarranged pipe pieces, the pipe bore shall be opened by application of a hydraulic expander.
- d. Pipe deformation shall be reversed back to the round configuration and repair sleeves installed capable of restoring the full structural capacity of the host pipe.
- e. In case the host pipe has completely collapsed and re-rounding is not possible without complete removal of the damaged pipe parts, an opening at least equal to the inside diameter of the host pipe must be cleared through the debris and the repair devices capable of sustaining the full soil load extended throughout the collapsed area at least 12 inches into the undamaged pipe.
- f. When a cracked host pipe has formed randomly directed elements the host pipe must be re-rounded with the repair sleeve, or the re-rounding must be completed before installing a sleeve, in the backfill is compacted too tight around the pipe. In this case re-rounding should be accomplished by using a hydraulic jack before the sleeve is inserted.
- g. The repair must extend at least 8" into undamaged pipe or joint adjacent to both extremities of the damage. If access to the line is limited such that shorter than specified sleeves must be used, or the length exceeds the manufacturer standard sleeve lengths, two or more sleeves shall be used with an overlap where two adjacent sleeves meet following manufacturer specified standards for overlapped repair sleeves.
- h. Upon completion of the repair, the entire sewer section shall be inspected and the inspection recorded on digital media at no additional cost to the Owner. This video inspection shall be submitted to the Engineer for verification of work quality and completion of repair.

802-9.3.5 Acceptance:

- a. All stainless steel sleeve locks have been engaged.
- b. All the pre-measured grout supplied by the manufacturer has been applied to each stainless steel sleeve as specified by the manufacturer.
- c. All host pipe leaking joints, cracks and holes are fully covered by the repair sleeve.
- d. The entire pipe damage has been repaired per these specifications.

802-9.4 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 814 of the Specifications.

802-10 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. **Rehab Sewer Pipe:** Measurement for the removal of existing sewer pipe and its replacement with sewer rehab pipe shall be made on a linear foot basis of pipe installed. Measurement will be made to the nearest whole foot for the various diameters listed in the Bid Form. When tying into a manhole or manholes, measurement will be to the inside face of the manhole structure. It is recognized that the Contractor must purchase pipe material at the minimum manufactured length based on the pipe material used; therefore, the unit bid price shall be based on a minimum main line length of six (6) feet at each point repair and will be recorded accordingly by the Engineer's field representative. Excavation, bedding, backfill, and compaction are NOT included in the measurement of sewer rehab pipe.
- c. **Connections to Existing Manholes:** Connections to existing manholes (sanitary sewer manhole or storm water conflict/junction/inlet box) will be measured each for the connections required.
- d. **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.
- e. **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.
- f. **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.
- g. **Sewer Service Lateral Termination:** Measurement for the sewer service lateral termination shall be the actual count of termination assemblies installed and accepted.
- h. **Non-Shear Couplings:** Non-shear couplings will be counted each for the diameter required.
- i. **Electrofusion Couplings:** Electrofusion couplings for jointing existing HDPE pipe to new HDPE pipe will be counted each for the diameter required.
- j. **Sanitary Sewer Clean-out:** Measurement for the sanitary sewer clean-out shall be the actual count of clean-outs installed and accepted.
- k. **Service Lateral Mainline Connection Associated with CIPP:** Measurement for the

service lateral mainline connection associated with mainline that has been previously rehabilitated with a CIPP liner shall be the actual count of each service lateral connection installed and accepted.

Excavation, bedding, backfill, and compaction associated with this item shall be paid for under the Sewer Point Repair Excavation, Backfill, and Compaction item by the appropriate depth range in accordance with Section 801. The pay limit length for this excavation, bedding, backfill, and compaction shall be limited to 6 feet at the depth range of the mainline beginning at the backside mainline excavation width pay limit. The pay limit width of excavation shall be the trench pay limit as shown on the Contract Documents.

- l. Service Lateral Mainline Connection Associated with Slip Lining:** Measurement for the service lateral mainline connection associated with slip lining shall be the actual count of each service lateral connection installed and accepted.

Excavation, bedding, backfill, and compaction associated with this item shall be paid for under the Sewer Point Repair Excavation, Backfill, and Compaction item by the appropriate depth range in accordance with Section 801. The pay limit length for this excavation, bedding, backfill, and compaction shall be limited to 6 feet at the depth range of the mainline beginning at the backside mainline excavation width pay limit. The pay limit width of excavation shall be the trench pay limit shown on the Contract Documents.

- m. Service Lateral Mainline Connection Associated with HDPE:** Measurement for the service lateral mainline connection associated with HDPE pipe or lining material shall be the actual count of each service lateral connection installed and accepted.

Excavation, bedding, backfill, and compaction associated with this item shall be paid for under the Sewer Point Repair Excavation, Backfill, and Compaction item by the appropriate depth range in accordance with Section 801. The pay limit length for this excavation, bedding, backfill, and compaction shall be limited to 6 feet at the depth range of the mainline beginning at the backside mainline excavation width pay limit. The pay limit width of excavation shall be the trench pay limit as shown on the Contract Documents.

- n. Abandon Sewer Pipe:** Abandonment of gravity sewer pipe will be measured on a lump sum basis or by the cubic yard of flowable fill required to complete all work indicated on the Contract Documents and as provided in the bid form. Abandonment shall include any equipment, cleaning, flowable fill throughout the full length of pipe, and disposal in accordance with the plans and specifications.
- o. 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.
- p. 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.

- q. **Remove or Abandon Sewer Pipe:** Removal or abandonment of gravity sewer pipe will be measured on a lump sum basis upon completion of all removal work indicated on the Contract Documents. 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. Abandonment in-place with this item shall include insertion of flowable fill throughout the full length of pipe.
- r. **Trenchless Point Repair:** Measurement for trenchless point repair shall be made on a linear foot basis of sleeve installed. Measurement will be made to the nearest whole foot for the various diameters listed in the Bid Form.

802-11 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 and/or manholes 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 Document. Sand-aggregate for bedding and initial backfill material and useable excavated soil for secondary backfill, as shown on City-Parish Standard Detail 801-01 shall be included in this pay item. When required, special bedding and backfill material such as #57 Stone Backfill, #610 Stone Backfill, CLSM Backfill, Sand-Aggregate for Secondary Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 801.
- b. **Rehab Sewer Pipe:** Payment for this Item will be full compensation for pipe, fittings (excluding non-shear couplings), plugging, removal and disposal of existing sewer pipe, sewer flow control, connections to existing pipe and service lines, laying, jointing, and cleaning new pipe, smoke testing of the repair, in accordance with the Contract Documents. Payment will be made for new pipe only when it is installed in the ground. No payment shall be made for pipe stored on the site but not yet installed. This item shall be used in conjunction with point repairs or remove and replace rehabilitation only. Excavation, bedding, backfill, and compaction required for Work associated with Rehab Sewer Pipe will be paid for under the relative pay item in Section 801.
- c. **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 (sanitary sewer manhole or storm water conflict/junction/inlet box).
- d. **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.
- e. **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 Document. Sand-aggregate for bedding and initial backfill material and useable excavated soil for secondary backfill, as shown on City-Parish Standard Detail 801-01 shall be included in this pay item. When required, special bedding and backfill material such as #57 Stone Backfill, #610 Stone Backfill, CLSM Backfill,

Sand-Aggregate for Secondary Backfill, and Select Material for Backfill required for Work associated with Sewer Pipe will be paid for under the relative pay item in Section 801.

- f. **Sewer Service Lateral Connection Stack:** Payment for this item shall include all material, labor, pipe, fittings, bedding material.
- g. **Sewer Service Lateral Termination:** Payment for this Item will be full compensation for SDR 35 PVC pipe, PVC fittings, and PVC cap.
- h. **Non-Shear Couplings:** Payment for this Item will be full compensation for all equipment, labor, and materials required to install non-shear couplings.
- i. **Electrofusion Couplings:** Payment for this Item will be full compensation for all electrofusion couplings, equipment, labor, and materials required to install electrofusion couplings.
- j. **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.
- k. **Service Lateral Mainline Connection Associated with CIPP:** Payment for this item will be full compensation for removal of host pipe (as required), saddle wyes, all fittings, grout, smoke testing, all equipment, labor, and materials.
- l. **Service Lateral Mainline Connection Associated with Slip Lining:** Payment for this item will be full compensation for removal of host pipe (as required), compressive-fit service connection, patching of host pipe, grout, all fittings, smoke testing, all equipment, labor, and materials.
- m. **Service Lateral Mainline Connection Associated with HDPE:** Payment for this item will be full compensation for electrofusion branch saddles, all fittings, smoke testing, all equipment, labor, and materials.
- n. **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.
- o. **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.
- p. **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.
- q. **Removal or Abandon Sewer Pipe:** 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 full length of pipe, in accordance with the Contract Document. Payment will be made for removed pipe and/or completely filled abandoned pipe.
- r. **Trenchless Point Repair:** Payment for this item will be full compensation for sewer flow control, public notification, traffic control, sewer pipe cleaning, repair device,

installation of the repair device, pre- and post-construction CCTV inspection, and clean-up in accordance with the Contract Documents.

802-12 PAY ITEMS:

Pipe Inner Diameter (I.D.) Schedule
(as Shown on Drawings)

Pipe Depth Schedule

A = 4" Pipe	N = 27" Pipe	0 = 0	- 6	Feet
B = 6" Pipe	O = 30" Pipe	1 = 6.1	- 8	Feet
C = 8" Pipe	P = 32" Pipe	2 = 8.1	- 10	Feet
D = 10" Pipe	Q = 36" Pipe	3 = 10.1	- 12	Feet
E = 12" Pipe	R = 42" Pipe	4 = 12.1	- 16	Feet
F = 14" Pipe	S = 48" Pipe	5 = 16.1	- 20	Feet
G = 15" Pipe	T = 54" Pipe	6 = 20.1	- 24	Feet
H = 16" Pipe	U = 60" Pipe	7 = 24.1	- 28	Feet
I = 18" Pipe	V = 64" Pipe	8 = 28.1	- 32	Feet
J = 20" Pipe	W = 66" Pipe	9 = 32.1	- 36	Feet
K = 21" Pipe	X = 72" Pipe			
L = 24" Pipe	Y = 76" Pipe			
M = 26" Pipe	Z = 80" Pipe			

<u>Item No.</u>	<u>Item</u>	<u>Unit</u>
80200_ _	Sewer Pipe (depth) (diameter)	Linear Feet
80210_ _	PVC Sewer Pipe (depth) (diameter)	Linear Feet
80211_ _	HDPE Sewer Pipe (depth) (diameter)	Linear Feet
80212_ _	Ductile Iron Sewer Pipe (depth) (diameter)	Linear Feet
80213_ _	Steel Sewer Pipe (depth) (diameter)	Linear Feet
80214_ _	Fiberglass Sewer Pipe (depth) (diameter)	Linear Feet
802200_	PVC Rehab Sewer Pipe (diameter)	Linear Feet
802210_	HDPE Rehab Sewer Pipe (diameter)	Linear Feet
802220_	Ductile Iron Rehab Sewer Pipe (diameter)	Linear Feet
802230_	Steel Rehab Sewer Pipe (diameter)	Linear Feet
802240_	Fiberglass Rehab Sewer Pipe (diameter)	Linear Feet
8023000	Connections to Existing Manholes	Each
8024000	Adjusted Sanitary Sewer Service Lateral Connections	Each
8024100	Sewer Service Lateral	Linear Feet
8024200	Sewer Service Lateral Connection Stack	Vertical Feet
8024300	Sewer Service Lateral Termination	Each
802500_	Non-Shear Couplings (diameter)	Each
802501_	Electrofusion Couplings (diameter)	Each

8026000	Sanitary Sewer Clean-out	Each
8027000	Service Lateral Mainline Connection Associated with CIPP	Each
8027001	Service Lateral Mainline Connection Associated with Slip Lining	Each
8027002	Service Lateral Mainline Connection Associated with HDPE	Each
8028000	Abandon Sewer Pipe (w/flowable fill in-place)	Lump Sum
8028001	Abandon Sewer Pipe (w/flowable fill in-place)	Cubic Yard
8028100	Plug and Abandon Sewer Pipe (cap each end)	Lump Sum
8028200	Remove Sewer Pipe	Lump Sum
8028300	Remove or Abandon Sewer Pipe	Lump Sum
802900_	Trenchless Point Repair (diameter)	Linear Feet