SECTION 816

SEWER PIPE AND LATERAL JOINT TESTING

I. GENERAL

1.1 DESCRIPTION OF WORK

The Work covered by this section consists of providing all labor, equipment, material and supplies and performing all operations required to air test the sewer pipe joints in active sewers. Contractor shall follow all federal, state and local requirements for safety in confined spaces and uniform traffic controls.

1.2 SUBMITTALS

Submittals shall be made by the Contractor in accordance with the procedures set forth in Section 105 - Control of Work, and as described below.

A. The Contractor shall provide a minimum 48-hour advance written notice of proposed testing schedules and testing procedures for review and concurrence of the Owner.

B. Equipment operating procedures and systems.

C. Identify the manufactures & models of the packers to be utilized on the project.

D. Upon completion of each pipe segment, submit to Owner a report showing the following data for each joint and/or lateral connection tested, grouted or attempted to be grouted as required by PACP/LACP.

1. Identification of the sewer pipe section tested by assigned sewer ID (if available) and length.

2. Type of pipe material, diameter & depth of pipe to the surface at manholes.

3. Length of pipe sections between joints.

4. Test pressure used and duration of test.

5. Pass/fail results for each joint/connection tested.

6. Location stationing of each joint/connection tested and location of any joints/connections not tested with an explanation for not testing.

7. Operator conducting testing shall be noted on the reports.

8. Video recordings

a. Video recording shall include testing operations for each joint/lateral (including inflation and deflation over the joint/lateral) displaying the final air test of joints or laterals.

b. Additional final recording shall include inspection of the pipe or lateral after all grouting work is complete.

1.3 RELATED DOCUMENTS

A. National Association of Sewer Service Companies (NASSCO) prepared Pipeline/Lateral Assessment and Certification Program (PACP/LACP), TV inspection form and sewer condition codes

B. ASTM F2304 Standard Practice for Rehabilitation of Sewers using Chemical Grouting (latest revision)

C. ASTM F2454 Standard Practice for Sealing Lateral Connections and lines from the Mainline Sewer Systems by Lateral Packer Method, Using Chemical Grouting (latest revision)

II. EXECUTION

2.1 GENERAL

A. After the sewer line cleaning and television inspection operations are completed as specified the Contractor shall proceed with joint testing on the designated lines.

B. Sewer line joint testing is to identify sewer pipe joints that are defective and that can be successfully sealed by the internal pipe joints sealing process. Joint testing is also used to test the effectiveness of the seal. Testing of joints that are visibly leaking is not required and will not be paid for by the Owner.

C. Testing will not be required on pipe exhibiting the following conditions or characteristics:

1. Longitudinally cracked, fractured or broken pipe.

2. Sections of the pipe with structural defects between joints.

3. Any sections of pipe or joints that are in such poor structural condition that, in the judgment of Owner or Contractor, significant structural damage of the pipe would occur as a result of the pressure test. Any structurally undamaged joint that structurally fails (breaks) during testing that are documented on video to have been done under normal pressure conditions shall be the Owner's responsibility and cost to repair.

D. Do not test any other pipe defects unless so specified or shown, or directed by Owner to do so. Any structurally failed pipe or joint that is tested at the Owner's direction that further fails/breaks during testing that are documented on video to have been done under normal pressure conditions shall be the Owner's responsibility and cost to repair. Promptly repair any other sewer damage resulting from the Contractor's operations at no additional compensation.

E. All testing shall be performed in the presence of the Owner.

2.2 TESTING EQUIPMENT

A. The basic equipment used for mainline pipe joints and for laterals connected to the mainline shall consist of a remotely operated color television camera capable of pan and tilt, joint testing device (referred to hereafter as a packer), and test monitoring equipment. The equipment shall be constructed in such a way as to provide means for introducing air under pressure into the void area created by the expanded ends of the packer against the host pipe and a means for continuously measuring, viewing and recording the actual static pressure of the test medium and grout within the void area only. The packer shall be of a size less than the diameter of the host pipe, with the cables at either end used to pull it through the line and may be constructed in such a manner as to allow a restricted amount of sewage to flow at all times. Packer shall be expanded by air pressure. Packers shall be of low void space construction with void volume given by the packer manufacturer.

B. The device for testing lateral connections shall consist of inflatable mainline end elements and a lateral grouting plug that creates a void area extending beyond the main connection. Whenever possible, use a lateral grouting plug sized to match the diameter of the lateral being grouted with an effective sealing length of at least predetermined distance by the Owner. Where the lateral is capped, utilize alternate lateral grouting plug or equipment sized appropriately for the capped lateral. In cases were the lateral transitions from 6” to 4” in diameter, use a 4” lateral grouting plug. However, it is possible that due to physical restrictions the lateral plug may not launch and thus the service may not be able to be grouted.

C. The basic equipment for 4-inch and 6-inch laterals connected to manholes shall consist of a flexible push-type packer and mini-push camera. The device for testing lateral pipe connected to the manhole shall be capable of testing the joints within predetermined distance by the Owner of the lateral or to the cleanout, whichever comes first, from the manhole toward the building. If the lateral contains a transition, Contractor may change out diameters of push packer or grout lateral using only a 4-inch push packer.

D. Void pressure data shall be transmitted from the void area to the monitoring equipment or video picture of a pressure gauge mounted on the packer and connected to the void area. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation of the televising monitor and test monitoring equipment.

E. Sewer line joint testing shall be performed before and after the joint sealing operation by applying a positive air pressure to each sewer joint and monitoring the pressure in the void. The intent of joint testing is to identify defective joints prior to the joint sealing process and determine the effectiveness of the joint seal.

F. The joint testing equipment used shall consist of a television camera, joint testing device (such as a packer), and test monitoring equipment. The equipment shall be constructed in such a way as to provide means for introducing air, under pressure, into the VOID area created by the expanded ends of the joint-testing device and a means for continuously measuring the actual static pressure of the air within the VOID areas only.

2.3 CONTROL TEST

Prior to starting the pipe joint testing phase of the Work, a two-part control test shall be performed as follows:

A. To ensure the accuracy, integrity, and performance capabilities of the testing equipment, a demonstration test will be performed aboveground in a test cylinder suitable to contain the full length of the packer and sustain the void test pressure. This technique will establish the test equipment performance capability in relationship to the test criteria and ensure that there is no leakage of the test medium from the system or other equipment defects that could affect the joint testing results. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the Owner. This test may be required at any other time during the joint testing Work if the Owner suspects the testing equipment is not functioning properly. The test cylinder shall be equipped with a void release valve to exercise a controlled release of pressurized air from the void area to test the packer under both sound and leaking conditions. The test cylinder shall also be equipped with a local pressure gauge (0-25 psi) within the void space.

1. With the void release valve sealed, inflate the packer and air test void at 7-10 psi. The observed void pressure at the test cylinder pressure gauge must be within ±1.0 psi of the reading in the control center/studio void pressure gauge and follow both up and down pressure changes (allowing time for pressure equalization).

2. If above test is passed, crack the release valve to simulate a very small leak. The cylinder shall be equipped with a void release valve to exercise a controlled release of the test media with the associated pressure drop to be equally displayed ±1.0 psi of the cylinder gauge and test monitoring equipment.

B. After entering each pipeline segment with the test equipment, but prior to the commencement of joint testing, position the packer on a section of sound sewer pipe between pipe joints, and perform a test as specified. The equipment shall hold a 7-10 psi test pressure for a period of 15 seconds with a pressure drop of less than 1 psi. In the event of a failed test, repair any defective equipment and re-test to verify proper operation of all equipment at no additional compensation. Should it be found that the surface or porosity conditions of the barrel of the sewer pipe cannot meet the joint test requirements, then the performance testing shall be waived or modified as determined by the Owner.

C. If air testing cannot be performed successfully, repair or otherwise modify air test equipment and repeat the tests. This test may be required at any other time during the performance of joint testing work if the Owner suspects the testing equipment is not functioning properly.

D. After entering each manhole section with the test equipment, but prior to the commencement of joint testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a test performed as specified. This procedure will demonstrate the reality of the test requirement, as no joint will test in

excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements (void pressure cannot be held for 60 seconds), the requirements will be modified as necessary.

2.4 PIPE PREPARATION

Prior to the application of the chemical grouting materials, the Contractor shall thoroughly clean the sewer designated to receive the joint testing or grouting. Cleaning shall be in accordance with Section 810 and shall constitute removal of all loose debris & solids which inhibit proper seating of the packer. If mineral deposits or protruding laterals are present, they shall be removed.

2.5 ROOTS AND LOOSE DEBRIS IN LATERAL CONNECTIONS

A. Remove all roots and loose debris from laterals connected to manholes for the length of lateral to be tested.

B. During mainline sewer cleaning or joint testing, document all lateral connections containing roots, mineral deposits or obstructive conditions that are either (a) greater than fine roots or (b) of a nature to prevent testing and sealing of connection. For each such connection, submit a screen shot image clearly showing the extent of roots or obstructive condition to the Owner. Submit images in electronic format, labeled and organized in a manner to easily retrieve the image for the lateral connection in question. The list of lateral connections with roots shall include upstream and downstream manhole numbers and stationing. Owner will review the list of lateral connections containing roots and obstructions and direct Contractor as to which laterals are to be (a) cleaned and tested, (b) grouted without cleaning – in which case such lateral connection would be excluded from warranty testing, or (c) removed from the scope of work – in which case no payment for such lateral will be made.

2.6 JOINT TESTING PROCEDURE FOR MAINLINE SEWER AND LATERALS CONNECTED TO MANHOLES

Each sewer line joint which is not visibly leaking shall be individually air tested at a test pressure equal to 0.5 psi per vertical foot of pipe depth plus 2 psi (not exceeding a pressure of 10 psi, but no less than a pressure of 3 psi) and in accordance with the following procedure:

A. The packer or testing device shall be positioned within the line in such a manner as to straddle joint to be tested.

B. The packer or testing device and elements (sleeves) shall be expanded so as to isolate the joint from the remainder of the line and create a void area between the packer or testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the air within the void without leaking past the expanded ends.

C. Air shall then be introduced into the void area until a pressure equal to or greater than the required test pressure is observed by the void pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test. Sealing of the joint, if approved by the Owner, shall be performed in accordance with Section 817 - Chemical Grouting.

D. After the 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 (due to joint leakage), the joint will have failed the test. Sealing of the joint, if approved by the Owner, shall be performed in accordance with Section 817 - Chemical Grouting.

E. Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display void pressure. Should the void pressure meter fail to drop to 0.0 +/- 0.5 psi, make necessary equipment repairs to provide for an accurate void pressure reading.

2.7 LATERAL CONNECTION TESTING PROCEDURES

A. Lateral connection joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without approval of the Owner.

B. Air testing lateral connections shall be accomplished by isolating the area to be tested with the lateral connection packer and by applying positive pressure into the isolated void area. A pan and tilt camera shall be used to position the lateral packer for laterals directly connected to the mainline sewer. The lateral bladder shall be inverted from the mainline assembly into the lateral pipe and inflated. The mainline elements shall then be inflated to isolate the lateral connection and the portion of the lateral to be tested. A sensing unit shall monitor the pressure of the packer void and will accurately transmit a continuous readout of the void pressure to the control panel at the grouting truck or to a pressure gauge on the packer recorded by the CCTV camera.

C. The test procedure will consist of applying a controlled air pressure into each isolated void area. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. Once the designated pressure in the isolated void is displayed on the meter of the control panel, the application of air pressure will be stopped and a 15 second waiting period will commence. The void pressure will be observed during this period. If the void pressure drop is greater than 2.0 psi within 15 seconds, the lateral shall be considered to have failed the air test and shall be grouted and retested.

D. After completing the air test for each individual lateral specified herein, deflate the lateral packer, with the void pressure meter continuing to display void pressure. If the void pressure does not drop to 0.0 +/- 0.5 psi, the equipment shall be adjusted to provide a zero void pressure reading at the monitor.

2.8 TEST RECORDS

A. A sample filled out records form shall be submitted to the Owner for approval prior to initiation of Work.

B. During the joint testing Work, complete records shall be kept which include:

1. Identification of the manhole-to-manhole section or lateral tested;

2. The test pressure used;

3. Location (footage) of each joint tested; and,

4. A statement indicating the test results for each joint tested.

III. MEASUREMENT FOR PAYMENT

A. Preparatory Sewer Cleaning of Mainline Sewer, including reaming of mineral deposits in mainline sewers, and preparatory cleaning and root cutting for laterals, shall be measured and paid in accordance with Section 810.

B. Cutting of Protruding Taps in Mainline Sewer

1. The measurement unit for this item will be per each based on the actual number of protruding taps cut.

2. The unit price for this item will be full compensation for providing all labor, materials, equipment, tools, and incidentals for all aspects of protruding tap cutting as required.

C. Testing of Pipe Joints in Mainline Sewers

1. This item will be measured based on the number of joints tested.

2. The unit price for this Item will be full compensation for providing all labor, materials, equipment, tools, and incidentals for all aspects of testing pipe joints as specified and shown. Visually leaking joints, whether tested or not, shall not be paid under this Item. Payment for testing joints following chemical sealing is included under Section 817.

D. Testing of Lateral Connections in Mainline Sewers

1. The measurement unit for this item will be per each based on the number of lateral connections directly connected to the mainline sewer that are pressure tested.

2. The unit price for this item will be full compensation for providing all labor, materials, equipment, tools, and incidentals for all aspects of testing lateral connection as specified and shown.

E. Testing of Laterals Connected to Manholes

1. The measurement unit for this item will be per each based on the number laterals tested.

2. The unit price for this Item will be full compensation for providing all labor, materials, equipment, tools, and incidentals for all aspects of testing of laterals directly connected to manholes as specified and shown, including all necessary cleaning and root removal.

End of Section