

PART IV - TESTING AND ACCEPTANCE

1. General

- A. All Sanitary sewers, manholes and force mains shall be acceptance tested, as hereinafter specified in the presence of the Township's representative. Acceptance testing shall be performed after backfilling is completed. The **Contractor** shall supply all required testing equipment and personnel to operate said equipment. The **Contractor** shall make any and all necessary repairs required to pass the acceptance test, at no additional cost to the **Township**. Each section of sewer between manholes shall be cleaned, tested and inspected. All repairs shown to be necessary by the tests are to be made promptly. Broken or cracked pipe shall be replaced and all deposits removed, the sewer pipe set into position true to the line and grade and entirely cleaned out.

2. Testing of Gravity Sewers

- A. All gravity sewer pipes shall be inspected manhole-to-manhole and tested by inducing low-pressure air into the pipe. The air shall be slowly introduced into the pipe and the pressures shall gradually be increased with the test section to 5.0 psi.
- B. The air test shall be conducted by the **Contractor** under the supervision of the **Township's** representative and shall be performed with equipment manufactured specifically for air testing of pipe.
- C. The **Contractor** may desire to perform an air test for his or her own purposes prior to backfilling; however, the "acceptance air test" shall be performed after backfilling has been completed.
- D. Each section of the sewer being tested shall be temporarily sealed-off by means of suitable plugs. In addition, all wyes, tees, or ends of lateral stubs shall be sealed with suitable removable caps securely fastened to withstand internal test pressure.
- E. All such pipe so tested shall be required to sustain the 5.0-psi test pressure without loss or drop in pressure for a time period of 5 minutes. In the event that the loss does occur, appropriate repairs or reconstruction shall be made and the test procedure shall be rerun until the test criteria (5.0 psi for 5 minutes) are successfully accomplished.
- F. In the event where ground water elevations prevail higher than the top of the sewer pipe being tested, 0.5 psi per foot of hydrostatic head above the top of the sewer pipe shall be added to the test pressure.

- G. The pressurizing equipment shall have a safety gauge, which shall limit the loading on the sewer line to ten (10) psi. In addition, the calibrations on all pressure gauges shall be no greater than 0.10 psi.
- H. All PVC pipes shall also be tested for pipe deflection. Said tests shall not be performed until the backfill has been in place for at least 60 days. The maximum acceptable deflection shall be five (5%) percent of the vertical internal diameter as defined in ASTM Specification D-3034. Said testing shall be performed with a mandrel similar or equal to that manufactured by Cherne Industries, Inc. Mandrels are to bear ASTM certification for the pipe size being tested. It is required that deflection-testing equipment receives the prior approval of the **Township**.

The Contractor is permitted to attach a mandrel to the camera, for a camera so equipped, to perform the television inspection and mandrel test simultaneously.

- I. The **Township** will lamp each section of sewer pipe between manholes by placing a light at one end and observing the pipe at the other end. Sewers not constructed on uniform line and grade, and therefore not showing a full circle of light during lamping, will not be accepted by the **Township**.
- J. If the pipe installation fails to meet these requirements, the **Contractor** shall determine at his own expense the source or sources of leakage, and he shall repair or replace all defective materials and workmanship.

3. **Hydrostatic Testing of Force Mains**

- A. All force mains shall be hydrostatically tested for leakage after installation is completed. Said testing shall be performed in accordance with the applicable sections of the AWWA C standards. Prior to performance of the testing work the **Contractor** shall submit to the **Township Engineer** the following:
 - 1. A testing schedule.
 - 2. A listing of equipment intended to be used, including general information on the pump, pressure gauge, pressure relief and water meter.
 - 3. Certification that the pressure gauge has been calibrated to 0.1 psi within the past three months.
- B. The **Contractor** will provide the water required for testing purposes and shall provide all required temporary fittings to complete testing prior to connection to the existing force main including temporary removal of air relief valves for testing purposes.

- C. Each section of pipe to be tested shall be slowly filled with water during which time air shall be expelled from the pipeline through the air release valves (where high points in the line exist at which there are no air release valves, **Contractor** shall install corporation cocks for that purpose). After all air is expelled, the air release devices shall be closed and line pressures shall be raised to the test pressure directed by the **Engineer**. Test pressures shall be 1.5 times the expected working pressure predicated upon the elevation of the lowest point in the line, corrected to the elevation of the lowest point in the line, corrected to the evaluation of the test gauge. Any joint, cracked pipe or other appurtenances revealing leakage during the pressure test shall be corrected after which the pressure test shall be rerun. Pressure tests shall be conducted for a 30-minute time period.
- D. After performance of the successful pressure test, a leakage test shall be performed over a duration period of two hours at a pressure to be determined by the **Engineer**. Leakage is defined as the quantity of water supplied to the test section of pipe, which is required to maintain pressure within 5 psig of said test pressure during the entire testing period. Pipe construction so tested shall be deemed to have failed the leakage test if the leakage resulting is greater than 10 gallons per inch diameter per mile of pipe per day.

4. Vacuum Testing of Manholes

- A. After erection of the manholes, connection of the sewers, and placement of the backfill to approximately the finished ground elevation, each manhole shall be vacuum-tested for water tightness. Connecting pipes shall be securely plugged and an approved vacuum-testing device shall be placed and sealed within the manhole frame/cover section.
- B. A vacuum of ten (10) inches of mercury (Hg) shall be drawn after which the vacuum pump shall be shut off. If the indicated vacuum pressure drops to nine (9) inches in less than three (3) minutes, the test apparatus shall be removed and appropriate repairs/plugging shall be performed. The test shall be repeated, as necessary, until a time period of a minimum of three (3) minutes occurs before the vacuum pressure drops one inch (1) and/or there is no visual indication of water leakage.
- C. Appropriate repairs/plugging is defined as sealing the grade rings and inside joints with Parsons Epoxy Compound, Parsonpoxy FG, or approved equivalent.

5. Television and Inspection

- A. After cleaning, and at the direction of the **Township**, and prior to acceptance of the sewers by the **Township**, sewer sections shall be visually inspected by the **Contractor, Engineer and Township** by means of closed-circuit television for final inspection. The inspection shall be done one manhole-to-manhole section of pipe at a time.

- B. The **Contractor** is permitted to attach a mandrel to the camera, for a camera so equipped, to perform the television inspection and mandrel test simultaneously.
- C. The television camera used for the inspection shall be one specifically designed and constructed for such inspection and shall be capable of pan and tilt direction movement to view lateral connections and defects. Lighting for the camera shall be suitable to allow a clear color picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a color picture quality to the satisfaction of the **Township**; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.
- D. The camera shall be utilized to record the condition of all manhole interior conditions.
- E. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary and at lateral connections and shall tilt and pan each lateral connection to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute.
- F. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the **Contractor** shall set up his equipment so that the inspection can be performed from the opposite manhole.
- G. Any section of gravity sewer that is found by internal TV inspection to be defective; to contain silt and/or debris; or to be otherwise unacceptable to the **Township**, shall be corrected and re-televised at the expense of the **Contractor**.
- H. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communications between members of the crew.
- I. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the **Township**.

- J. Documentation of the television results shall be as follows:
- a. Television Inspection Logs: Printed location records shall be kept by the **Contractor** and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, broken pipe, and other discernible features will be recorded and a copy of such records will be supplied to the **Township**.
 - b. Videotape Recordings: Videotapes shall be color VHS format. The purpose of tape recording shall be to supply a visual and audio record of condition of the lines. Videotape recording shall be played back at the same speed that it was recorded at. Slow motion or stop-motion playback features may be supplied at the option of the **Contractor**. All original videotapes shall become the property of the **Township**.
 - c. Digital Video Recordings: Digital video recording shall be provided at the discretion of the Township in lieu of videotape recordings and shall be either color DVD or mpeg compatible.
- K. Prior to the end of the eighteen (18) month warranty/maintenance period, and subsequent release of the 15% financial security, the **Township** may require that the **Contractor** retelevisé selected "segments of interest."

END OF PART IV