

Pipe required to be laid on curved alignment shall be joined in straight alignment and then be deflected, joint by joint. Special care shall be taken in blocking the pipe just previously laid, by tamped fill or otherwise to resist the misaligning forces generated during compression of the joints being made.

31-1.09 JOINTING OF DISSIMILAR PIPES

Suitable adaption couplings shall be specified in the Special Provisions for the jointing of dissimilar pipes. Where suitable adaptor couplings are not available for dissimilar pipes the jointing shall be accomplished with a special fabricated coupling as specified, or as approved by the ENGINEER.

31-1.10 SANITARY SEWER LINE CONNECTIONS

Sanitary sewer line connections to existing trunks, mains, laterals or side sewers shall be left uncovered until after an acceptance inspection has been made. The ENGINEER will make such inspection within two working days after notification by the CONTRACTOR. After approval of the connection, the trench shall be backfilled as specified in Section 20.

No existing sanitary sewer shall be connected to a new sanitary sewer unless specifically authorized in each instance by the ENGINEER or OWNER. Storm drains and drain tiles shall not be connected to a sanitary sewer. Storm drains and drain tiles discovered during construction shall be brought to the attention of the ENGINEER.

31-1.11 SANITARY SERVICE RISERS

Where the depth of the sanitary sewer invert is greater than twelve (12) feet (3.65 m) below the surface of the ground, a sanitary service riser shall be constructed to an elevation of nine (9) feet (2.75 m) below the ground elevation or as shown on the Plans.

The sanitary service riser shall be constructed with a tee or wye as shown on the Plans placed to receive the riser pipe. The tee or wye shall be bedded as shown on the Standard Drawing No. 7.

The riser pipe shall extend to the proper elevation and shall terminate with a manufactured plug.

Extreme care shall be taken in backfilling around risers. Where the excavated material is not suitable for this purpose in the opinion of the ENGINEER, granular material shall be placed around the riser.

31-1.12 TESTING AND INSPECTION FOR ACCEPTANCE OF SANITARY SEWERS

Testing and inspection of sanitary sewers for acceptability shall be conducted by:

- A. Exfiltration of air under pressure
- B. Infiltration of water
- C. Exfiltration of water
- D. Deflection for flexible pipe
- E. Closed Circuit Televising (CCTV)

The method(s) of testing shall be specified in the Special Provisions or on the Plans. At a minimum, all sanitary sewers shall be tested for acceptability by either A., B., or C. above or a combination thereof. Unless otherwise authorized, the CONTRACTOR shall arrange to commence the test within 15 days after the sewer has been installed or 15 days after notification by the ENGINEER, whichever date is later. The CONTRACTOR may at his option divide the sanitary sewer into sections of more convenient length for testing. If the sanitary sewer or section tested does not pass the test it shall be repaired and the test repeated until a satisfactory test is obtained.

In addition, all sanitary sewer constructed of flexible pipe materials shall be tested by D. above. The deflection testing of the installed pipe shall not occur sooner than thirty (30) days after completion of the installation of the section being tested. The ENGINEER reserves the right to require preliminary deflection testing of sections he may designate.

As an optional procedure to supplement items A. through D., the ENGINEER may require all or a portion of sanitary sewer constructed to be tested for acceptability by E. above. The televising of the installed pipe shall not occur sooner than thirty (30) days after completion of the installation of the section being tested.

All lines shall be cleaned of debris and flushed clean as necessary. Debris shall not be flushed into a sanitary sewer.

31-1.13 TESTING TECHNIQUE AND ALLOWABLE LIMITS

All Testing Methods: All wyes, tees, risers and service stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.

- A. Exfiltration Method Procedures: The section of sewer to be tested shall have been trench backfilled and cleared. The section of sewer to be tested shall be sealed by inserting inflatable rubber bags in the pipes or by other means approved by the ENGINEER, and then water shall be introduced into a manhole until the section is completely filled. The CONTRACTOR shall fill the pipe to the test level prior to the time of exfiltration testing to permit normal absorption into the pipe walls as recommended by the manufacturer.

Throughout the test period of at least one (1) hour, the water level in the upper manhole shall be maintained at least twenty-four (24) inches (600 mm) above the crown of the upper end of the pipe or at least twenty-four (24) inches (600 mm) above the ground water table, whichever is higher. The length of pipe tested shall be limited so that the pressure on the centerline of the lower end of the section tested shall not exceed six (6) feet (1.80 m) of water column.

Exfiltration leakage shall not exceed 240 gallons per inch of pipe diameter per mile per day (22.2 liters per millimeter of pipe diameter per kilometer per day) of sewer pipe, including manholes in the test section.

Where the pipe fails to meet or exceed the minimum test requirements, the CONTRACTOR shall remedy the failure to the satisfaction of the ENGINEER and OWNER and retest.

- B. Infiltration Method Procedures: The section of sewer to be tested shall have been trench backfilled and cleared. The tests shall be conducted by inducing infiltration conditions by jetting the sewer trench for a sufficient length of time to insure that the water level in the trench is a minimum of twenty-four (24) inches (600 mm) over the crown of the sewer pipe at the upper end of the pipe. The test must be performed before existing sewers are connected and before sewage flow is allowed in the sewers.

Infiltration flow shall be measured by a 90 degrees V notch weir with free fall discharge or other means acceptable to the ENGINEER. Infiltration leakage shall not exceed 200 gallons per inch of pipe diameter per mile per day (18.5 liters per millimeter of pipe diameter per kilometer per day) of sewer pipe, including manholes in the test section.

Where the pipe fails to meet or exceed the minimum test requirements, the CONTRACTOR shall remedy the failure to the satisfaction of the ENGINEER and OWNER and retest.

- C. Air Testing Method Procedures: The section of sewer to be tested shall have been trench backfilled and cleared. Pneumatic plugs (having a sealing length equal to or greater than the diameter of the pipe to be tested) placed in both ends of the pipe to be tested shall be inflated to twenty-five (25) psig (170 kPag). The sealed sewer pipe shall then be pressurized to four (4) psig (27.5 kPag) above the average back pressure of ground water over the sewer pipe and the air pressure allowed to stabilize for at least two minutes.

After the stabilization period the line shall be pressurized to 3.5 psig (24 kPag) and the time in minutes measured for pressure to drop to 2.5 psig (17 kPag). If ground water is present, the air pressure within shall be increased to 3.5 psig (24 kPag) above the level of the ground water and the drop of one (1) pound psig (7 kPag) of air pressure measured in minutes.

Air testing techniques shall be in accordance with the ASTM F 1417 (plastic), ASTM C 828 (clay), ASTM C 924 (concrete), or latest standard practice for testing sewer lines by low-pressure air test method for the appropriate pipe material for which no ASTM air testing standard exists.

Air leakage test results shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified in the appropriate testing standards for each pipe material or the manufacturer's recommended limits, whichever is more stringent.

Where the pipe fails to meet or exceed the minimum test requirements, the CONTRACTOR shall remedy the failure to the satisfaction of the ENGINEER and OWNER and retest.

- D. Deflection Testing for Flexible Pipe Materials: The pipe line shall be tested for excess deflecting by pulling a "go - no go" mandrel through the pipe line from manhole to manhole. The mandrel should be sized as specified in the Special Provisions. A "deflectometer" may also be used to check and record deflections. Wherever possible and practical, the testing shall initiate at the downstream lines and proceed towards the

upstream lines. Where deflection is found to be in excess of allowable testing limits, the CONTRACTOR shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found. The line shall then be retested for deflection. However, should after the initial testing the deflected pipe fail to return to the original size (inside diameter), the line shall be replaced.

Deflection limits for flexible pipe materials shall not exceed the manufacturer's recommended deflection limits or a maximum of 5.0% of the internal diameter of the pipe, whichever is more stringent.

31-2 MEASUREMENT

For payment purposes, the length of sanitary sewers installed will be measured along the centerline. No deductions in length will be made for tees, fittings or manholes. Where a change in sewer size is involved, it shall be assumed for measurement purposes that each sewer entering the manhole extends to the center of the manhole. Where sanitary sewers are connected to special structures, the length of sanitary sewer for measurement purposes shall extend to the nearest inside wall of the special structure.

Where a depth of sanitary sewer is indicated on the bid item it shall be construed to mean the depth from the top of the existing surface to the invert of the sewer.

Where no depth is stated in the bid item for a particular size and type of sanitary sewer, the CONTRACT unit price for all sanitary sewer of such a size and type will be based upon constructing sanitary sewer of that size and type to the depths shown on the Plans. Where a change in the alignment or grade, ordered by the ENGINEER, causes a change in depth of sewer and the bid item does not state a depth, measurement of quantity for any addition or deduction in excavation work caused by the changes ordered will be made in cubic yards (cubic meters) and will be computed by using the average difference in depth between that shown on the plans and that ordered by the ENGINEER, the maximum trench width specified for the top of pipe and the actual length of sewer where the change is involved.

Measurement for "Tees, Fittings, and Service Risers" will be per each for each size, class and type as constructed.

31-3 PAYMENT

Payment for sanitary sewers will be made at the CONTRACT unit price for "Sanitary Sewers" of the size, type and depth indicated on the bid item. Where no depth is indicated on the bid item, payment will be made at the CONTRACT unit price for the size and type indicated. The cost of all items of construction not specifically listed for separate payment shall be included as an incidental expense in the CONTRACT price for "Sanitary Sewers."

Payment for tees and fittings will be at the CONTRACT unit price for "Tees and Fittings" per each of the size, class and type. No additional compensation will be allowed for providing the cap or plug. The CONTRACT unit price for "Service Risers" includes the cost of the tee, 45° bend, and plug. Payment for "Service Risers" will be at the CONTRACT unit price per foot (per meter) for each size, class and type for pipe measured vertically in place.

END OF SECTION 31