

SECTION 3200 ACCEPTANCE TESTS FOR SANITARY SEWERS

3201 SCOPE. This section governs the furnishing of all labor, equipment, tools and materials, and the performance of any or all acceptance tests as required by the Plans, Special Provisions, and these specifications.

3202 ACCEPTANCE TESTS FOR GRAVITY SEWERS.

A. Visual Inspection

1. Contractor shall clean pipe of excess mortar, joint sealant and other dirt and debris prior to inspection.
2. Sewer shall be inspected by running a T.V. camera the full length of the line and recording on audio/visual media compatible with WinCan software or approved equal, recording shall be retained by the City. Correct defects as determined by T.V. inspection including the presence of any misaligned, displaced, or broken pipe and the presence of visible infiltration or other defects. Sewer lateral locations shall be identified on the recording by distance from a manhole.
3. Correct defects as required. Any section with defects shall be re-inspected as set forth in paragraph 2.

B. Leakage Tests. A leakage test shall be performed on the full length of all sewer lines prior to acceptance.

1. Exfiltration Leakage Test.

- a. Contractor may perform leakage testing by exfiltration on sewer pipe larger than eighteen (18) inches I.D.
- b. Furnish all labor, equipment, tools and materials required including bulkheads, water and all miscellaneous items required to perform the tests.
- c. Test all sewer pipe over eighteen (18) inches I.D. after either the completed backfill or partial backfill sufficient to stabilize the position of the pipe in both alignment and grade is accomplished. Contractor may select section of the project for testing at any time by notifying the Engineer in advance.
- d. Perform at depths of ground water of not less than two (2) feet nor more than ten (10) feet as measured above center line of pipe or adjacent water table, whichever is higher.
- e. Maintain test as necessary to locate all leaks, but not less than two hours.

- f. Repeat as necessary after repair of leaks and defects until leakage, as measured, does not exceed 0.80 gallons per inch of internal diameter per hour per 1000 feet of pipe length (100 gal/inch of I.D./day/mile).
- g. Protect manholes and other structures by means of bulkheads to prevent bursting pressures from being applied inside the structure.
- h. De-water pipe upon completion of testing.

2. Air Leakage Testing.

- a. Contractor shall perform air tests on all pipe 18” and smaller, and may perform air tests for all pipe sizes larger than 18”.
- b. Furnish all facilities required including necessary piping connections, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over pressurization, and all miscellaneous items required.

(1) The pipe plug for introducing air to the sewer line shall be equipped with two taps. One tap will be used to introduce air into the line being tested, through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valve and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. An additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.

(2) The pressure test gauge shall meet the following minimum specifications:

Size (diameter)	4-1/2 inches
Pressure Range	0-15 P.S.I.
Figure Intervals	1 P.S.I. Increments
Minor Subdivisions	0.05 P.S.I.
Pressure Tube	Bourdon Tube or Diaphragm
Accuracy	+/- 0.25% of maximum scale reading
Dial	White coated aluminum with black lettering, 270 deg. Arc and mirror edge.
Pipe Connection	Low Male 1.2" N.P.T.

Calibration data will be supplied with all pressure test gauges. Certification of pressure test gauge will be required from the gauge manufacturer. This certification data shall be up to date (within 1 year from test) will be available when tests are performed

- c. Test each reach of sewer pipe between manholes after completion of the installation of pipe and appurtenances and the backfill of sewer trench.
- d. Plug ends of line and cap or plug all connections to withstand internal pressure. One of the plugs provided must have two taps for connecting equipment. After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig. After reaching 4.0 psig throttle the air supply to maintain between 4.0 and 3.5 psig for at least two (2) minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressured is allowed to decrease to 3.5 psig. At 3.5 psig, begin timing to determine the time required for pressure to drop from 3.5 psig to 2.5 psig. If the time, in seconds, for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the table below, the pipe shall be presumed free of defects.

<u>Pipe size</u>	<u>Required Time per 100 LF</u>	<u>Maximum Required Time</u>
8"	70 sec	227 sec
10"	110 sec	283 sec
12"	158 sec	340 sec
15"	248 sec	425 sec
18"	356 sec	510 sec
21"	485 sec	595 sec
24"	634 sec	680 sec
27"	765 sec	765 sec
30"	851 sec	851 sec
33"	935 sec	935 sec
42"	1050 sec	1050 sec
48"	1100 sec	1100 sec

Sizes above 48" I.D. shall not be tested by air

If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired. Prior to acceptance all constructed sewer lines shall satisfactorily pass the low pressure air test.

- e. The height of groundwater above pipe in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings.

C. Deflection Tests. A deflection test shall be required on all installations after pipe has been laid and backfilled. The deflection test shall take place no sooner than 30 days after said pipe has been laid and backfilled. The maximum allowable deflection shall

not exceed 5.0% of the pipe's internal diameter.

The rigid ball or mandrel used for the deflection test shall have a diameter not less than ninety-five percent (95%) of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices. A mandrel must have nine (9) or more odd number of flutes or points. The deflection test shall consist of guiding such a device of the appropriate size for the pipe involved to accurately measure any deflection in the pipe. The device to be used shall be approved by the City Engineer prior to its use. Attention is directed to the fact that the pipe's nominal diameter is greater than the actual internal diameter of the pipe.

Upon completion of the testing, all piping showing a deflection greater than 5.0% shall be excavated, replaced, backfilled, and retested to the satisfaction of the Engineer.

3203 ACCEPTANCE TESTS FOR PRESSURE SEWAGE FORCE MAINS.

- A. Perform hydrostatic pressure and leakage tests. Conform to AWWA C 600 procedures as modified herein. Test shall apply to all pressure sewers. Perform after backfilling.
- B. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs. Select test segments such that adjustable seated valves are isolated for individual checking. Contractor shall furnish and install test plugs at no additional cost to the Owner, including all anchors, braces, and other devices to withstand hydrostatic pressure on plugs. Contractor shall be responsible for any damage to public or private property caused by failure of plugs. Limit fill rate of line to available venting capacity.
- C. Pressure Test. Conduct at 1.5 time maximum operating pressure determined by the following formula:

$$P_{pt} = 0.650 (OP-GE), \text{ in which}$$

P_{pt} = test pressure in psi at gauge elevation

OP = the highest elevation of each section of the line in feet

GE = elevation of the gauge in feet.

3204 ACCEPTANCE TEST FOR MANHOLES:

- A. Visual Inspection.

All precast concrete manholes shall be visually inspected to determine the presence of misaligned, displaced, broken manhole sections or other physical defects. All defects shall be satisfactorily corrected prior to conducting vacuum leakage tests.

- B. Vacuum testing procedure: Vacuum testing, if specified for concrete sewer manholes, shall conform to the test procedures in ASTM C1244 or the

manufacturer's recommendation.

All vacuum tests on concrete sewer manholes shall be performed according to ASTM C1244 procedures, as modified herein. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation. A vacuum of at least ten and one half (10 1/2) inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum drop from ten (10) inches to nine (9) inches.

The manhole shall pass if the time is greater than one and one half (1 1/2) minutes for a forty eight (48) inch diameter manhole, two (2) minutes for sixty (60) inch manholes and two and one half (2 1/2) minutes for seventy two (72) inch manholes.

If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. If the joint mastic or gasket is displaced during the vacuum testing, the manhole shall be disassembled, the seal replaced and the manhole retested.