

SECTION 039
SPECIFICATIONS - INSPECTION AND TESTING OF SEWERS

Constructed sewers shall be tested in conformance with the following specifications.

1.0 Gravity Sewers

After the Contractor constructs and cleans of the sewer the Engineer shall inspect all sanitary sewers, appurtenances, and work procedures prior to the final acceptance of the Project.

All sewers shall be visually inspected for conformance to line and grade. The Engineer, with the assistance of the Contractor, shall also subject the sewers to testing for infiltration and/or leakage. The Contractor shall notify the Engineer when the work is ready for inspection and testing. The Contractor shall furnish all labor, equipment and materials as required to complete the testing.

As required by the Engineer, sewers & manholes shall be tested using the following methods: exfiltration of water; infiltration of water; pressure testing using compressed air; closed circuit televising of the interior of sewer pipes; and deflection testing of flexible-type pipe. The method or combination of methods to be used shall be approved by the Engineer. Air testing shall be the basic standard of acceptance testing; however, the Engineer may require that sections of sewers and manholes be tested using infiltration or exfiltration methods.

1.1 Testing Procedures and Requirements

Before the commencement of testing, all wyes, tees, and stubs shall be sealed with Cherne Gripper Mechanical Plugs or approved equal. Testing procedures shall conform to the following:

- (1) **Exfiltration of Water Procedure:** Prior to testing, the section of sewer to be tested shall have been trench backfilled. The section of sewer to be tested shall be sealed by inserting inflatable rubber bags into 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. 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 above the crown of the upper end of the pipe or at least twenty-four (24) inches 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 of water column. The exfiltration leakage shall not exceed 240 gallons per inch of pipe diameter per mile per day of sewer pipe, including manholes in the test section;
- (2) **Infiltration of Water Procedure:** Prior to testing, the section of sewer to be tested shall have been trench backfilled. Infiltration testing 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 over the crown of the sewer pipe. The test must be performed before existing sewers are connected and before sewage flow is allowed into the sewers. Infiltration leakage shall not exceed 200 gallons per inch of pipe diameter per mile per day of sewer pipe, including manholes in the test section;
- (3) **Procedure for Pressure Testing using Compressed Air:** Prior to testing, the section of sewer to be tested shall have been trench backfilled. Pneumatic plugs, having a sealing length equal to or greater than the diameter of the pipe to be tested and placed in both ends of the

pipe to be tested, shall be inflated to twenty-five (25) psig. The sealed sewer pipe shall then be pressurized to four (4) psig above the average back pressure of ground water over the sewer pipe. The air pressure shall then be allowed to stabilize for at least two (2) minutes. After the stabilization period the line shall be pressurized to 3.5 psig and the time measured in minutes and seconds until the pressure drops to 2.5 psig. Air leakage shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified below:

MINIMUM AIR TEST TIME FOR VARIOUS PIPE SIZES

(Per Standard Specifications for Water & Sewer Main Construction in Illinois, Fifth Edition, May, 1996)

**SPECIFICATION TIME (min: sec) REQUIRED FOR PRESSURE DROP FROM
3 ½ TO 2 ½ PSIG WHEN TESTING ONE PIPE DIAMETER ONLY**

Length of Sewer Pipe (ft)	4 (in.)	6 (in.)	8 (in.)	10 (in.)	12 (in.)	15 (in.)	18 (in.)	21 (in.)	24 (in.)
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30		
175	0:31	1:09	2:03	3:13	4:37	7:05			
200	0:35	1:19	2:21	3:40	5:17				12:06
225	0:40	1:29	2:38	4:08	5:40			10:25	13:36
250	0:44	1:39	2:56	4:35			8:31	11:35	15:07
275	0:48	1:49	3:14	4:43			9:21	12:44	16:38
300	0:53	1:59	3:31				10:12	13:53	18:09
350	1:02	2:19	3:47			8:16	11:54	16:12	21:10
400	1:10	2:38			6:03	9:27	13:36	18:31	24:12:00
450	1:19	2:50			6:48	10:38	15:19	20:50	27:13:00
500	1:28			5:14	7:34	11:49	17:01	23:09	30:14:00

- (4) Deflection Testing Procedure: All gravity sewers constructed of flexible piping materials shall be tested for deflection. The deflection tests shall not be performed prior to thirty (30) days after installation and backfilling of the sewer trench. Deflection testing shall be performed by either using a deflectometer or by pulling a mandrel or rigid ball through the pipeline. The diameter of the device shall be ninety-five (95) percent of the un-deflected inside diameter of the pipe. Deflection testing shall be performed without mechanical pulling devices. Whenever possible, the testing shall initiate at the downstream manhole and proceed upstream.

Where the deflection is found to be in excess of five (5) percent, the Contractor shall excavate to the point of excess deflection, remove the excessive deflection from the installed pipe and carefully re-compact bedding and backfill materials around the repaired pipe. The line shall then again be re-tested for excessive deflection. After subsequent testing, should the pipe continue to exhibit unacceptable deflection, the line shall be replaced by the Contractor at no additional cost to the District.

2.0 Force Main Sewers

After the Contractor constructs and cleans force main pipe, the Engineer shall inspect all sewer piping and appurtenances and work procedures prior to the final acceptance of the project. Force main piping shall be visually inspected for line and consistent grades.

Force main pipe shall be tested in accordance with the current Standard Specifications for Water and Sewer Main Construction in Illinois, most recent edition, for pressure test and leakage test of water mains. Prior to pressure testing pipe used to construct pressure pipe applications, the portion of the line being pressure tested shall be complete with all necessary thrust blocks and temporary end blocking in place.

Regarding the frequency of pressure testing, when force main pipe is constructed using excavation methods, pressure testing shall be performed at intervals of constructed pipe no greater than four-hundred feet (400'); when force main pipe is constructed using horizontal directional drilling (HDD) methods, pressure testing shall be performed after the construction of pipe and prior to any connections of fittings, couplings, structures, pipe, etc., to the same.

3.0 Repairing Leaks

When infiltration or exfiltration occurs in excess of the specified amounts, defective pipe or joints shall be located and repaired at the expense of the Contractor. If defective portions cannot be located, the Contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a sewer within the allowable infiltration limits. All methods for repairing defects shall be approved by the Engineer.

END OF SECTION