SECTION 330505.33 - INFILTRATION AND EXFILTRATION TESTING

This section specifies infiltration and exfiltration testing of gravity sewer piping and manholes.

This section includes performance, proprietary, and descriptive specifications. Edit to avoid conflicting requirements.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Testing of Gravity Sewer Piping:

Exfiltration testing.

Infiltration testing.

Testing of Manholes: Exfiltration testing.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Submit following items prior to start of testing:

Testing procedures.

List of test equipment.

Testing sequence schedule.

Provisions for disposal of flushing and test water.

Certification of test gage calibration.

* + - * 1. Test and Evaluation Reports: Indicate results of manhole and piping tests.
				2. Qualifications Statement:

Coordinate following subparagraph with requirements specified in qualifications article.

Submit qualifications for applicator.

* + - 1. QUALITY ASSURANCE

Include this article to specify compliance with overall reference standards affecting products and installation included in this section.

* + - * 1. Perform Work according to [**ASTM**] standards.
			1. QUALIFICATIONS

Coordinate following paragraph with requirements specified in submittals article.

* + - * 1. Applicator: Company specializing in performing Work of this Section with minimum [**three**] years' [**documented**] experience.
1. PRODUCTS

Generally, vacuum testing rather than exfiltration testing is performed on manholes because it is less expensive. Delete following article if exfiltration testing is not used.

* + - 1. EXFILTRATION TESTING
				1. Equipment:

Plugs.

Pump.

Measuring device.

* + - 1. INFILTRATION TESTING
				1. Equipment: Weirs.
1. EXECUTION
	* + 1. EXAMINATION
				1. Verify that manholes and piping are ready for testing.
				2. Verify that trenches are backfilled.
				3. Satisfactorily complete lamping of gravity piping prior to testing.
			2. PREPARATION
				1. Plugs:

Plug outlets, wye branches, and laterals.

Brace plugs to resist test pressures.

* + - 1. FIELD QUALITY CONTROL
				1. Notify and coordinate with the Director’s Representative a minimum of 48-hours before testing.
				2. Exfiltration Testing of Pipes Larger Than 36 Inches in Diameter:

Perform exfiltration testing not exceeding 100 gal. for each inch of pipe diameter for each mile per day for each reach of piping undergoing testing.

Perform testing with minimum positive head of 2 feet.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Consider using infiltration testing only when gravity piping is submerged in minimum of 4 feet of ground water above crown of pipe for entire length being tested.

* + - * 1. Infiltration Testing:

Maximum Allowable Infiltration: 100 gal./in. of pipe diameter for each mile per day for reach of piping undergoing testing.

Include allowances for leakage from manholes.

Perform testing with minimum positive head of 2 feet.

* + - * 1. Manhole Testing:

Repair both outside and inside of joint to ensure permanent seal.

Test manholes with manhole frame set in place.

Plug pipes in manhole.

Remove water from manhole.

Observe plugs over period of not less than two hours to ensure that there is no leakage into manhole.

Determine ground water level outside manhole.

Fill manhole with water within 4 inches of top of cover frame.

Prior to testing, allow manhole to soak from minimum of four hours to maximum of 72 hours.

After soak period, adjust water level inside manhole to within 4 inches of top of cover frame.

Measure water level from top of manhole frame.

At end of four-hour testing period, again measure water level from top of manhole frame; compute drop in water level during testing period.

Manhole exfiltration test is considered satisfactory when drop in water level is less than following:

Edit out manhole depths that are not project applicable.

Manhole Depth of 4 Feet:

Diameter of 4 feet: 0.11 inch.

Diameter of 5 feet: 0.14 inch.

Diameter of 6 feet: 0.17 inch.

Manhole Depth of 6 Feet:

Diameter of 4 feet: 0.17 inch.

Diameter of 5 feet: 0.21 inch.

Diameter of 6 feet: 0.26 inch.

Manhole Depth of 8 Feet:

Diameter of 4 feet: 0.23 inch.

Diameter of 5 feet: 0.29 inch.

Diameter of 6 feet: 0.35 inch.

Manhole Depth of 10 Feet:

Diameter of 4 feet: 0.28 inch.

Diameter of 5 feet: 0.35 inch.

Diameter of 6 feet: 0.42 inch.

Manhole Depth of 12 Feet:

Diameter of 4 feet: 0.34 inch.

Diameter of 5 feet: 0.43 inch.

Diameter of 6 feet: 0.51 inch.

Manhole Depth of 14 Feet:

Diameter of 4 feet: 0.40 inch.

Diameter of 5 feet: 0.50 inch.

Diameter of 6 feet: 0.60 inch.

Manhole Depth of 16 Feet:

Diameter of 4 feet: 0.45 inch.

Diameter of 5 feet: 0.56 inch.

Diameter of 6 feet: 0.68 inch.

Manhole Depth of 18 Feet:

Diameter of 4 feet: 0.51 inch.

Diameter of 5 feet: 0.64 inch.

Diameter of 6 feet: 0.77 inch.

Manhole Depth of 20 Feet:

Diameter of 4 feet: 0.57 inch.

Diameter of 5 feet: 0.71 inch.

Diameter of 6 feet: 0.86 inch.

Manhole Depth of 22 Feet:

Diameter of 4 feet: 0.62 inch.

Diameter of 5 feet: 0.78 inch.

Diameter of 6 feet: 0.93 inch.

Manhole Depth of 24 Feet:

Diameter of 4 feet: 0.68 inch

Diameter of 5 feet: 0.85 inch.

Diameter of 6 feet: 1.02 inch.

Manhole Depth of 26 Feet:

Diameter of 4 feet: 0.74 inch.

Diameter of 5 feet: 0.93 inch.

Diameter of 6 feet: 1.11 inch.

Manhole Depth of 28 Feet:

Diameter of 4 feet: 0.79 inch.

Diameter of 5 feet: 0.99 inch.

Diameter of 6 feet: 1.19 inch.

Manhole Depth of 30 Feet:

Diameter of 4 feet: 0.85 inch.

Diameter of 5 feet: 1.06 inch.

Diameter of 6 feet: 1.28 inch.

If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.

Repair visible leaks regardless of quantity of leakage.

END OF SECTION 330505.33