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Introduction

This report documents the test results witnessed by MGA Research Corporation (MGA) for Underground Technologies (UGT) on January 31, 2008. This test was conducted at the Underground Technologies facility located at 2546 Elliot Ave. Troy, MI 48083.

Test Procedure/Preparation

Statement of test set-up and preparation prepared by Underground Technologies personnel as follows:

1. MANHOLE VACUUM TESTING

- a) The CONTRACTOR shall provide all labor and equipment for vacuum testing.
- b) All manholes are to be vacuum tested following backfill and compaction. The ring and lid casting assembly shall be installed prior to testing. The testing equipment shall consist of a gasoline-powered vacuum pump with sufficient vacuum hose length and a test head of proper size to fit the inside opening of the manhole. The test head shall be equipped with an inflatable rubber bladder to affect the seal to the manhole, an air pressure gauge, and a safety valve for filling the bladder, a 30 inch Hg liquid-filled vacuum gauge, a double air exhaust manifold with quarter turn ball valves, three bolt-on feet, and a bridge assembly with height adjustment rod.
- c) CONTRACTOR shall plug all pipe openings, taking care to securely brace the plugs and the pipe. The plugs shall be placed a minimum of 6 feet beyond the manhole wall.
- d) With the vacuum tester in place, inflate the compression to affect a seal between the vacuum base and the structure. Connect the vacuum pump to the outlet port with the valve open and evacuate the manhole to 10 inches Hg (0.3 bar) for 48 inch diameter manholes and 5 inches Hg (0.15 bar) for 60-inch and greater diameter manholes.
- e) Close vacuum inlet/outlet ball valve, disconnect the vacuum pump, and monitor the vacuum for the specified time period. **If the vacuum does not drop in excess of 1 inch Hg over the specified time period, the manhole is considered acceptable passes the test.** If the manhole fails the test, identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Once the leaks have been identified, complete all necessary repairs by sealing the leaks of the manhole to the satisfaction of the PROGRAM MANAGER, and repeat test procedures until satisfactory results are obtained.

Vacuum Test Timetable

Depth of Manhole (Ft)	Manhole Diameter (Inches)		
	48"	60"	72"
4'	10 sec.	13 sec.	16 sec.
8'	20 sec.	26 sec.	32 sec.
12'	30 sec.	39 sec.	48 sec.
16'	40 sec.	52 sec.	64 sec.
20'	50 sec.	65 sec.	80 sec.
24'	60 sec.	78 sec.	96 sec.
*	5.0 sec.	6.5 sec.	8.0 sec.

*Add extra testing time "T", for each additional 2 foot depth. (The values listed above have been extrapolated for **ASTM designation C924-85**.)

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The vacuum test was performed at Underground Technologies facilities in Troy Michigan. The fixture consisted of a fabricated base which a concrete cone section attached and sealed to the base. UGT's Secure-n-Seal was installed on the first ring and was placed on the cone; sealant side down. The next ring was placed on top of the prior ring without sealant. The top surface of the ring was caulked with 2 beads of UGT's Secure-n-Seal product. The manhole frame was then installed.

The assembly was then coated by using UGT's Veil Safe Product. This was a two part liquid that was mixed and poured on the frame and painted down the sides of the rings and dripping on to the cone. The material solidified and the test fixture was ready to test.



The structure is a 48" diameter and the depth of the hole was measured at 28" and compared with the prior table. The table doesn't have a structure that is less than 4 feet the test will be run at this setting.

Test Procedure:

Connect the vacuum pump to the outlet port with the valve open and evacuate the manhole to 10 inches Hg (0.3 bar)

Close vacuum inlet/outlet ball valve, disconnect the vacuum pump, and monitor the vacuum for the specified time of 10 seconds.

Monitor vacuum gauge to determine the loss over the 10 seconds..



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MGA personnel test witness statements:

1. The vacuum pump was connected to the outlet port with a valve open and the manhole cavity as evacuated to 10" Hg (0.3 bar).
2. The output ball valve was closed, and the stop watch was triggered.
3. The Winters vacuum gauge was monitored at 10 seconds, and the results were recorded.

Test Results

	Vacuum Gauge reading after 10 seconds	Change in vacuum after 10 Seconds	Time elapsed until loss of 1" Hg
Trial #1	9.5" Hg	0.5" Hg	21.1 Seconds
Trial #2	9.5" Hg	0.5" Hg	21.0 Seconds

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