



**LAW**

ENGINEERING AND ENVIRONMENTAL SERVICES

February 7, 1996

Mr. Craig Williams  
American Step  
830 East Broadway  
Griffin, Georgia 30224

Subject: Manhole Step Testing  
Griffin, Georgia  
LAW Project Number: 50163-6-9921

Dear Mr. Williams:

Law Engineering & Environmental Services, Inc. (LAW) has completed testing of four manhole step types in accordance with our Work Authorization Sheets (WAS) dated January 24, 1996 and January 29, 1996. The purpose of this testing was to determine if the four types of manhole steps (ML10, ML11, I11 and ML13) supported the loads required by American Society for Testing and Materials (ASTM). The ML 10 was also tested for Australian Standard (AS) compliance. Testing was performed on January 25, 1996 and January 31, 1996.

**Test Procedures**

Two of each of the steps were tested in accordance with the ASTM C 478-94 *Standard Specification for Precast Reinforced Concrete Manhole Sections*, which requires a vertical load of 800 pounds with a maximum permanent deflection of 0.500 inches and a horizontal load of 400 pounds with no permanent deflection. Section 13.6.1 referred to Section 10 of the ASTM Test Method C 497-94a for the actual testing procedures to use.

A horizontal pull-out test was performed by placing a previously calibrated hydraulic ram behind each step and applying a force until the step was unable to maintain the load that was being applied. The load from the ram was spread across a 3.5 inch length of the step.

The ML 10 steps were tested in a dry-cast manhole with standard production holes reportedly formed during manufacturing to accommodate three steps, manufacturing date 1/19/96. In addition to ASTM testing, the ML 10 steps were tested in accordance with sections 2.1.2.5 and 5.7.2 of AS 1657-1992 *Fixed platforms, walkways, stairways and ladder-Design, construction and installation*, which requires maximum vertical load of 1 kilonewton or 225 pounds and a maximum vertical deflection of 3 millimeters or 0.118 inches.

The ML 11 steps were tested in a wet-cast manhole with standard production holes reportedly formed during manufacturing to accommodate two steps, manufacturing date 1/19/96.

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The I 11 steps were tested in a wet-cast manhole with standard production plastic square inserts which were placed in during manufacturing to accommodate two steps, manufacturing date 1/19/96.

The ML 13 steps were tested in the same dry-cast manhole as the ML 10. Craig Williams of American Step drilled four, one-inch diameter holes, opposite from the ML 10 production holes, with a rotary hammer drill to accommodate two ML 13 steps.

LAW did not observe fabrication of any of the manholes that were tested.

**TEST RESULTS**

The table below summarizes the test results with a pass/fail evaluation of each step based on ASTM requirements.

SAMPLE TYPE	TESTING RESULTS		ASTM REQUIREMENTS		PASS/FAIL
	Horizontal Set (in)	Vertical Set (in)	Horizontal Set Max. (in)	Vertical Set Max. (in)	
ML 10					
Sample 1	0.000	0.064	0.000	0.500	PASS
Sample 2	0.000	0.062	0.000	0.500	PASS
ML 11					
Sample 1	0.000	0.071	0.000	0.500	PASS
Sample 2	0.000	0.105	0.000	0.500	PASS
I 11					
Sample 1	0.000	0.075	0.000	0.500	PASS
Sample 2	0.000	0.075	0.000	0.500	PASS
ML 13					
Sample 1	0.000	0.132	0.000	0.500	PASS
Sample 2	0.000	0.092	0.000	0.500	PASS

The following table presents the results of the maximum load sustained during the horizontal testing.

SAMPLE TYPE	HORIZONTAL LOADING PULL-OUT FORCE (lbf)
ML 10	
Sample 1	1973
Sample 2	2038
ML 11	
Sample 1	2499
Sample 2	1841
I 11	
Sample 1	2630
Sample 2	2893
ML 13	
Sample 1	3288
Sample 2	3945

The following table presents the results of the Australian Standard testing.

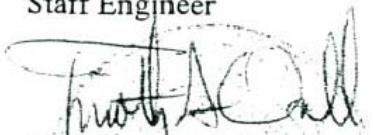
SAMPLE TYPE	TESTING RESULTS		AS REQUIREMENTS		PASS/FAIL
	Vertical Deflection (mm)	Vertical Deflection (in)	Vertical Deflection Max. (mm)	Vertical Deflection Max. (in)	
ML 10					
Sample 1	2.29	0.090	3.000	0.118	PASS
Sample 2	2.46	0.097	3.000	0.118	PASS
Sample 3	2.34	0.092	3.000	0.118	PASS
Sample 4	2.39	0.094	3.000	0.118	PASS
Sample 5	2.34	0.092	3.000	0.118	PASS
Sample 6	2.36	0.093	3.000	0.118	PASS
Sample 7	2.49	0.098	3.000	0.118	PASS
Sample 8	2.46	0.097	3.000	0.118	PASS
Sample 9	2.31	0.091	3.000	0.118	PASS
Sample 10	2.31	0.091	3.000	0.118	PASS
<b>AVERAGE</b>	<b>2.38</b>	<b>0.094</b>	<b>3.000</b>	<b>0.118</b>	<b>PASS</b>

LAW was pleased to serve you on this project and we look forward to fulfilling your future engineering needs. If you should have any questions or comments about this testing please do not hesitate to call us at (404) 873-4761.

Sincerely,  
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.



Darron V. Edens  
Staff Engineer

  
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Principal Engineer

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