CONSTRUCTION MATERIALS SERVICES, INC.
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May 21, 2009

American Step Company
Mr. Craig Williams
830 East Broadway
P.O. Box 137
Griffin, Georgia 30223

Re: American Step Company, Inc.
Lift Device – Product Evaluation Round 4
CMS # 09086

Dear Mr. Williams,

As authorized by you, Construction Materials Services, Inc. (CMS) has observed test prism fabrication with lift device installation, tested prism concrete, and performed the requested lifting device load testing on twenty eight separate lifting device systems for the American Step Company, Inc. (ASC). The primary purpose of this testing was to determine safe load ratings for the specified systems. This report describes the systems tested and presents the testing procedures, our observations, and the load test results.

If you have any questions, please contact me at (770) 914-1744.

Respectfully submitted,

Andrew Johnson, P.E.
President

AJ:mg

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LIFTING DEVICE SYSTEMS

Thirty-one different lifting device/systems were fabricated with twenty eight being actually tested in this evaluation; using a total of twenty four rectangular concrete test prisms. The lifting devices fall into one of the following three categories:

A. LEWRLS - Lift Eye Wire Rope Loop (or non-looped/Swaged) Systems
B. Pulling Irons/ Lift Cables – Consisting of 270 kip, 7 – wire, PC Strands
C. Utility Anchors

Each of the lifting devices was made/fabricated by ASC except for Test Specimen No. 17. Test Specimen No. 17 is a China Anchor (CA) and was made in, and imported from, China. The tables in **Appendices 1 and 2** of this report detail the various lift device types along with their corresponding test specimen numbers and test types (i.e. shear or tension).

We understand that the manufacturer of the wire rope (Category A, above) has provided ASC with mill certificates for the wire rope used in the testing. We also understand that the steel in the remaining lift devices used in the testing (Categories B and C, above) has mill certificates. Each of these certificates can be viewed by contacting ASC.

During normal application of the subject lifting devices, the devices will be embedded into pre-cast Portland Cement Concrete (PCC) members while the PCC is in the plastic state, for the purpose of lifting the pre-cast member once cured. The various lifting devices and the diagrams of their dimensions, embedments, etc. are illustrated in the photographs in **Appendix 5** and/or detailed schematically on drawings in **Appendix 3**. For pre-cast concrete items requiring steel reinforcement, the lifting device is to be integrated into the pre-cast member such that the steel reinforcement of the member shall be placed through or tied to the loop or leg during member fabrication. With regards to the subject load testing, only the concrete test prism for test specimen No. 4 called for actual reinforcing steel. This lift device was integrated into the reinforcing steel as detailed in the diagram in **Appendix 3**.

RECTANGULAR CONCRETE TEST PRISMS

As detailed by ASC, in order to perform the requested load testing, each of the various lifting devices was encased into cast-in-place rectangular, concrete prisms (test blocks). The forms for the testing were constructed by ASC at their facility in Griffin, Georgia. Each concrete test prism except the prisms for test specimen Nos. 1(1), 1(2), 2, 4, and 5 were fabricated with perimeter steel reinforcement placed only to attempt to improve the test prisms' resistance to the four legged point loading imposed by the load testing apparatus. This prism test reinforcement is made up of six number four, grade 60, square shaped reinforcing steel frames. The individual rebar that make up each square frame is

welded or bent (90 degrees) at all four corners. The three topmost horizontal rebar frames form concentric squares on about 1 ½- to 2 ½-inch spacing, beginning about one to two inches from the outside edges of the concrete test prisms. The three additional vertically placed rebar frames are each the same size and are spaced approximately on 4- to 5-inch vertical spacing; each about two inches from the outside edges of, and beginning about two inches from the top of, the concrete test prisms.

As noted in the previous section of this report, the prism for Test Specimen No. 4 was the only test prism that was fabricated with actual reinforcing steel (not reinforcing steel placed only for testing purposes). This reinforcement is a bottom rebar mat made up of four number four bars (each direction) equally spaced and about two inches clear of the bottom of the concrete test prism. The outermost rebar of the subject rebar mat is about two inches from the four sides of the concrete test prism. **Appendix 3** contains diagrams of each of the lift devices and details the measurements/specifications of the prism construction used in the load testing. As noted, **Appendix 5** contains photographs that show the prism formwork prior to prism concrete placement. The prism fabrication was performed by ASC. The prism fabrication details were observed and "spot checked" by CMS.

Walker Concrete produced and delivered the concrete for the load test prisms from their Griffin, Georgia plant on April 30, 2009. During prism concrete placement, concrete test cylinders were molded from samples of the plastic concrete used for prism fabrication. The compressive strength of the concrete test cylinders was used to determine when to begin load testing of the various lift devices. The concrete mix design product code was specified as "B85NAZ" and our PCC test cylinder compressive strength results can be found in **Appendix 4**. We note that the test cylinders were cast and tested using standard ASTM protocol.

ASC specified that they wanted to load test specimen No. 6 after achieving a concrete strength of 1000 pounds per square inch (psi). Test specimen No. 6 was the first lift device to be load tested (tested mid-afternoon on April 30, 2009) after concrete cylinder testing revealed a concrete test cylinder strength of about 1200 psi. Test specimen No. 7 was the next lift device to be load tested (also tested on April 30, 2009). ASC also specified that they wanted to test this device after achieving a concrete strength of 1000 psi. Cylinder testing just prior to this second load test revealed a concrete test cylinder strength of just over 2000 psi.

ASC specified that they wanted to load test specimen Nos. 5 and 10 after achieving a concrete strength of 2000 psi. Test specimen Nos. 5 and 10 were the third and fourth (final) lift devices to be load tested on April 30, 2009. Test results for each of these tests performed on April 30, 2009 are located in **Appendix 1**.

ASC specified that all remaining test specimen were to be tested after achieving a concrete strength of 4000 psi. Concrete test cylinders tested on May 1, 2009 revealed test cylinder strengths exceeding 4000 psi. Appendix 1 also contains load test results for each of these lift devices tested on May 1, 2009 and May 5, 2009.

TEST CONFIGURATIONS

The load capacity for each of the lifting device systems was determined by engaging the loops formed by the lifting devices imposing a load perpendicular to the top surface of each of the concrete test prisms from which the loading devices were embedded. The load was imposed with a calibrated sixty ton, hollow core jack supported by a four legged metal frame, which reacted against the top of the concrete prism surfaces. The jack, ram and pressure gauge calibration was checked by our engineers against our CMS calibrated concrete break machine on April 30, 2009 and found to be satisfactory. As the load was applied, the concrete prism surfaces nearest the load devices were observed for evidence of distress. All loads applied for each test was a smooth continuous gradually increasing load to failure. **No dynamic load testing was performed on any test prism and/or loading devise during this round of testing.** The ultimate load capacity (in either the shear condition or the tension condition) was recorded when the lift device system experienced failure. Failure, for our test purposes, was defined as either:

1. Lift device breakage;

2. Lift device pull out with greater than about one inch of lift device displacement (evidenced in tension by the lift device pulling out in a similar fashion to the extraction of a nail from a piece of lumber with a claw hammer) which would not allow any additional, sustained jack loading to occur; or

3. Prism PCC spalling/cracking which would not allow any additional, sustained jack loading to occur.

In each case (for each prism) the failure was rather abrupt and definable. The predominant type failure observed for each lift device is listed in Appendix 1 / Appendix 2. We note that when "pull out" was observed as the failure type, some minor concrete spalling may have occurred, as well. Load test procedures are illustrated in some of the photographs in Appendix 5.

RESULTS

The load test results are summarized in the table in Appendix 1 with some added discussion in the Remarks section of the table in Appendix 2 where deemed appropriate. We note that Test Specimen Nos. 9A (2), 23 (1), and 23 (2) were cast in concrete test prisms for testing, but later it was decided by ASC that it was not necessary to load test them.

CMS appreciates the opportunity to perform this service for American Step Company. If you have any questions concerning this report, please contact us at (770) 914-1744.

Respectfully submitted,

Peyton Thomas Duncan
Project Engineer

Andrew Johnson, P.E.
Company President

Attachments

PTD:AJ

LIST OF APPENDICES

Appendix 1

Load Test Results of Lifting Devices by Type

American Step Company
Load Test Results of Lifting Devices by Type
Tested by Construction Materials Services

Test Specimen Number	Prism Dimensions Length x Width x Ht. (inches)	Date		Lifting Device			Tension, Shear, or Impact Test	Anchor Embed or Recess Depth (inches)	Ultimate Load at Failure (lbs.)	Type Failure
		Fabricated	Tested	LEWRLS Dimensions Dia.x Length (inches)	Pulling Iron/ Lift Cable Dimensions (inches)	Utility Anchor Dia. x Length or Dia. x Length x Width (inches)				
1 (1)	48x48x6	4/30/2009	5/1/2009			ASC 0.25x3.75x9.375	Tension	Embed - 2.25	3,500	Anchor Pull Out
1 (2)	48x48x6	4/30/2009	5/1/2009	0.3125x9.25 L			Tension	Not Recessed	15,500	Concrete
2	48x48x6	4/30/2009	5/1/2009			ASC 0.25x5.25x9.375	Tension	Embed - 3.75	4,500	Anchor Pull Out
3 (1)	48x48x24	4/30/2009	5/1/2009	0.375x11.25 L			Shear	*	16,500	Cable break
3 (2)	48x48x24	4/30/2009	5/1/2009	0.375x18.5 L			Shear	*	22,500	Cable break
3 (3)	48x48x24	4/30/2009	5/1/2009	0.375x18.5 SE			Shear	*	20,000	Cable break
4	48x48x12	4/30/2009	5/1/2009		0.375x5.5x4.5x34		Tension	Not Recessed	20,000	Concrete
5	48x48x14	4/30/2009	4/30/2009		0.375 x 18		Tension	Not Recessed	38,000	Anchor break
6	48x48x12	4/30/2009	4/30/2009			ASC 0.375x8.5 SLL	Tension	Not Recessed	12,000	Anchor Pull Out
7	48x48x12	4/30/2009	4/30/2009			ASC 0.375x8.5 SLL	Tension	Recess - 0.75	12,000	Anchor Pull Out
8	48x48x12	4/30/2009	5/1/2009			ASC 0.375x8.5 SLL	Tension	Recess - 0.75	15,000	Anchor Pull Out
9	48x48x12	4/30/2009	5/1/2009			ASC 0.375x8.5 SLL	Tension	Not Recessed	15,000	Anchor Pull Out
10	48x48x18	4/30/2009	4/30/2009			ASC 0.5x9.75 SLL	Tension	Not Recessed	22,000	Concrete
11	48x48x18	4/30/2009	5/1/2009			ASC 0.5x9.75 SLL	Tension	Recess - 0.75	25,000	Anchor Pull Out
12	48x48x24	4/30/2009	5/1/2009			ASC 0.5x9.75 SLL	Shear	Recess - 0.75	38,000	Concrete
13	48x48x24	4/30/2009	5/1/2009			ASC 0.5x4.25x11.75	Shear	Recess - 0.75	27,500	Anchor Pull Out
14	48x48x12	4/30/2009	5/1/2009			ASC 0.5x4.25x11.75	Tension	Recess - 0.75	21,000	Anchor Pull Out
15	48x48x12	4/30/2009	5/1/2009			ASC 0.625x5x15.5	Tension	Recess - 0.75	14,000	Concrete
16	48x48x24	4/30/2009	5/1/2009			ASC 0.625x5x15.5	Shear	Recess - 0.75	23,000	Concrete
17	48x48x12	4/30/2009	5/1/2009			CA 0.47x3.75x6.2	Tension	Recess - 0.75	3,500	Concrete
18	48x48x24	4/30/2009	5/1/2009			ASC 0.75x6.75x7.75	Tension	Recess - 0.75	35,000	Anchor Pull Out
19	48x48x18	4/30/2009	5/1/2009			ASC 0.625x7x18.5	Tension	Recess - 0.75	20,000	Concrete
20 (1)	48x48x36	4/30/2009	5/1/2009			ASC 0.625x7x18.5	Shear	Recess - 0.75	38,000	Concrete
20 (2)	48x48x36	4/30/2009	5/5/2009		0.375 x 44		Tension	Not Recessed	42,000	Anchor break
21	48x48x36	4/30/2009	5/1/2009			ASC 0.75x8x18.75	Shear	Recess - 0.75	75,000	Concrete
22	48x48x18	4/30/2009	5/1/2009			ASC 0.75x8x18.75	Tension	Recess - 0.75	40,000	*
23 (1)	48x48x36	4/30/2009	5/1/2009	0.5x14.5 L			Shear	*	Not Tested	---
23 (2)	48x48x36	4/30/2009	5/1/2009	0.5x18.5 L			Shear	*	Not Tested	---
23 (3)	48x48x36	4/30/2009	5/1/2009	0.5x18.5 SE			Shear	*	42,000	Anchor break
9A (1)	48x48x18	4/30/2009	5/1/2009			ASC 0.375x8.5 SLL	Shear	Recess - 0.75	20,000	*
9A (2)	48x48x18	4/30/2009	5/1/2009			ASC 0.375x8.5 SLL	Impact	Recess - 0.75	Not Tested	---

LEWRLS - Lift Eye Wire Rope Loop (or Swaged) System
ASC - American Stamp Company
CA - China Anchor

* - See Information in "Remarks" Column (table in Appendix 2)
L - Looped
SE - Swaged Ends (Non Looped)
SLL - Solid Loop Lifter