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Atlantic Water Gardens:

Eco-Blox Compression Testing Report

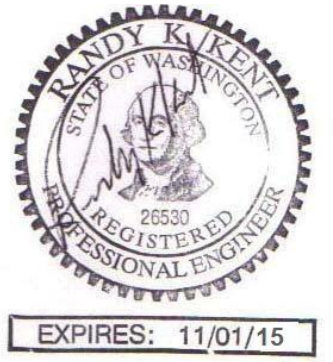
June 9, 2014

Prepared for:

Mr. Chris McClure
Customer and Technical Support Manager

Atlantic Water Gardens
4494 Orchard St.
Mantua, OH 44255

Prepared by:



Kent Engineering, LLC

Randy K. Kent, M.S., P.E.
Principal Engineer
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1. Introduction

Kent Engineering (KE) is a forensic engineering firm with over 30 years of experience in product testing, design, manufacturing processes and quality control. KE has assisted in developing and implementing multiple patented products and materials used in the construction industry. We were hired by Atlantic Water Gardens to perform a compression test on a set of Eco-Blox water matrix blocks, as well as offer insights into physical property analysis and improvements. The primary objective to testing was to determine if the product would be able to withstand loading in accordance with ASSHTA HS-20 loading conditions. The testing was done in a manner to test the unconstrained condition of a single matrix block, which would be the worst loading case possible. The average dimensions of the Eco-Blox, when fully assembled, are 17.6" x 26.9" x 16.0".

The matrix design is comprised of multiple 1.5" squares with diagonal supports, which is known as one of the strongest designs for load support and is used in bridge, home, and general construction designs. To test the compressive strength, a load was applied to the top of the matrix block, which is the 16" x 26.9" side. The compressive force was applied to 3 individual blocks until failure occurred and the data was recorded, then analyzed and calculated to define the strength of the blocks.

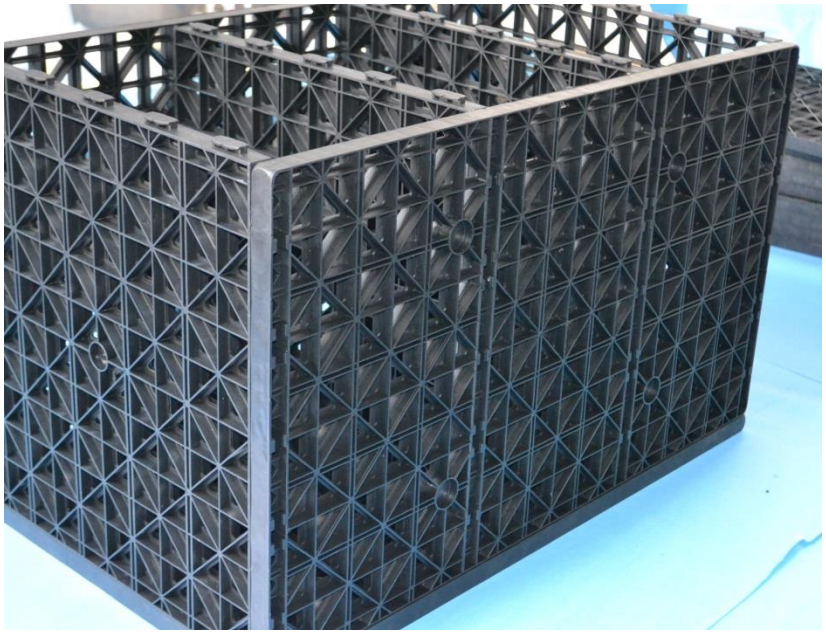

Figure 1: Atlantic Water Gardens Eco-Blox assembly without lid.

2. Testing Setup

To evenly distribute the loading across the top of the Eco-Blox, a steel plate measuring 27" x16" x 0.75" was placed between the press and the test piece. The steel plate connected to the press cylinder measures 12" x 16" x 1" and is used to distribute the load. The test machine utilized was a Satec 600WHVL with a 600,000 lb capacity. The cross head was a Satec WHVL600 with a range of 0.050in/min to 1.000 in/min. The cross head speed and the load cell were both calibrated on May 6, 2014 and the calibration certificate is attached for reference.

The loading was applied by the top platen movement and controlled by lowering at a rate of 0.050" per minute, which was adopted from the ASTM D695-10, which is the standard test method for compressive properties of ridged plastics. A computer readout was given and the raw data of load, displacement, and time was supplied for reference as well. Pictures and video were taken during the testing to show the process and results.

Figure 2: Test machine with steel plate on the test block.

3. Testing Process

For each of the three Eco-Blox tested, the following procedure applies; Initially, the Eco-Blox was assembled according to the instructions provided. The block was measured for overall dimensions and photo documented in the "prior test" condition. Each matrix block was labeled 6530A, 6530B, and 6530C for test 1, 2, and 3 respectively. The block was placed on the lower platen of the test machine and centered with the top of the block as noted from the assembly instructions. Next, the steel plate was placed on top of the block and centered. Then, the top platen and press plate were lowered to contact with the steel plate. A preload of 120 lbs was applied. Once the machine was zeroed the test was initiated with steady state displacement, increasing the load.

4. Test Results

From zero to 10,000 lbs, the system showed no change in structural integrity. When the load reached approximately 10,000 lbs, the sides bowed slightly toward the outside and on the back and side panels. As the load neared 14,000 lbs of force, sounds of cracking or popping were heard. At this load, significant bowing of the end pieces were observed. After failure occurred, it was clearly observed where the de-bonding or cracking was located. These locations were at the tabs. The test was performed until failure/fracture of the vertical end pieces. The data was recorded and the test repeated for the remaining blocks.

The test results showed good consistency between the three test blocks and showed an average loading capacity of approximately 15,500 lbs and strength of 36.2 lbs/in^2 (psi) at failure. Table 1 shows the results of the three compression tests. The stress was calculated using the dimensions of the cross section being compressed. This assumes that the load and stress is distributed evenly across the area being tested. Various graphs and photos are attached as an appendix and all the data, photos, and video are available on a DVD or other method of your choice.

Table 1: Results of the compression tests of the three Eco-Blox

Test data from Eco-Blox Compression testing					
Test #	**1**	**2**	**3**	**Average**	**Range**
Specimen Label	6530A	6530B	6530C	N/A	N/A
Maximum Load (lbs)	14740.54	16015.79	15736.77	**15497.7**	1275.244
Maximum Displacement (in)	0.366036	0.406011	0.388592	**0.38688**	0.039974
Maximum Stress (psi)	34.40233	37.38621	36.75796	**36.18216**	2.983882
Length (in)	26.83	26.875	26.875	26.86	0.045
Width (in)	15.97	15.94	15.93	15.94667	0.04
Height (in)	17.562	17.562	17.562	17.562	0
Area (sq in)	428.4751	428.3875	428.1188	428.3271	0.35635

5. Conclusion

After compression testing of three of the Atlantic Water Gardens Eco-Blox in a worst case loading condition, it has been found that they are able to hold an average of 36.2 pounds per square inch (psi). When these blocks are used in the field, they will likely be stacked, and/or placed side to side with backfill, so the sides will be able to resist buckling and hold higher loads. In order to meet the requirements for ASSHTA HS-20 loading conditions the matrix blocks need to hold the loads of an axle from a tractor trailer, which equates to approximately 32,000 lbs per axle. Using the below conditions for HS-20 loading, KE calculated a minimum safety factor of 1.87, at a depth of 18 inches, under the most extreme conditions, as seen in Table 2. KE also calculated using less extreme conditions and included the results in Tables 3 and 4 below. It is clear from the results of the results in Tables 2-4, that the assumptions and input values into the equations make a large difference in the factor of safety. These blocks have factor of safety above 2.0 for every condition and depth calculated except the one condition using the most extreme angle and a depth of 18 inches.

6. Calculations

To calculate the loads needed, Kent Engineering used liberal estimations, to calculate the worst case loading conditions that will be seen in the field. As seen in figures 3-5 below the angle of repose can drastically change the applied load area and with a larger angle of repose, such as a

63.4 degree angle, depicted in figure 5, the load does not get distributed as wide as with a shallower angle, such as a 45 degree angle, depicted in figure 4. The distribution of the load across a wider area decreases the load that each block will support, therefore reducing the stress on each block. The highest slope that KE used was based on a 1:2 slope ratio, which means for every unit in width, there are two units of depth. In addition to the angle of repose, the weight of the road base material that is between the surface and the buried matrix blocks can vary between 100 lbs per cubic foot and140 lbs per cubic foot. KE used the maximum angle of repose of 63.4° (1:2 ratio) and used a weight of 130 pounds per cubic foot of road base material. In

Table 2: Shown below are the calculations of HS-20 loading conditions with most difficult assumed conditions of 1:2 slope (26.6° angle from the vertical) and 130lbs per cubic foot.

HS-20 Loading Calculation and Capacity of Eco-Blox

	Cover Base Depth (inches/feet)										
Variable	**18/1.5**	**24/2**	**36/3**	**48/4**	**60/5**	**72/6**	**84/7**	**96/8**	**108/9**	**120/10**	**144/12**
Axle Load (lbs)	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Tire Load (lbs)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Tire Contact Area (10" x 20" = 200 sq in)	200	200	200	200	200	200	200	200	200	200	200
Area of Applied Load at 63.4° Angle of Repose (sq in)	1,064	1,496	2,576	3,944	5,600	7,544	9,776	12,296	15,104	18,200	25,256
Area of Applied Load at 63.4°Angle of Repose (sq ft)	7.39	10.39	17.89	27.39	38.89	52.39	67.89	85.39	104.89	126.39	175.39
Static Wheel Load Applied to Eco-Blok	15.04	10.70	6.21	4.06	2.86	2.12	1.64	1.30	1.06	0.88	0.63
Dynamic Loading Safety factor of 1.2	18.05	12.83	7.45	4.87	3.43	2.55	1.96	1.56	1.27	1.05	0.76
Cover Base Pressure at 130 lbs/cf (psi)	1.35	1.81	2.71	3.61	0.35	5.42	6.32	7.22	8.13	9.03	10.83
Total Load Applied to Eco-Blox (psi)	**19.40**	**14.64**	**10.16**	**8.48**	**3.78**	**7.96**	**8.28**	**8.78**	**9.40**	**10.08**	**11.59**
Capacity of Eco-Blox Unit (psi)	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20
Safety Factor	**1.87**	**2.47**	**3.56**	**4.27**	**9.59**	**4.55**	**4.37**	**4.12**	**3.85**	**3.59**	**3.12**

Table 3: Shown below are the calculations of HS-20 loading conditions with less extreme field condition of a slightly less steep angle of 30° and keeping 130lbs per cubic foot.

HS-20 Loading Calculation and Capacity of Eco-Blox

	Cover Base Depth (inches/feet)										
Variable	**18/1.5**	**24/2**	**36/3**	**48/4**	**60/5**	**72/6**	**84/7**	**96/8**	**108/9**	**120/10**	**144/12**
Axle Load (lbs)	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Tire Load (lbs)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Tire Contact Area (10" x 20" = 200 sq in)	200	200	200	200	200	200	200	200	200	200	200
Area of Applied Load at 60° Angle of Repose (sq in)	1,262	1,810	3,197	4,971	7,132	9,681	12,618	15,942	19,653	23,753	33,114
Area of Applied Load at 60°Angle of Repose (sq ft)	8.77	12.57	22.20	34.52	49.53	67.23	87.62	110.71	136.48	164.95	229.96
Static Wheel Load Applied to Eco-Blok	12.67	8.84	5.01	3.22	2.24	1.65	1.27	1.00	0.81	0.67	0.48
Dynamic Loading Safety factor of 1.2	15.21	10.61	6.01	3.86	2.69	1.98	1.52	1.20	0.98	0.81	0.58
Cover Base Pressure at 130 lbs/cf (psi)	1.35	1.81	2.71	3.61	0.35	5.42	6.32	7.22	8.13	9.03	10.83
Total Load Applied to Eco-Blox (psi)	**16.56**	**12.41**	**8.71**	**7.47**	**3.04**	**7.40**	**7.84**	**8.43**	**9.10**	**9.84**	**11.41**
Capacity of Eco-Blox Unit (psi)	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20
Safety Factor	**2.19**	**2.92**	**4.15**	**4.84**	**11.91**	**4.89**	**4.62**	**4.30**	**3.98**	**3.68**	**3.17**

Table 4: Shown below are the calculations of HS-20 loading conditions with conditions of a 1:1 slope (angle of 45°) and keeping 130lbs per cubic foot.

HS-20 Loading Calculation and Capacity of Eco-Blox

	Cover Base Depth (inches/feet)										
Variable	**18/1.5**	**24/2**	**36/3**	**48/4**	**60/5**	**72/6**	**84/7**	**96/8**	**108/9**	**120/10**	**144/12**
Axle Load (lbs)	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Tire Load (lbs)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Tire Contact Area (10" x 20" = 200 sq in)	200	200	200	200	200	200	200	200	200	200	200
Area of Applied Load 45°Angle of Repose (sq in)	2,576	3,944	7,544	12,296	18,200	25,256	33,464	42,824	53,336	65,000	91,784
Area of Applied Load 45°Angle of Repose (sq ft)	17.89	27.39	52.39	85.39	126.39	175.39	232.39	297.39	370.39	451.39	637.39
Static Wheel Load Applied to Eco-Blok	6.21	4.06	2.12	1.30	0.88	0.63	0.48	0.37	0.30	0.25	0.17
Dynamic Loading Safety factor of 1.2	7.45	4.87	2.55	1.56	1.05	0.76	0.57	0.45	0.36	0.30	0.21
Cover Base Pressure at 130 lbs/cf (psi)	1.35	1.81	2.71	3.61	4.51	5.42	6.32	7.22	8.13	9.03	10.83
Total Load Applied to Eco-Blox (psi)	**8.81**	**6.67**	**5.25**	**5.17**	**5.57**	**6.18**	**6.89**	**7.67**	**8.48**	**9.32**	**11.04**
Capacity of Eco-Blox Unit (psi)	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20	36.20
Safety Factor	**4.11**	**5.42**	**6.89**	**7.00**	**6.50**	**5.86**	**5.25**	**4.72**	**4.27**	**3.88**	**3.28**

7. Appendix A: Diagrams and Testing Results

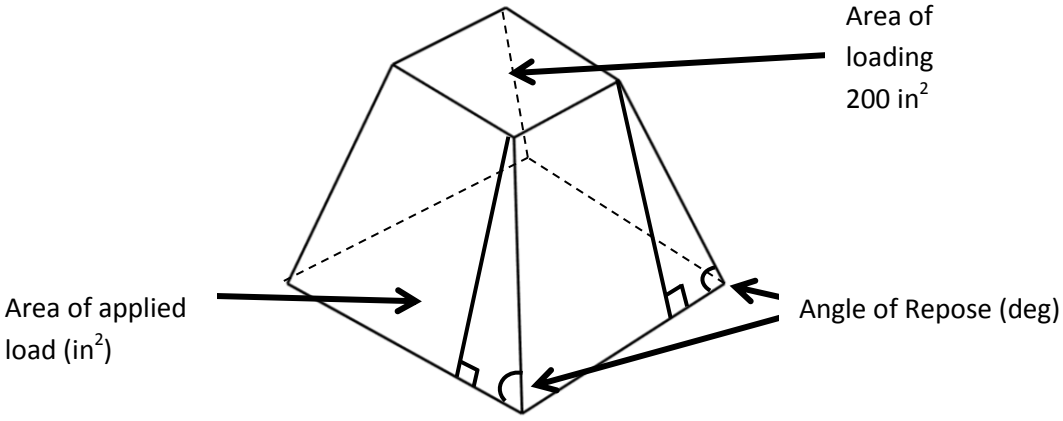

Figure 3: An example of how the angle of repose and depth expand and increase the loading area in all four directions.

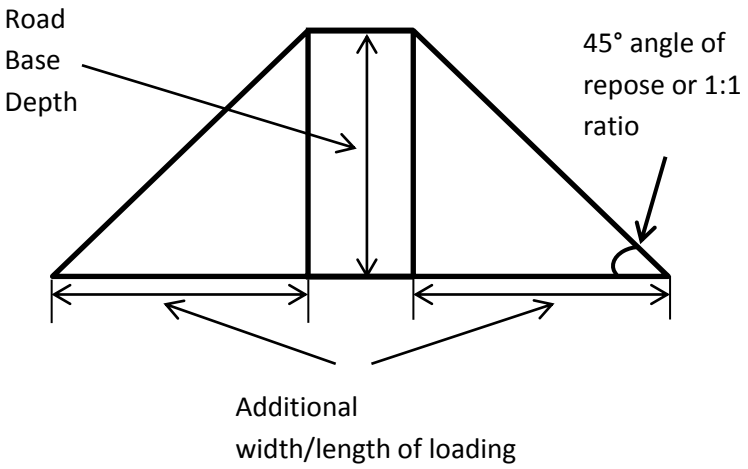

Figure 4: An example of how the angle of repose affects the amount of increased area. Angle is not to scale.

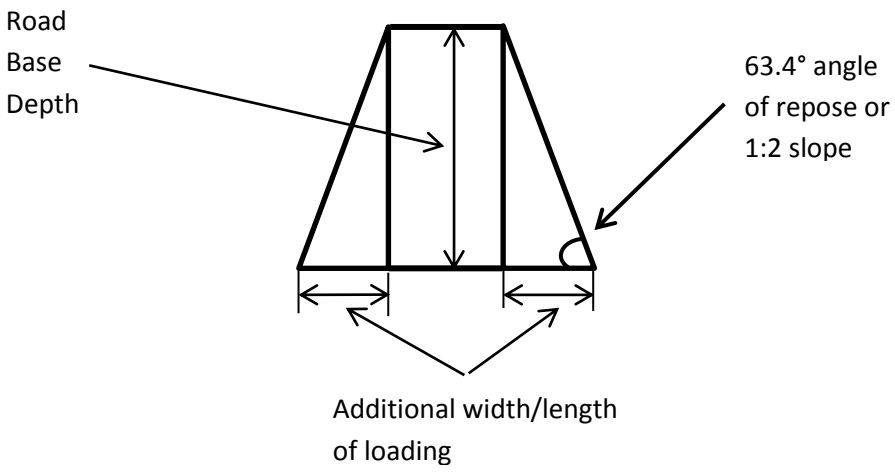

Figure 5: An example of how the angle of repose affects the amount of increased area. Angle is not to scale.

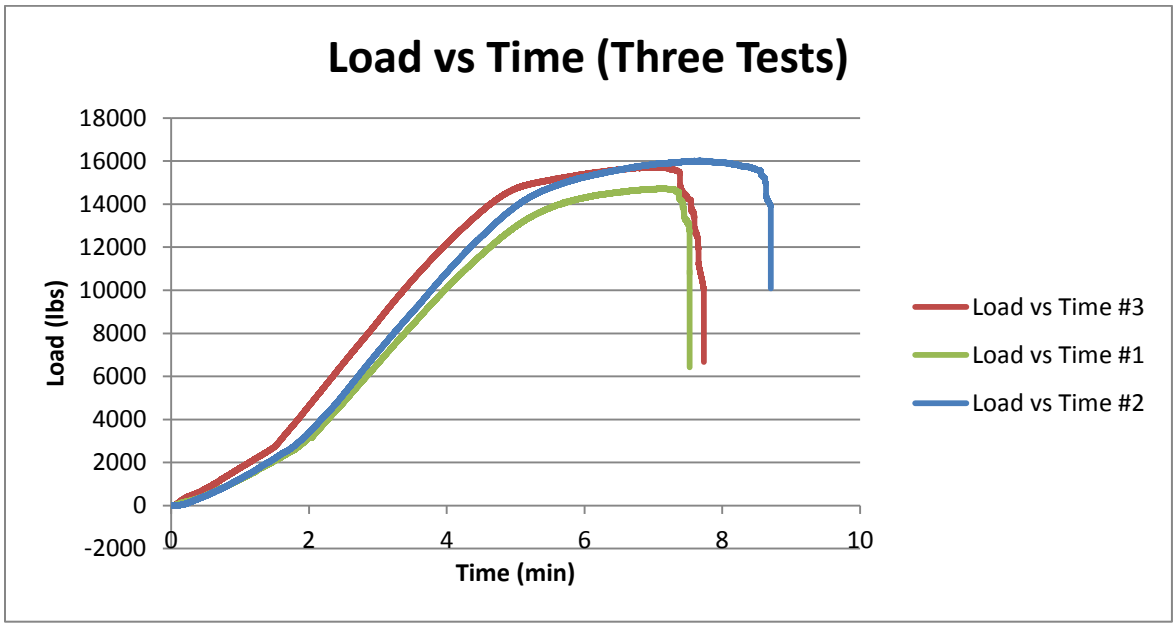

Figure 6: Load vs Time graph showing the consistency of the three test matrix blocks.

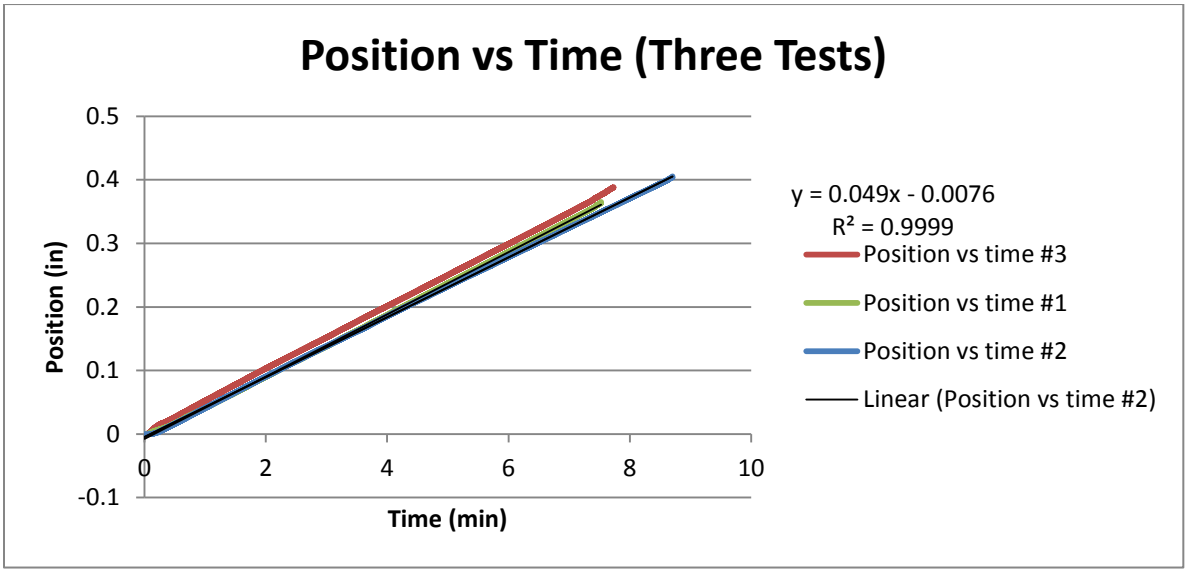

Figure 7: Position vs Time graph showing the consistency of the cross head speed across the three tests.

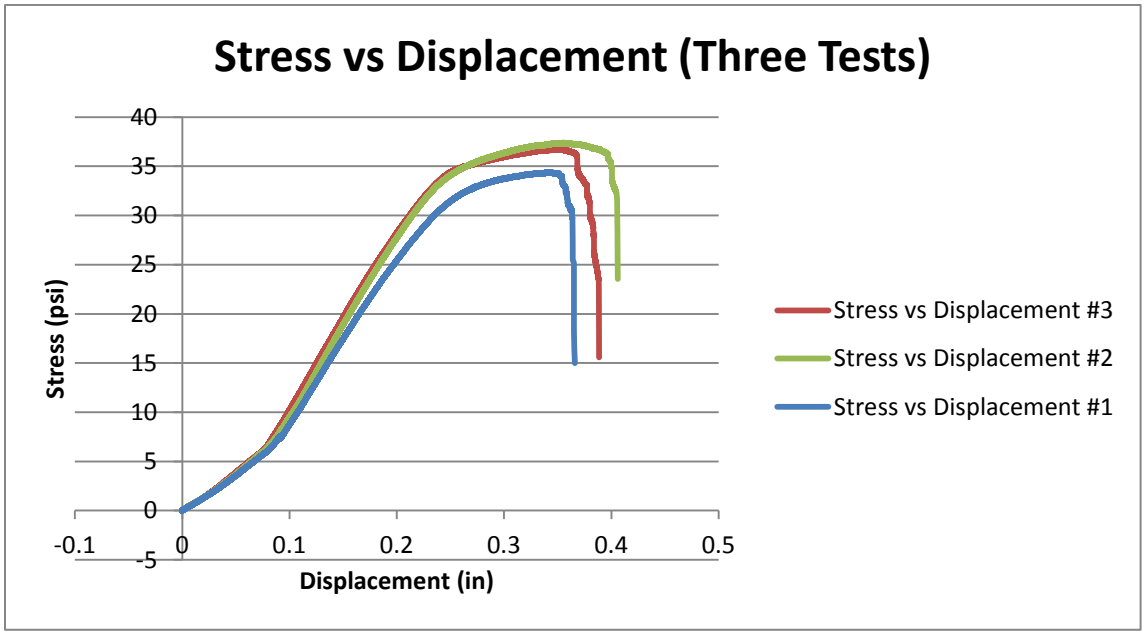

Figure 8: Stress vs Displacement graph showing the consistency of the three test matrix blocks.

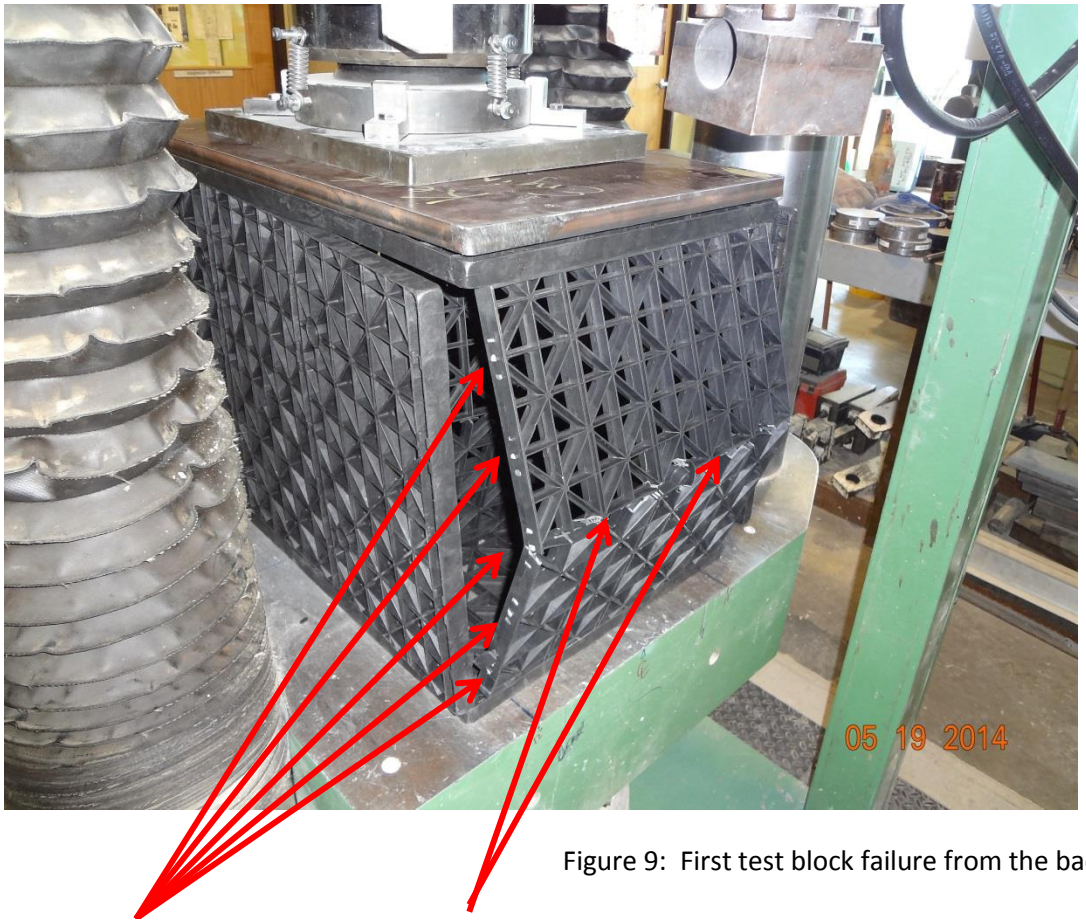

Figure 9: First test block failure from the back side

Broken tabs from the back and side plate bowing and buckling under the load

Broken back plate in the center, from buckling under the load

Figure 10: Second test block failure from the back side

Figure 11: Broken Tabs from second test block

Figure 12: Third test block failure from backside

8. Appendix B: Calibration Certificates

Report and Certificate of Calibration

CAL-CERT

by

Cal-Cert

6709 S.E. Lake Road Milwaukie, OR 97222 (800)356-4662 Fax (503)654-9670

ACCREDITED
Laboratory Code CL-108

Report #:	48091-M-01	**Customer PO#:**	
Customer Name:	Mayes Testing		
Customer Address:	20225 Cedar Valley Road		
City:	Lynnwood	**State:** WA	**Zip:** 98036
Contact:	Dale Yoder		
Service Address:	20225 Cedar Valley Road,	Lynnwood, WA 98036	

Calibration Standards

16-10KC/00474 Interface Load Cell S/N: 355988A Cal Date: 4/9/14 Due Date: 4/9/15 Vendor: CC Range: 503.7 to 10K lbs NIST#: 48238-C-04

16-60KC/00289 Interface Load Cell S/N: 117123A Cal Date: 4/8/14 Due Date: 4/8/15 Vendor: CC Range: 1,143 to 60K lbs NIST#: 48238-C-02

16-600K/00703 Strainsense Load Cell S/N: 120812 Cal Date: 4/7/14 Due Date: 4/7/15 Vendor: CC Range: 11,594 to 600K lbs NIST#: 48238-C-01

16-RH/00455 Comark Thermohygrometer S/N: 06216410110 Cal Date: 4/11/14 Due Date: 4/11/15 Vendor: CC NIST#: 48238-C-11

Instrument Data

Calibration Date:	May 6, 2014	**Method Used:**	ASTM E-4
Recommended Due Date:	May 6, 2015	**Number of Ranges:**	One
Calibration Frequency:	12 Months	**Indicating System:**	Computer
Manufacturer:	Satec	**Temperature:**	68 °F
Type:	Testing Machine	**Humidity:**	51% RH
Model Number:	600WHVL	**Cal Factor:**	71820
Serial #:	1019/MTQ-130419-417	**Asset Number:**	ID# 778
Capacity:	600,000 lbs.	**Service Location:**	Service Address
		As Found:	Pass
		As Left:	Pass

Machine Inspection/Service:

Cleaned, Tightened and Lubricated Spherical Seat:	N/A	Pump Oil Level Check:	N/A
Springs, Safety Brackets, Holding Stem Inspection:	N/A	Piston Retraction Check:	N/A
Upper Platen Planeness Inspection:	N/A	Hydraulic System Leak Check:	N/A
Lower Platen Planeness Inspection:	N/A		

Instrument Range: 600,000 lbs. **Range Resolution:** 0.1 lbs. **Mode Verified:** Compression

UUT Reading	As Found	As Found Percentage Error	Verification Reading #1	Error	Percentage Error	Verification Reading #2	Error	Percentage Error	Algebraic Difference
0	0.0	0.00%	0.0	0.00	0.00%	0.0	0.00	0.00%	0.00%
600	599.7	0.05%	599.7	-0.30	-0.05%	598.6	-1.40	-0.23%	0.18%
1,200	1,203.8	-0.32%	1,203.8	3.80	0.32%	1,204.9	4.90	0.41%	-0.09%
2,400	2,405.2	-0.22%	2,405.2	5.20	0.22%	2,407.4	7.40	0.31%	-0.09%
7,200	7,195.8	0.06%	7,195.8	-4.20	-0.06%	7,197.2	-2.80	-0.04%	-0.02%
12,000	11,978.0	0.18%	11,978.0	-22.00	-0.18%	11,995.0	-5.00	-0.04%	-0.14%
24,000	23,964.0	0.15%	23,964.0	-36.00	-0.15%	23,990.0	-10.00	-0.04%	-0.11%
48,000	47,903.0	0.20%	47,903.0	-97.00	-0.20%	47,909.0	-91.00	-0.19%	-0.01%
84,000	83,860.0	0.17%	83,860.0	-140.00	-0.17%	83,815.0	-185.00	-0.22%	0.05%
120,000	119,715.0	0.24%	119,715.0	-285.00	-0.24%	119,745.0	-255.00	-0.21%	-0.03%
240,000	239,420.0	0.24%	239,420.0	-580.00	-0.24%	239,485.0	-515.00	-0.21%	-0.03%
360,000	359,085.0	0.25%	359,085.0	-915.00	-0.25%	358,920.0	-1080.00	-0.30%	0.05%
480,000	478,615.0	0.29%	478,615.0	-1,385.00	-0.29%	478,580.0	-1420.00	-0.30%	0.01%
600,000	598,000.0	0.33%	598,000.0	-2,000.00	-0.33%	598,305.0	-1695.00	-0.28%	-0.05%
0	0.0	0.00%	0.0	0.00	0.00%	0.0	0.00	0.00%	0.00%

Auto Range Testing Machine CF-001-17 Revision 7 11/13/2013

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Report and Certificate of Calibration

CAL-CERT

by

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6709 S.E. Lake Road Milwaukie, OR 97222 (800)356-4662 Fax (503)654-9670

ACCREDITED

Report #:	48091-M-06	**Customer PO#:**	
Customer Name:	Mayes Testing		
Customer Address:	20225 Cedar Valley Road		
City:	Lynnwood	**State:** WA	**Zip:** 98036
Contact:	Dale Yoder		
Service Address:	20225 Cedar Valley Road, Lynnwood, WA 98036		

Calibration System Information

16-HG2/10778 Mitutoyo Height Gage S/N: 03019985 Cal Date: 6/5/13 Due Date: 6/5/14 Vendor: CC NIST#: 45366-C-11
16-SW/00233 Sportline Stopwatch S/N: 2832 Cal Date: 4/10/14 Due Date: 4/10/15 Vendor: CC NIST#: 48238-C-10
16-RH/00455 Comark Thermohygrometer S/N: 06216410110 Cal Date: 4/11/14 Due Date: 4/11/15 Vendor: CC NIST#: 48238-C-11

Instrument Data

Calibration Date:	May 6, 2014	**Method Used:**	Set the Force
Calibration Due Date:	May 6, 2015	**Number of Ranges:**	One
Calibration Frequency:	12 Months	**Indicating System:**	Computer
Manufacturer:	Satec	**Temperature:**	68 °F
Type:	Cross Head Speed	**Humidity:**	51% RH
Model Number:	WHVL600	**Cal Factor:**	None
Serial #:	1019/MTQ-130419-417	**Asset #:**	ID# 778
Capacity:	1 in/min.	**Service Location:**	Service Address
Tolerance:	1.00% Full Scale	**As Found:**	Pass
		As Left:	Pass

Mode Verified: Compression

Instrument Range: 1 in/min. **Range Resolution:** 0.001 in/min.

Speed Setting in/min	Duration in Minutes	Nominal	As Found Reading	Error in/min As Found	Verification Reading #1	Error in/min Reading 1	Verification Reading #2	Error in/min Reading 2
0.050	**0.050**	0.0025	**0.050**	0.0475	0.050	0.0475	0.005	0.0025
0.100	**0.100**	0.0100	**0.099**	0.0890	0.099	0.0890	0.098	0.0880
0.500	**0.500**	0.2500	**0.501**	0.2510	0.501	0.2510	0.503	0.2530
0.750	**0.750**	0.5625	**0.747**	0.1845	0.747	0.1845	0.746	0.1835
1.000	**1.000**	1.0000	**0.994**	-0.0060	0.994	-0.0060	0.995	-0.0050

Expanded Uncertainty ± 0.063677 in/min.

Remarks:

We sincerely thank you for your business.
Please call us at 1-800-356-4662 for all your calibration needs.
Cleaning and preventive maintenance were preformed before calibration of this equipment.

A Test Accuracy Ratio (TAR) of at least 4:1, if achievable, is maintained unless otherwise stated. This uncertainty expression is expanded at approximately 95% confidence level, coverage factor (k=2).
This is to certify that the equipment herein identified has been inspected and calibrated in accordance with standard procedures set forth and is found in accordance with manufacturer, ASTM E83, and Cal-Cert Procedures CP-115, CP-032.

Accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108.
This Laboratory meets the requirements of ISO/IEC 17025 AND ANSI/NCSL Z540-1

This Certificate is issued as a statement of the fact that on this date the above instrument(s) had an accuracy as indicated. It should not be construed or regarded as a Guarantee or Warranty of any kind (in favor of the client, the client's customers, or the public at large) that the instrument(s) will continue to retain the same percentage (%) of accuracy or efficiency as determined on the date when the calibration, and adjustments if required, was performed and reported by 'CAL-CERT', since the calibrator has absolutely no control over the future operation, damage, maintenance, repairs, and overall condition of the instrument(s) and hereby expressly disclaims any and all liability for damage or loss sustained by all parties arising or resulting from deterioration, obsolescence, malfunction, or substandard performance of said instrument(s), which shall be deemed to be and which shall remain the sole responsibility of the machines regular custodian, owner, and/or manufacturer.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: MIKE JOHNSON **Date:** May 6, 2014

Technical Manager: MARSHALL DOYLE **Signature:**

Cross Head Speed CP-115-14 Revision 5 11/11/2013

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Manufacturer: Satec **Type:** Testing Machine **Serial #:** 1019/MTQ-130419-417

Remarks:

Uncertainty: The UUT % uncertainty includes the uncertainty of the Calibration standards used combined with the uncertainty of the measurement process using the RSS method with a K factor of 2 for an approximate 95% level of confidence. The uncertainty for this measurement is < 0.25% of the test load applied unless otherwise stated. The calibration process meets or exceeds a ratio of 4:1.

We sincerely thank you for your business.
Please call us at 1-800-356-4662 for all your calibration needs.
Cleaning and preventive maintenance were preformed before calibration of this equipment.

Tested with Reference Standards Traceable to the National Institute of Standards and Technology using ASTM E-4 Follow the Force Tests Methods. The indicated due date was determined by the customer. Cal-Cert Test Method: CP-001. The Tolerance for this instrument is ±1% of Applied Load.

Accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108.
This Laboratory meets the requirements of ISO/IEC 17025 AND ANSI/NCSL Z540-1

The above system (Instrument, Load Cell, Integral Software and Output Device(s), and accessories has been calibrated in accordance with ASTM E4 - Standard Practices for Force Verification of Testing machines using apparatus and standards calibrated in accordance to ASTM E74 - Standard practice for Calibration of Force-Measuring Instruments for Verifying the Load Indication of Testing Machines and which are traceable to NIST (National Institute of Standards and Technology). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC Guide 17025 and ANSI/NCSL Z540-1.

This Certificate is issued as a statement of the fact that on this date the above instrument(s) had an accuracy as indicated. It should not be construed or regarded as a Guarantee or Warranty of any kind (in favor of the client, the client's customers, or the public at large) that the instrument(s) will continue to remain the same percentage (%) of accuracy or efficiency as determined on the date when the calibration, and adjustments if required, was performed and reported by "CAL-CERT", since the calibrator has absolutely no control over the future operation, damage, maintenance, repairs, and overall condition of the instrument(s) and hereby expressly disclaims any and all liability for damage or loss sustained by all parties arising or resulting from deterioration, obsolescence, malfunction, or substandard performance of said instrument(s); which shall be deemed to be and which shall remain the sole responsibility of the machines regular custodian, owner, and/or manufacturer.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: MIKE JOHNSON **Date:** May 6, 2014

Technical Manager: MARSHALL DOYLE **Signature:** 

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Appendix C: Lab Test Report

MAYES TESTING ENGINEERS, INC.

Seattle Office
20225 Cedar Valley Road
Suite 110
Lynnwood, WA 98036
ph 425.742.9360
fax 425.745.1737

Tacoma Office
10029 S. Tacoma Way
Suite E-2
Tacoma, WA 98499
ph 253.584.3720
fax 253.584.3707

Portland Office
7911 NE 33rd Drive
Suite 190
Portland, OR 97211
ph 503.281.7515
fax 503.281.7579

DATE: 5/27/2014
CLIENT: Kent Engineering
PROJECT: Quality Control
PROJECT #: S14026
LAB. #: 6530
DATE REC'D: 5/19/2014

REPORT STATUS:
Original ☑
Amended ☐

SAMPLE DESCRIPTION:

Three 16"x27" ecology blocks

TEST RESULTS:

Compression Test

Each block was loaded in compression at a rate of 0.050"/minute until failure occurred. Load vs Crosshead Position was recorded during the testing of the blocks. Results are as follows:

Block #	Laboratory #	Load @ Failure (lbs)	Crosshead movement @ Failure Load (inches)	Maximum crosshead movement during test (inches)
1	6530A	14,740	0.343	0.366
2	6530B	16,020	0.353	0.406
3	6530C	15,740	0.351	0.389

Tested By: Dale Yoder Reviewed By:

Information in this report applies only to the actual samples tested and shall not be reproduced except in full, without the approval of Mayes Testing Engineers, Inc.

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MAYES TESTING ENGINEERS, INC.

Pictures of Ecology Block Testing

Ecology Block 6530B after Failure

Ecology Block 6530C @ Failure

Ecology Block 6530C after Failure

Ecology Block 6530C after Failure

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