AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

REPORT OF DYNAMIC LOAD TESTING FOR PROFESSIONAL PANEL MOCK-UP

AET Report No. 05-06717

Date:

October 27, 2016

Prepared for:

UltraBaseSystems
5030 Seminole Blvd.
Saint Petersburg, FL 33708

www.amengtest.com

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October 27, 2016

UltraBaseSystems
5030 Seminole Blvd.
Saint Petersburg, FL 33708

Attn: Mr. Dave Barlow
dave@tourlinks.net

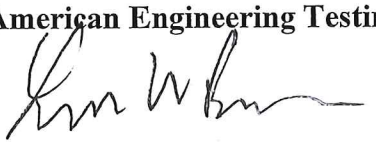
RE: Report of Dynamic Load Testing for Professional Panel Mock-up
AET Report No. 05-06717

Dear Mr. Barlow:

American Engineering Testing, Inc. (AET) is pleased to present the results of our dynamic load testing of your Professional Panel. Our services were performed according to our proposal to you dated May 26, 2016.

We are submitting a digital copy of the report to you. Please contact me if you have any questions about the report.

Sincerely,
American Engineering Testing, Inc.



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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under Minnesota Statute Section 326.02 to 326.15

Name: Loren W. Braun

Date: October 27, 2016 License # 014969

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APPENDIX

1.0 INTRODUCTION

UltraBaseSystems is testing their Professional Panel for use as a subbase replacement in an inverted (up-side-down) position. In order to test the panels, American Engineering Testing, Inc. (AET) was retained to complete a rolling test of the panels by loading with a large truck.

2.0 SCOPE OF SERVICES

AET's services were performed according to our proposal to UltraBaseSystems dated May 26, 2016. We were authorized to simulate the rolling load of a heavy truck (H-20) on an assembly of UltraBaseSystems Professional base panels placed upside down on the ground in order to observe the amount of indentation into the ground, and any damage to the test panels.

The authorized scope consists of the following:

- Inspect the condition of the base panels for comparison after testing.
- Assemble professional base panels on untreated ground with an approximate CBR value of 3 to simulate typical soft soil conditions.
- Configure the weight on a single tire of our loaded truck to match a 16,000 pound axle using a calibrated load cell traceable to NIST standards.
- Traverse the assembled panels at about 5 mph.
- Inspect the panels for deflection/damage, distinguishing edge conditions at start/stop.

3.0 TEST INFORMATION

3.1 Test Materials

3.1.1 Vehicle

For the test, we used an ASSHTO H-20 rated truck with 16,000 pounds on each of two rear axles; resulting in 8000 pounds per "super-single" tire and 8000 pounds on each of the two front "super-single" tires. We used the front wheel of the truck for our testing. The truck used is shown in Figure 1.

Figure 1: Test Vehicle

3.1.2 Soil Subgrade

The subgrade soil at the test location consisted of a clayey sand with a little gravel that was in a moist condition, although above optimum moisture content. The soil had an estimated California Bearing Ratio (CBR) of about 3%. The soil depicted in Figure 2 is a one inch thick layer of clayey silt we used to accentuate the pattern of contact.

Figure 2: Subgrade Soil at Test Location

3.1.3 Geotextile Fabric

For the geotextile separation fabric, we used DuPont™ Typar® SF65 geotextile fabric. Specifications for the fabric are provided in the Appendix.

3.1.4 Panels

We used the UltraBaseSystems Professional Panels for the testing. The panels are square and have an installed dimension of 28 inches and are 1.25 inches thick. The panels are interconnected by a tongue and groove method but are not connected by mechanical fasteners. Specifications for the panels are included in the appendix. The panels and underlying geotextile fabric are shown in Figure 3.

Figure 3: Panels and Geotextile Fabric

3.1.5 Filler Sand

In order to fill the ribs in the panels, we placed a clean, fine-grained sand. The sand was placed to avoid breaking of the ribs due to the wheel movement across the panels.

3.2 Test Procedure

We completed two travel patterns for the wheel. The first pattern was perpendicular to the traverse panel joints, and the second pattern was over the longitudinal joints. The second pattern is shown in Figure 4. The sand was extended beyond the edge to the panels to avoid shoving of the panels during the vehicle approach. The vehicle speed was approximately 5 miles an hour. The wheel load was about 8,000 pounds. The wheel load was confirmed by a certified scale.

Figure 4: Wheel Load Across the Longitudinal & Transverse Panel Joint

4.0 TEST RESULTS

The test results are summarized in Table 1.

Table 1: Testing Results

	8000 Pound Wheel Load Orientation	
Impact Area	Wheel traversing the center of a group of six panels & crossing one transverse joint	Wheel traversing one longitudinal joint & crossing one transverse joint connecting four of the six panels
Impact on test panel cells	No discernable damage	None
Impact on panel joints	No separation or damage	None
Impact on geo-fabric	No tearing or shoving	None
Impact on silt soil layer See Note 1 See Note 2	The center of the panels made an impression of about ⅝ inch. The edge of the panels at the transverse joint made an impression of about ¾ inch.	Longitudinal & transverse joint impressions were about ¾ inch.

Note 1: One inch thick layer of grey clayey silt under the geo-fabric, spread over clayey sand with gravel subbase.
Note 2: We would expect the depth of the panel impression (⅝ inch) to be reduced if the test panels were restrained by connection to a full panel system. We noted that the test panels appeared to be tugged toward the load of the tire, causing an increase in the effective contact pressure on test layer of soil.

5.0 CONCLUSIONS

The results of the tests indicate that the Professional Panel with the hexagonal ribbed reinforcement filled with sand is competent to support large vehicle traffic without significant deflection or damage to the panel. Furthermore, based on the test results, joint separation or deflection was not observed during the testing. Based on these results, it is our opinion that the panels are capable of supporting large vehicle traffic.

Appendix

DuPont™ Typar® SF65 Geotextile Specification
Professional Panel Specification

Geotechnics

DuPont™ Typar® SF

DuPont™ Typar® SF is a thin, thermally bonded, water permeable nonwoven geotextile made of polypropylene filaments. Typar® SF is designed with a combination of a high initial modulus and a high elongation. This gives a resistants to damage during and after the installation. Typar® SF is a reliable solution for a broad array of engineering structures and installations, wherein it fulfills separation and filtration functions.

Descriptive properties	**Test Method**	**Unit**	**SF27**	**SF32**	**SF45**	**SF56**	**SF65**
Area Weight	EN ISO 9864	g/m²	90	110	150	190	220
Thickness under 2kN/m²	EN ISO 9863-1	mm	0,39	0,43	0,50	0,57	0,65
Polymer			100% polypropylene, UV stabilised				
Mechanical properties							
Energy Absorption	EN ISO 10319	kJ/m²	1,8	3,6	4,8	5,8	8,6
Tensile strenght	EN ISO 10319	kN/m	5,0	8,5	12,0	13,1	20,0
Elongation	EN ISO 10319	%	40	45	50	52	55
Strength at 5%	EN ISO 10319	kN/m	2,3	3,3	4,4	5,7	8,2
Puncture CBR	EN ISO 12236	kN	0,8	1,0	1,6	1,9	2,9
Dyn. Cone Puncture	EN ISO 13433	mm	45	35	30	22	22
Hydraulic properties							
Opening Size O90 Wet	EN ISO 12956	µm	175	140	130	80	75
Permeability (VH50)	EN ISO 11058	10^{-3} m/s	100	70	33	18	12
Rol Dimensions							
Width		m	5,20 (other widths available)				
Length		m	200	200	100	100	100
Area		m²	1040	1040	520	520	520
Diameter		cm	38	29	27	29	32
Weight of roll		kg	154	111	78	112	148

There are more types available, please contact us for more information.

Part Number: UBSPRO

Professional Panel

UltraBaseSystems is first and foremost a STRUCTURALLY engineered sub base replacement system which successfully addresses the safety, drainage and aesthetic demands of an entire industry. From athletic fields to residential landscaping installations, putting greens to pet areas, concrete paver installations to athletic courts, UBS Professional Panels cover all of your base requirements.

Panel Dimensions: Actual panel dimension: 30" x 30" x 1.25"/762mm x 762mm x 31.6mm |
Square footage area once installed: 28" x 28"x 1.25"/ 711.2mm x 711.2mm x 31.6mm = 5.44 ft.² /.505 sq m

Panel Weight: Average panel weight: 1.67 pounds/.748kg per sq ft 9.1 lbs /4.12 kg per panel

US Patent # 7,516,587 | US Patent # 7,930,865 | CA Patent #2,663,050 | RA Patent #2410508 | Additional US and Foreign Patents Pending

Isometric View, Top of Panel

Isometric View, Bottom of Panel

***Also Available with Golf Cup Hole**
Product Number:UBSPROCUPHOLE

Pallet and Box Dimensions and Volumes:
Box of 8: 32"x31"x12"--75lbs 81cm x 78cm x 73cm
Pallet of 36: 58"x 30"x29" -- 378 lbs 147cm x 76cm x 73cm 171 kg
Pallet of 70: 58"x30"x52" -- 698 bs 147cm x 76cm x 132 cm 316kg

Truck & Container Volumes:
20ft. Container: 1,432 panels=7,790 sq ft./723 sq. m. | 40ft. High Cube: 3,316 panels=18,039 sq. ft./1675 sq. m.
53ft. Truck: 4,560 panels = 24,806 sq. ft./2304 sq. m.
**All Measurments are per truck*

UltraBaseSystems®

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