SOR TESTING LABORATORIES, INC.

Geotechnical Engineering - Materials Testing - Forensic Studies
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Kamil Sor, Ph.D
Orhun Sor, P.E.
Peter G. Micklus, P.E.
Yilmaz Arhan, Ph.D.
Kenneth Rowbotham, P.E.

Client:	PolySat Inc. (Vexcon Chemicals, Inc.)		
Project:	Information of Client (P.O. No. 61510 DFM)		
Subject:	Laboratory Tests of Vexcon Powerseal-40		
Job No.:	10-153	Report No.: 10-1582	Date: 7/9/2010

We present herewith laboratory test results of the "Vexcon Powerseal-40" sample received on June 24, 2010. At the client's request, the sample was tested to determine its effect on the reduction of water absorption by concrete and by masonry brick. The test methods used were as follows:

- NC-HRP Report No. 244
- ASTM-C67
- ASTM-C642.

TEST PROCEDURE

A series of samples of concrete and brick specimens, that were at least 28 days old, were oven-dried at 110°C for 48 hours; then removed from the oven and allowed to cool for 48 hours at 25°C and weighed. Then the sealer (Powerseal-40) was applied at two application rates: at 125 sq. ft./gal. and at 140 sq. ft./gal. on separate specimens. All specimens were allowed to air-dry for 7 days at room temperature; then the specimens were weighed. Then both the coated and the uncoated (control) specimens were soaked in clean water for 48 hours in room temperature, after which all specimens were weighed as SSD (Saturated Surface Dry). The water absorptions were calculated with the following results.

TEST RESULTS

Specimen I.D.	Surface Condition	% Water Absorbed (*)	% Reduction in Absorption
Concrete	• Uncoated	5.10	--
	• Coated with 125 sq. ft./gal.	0.49	90.4
	• Coated with 140 sq. ft./gal.	0.47	90.8
Brick	• Uncoated	4.35	--
	• Coated with 125 sq. ft./gal.	0.36	91.7
	• Coated with 140 sq. ft./gal.	0.34	92.2

(*) Average of triplicate tests.

CONCLUSIONS

Based on these test results, the following conclusions were drawn:

- Coating the concrete and masonry brick specimens with Vexcon Powerseal-40 at the application rates of 125 sq. ft./gal. and at 140 sq. ft./gal reduced the water absorption by 90+%.

- These test results were obtained using the test procedures described herein.

Very truly yours,

SOR TESTING LABORATORIES, INC.

Kamil Sor

Kamil Sor, Ph.D.
President

KS/gs
cc: (1) Client, Attn: Darryl F. Manuel
(E-Mail: dmanuel@vexcon.com)

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Client:	Poly Sat, Inc./Vexcon Chemicals		
Project:	Information of Client (P.O. No. 61510 DFM)		
Subject:	Water Vapor Permeability Test of Concrete Coated with Vexcon Powerseal-40		
Job No.:	10-253	Report No.: 10-1804	Date: 8/4/2010

We present herewith laboratory test results of the "Vexcon Powerseal-40" sample received on June 24, 2010. As requested, the sealer was tested to determine its effects on reducing the water vapor transmission of concrete. The test method used was ASTM-E96.

TEST RESULTS

Material	Permeance (perms) (*)	% Reduction in Vapor Transmission
• Control (Uncoated)	4.75	--
• Coated with 125 sq. ft./gal. of Powerseal-40	0.40	91.6
• Coated with 140 sq. ft./gal. of Powerseal-40	0.12	97.5

(*) --- 1.0 perm = 57.45 ng/sm^2 Pa
-- The test results are the average of triplicate specimens.

CONCLUSIONS

Based on these test results, the following conclusions were drawn:

- Concrete specimens coated with Vexcon Powerseal-40 reduced the water vapor permeability of concrete by 91.6% when the sealer amount used was 125 sq. ft./gal.
- When the sealer amount used was 140 sq. ft./gal., the reduction of vapor permeability was 97.5%.

Very truly yours,

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Client:	Poly Sat, Inc./Vexcon Chemicals		
Project:	Information of Client (P.O. No. 61510 DFM)		
Subject:	Scaling Resistance Test of Concrete Surfaces Coated with Vexcon Powerseal -40		
Job No.:	10-253	Report No.: 10-1842AA	Date: 9/23/2010

We present herewith laboratory test results of the "Vexcon Powerseal -40" sample received on June 24, 2010. At the client's request, the sealer was used to improve the scaling resistance of concrete surfaces exposed to De-Icing salts. The test method used was ASTM- C672.

TEST RESULTS (*)

Materials	Scaling Resistance. at			
	25- Cycles	50-Cycles	100-Cycles	N.J. DOT Requirements
• Uncoated Concrete (Control)	2	4	5	3 Max
• Coated with 125 sq. ft/Gal. of Powerseal -40	0	0	0	3 Max
• Coated with 140 sq. ft./Gal. of Powerseal -40	0	0	0	3 Max

(*) Rating of surface conditions as per ASTM- C672:

0 = No Scaling
1 = Very Slight Scaling
2 = Slight to Moderate Scaling
3 = Moderate Scaling
4 = Moderate to Severe Scaling
5 = Severe Scaling

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CONCLUSIONS

Based on these test result s, the following conclusions were drawn:

The scaling of horizontal concrete surfaces exposed to freezing and thawing cycles in the presence of Calcium Chloride Solution is prevented by coating the concrete surfaces with Vexcon Powerseal -40 Solution.

Very truly yours,
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Client:	Poly Sat, Inc./Vexcon Chemicals		
Project:	Information of Client (P.O. No. 6150 DFM)		
Subject:	Depth of Penetration of Vexcon Powerseal-40 into Concrete and Brick Surfaces		
Job No.:	10-253	Report No.: 10-1881	Date: 8/11/2010

We present herewith laboratory test results of the "Vexcon Powerseal-40" test results received on June 24, 2010. As requested, the depth of penetration of sealer into concrete surfaces was studied under magnification by microscopic examination (ASTM-C457).

TEST RESULTS

Material Coated	Amount of Powerseal-40	Depth of Penetration, inches (*)
Concrete	125 sq. ft./gal. 140 sq. ft./gal.	0.255 0.260
Masonry Brick	125 sq. ft./gal. 140 sq. ft./gal.	0.148 0.150

(*) There was no change in the substrate appearances.

Very truly yours,

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Client:	Poly Sat, Inc./Vexcon Chemicals		
Project:	Information of Client (P.O. No. 61510 DFM)		
Subject:	Laboratory Tests of Powerseal -40 as per NCHRP-244 for Series II and Series IV Methods		
Job No.:	10-253	Report No.: 10-1988RAA	Date: 8/18/2011

We present herewith laboratory test results of the "Vexcon Powerseal -40" test results. The sealer was sent to us in a sealed container by the client in June, 2010. The sealer was tested in accordance with methods in the NCHRP report no. 244. The amount of the sealer used 140 sq. ft./Gal. on concrete specimen surfaces.

I. CONCRETE MIX DESIGN (f'c = 4000 psi)

Materials	lbs/cu. yard
Portland Cement, Type –I (ASTM –C150)	611
Clayton Sand (ASTM –C33)	1450
Weldon Stone, Size #67 (ASTM –C33)	1800
Water	275
Slump, inches	3.0
Air Content, %	2.0
Water/Cement Ratio, lbs/lb	0.45
Plastic Unit Weight, lbs/cu. ft.	153.2
Compressive Strength, psi (28 days of age)	5300

II. EXPERIMENTAL DESIGN

The concrete specimen used in these studies were 4-inch cubes. The curing methods and other treatments were as follows:

1. Control Samples – Uncoated.
   --Cured 7 days in Curing Room at 100% Relative Humidity at 73°F.
   --Air dried for 21-days at 50% Relative Humidity and 73°F.
   --No other treatment.

2. Controlled Samples Soaked in NaCl Solution-Uncoated.
   --Cured 7-days in Curing Room at 100% Relative Humidity at 73°F.
   --Air dried for 21-days at 50% Relative Humidity and 73°F.
   --Coated with the Sealer at 28 days of age.

–Kept in controlled Climate Room for 14 days at 50% Relative Humidity at 73°F.
–Soaked in 15% NaCl solution for 21 days.
--Half of the cubes were removed from salt solution, rinsed with clean water, and then subjected to Ultra Violet light and Infrared Heat at 100°F for 14 days prior to soaking in NaCl solution (Southern exposure).

III. TEST PROCEDURES

--At the end of the curing and treatment periods all samples were weighed to determine moisture loss or gain.
--At the end of the NACl solution treatment period, all cubes were saw cut At 1-inch and 2-inch depths from the surface. Total chloride content at each section (0-1 inch and 1-2 inch) was determined in accordance with AASHTO- T260 procedures. At each depth, duplicate chloride tests were performed.

IV. TEST RESULTS

1. WATER LOSS DURING THE INITIAL 28-DAY CURING PERIOD

Day after Casting of Cubes	Moisture Loss % by Weight (*) (**)
7	0.06
28	2.10

(*) Based on the cube weights at 1-day of age.
(**) Average of 30 cubes.

2. WATER LOSS OF COATED SAMPLES DURING 14-DAYS IN CONTROLLED ROOM AT 50% R.H.

Type of Treatment	Water Loss, g/Cm^2 (*)
Control (Uncoated)	0.090
The Sealer	0.012
Sealer (Exposed to U.V. Light)	0.013

(*) All test results are the average of triplicates.

3. WATER ABSORPTION AFTER SOAKING IN 15% NACI SOLUTION FOR 21-DAYS

Type of Treatment	Weight Gain, % (*)
Control – Uncoated	2.95
Control – Uncoated (Exposed to U.V. Light)	2.98
The Sealer	0.20
The Sealer (Exposed to U.V. Light)	0.22

(*) All test results are average of triplicate tests.

4. CHLORIDE (CL-) ION CONTENT OF CONCRETE CUBES AFTER 21-DAYS SOAKING IN 15% NACI SOLUTION (*)

Type of Treatment	Chloride Ion Content % by Weight of Concrete	
	0-1 inch Depth	1-2 Inch Depth
Control – Uncoated	0.255	0.010
Control – Uncoated (Exposed to U.V. Light)	0.259	0.011
The Sealer	0.012	0.005
The Sealer (Exposed to U.V. Light)	0.014	0.006

(*) All test results are average of triplicate tests.

5. REDUCTIONS OF WATER ABSORPTION AND CHLORIDES INTO THE CONCRETE

Type of Treatments	Reduction Water Absorption into Concrete, %	Reduction of Chloride Content in Concrete, % (*)	
		0-1" Depth	0-2" Depth
• The Sealer Coated	93.2	95.3	93.6
• The Sealer Coated (Exposed to U.V. Light)	92.6	94.6	92.6

(*) The chloride reduction is for Series IV Method.

CONCLUSIONS

Based on these test result s, the following conclusions were drawn:

1. The moisture loss of the cubes, all of which were uncoated, at the age of 28 days was 2.10% by weight of the concrete. This amount of loss is normal for concrete exposed to 50% relative humidity at normal air temperatures.

   At the age of 7-days the water loss was only 0.06%. This is expected since during the first 7-days the cubes were in 100% relative humidity.

2. The water losses of coated cubes during the 14-days in the controlled room at 50% relative humidity were between 0.012 and 0.013 grams per Cm^2 area.

   It should be noted that the average reduction in the moisture loss, as compared to the control, was 86.7%.

   Exposure to ultraviolet light and Infrared Heat at 100°F did not have any significant effect on the performance of the sealer.

3. Water absorption of the cubes coated with the sealer was considerably lower than the absorption of the uncoated control samples. Exposure of the coated cubes to ultraviolet light had very little effect (for example 0.20% gain for unexposed vs. 0.22% for ultraviolet exposed) on the water absorption after soaking the cubes in 15% NaCl solution for 21 days. The reduction in weight gain was 93.2%.

4. There was considerable reduction in the chloride content in the cubes coated with the Sealer. The reductions in chloride absorption by weight percent were:

Treatment	% Reduction	
	0-1" Depth	0-2" Depth
Powerseal-40 Coated	95.3	93.6
Powerseal-40 Coated (Exposed to U.V.)	94.6	92.6

It was noted that exposure to Ultraviolet Light had only a minor effect on the chloride absorption.

5. It is concluded from these test results that sealing concrete surfaces with Power Seal-40 at the rate studied reduces considerably (at least 95%) the amounts of chloride penetrations to a concrete.

Very truly yours,

SOR TESTING LABORATORIES, INC.

Kamil Sor

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President

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Client:	Poly Sat, Inc./Vexcon Chemicals				
Project:	Information of Client				
Subject:	Exposure of Powerseal-40 Coated Concrete Specimens				
Job No.:	10-253	Report No.:	10-3021AAAAA	Date:	5/2/2011

Reference is made to our Report No. 10-1988R dated 8/20/2010. In that report, the test results of Powerseal-40 treated concrete specimens which were tested in accordance with the test methods specified in the NCHRP-244 were presented.

At the client's request, the specimens used for U.V. light exposure were subjected to exposure to the exterior conditions (sunlight, etc.) for several months. The objective of this test was to check the discoloration and deterioration, if any, of the specimens.

Our observations were as follows:

TEST RESULTS

Outside Exposure Time, months (*)	Conditions of the Powerseal-40 Coated Specimens
1	No discoloration, no deterioration
2	No discoloration, no deterioration
3	No discoloration, no deterioration
4	No discoloration, no deterioration
5	No discoloration, no deterioration
6	No discoloration, no deterioration

(*) The exposure was started on November 1, 2010.

Very truly yours,

SOR TESTING LABORATORIES, INC.

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Laboratory Report

- **CUSTOMER NAME** Vexcon Chemicals, Inc.
- **ATTENTION OF** Darryl Manuel
- **CUSTOMER'S REF. NO.** Powerseal 40
- **REPORT DATE** 6-21-10
- **PROJECT NO.** 10056
- **ANALYST** W. Britton
- **ANALYSIS REQUESTED** Analyze Powerseal 40 for DC Z6341 and quantify reference material
- **METHODS** ASTM D6886 modified
- **SAMPLE IDENTIFICATION AND RESULTS**

Samples and reference material are analyzed by Gas Chromatography Mass Spectrometry using an internal standard. The standard provided was Dow Corning ® Z-6341 silane and was used for quantification. The product material has a major peak identified at octyltriethoxysilane along with isomers. Based upon our analysis, the product contains in excess of 42% of the Dow Corning octyltriethoxysilane including the hexytriethoxysilane.

Wayne Britton, PhD

Case Consulting Laboratories, Inc.

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August 19, 2004

To: VEXCON Chemicals, Inc.
7240 State Road
Philadelphia, PA 19135

Attention: Darryl Manuel

From: Bruce Sanchez

Project No.: 6335

Subject: Coefficient of Friction Determinations

INTRODUCTION

We were authorized to determine the coefficient of friction of concrete block samples identified as Powerseal 40%. The evaluation was conducted in accordance with ASTM D 2047 utilizing the James Machine fitted with leather sole material. The samples were tested in triplicate under laboratory conditions of 23°C and 40% relative humidity.

RESULTS

Powerseal 40%

Coefficient of Friction (Average Over 4 Cycles)			Coefficient of Friction
Replicate 1	Replicate 2	Replicate 3	(Average Over 12 Cycles)
0.79	0.86	0.88	0.84

DISCUSSION

A coefficient of friction value of 0.5 or greater is generally accepted for classifying a walking surface as slip resistant.

Respectfully submitted,

Bruce R Sanchez

Bruce Sanchez
Research Director

CASE CONSULTING LABORATORIES, INC.

ra

PENNIMAN & BROWNE, INC.

CHEMISTS / ENGINEERS / INSPECTORS
INDUSTRIAL HYGIENE SERVICES
FOUNDED 1896

June 22, 2012 (revised)

Vexcon Chemical
7240 State Road
Philadelphia, PA 19135
Attention: Darryl Manuel

Re: Concrete Absorption Testing
Product: Powerseal 40
Application Rate: 250 sqft/gallon Powerseal 40
P&B Lab No: 201200765

Absorption in Hardened Concrete - ASTM C642

Sample	Absorption			
	48hr. Immersion		24 hr. boil	Spec.
Powerseal 40	0.51	%	1.25%	1.3% Max.

Respectfully,

Alex Shnaider
Laboratory Manager

6252 Falls Rd. / P.O. Box 65309 / Baltimore, Maryland 21209-0509
Tel. 410-825-4131 / Fax 410-321-7384 / www.pandbinc.com

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September 26, 2012

Vexcon Chemical
7240 State Road
Philadelphia, PA 19135
Attention: Darryl Manuel

Re: Concrete Absorption Testing
Product: Powerseal 40
Application Rate: 250 sqft/gallon Powerseal 40
P&B Lab No: 201200765

Absorption in Hardened Concrete - ASTM C642

Sample	**Absorption**		
	24 hr.	50 days	Spec.
Powerseal 40	0.21%	1.28%	1.% Max. after 48 hr./ 2% after 50 days

Respectfully,

Alex Shnaider
Laboratory Manager

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November 21,2012

Vexcon Chemical
7240 State Road
Philadelphia, PA 19135
Attention: Darryl Manuel

Re: 90 day salt ponding/Chloride Ion Analysis(AASHTO T259/260) Subparagraph 923.06(F)(6)
Product: Powerseal 40
Application Rate: 125 sqft/gallon
F&R Lab No: 201200765
Specification for treated samples1/16-1/2 in.depth 1.5lbs.chloride max., 1/2-1 in. depth-0.75lbs.chloride max;Untreated 6 to 3.5 lbs.chloride max. at respective depths.
Note:S-treated samples,U-untreated samples

CONCRETE WATER SOLUBLE CHLORIDE ION ANALYSIS AASHTO T260

		Chloride Content	
Sample	**Depth**	**% Weight of Concrete**	**lbs,/cubic yard of Concrete**
S1	1/16-1/2"	.011	0.44
S1	1/2-1"	< .005	<0.20
S2	1/16-1/2"	.010	0.43
S2	1/2-1"	< .005	<0.20
S3	1/16-1/2"	.016	0.65
S3	1/2-1"	.006	0.22
S4	1/16-1/2"	.011	0.44
S4	1/2-1"	.005	0.22
S5	1/16-1/2"	.016	0.65
S5	1/2-1"	.005	0.22
S6	1/16-1/2"	.021	0.87
S6	1/2-1"	.005	0.22
Avg lbs. of chloride(1/16-1/2")-0.52;Avg lbs. of chloride (1/2-1")-0.21			
U1	1/16-1/2"	.099	3.98
U1	1/2-1"	.086	3.44

Respectfully,

Alex Schnaider
Lab Manager