Final Report

Evaluation of PoreShield™ Concrete Sealer

Prepared for

Crafco, Inc

Prepared by
Joni Jones, PE (Illinois)
Director Concrete Science, Senior Engineer

BRAUN INTERTEC
The Science You Build On.

Project B2400900

Braun Intertec Corporation

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220 N. Laflin Street
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July 22, 2024

Project B2400900
Crafco PO No. 33083

Paul Imbrock
Crafco, Inc.
6165 W. Detroit St.
Chandler, AZ 85226
602.276.0406
Paul.Imbrock@crafco.com

RE: Evaluation of PoreShield™ Concrete Sealer by Crafco® Inc.

Dear Mr. Imbrock,

As requested, Braun Intertec has completed testing on a concrete sealer identified as PoreShield™. The sealer arrived at our Chicago laboratory on February 13, 2024. For testing purposes, Braun Intertec fabricated concrete substrates for each test. In addition, the density of the sealer is reportedly 7.44 lbs/gal, and the requested coverage rate used for test samples was 225 to 230 ft^2/gallon. The sealer was applied to each sample by brush.

For the scope of work, concrete substrates and testing was performed in general accordance with the following test methods.

- ASTM C1585, *Standard Test Method for Measurement of Rate of Absorption of Water by Hydraulic-Cement Concretes*
- ASTM C666, *Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing*
- ASTM C672, *Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals*
- AASHTO T259, *Standard Method of Test for Resistance of Concrete to Chloride Ion Penetration*

A summary of the results of is shown in Table 1, and detailed reports of each test are attached.

Table 1. Summary of Results

Description	Results
ASTM C1585, Initial Rate of Water Absorption Secondary Rate of Water Absorption	30.3×10^{-4} mm/$s^{½}$ 27.0×10^{-4} mm/$s^{½}$
ASTM C666, Resistance to Freezing and Thawing	RDM of 94% after 300 cycles
ASTM C672, Scaling Resistance	Slight to no scaling after 50 cycles
AASHTO T259, Resistance to Chloride Ion Penetration	64% reduction from surface to ½” 89% reduction from ½” to 1”

Rate of Absorption

Four (4) 4x8-inch cylinders were fabricated, prepared, and tested in accordance with ASTM C1585. Two (2) samples were treated with the sealer, and the initial and secondary water absorption rates were determined. Samples with the sealer reduced the rate of water absorption by 84% and 79% for the initial and secondary rates, respectively.

Resistance to Freezing and Thawing

Four (4) 3x3x11-inch beams were cast, and cured in limewater for 14 days, followed by laboratory air curing for 14 days. At the 21-day age, two (2) samples were treated with the sealer. After 28 days, all samples were subjected to 300 cycles of freezing and thawing in water (Method A). Results after 300 freeze thaw cycles show a relative dynamic modulus of 66% for the control samples and 94% for the samples with the sealer.

Resistance to Deicer Scaling

Four (4) 12x12x3-inch slabs were cast and cured in accordance with the test method. Two (2) samples were treated with the concrete sealer at 21 days. Samples were subjected to 50 cycles of freezing and thawing with a 4% $CaCl_2$ solution ponded on the surface. After 50 cycles of freezing and thawing, control samples showed severe scaling in which the coarse aggregate is visible over the entire test surface while the samples with Poreshield™ showed very slight scaling.

Resistance to Chloride Ion Penetration

Concrete mix proportions, fabrication, curing, and testing of substrates were performed in accordance with AASHTO T259. One control specimen (untreated) and three test specimens (treated) were fabricated from the concrete mixture. Specimens were 12x12x3-inches and air-entrained. Per the test method, the concrete substrates were moist cured for 14 days followed by air curing for 14 days. The sealer product was applied by brush at the specified application rate for three samples at the 21-day age. At the 29th day age, the slab surfaces were lightly abraded by sandblasting. After the 90-day ponding of 3% NaCl, the total chloride ion content was determined at two depths in accordance with AASHTO T260, *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.* Results indicate a 64% reduction in chloride content near the surface and 89% reduction in chloride content at a depth of 0.5 to 1.0 inches.

General Remarks

Findings of this study are based solely on the analysis of the samples tested and provided sample(s) and may not necessarily represent the materials and condition of materials elsewhere. In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

The tested samples and any remaining sealer product will be retained for at least 30 days from the date of this report. Unless we are instructed otherwise, the samples may be discarded.

If you have any questions or concerns, please do not hesitate to contact us.

Sincerely,

BRAUN INTERTEC CORPORATION

Joni Jones
Director Concrete Science

ASTM C1585

MEASUREMENT OF RATE OF ABSORPTION OF WATER BY HYDRAULIC-CEMENT CONCRETES

PROJECT INFORMATION

CLIENT:	Paul Imbrock	PROJECT NAME:	Evaluation of PoreShield™ Concrete Sealer
	Crafco, Inc.	PROJECT NO.:	B2400900
	6165 W. Detroit Street	PROJECT MGR:	Joni Jones
	Chandler, AZ 85226	TECHNICIAN:	J. Pycz / D. Allemana
	(602) 276-0406	DATE RECEIVED:	13-Feb-2024
		REPORT DATE:	11-Jul-2024

SAMPLE DESCRIPTION

DESCRIPTION: **C1 & C2 - Control (no sealer)**
P1 & P2 - PoreShield™ Concrete Sealer

APPLICATION: Applied by brush at 225 to 230 ft^2/gal

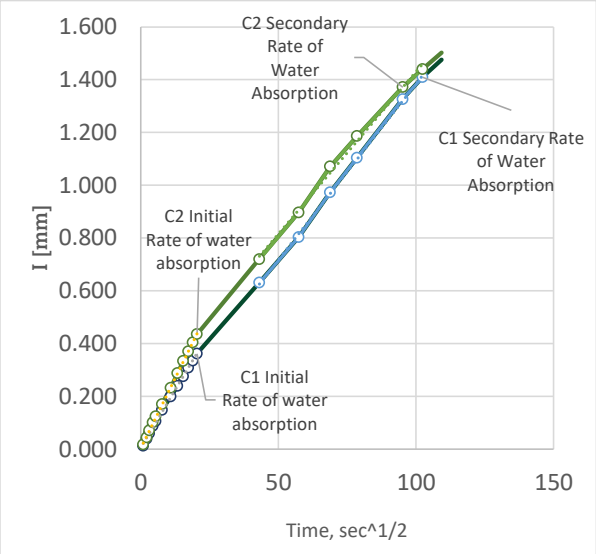
TEST DATE: 30-Apr-2024 to 08-May-2024

DIAMETER:	C1: 102.06 mm	P1: 102.11 mm
	C2: 102.01 mm	P2: 102.15 mm
EXPOSED	C1: 8181.30 mm^2	P1: 8188.92 mm^2
AREA:	C2: 8173.29 mm^2	P2: 8194.93 mm^2

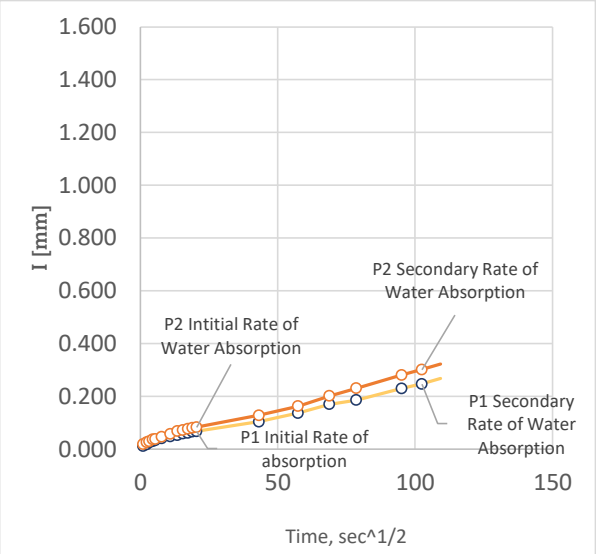
NOTES: Concrete substrates were fabricated in general accordance with the recommended proportions in ASTM C672 with no air entrainment.
Fresh properties:
slump: 3 inches, air content: 3%
unit weight: 148.1 pcf

TEST RESULTS

Control Samples (no sealer)



With PoreShield™ Concrete Sealer



Initial Rate of Water Absorption

C1	175.6 x10^{-4} mm/$s^{½}$
C2	212.8 x10^{-4} mm/$s^{½}$
AVERAGE	**194.2 x10^{-4} mm/$s^{½}$**

Secondary Rate of Water Absorption

C1	133.3 x10^{-4} mm/$s^{½}$
C2	122.6 x10^{-4} mm/$s^{½}$
AVERAGE	**128.0 x10^{-4} mm/$s^{½}$**

Initial Rate of Water Absorption

P1	27.5 x10^{-4} mm/$s^{½}$
P2	33.1 x10^{-4} mm/$s^{½}$
AVERAGE	**30.3 x10^{-4} mm/$s^{½}$**

Secondary Rate of Water Absorption

P1	24.1 x10^{-4} mm/$s^{½}$
P2	29.8 x10^{-4} mm/$s^{½}$
AVERAGE	**27.0 x10^{-4} mm/$s^{½}$**

Notes:

1. This report may not be reproduced except in its entirety.
2. Results specifically represent the samples prepared and tested.

Reviewed by: *Joni Jones, PE (Illinois)*

BRAUN INTERTEC
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ASTM C666 (AASHTO T161), RESISTANCE OF CONCRETE TO RAPID FREEZING AND THAWING

PROCEDURE A - FREEZING AND THAWING IN WATER

PROJECT INFORMATION

CLIENT:	Paul Imbrock	PROJECT NAME:	Evaluation of PoreShield™ Concrete Sealer
	Crafco, Inc.	PROJECT NO.:	B2400900
	6165 W. Detroit Street	PROJECT MGR:	Joni Jones
	Chandler, AZ 85226	TECHNICIAN:	J. Pycz / D. Allemana
	(602) 276.0406	DATE RECEIVED:	13-Feb-2024
		REPORT DATE:	11-Jul-2024

SAMPLE DESCRIPTION

CLIENT IDs:	**C1 & C2 - Control (no sealer)**	CAST DATE:	31-Jan-2024
	P1 & P2 - PoreShield™ Concrete Sealer	TEST DATE:	28-Feb-24 to 01-May-24
	Applied by brush at 225 to 230 ft^2/gal	CURE PERIOD:	Cured in 40°F limewater for 3 days prior to testing

TEST RESULTS

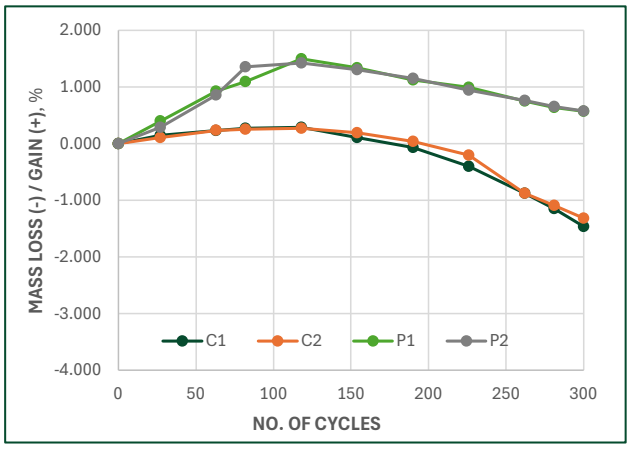
MASS LOSS (-) OR MASS GAIN (+), %

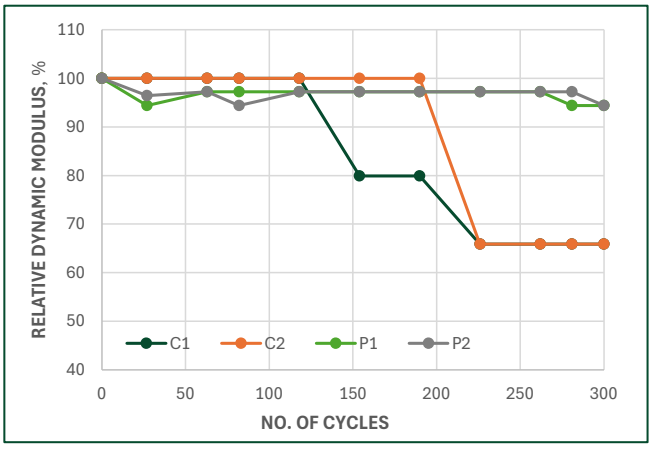
CYCLE NO.	C1	C2	P1	P2
0	0.000	0.000	0.000	0.000
27	0.143	0.104	0.397	0.289
63	0.230	0.233	0.925	0.859
82	0.268	0.251	1.095	1.355
118	0.286	0.269	1.494	1.424
154	0.107	0.193	1.337	1.303
190	-0.072	0.038	1.123	1.148
226	-0.401	-0.205	0.994	0.939
262	-0.876	-0.879	0.747	0.761
281	-1.150	-1.089	0.639	0.653
300	-1.467	-1.317	0.567	0.573
Initial Mass	3914 g	3948 g	3882 g	3151 g

RELATIVE DYNAMIC MODULUS, %

CYCLE NO.	C1	C2	P1	P2
0	100	100	100	100
27	100	100	94	96
63	100	100	97	97
82	100	100	97	94
118	100	100	97	97
154	80	100	97	97
190	80	100	97	97
226	66	66	97	97
262	66	66	97	97
281	66	66	94	97
300	66	66	94	94

GRAPHS





Notes:

1. This report may not be reproduced except in its entirety.
2. Defects present at 0 cycles of freezing and thawing: none
3. Results specifically represent the samples tested.

Reviewed by: Joni Jones, PE (Illinois)

AASHTO ACCREDITED

ASTM C672

SCALING RESISTANCE OF CONCRETE SURFACES EXPOSED TO DEICING CHEMICALS

PROJECT INFORMATION

CLIENT: Paul Imbrock
Crafco, Inc.
6165 W. Detroit Street
Chandler, AZ 85226
(602) 276.0406

PROJECT NAME: Evaluation of PoreShield™ Concrete Sealer
PROJECT NO.: B2400900
PROJECT MGR: Joni Jones
TECHNICIAN: J. Pycz / D. Allemana
DATE RECEIVED: 13-Feb-2024
REPORT DATE: 11-Jul-2024

SAMPLE DESCRIPTION

DESCRIPTION: **C1 & C2 - Control (no sealer)**
P1 & P2 - PoreShield™ Concrete Sealer
APPLICATION: **Applied by brush at 225 to 230 ft^2/gal**
TEST DATE: 11-Mar-2024 to 20-May-2024
CURE PERIOD: 01-Feb-2024 to 11-Mar-2024

NOTES: Concrete substrates were fabricated in general accordance with the recommended proportions in ASTM C672 with no air entrainment.
Fresh properties:
slump: 3.5 inches, air content: 3%
unit weight: 148.1 pcf

TEST RESULTS - VISUAL RATINGS

Control Samples (no sealer)

CYCLE NO.	C1	C2	AVG.
0	0	0	0
5	1	1	1
10	2	2	2
15	3	3	3
20	4	3	4
25	4	3	4
30	4	3	4
35	4	4	4
40	4	4	4
45	5	5	5
50	5	5	5

With PoreShield™ Concrete Sealer

CYCLE NO.	P1	P2	AVG.
0	0	0	0
5	0	0	0
10	0	0	0
15	0	0	0
20	1	1	1
25	1	1	1
30	1	1	1
35	1	1	1
40	1	1	1
45	1	1	1
50	1	1	1

Rating	Condition of Surface
0	no scaling
1	very slight scaling (3mm [1/8 in.] depth, max, no coarse aggregate visible
2	slight to moderate scaling
3	moderate scaling (some coarse aggregate visible)
4	moderate to severe scaling
5	severe scaling (coarse aggregate visible over entire surface)

Notes:
1. This report may not be reproduced except in its entirety.
2. 4% Calcium chloride solution was used as the deicing chemical.
3. Results specifically represent the samples prepared and tested.

Reviewed by: *Joni Jones, PE (Illinois)*

AASHTO T260, Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials after AASHTO T259, Standard Test Method for Resistance of Concrete to Chloride Ion Penetration

PROJECT INFORMATION

CLIENT: Crafco, Inc.
6165 W. Detroit Street
Chandler, AZ 85226
(602) 276-0406

ATTN: Paul Imbrock

PROJECT NAME: Evaluation of PoreShield™ Concrete Sealer
PROJECT NO.: B2400900
PROJECT MGR: Joni Jones
TECHNICIAN: J. Pycz / D. Allemana
DATE RECEIVED: 13-Feb-2024
REPORT DATE: 22-Jul-2024

SAMPLE DESCRIPTION

CLIENT ID: **Poreshield™ Concrete Sealer**
CAST DATE: 31-Jan-2024
Four 12x12x3 inch slabs
MOIST CURE: 01-Feb-2024 to 15-Feb-2024
AIR CURE: 15-Feb-2024 to 28-Feb-2024

APPLICATION: By brush at 225 to 230 ft^2/gal
CONCRETE FRESH PROPERTIES:
SLUMP: 5 inches
AIR CONTENT: 6.4%
UNIT WEIGHT: 140.1 pcf

TEST RESULTS

AASHTO T260, Total Chloride Ion Content after AASHTO T259, 90-day Pond Test

	Content % Weight of Sample		Average Absorbed Chloride % Weight of Sample		Average Reduction in Chloride Content	
Sample ID	0.0625-0.5"	0.5" - 1.0"	0.0625-0.5"	0.5" - 1.0"	0.0625-0.5"	0.5" - 1.0"
Control	0.312	0.099	…	…		
Poreshield™ 1	0.118	0.009				
Poreshield™ 2	0.141	0.017	0.113	0.011	64%	89%
Poreshield™ 3	0.081	0.006				
Baseline Chloride Content	0.010					

Notes:
1. Sample(s) prepared and tested by: D. Allemana
2. Analysis by potentiometric auto-titration with silver nitrate (automated).
3. Results refer specifically to the sample(s) submitted.
4. This report may not be reproduced except in its entirety.
5. The sample(s) will be retained for 30 days unless otherwise instructed.

AASHTO ACCREDITED

Reviewed by: *Joni L. Jones, PE (Illinois)*