

File: L18-0198MT

**Thor & Partners
2 Sheffield Street
Toronto, Ontario
M6M 3E6**

November 8, 2018

Attn.: Mrs. Christina Kentris
Christina@thorandpartners.com

***EverCrete Vetrufuid Waterproofing &
Concrete Protection Product Testing Program
Verdi/Alliance Hwy # 407 Yard Facility
6300 Steeles Avenue West
Toronto, Ontario***

As per your request, Davroc Testing Laboratories Staff visited the above noted Yard location on February 26, 2018. The purpose of our visit was to sample and test concrete for slump, air content, temperature and cast a number (thirty (30)) of 100 mm diameter by 200 mm long cylinder specimens for compressive strength and various comparative sealer application testing, and also to cast four (4) 300 by 300 by 75 mm in size concrete slabs for comparative salt scaling resistance testing.

The cast cylinder and slab specimens were returned to our laboratory on February 27, 2018. The specimens were demolded, and given a unique Laboratory Identification No., and then placed in standard wet curing conditions until time of testing.

Test Procedures

Testing procedures included the following items:

Cylinder Compressive Strength Test Specimens

As instructed, four (4) cylinders were tested for compressive strength in accordance with the CSA Standard A23.2-9C tests procedures. The test ages of the cylinders were as follows: two (2) cylinders at 7 days of age, and two (2) cylinders at 28 days of age.



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2.

Specimen Sealing Procedures

Upon completion of the specimen curing period (minimum 28 days wet curing), twelve (12) 100 mm diameter by 200 mm long cylinder and two (2) 300 by 300 by 75mm thick slab specimens were supplied to you for the application of the EverCrete Vetruf fluid waterproofing sealer product. The remaining cylinder and slab specimens were retained in Davroc's laboratory facility for comparative testing purposes.

We understand that the EverCrete Vetruf fluid product was applied to the cylinder and slab specimens in two (2) coats, with an application rate of two (2) square metres per Litre of EverCrete Vetruf fluid product. We also understand that the EverCrete Vetruf fluid product was applied with a combination of spray and paint brush. Following the EverCrete Vetruf fluid product application and curing period, the sealed samples were delivered to Davroc' laboratory for testing purposes.

Comparative Sealer Testing

Salt Scaling Resistance

Two (2) EverCrete Vetruf fluid product sealed concrete **Test** slabs, and two (2) unsealed concrete **Control** slabs were prepared and then tested for comparative salt scaling resistance in accordance with the MTO LS-412, test method for "Scaling Resistance of Concrete Surfaces Exposed to De-icing Chemicals".

Chloride Content in Concrete

One (1) EverCrete Vetruf fluid product sealed concrete **Test** cylinder, and one (1) unsealed concrete **Control** cylinder that was submerged in a 15% Sodium Chloride solution (NaCl) for twenty-one (21) days was tested for acid-soluble chloride ion content in accordance with the LS-417 test method for "Determination of Total Chloride Ion in Concrete (Acid Soluble)".

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3.

Water Absorption

Two (2) EverCrete Vetruf fluid product sealed concrete **Test** cylinders, and two (2) unsealed concrete **Control** cylinders were prepared and then tested for comparative water absorption tests. Testing procedures included weighing the two (2) sealed and two (2) unsealed cylinders, and then immersing them in water until the tops of the samples were covered with 25mm of water for a period of twenty-one (21) days, during which time saturated surface dry weights of the specimens were taken at 1, 3, 7, 14 and 21 days age.

Water Vapour Transmission

Upon completion of the water absorption testing, the cylinders that were tested for water absorption were allowed to air dry at air temperature of $23\pm 2^{\circ}\text{C}$ with a relative humidity of $50\pm 4\%$ for a period of twenty-one (21) days, during which time air dry weights of the specimens were taken at 1, 3, 7, 14 and 21 days age.

15% NaCl Solution Absorption

Two (2) EverCrete Vetruf fluid product sealed concrete **Test** cylinders, and two (2) unsealed concrete **Control** cylinders were prepared and then tested for comparative 15% NaCl Solution absorption tests. Testing procedures were similar to the water absorption testing, except that a 15% NaCl Solution was used to submerge the specimens.

15% NaCl Solution Vapour Transmission

Upon completion of the 15% NaCl Solution absorption tests testing, the cylinders that were tested for 15% NaCl Solution absorption were allowed to air dry at air temperature of $23\pm 2^{\circ}\text{C}$ with a relative humidity of $50\pm 4\%$ for a period of twenty-one (21) days, during which time air dry weights of the specimens were taken at 1, 3, 7, 14 and 21 days age.

Rapid Chloride Ion Penetrability

Two (2) EverCrete Vetruf fluid product sealed concrete **Test** cylinders, and two (2) unsealed concrete **Control** cylinders were prepared and then tested for comparative rapid chloride penetrability tests. At the time of testing, the top 0 to 51mm of each cylinder was saw cut. Then four (4) specimens were prepared and tested for Chloride Ion Penetrability in accordance with ASTM C1202 "Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration".

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4.

Test Results

Compressive Strength

The compressive strength test results are shown on the attached Compressive Strength Cylinder Test Report No. 1 in Appendix “A”.

Salt Scaling Resistance

The results of the salt scaling resistance tests are shown in the attached Table No.’s 1 and 2, along with the graphical plots of the mean loss results in Appendix “B”. Photographs showing the slab samples before and after subjecting them to 10, 25 and 50 cycles of freezing and thawing are shown in Appendix “C”.

Chloride Content in Concrete

The results of the chloride ion content tests are given in the following Table No. 3.

Table No. 3
Summary of Acid-Soluble Chloride Ion Content

Davroc Sample No.	Test Specimen Description	Total Acid-Soluble Chloride Ion Content % by Mass of Sample
463-15	Unsealed Control Specimen	0.278
463-22	Sealed Test Specimen	0.231
	% Difference	-0.047

Absorption & Vapour Transmission

The results of the water absorption, water vapour transmission, NaCl absorption and NaCl vapour transmissions tests are show on the attached Table No.’s 4, 5, 6 and 7 in Appendix “D”.

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5.

Rapid Chloride Ion Penetrability

The results of the rapid chloride penetrability tests are summarized in the following Table No. 8.

Table No. 8
Summary of Rapid Chloride Penetrability Tests

Davroc Sample No.	Test Specimen Description	Test Horizon (mm)	Charge Passed in 6 Hours (Coulombs)
462-13	Unsealed Control Specimens	0-51	1062
462-14		0-51	1227
		Mean	1145
463-23	Sealed Test Specimens	0-51	407
463-24		0-51	489
		Mean	448

Summary Comments

Base Concrete

As can be seen from the test results presented in Cylinder Compressive Strength Report No. 1, the measured slump, air content and compressive strength of the concrete met the specified requirements, and as such the concrete mix was acceptable for use in the sealer testing program.

Salt Scaling Resistance

As you will note, the average surface loss of the Control unsealed slab specimens was 3.684 kg/m^2 , which fails to meet the OPSS 1352 requirement of a maximum loss of 0.80 kg/m^2 from the surface after 50 cycles of freezing and thawing, by a substantial margin. The average surface loss of the Test sealed slab specimens was 0.123 kg/m^2 which complies with the OPSS 1352 requirement by a substantial margin, and indicates that the sealer product has provided significant protection to concrete that would otherwise have failed to meet the OPSS 1352 loss requirement.

Chloride Content in Concrete

Based on the results of the chloride tests presented in Table No. 3, there was an approximate 16% reduction in the chloride content in the sealer treated cylinder specimens as compared to the control unsealed cylinder.

Water Absorption

As you will note from the water absorption results after 21 days presented in Table No. 4, the average water absorption for the Control cylinders (unsealed) was 1.7%, as compared to the average water absorption for the Test cylinders of 1.1%, which represents an approximate 65% reduction in the in the water absorption of the sealed cylinders.

Water Vapour Transmission

As you will note from the water vapour transmission results after 21 days presented in Table No. 5, the average water vapour transmission for the Control cylinders (unsealed) was 68.4%, as compared to the average water vapour transmission for the Test cylinders of 94.2%, which represents an approximate 25.8% reduction in the in the water vapour transmission of the sealed cylinders.

15% NaCl Solution Absorption

As you will note from the 15% chloride absorption results after 21 days presented in Table No. 6, the average 15% chloride absorption for the Control cylinders (unsealed) was 1.7%, as compared to the average water absorption for the Test cylinders of 1.0%, which represents an approximate 59% reduction in the in the 15% chloride absorption of the sealed cylinders.

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7.

15% NaCl Solution Vapour Transmission

As you will note from the 15% NaCl solution vapour transmission results after 21 days presented in Table No. 7, the average 15% chloride solution vapour transmission for the Control cylinders (unsealed) was 50.1%, as compared to the 15% chloride solution vapour transmission for the Test cylinders of 72.4%, which represents an approximate 22.3% reduction in the 15% NaCl solution vapour transmission of the sealed cylinders.

Rapid Chloride Ion Penetrability

You will note that the average coulomb charge passed through the Control (unsealed cylinders) was 1145, as compared to the average coulomb charge passed through the Test (sealed) cylinders. This represents an approximate 61% reduction in the sealed Test cylinders.

According to the CSA A23.1-14 standard for concrete, the required coulomb rating for a Class C-1 concrete is 1500 coulombs within 91 days age, as you will note that the average results obtained for the Control concrete would comply with this requirement. The average results obtained for the sealed Test cylinders would comply with the C-XL concrete is 1000 coulombs within 91 days age, and indicates the sealed concrete has a very low coulomb rating to chloride penetrability.

We trust the above provides you with the information you require. Should you have any questions, please do not hesitate to contact the undersigned.

**Yours very truly,
Davroc Testing Laboratories Inc.**



**Kateryna Fiyalko, C.E.T.
Concrete Laboratory Supervisor**



**Sal Fasullo, C.E.T.
Vice President**

File: L18-0198MT

8.

Appendix A

Concrete Cylinder
Compressive Strength Test Report

CYLINDER COMPRESSIVE STRENGTH TEST REPORT

FILE NO. : L18-0198CT

TEST REPORT NO. : 1

CLIENT : Thor & Partners
2 Sheffield Street
Toronto, Ontario
M6M 3E6

CONTRACTOR : Verdi Alliance

PROJECT : Concrete Sealer Testing Program

DATE OF POUR : 26-Feb-18

CONTRACT NO: N/A

ATTN. : Christina Kentris
Christina@thorandpartners.com

LAB NO.	CYLINDER NO.	DATE CAST (D-M-Y)	DATE RECEIVED IN LAB (D-M-Y)	MASS (Kg/m ³)	CURE	DATE TESTED (D-M-Y)	T.O.F.	SPECIFIED 28 Day STRENGTH (MPa)	DAY STRENGTH (MPa)	7 DAY STRENGTH (MPa)	28 DAY STRENGTH (MPa)
462	1	26-Feb-18	27-Feb-18	2383	L	5-Mar-18	1			38.5	
462	2	26-Feb-18	27-Feb-18	2383	L	5-Mar-18	1			40.1	
462	3	26-Feb-18	27-Feb-18	2395	L	26-Mar-18	1	35			51.0
462	4	26-Feb-18	27-Feb-18	2395	L	26-Mar-18	1	35			51.4

NOTE: SUFFIX "L" DENOTES : LAB CURED - "F" DENOTES FIELD CURED "T.O.F." DENOTES TYPE OF FRACTURE: 1 - SATISFACTORY ; 2 - UNSATISFACTORY

LOCATION ON STRUCTURE:

Trial Sealer Tests.

	SLUMP (mm)	AIR (%)	TEMPERATURE (° C)	TIME	INITIAL 24 HOUR CURING TEMPERATURE (° C)	CYLINDERS CAST
MEASURED	75	5.2	CONCRETE : 15.4	MIXER CHARGED: 8:32	MIN. : 19	BY : Kirit / Bakee
SPECIFIED	70 - 90	5.0 - 7.0	AIR : 4.0	CYLINDERS CAST: 9:40	MAX. : 23	OF : Davroc
CONCRETE SUPPLIER : Dufferin			NOMINAL AGGREGATE SIZE (mm): 19mm		WATER ADDED ON THE JOB : No	
PLANT NO. : 4032			AIR ENTRAINING AGENT : Yes		BY WHOSE AUTHORITY : N/A	
TRUCK NO. : 1103			TYPE OF ADMXTURE: N/R		TYPE OF MOULD : Plastic	
LOAD NO. : 1			DRUM COUNT REVOLUTION: N/R		SIZE OF MOULD (mm): 100 x 200	

REMARKS:

Mix No. M3529310. Ticket No. 25866468. 35MPa @ 28 days; MTO; 19mm; AEA.

DISTRIBUTION:

Sandeep Makkar, C. Tech
Field Supervisor

Sal Fasullo, C.E.T.
Vice President

Date

Date Result

Appendix B

**Salt Scaling Resistance Test Results
and
Graphical Presentation
of Test Data**

Table No. 2
Salt Scaling Resistance Test Results
Concrete Sealer Testing Program
Dufferin Mix No.: M3529310, Control Specimens
Specimens Cast on February 26, 2018
Area: Davroc Sample No. C306-1- 0.0625m² & Davroc Sample No. C306-2-0.0625 m²

Number of Freeze-Thaw Cycles	Cumulative Loss in Surface Mass (kg/m ²)			*Visual Rating	*Characteristic of The Scaling Surface
	C306-1	C306-2	Mean	Category	
5	1.690	2.090	1.890	5/5	5/5- Severe scaling (coarse aggregate visible over entire surface)
10	2.662	2.808	2.735	5/5	As above
15	2.998	3.045	3.022	5/5	As above
20	3.158	3.208	3.183	5/5	As above
25	3.278	3.605	3.442	5/5	As above
30	3.605	3.666	3.636	5/5	As above
35	3.616	3.690	3.653	5/5	As above
40	3.623	3.702	3.663	5/5	As above
45	3.635	3.712	3.674	5/5	As above
50	3.650	3.718	3.684	5/5	As above

Note: The Ontario Provincial Standards Specification, Form 1352 salt scaling resistance requirement is based upon a loss of mass of not more than 0.80 kg/m² from the surface after 50 cycles of freezing and thawing.

*Visual ratings from CSA A 23.2-22C Test Method, Table 1.

Table No. 2
Salt Scaling Resistance Test Results
Concrete Sealer Testing Program
Dufferin Mix No.: M3529310, Sealed Test Specimens
Specimens Cast on February 26, 2018
Area: Davroc Sample No. C306-3- 0.0625m² & Davroc Sample No. C306-4-0.0625 m²

Number of Freeze-Thaw Cycles	Cumulative Loss in Surface Mass (kg/m ²)			*Visual Rating	*Characteristic of The Scaling Surface
	C306-3	C306-4	Mean	Category	
5	0.016	0.008	0.012	0/0	0/0-No significant scaling
10	0.030	0.013	0.022	1/0	1- Slight scaling /0-As above
15	0.077	0.019	0.048	2A/0	As above
20	0.101	0.029	0.065	2A/1	2A- Slight to moderate scaling of the surface mortar (few popouts)/1- Slight scaling
25	0.130	0.032	0.081	2B/1	2B- Slight to moderate scaling of the surface mortar(several popouts)/1-As above
30	0.144	0.040	0.092	2B/1	As above
35	0.152	0.045	0.099	2B/1	As above
40	0.166	0.051	0.109	2B/2A	2B-As above/2A-As above
45	0.179	0.056	0.118	2B/2A	As above
50	0.187	0.059	0.059	2B/2A	As above

Note: The Ontario Provincial Standards Specification, Form 1352 salt scaling resistance requirement is based upon a loss of mass of not more than 0.80 kg/m² from the surface after 50 cycles of freezing and thawing.

*Visual ratings from CSA A 23.2-22C Test Method, Table 1.

Graph # 1

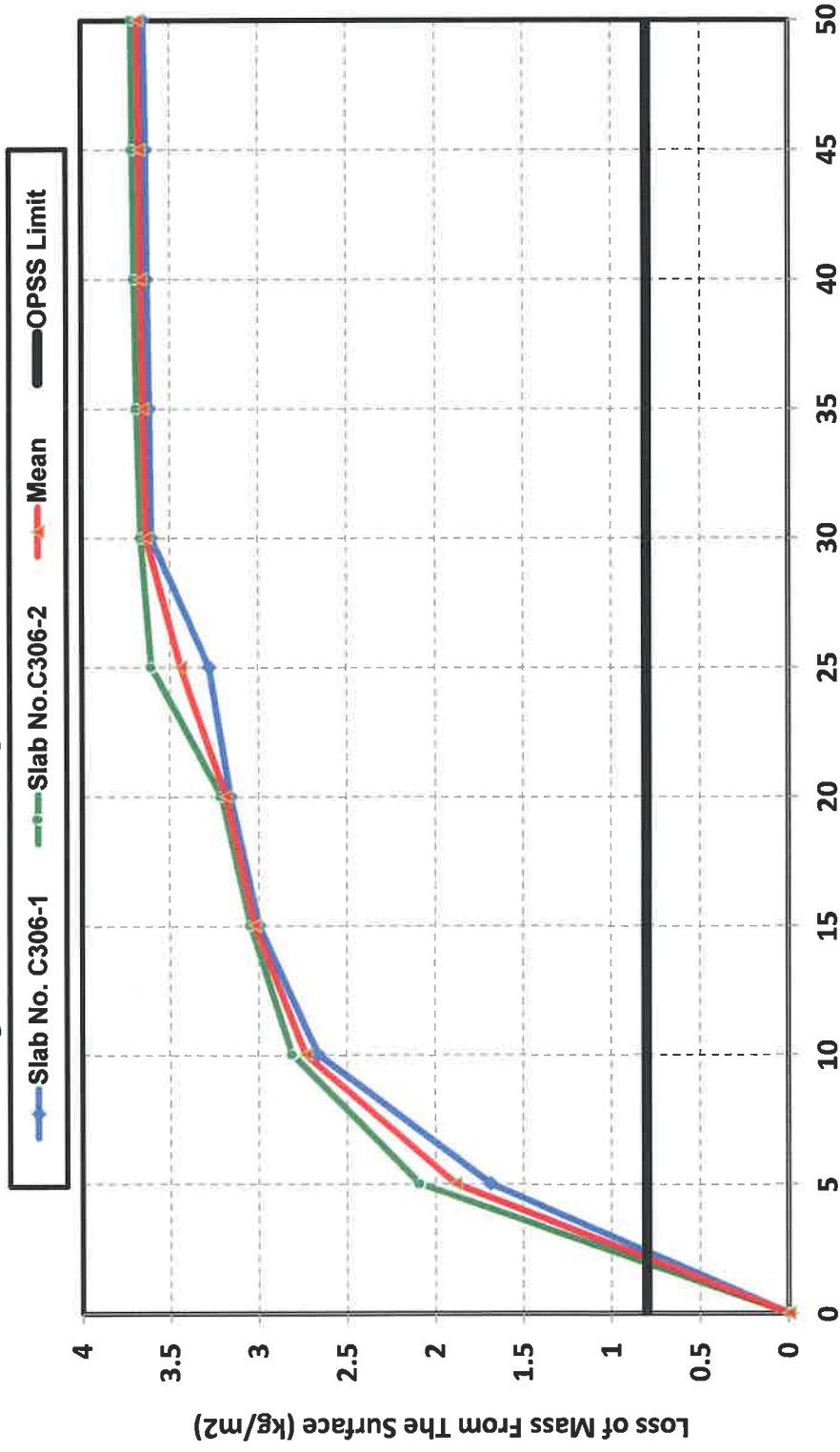
Salt Scaling Resistance Test

Thor & Partners

September 10, 2018

L18-0198SS

Project: Concrete Sealer Testing Program
Dufferin Mix No.: M3529310, Control Samples
Salt Scaling Resistance Testing in Accordance to LS-412 Test Procedure



Davroc Sample No. C306-1 & 2

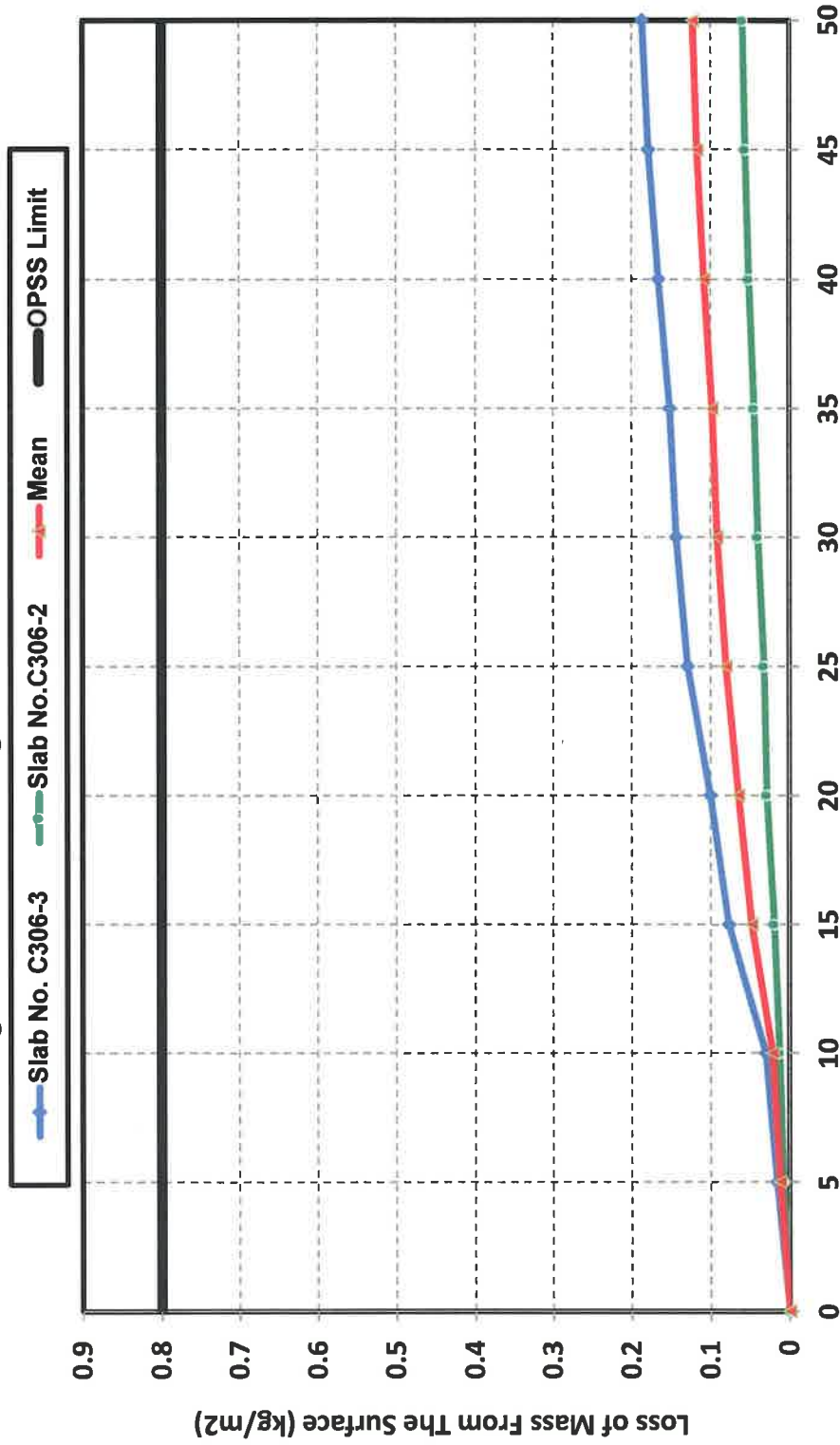
Number of Freeze-Thaw Cycles

Graph # 2 Salt Scaling Resistance Test Thor & Partners

September 10, 2018

Project: Concrete Sealer Testing Program
 Dufferin Mix No.: M3529310, Sealed Test Samples
 Salt Scaling Resistance Testing in Accordance to LS-412 Test Procedure

L18-0198SS

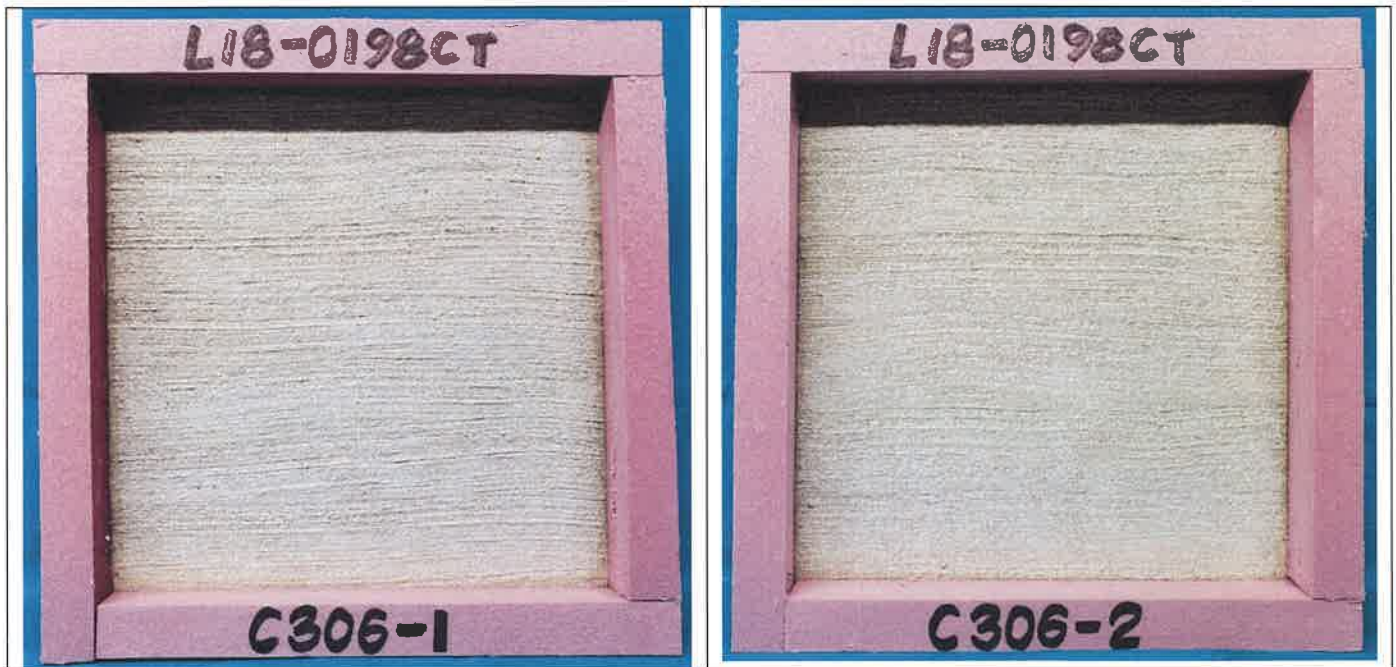


Number of Freeze-Thaw Cycles

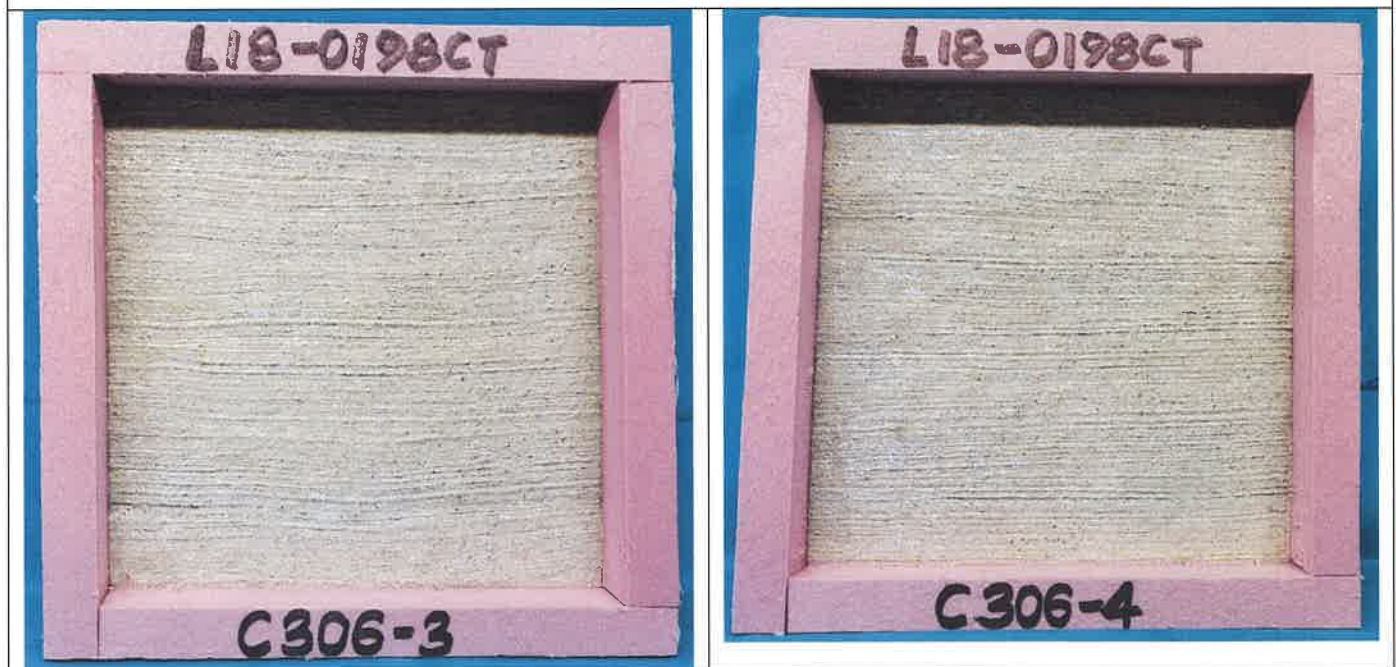
Davroc Sample No. C306--3 & 4

Appendix C

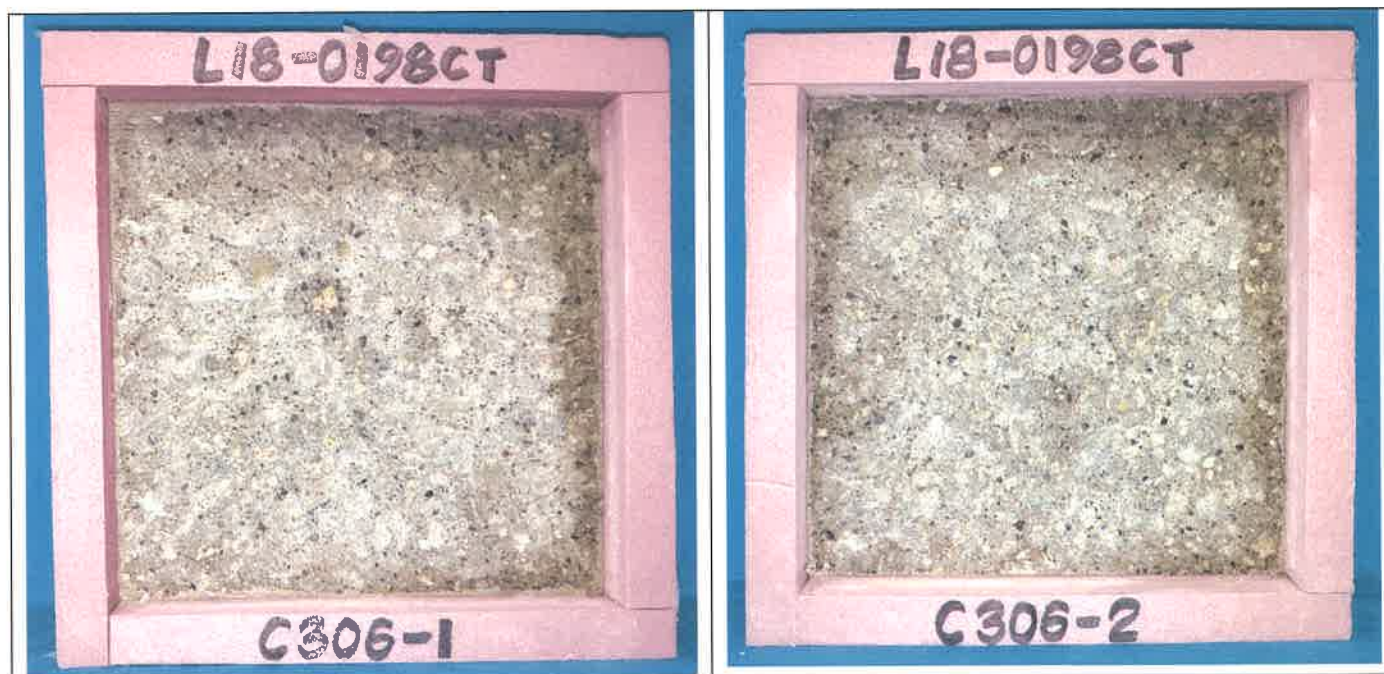
Photographs of the Salt Scaling Test Specimens



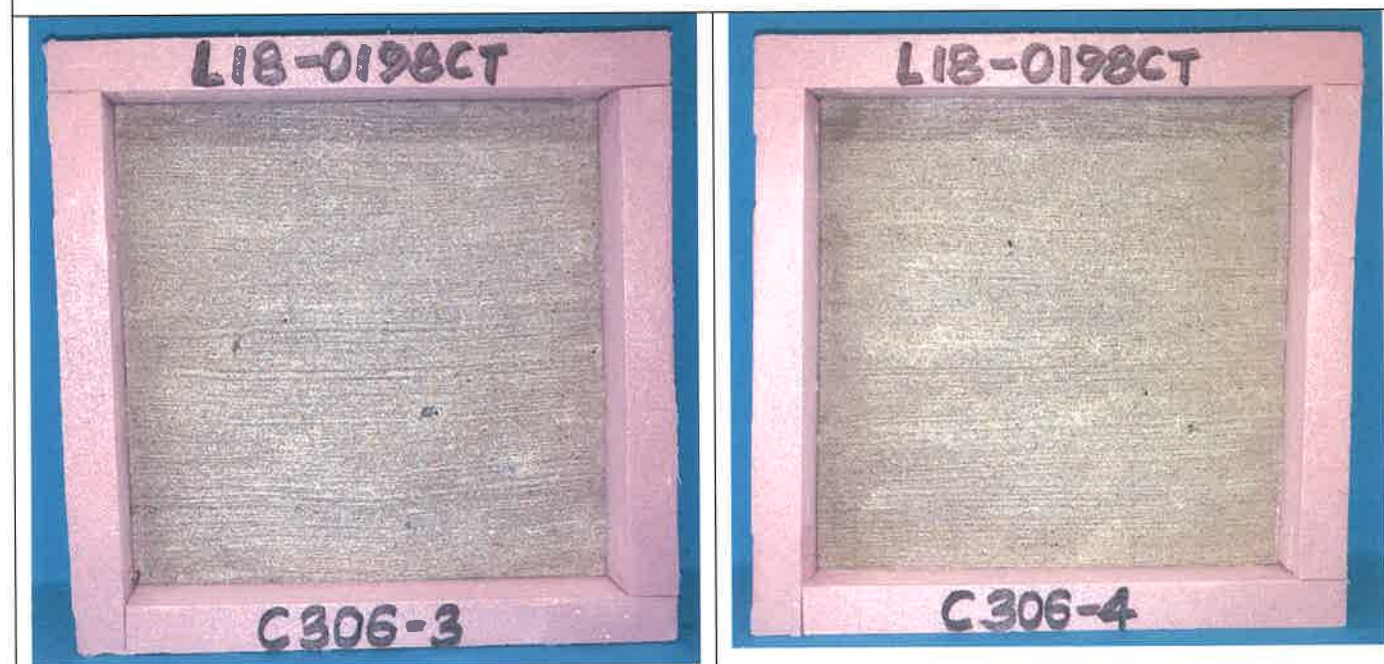
Slab C306-1 and Slab C306-2 Control samples before testing.



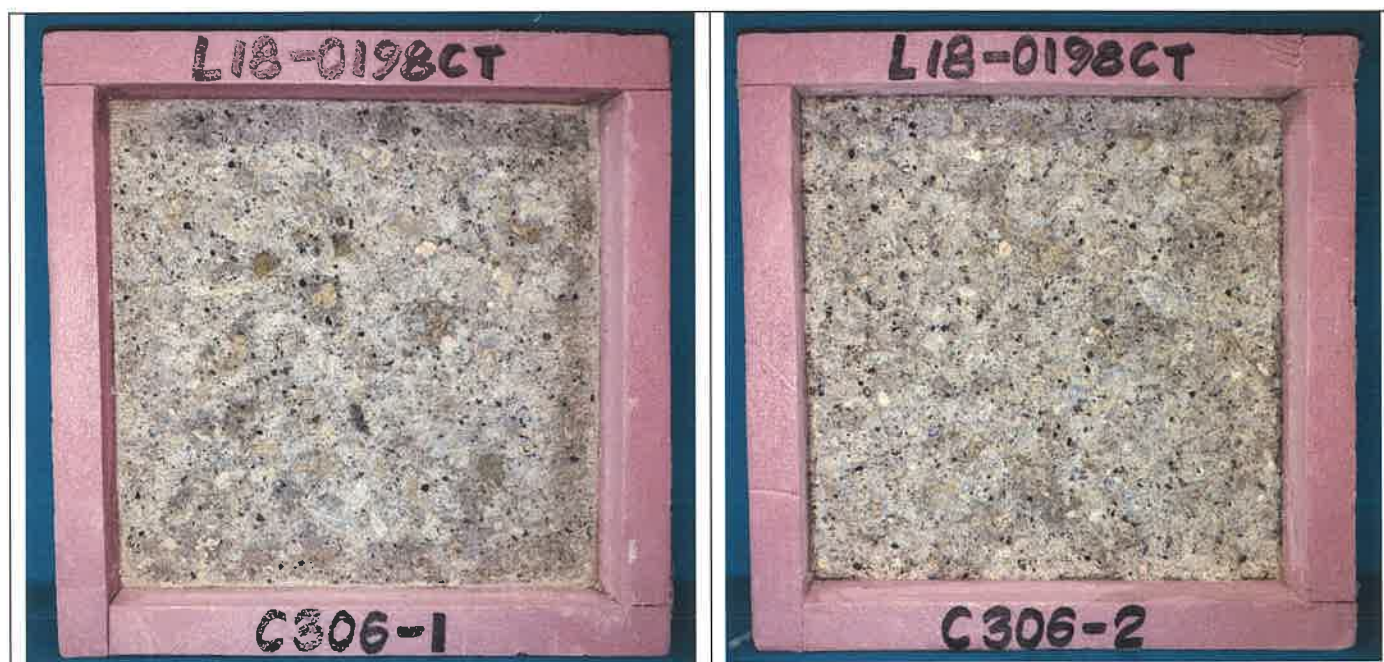
Slab C306-3 and Slab C306-4 Sealed test samples.



Slab C306-1 and Slab C306-1, Control samples after completion of 10 freeze-thaw cycles.



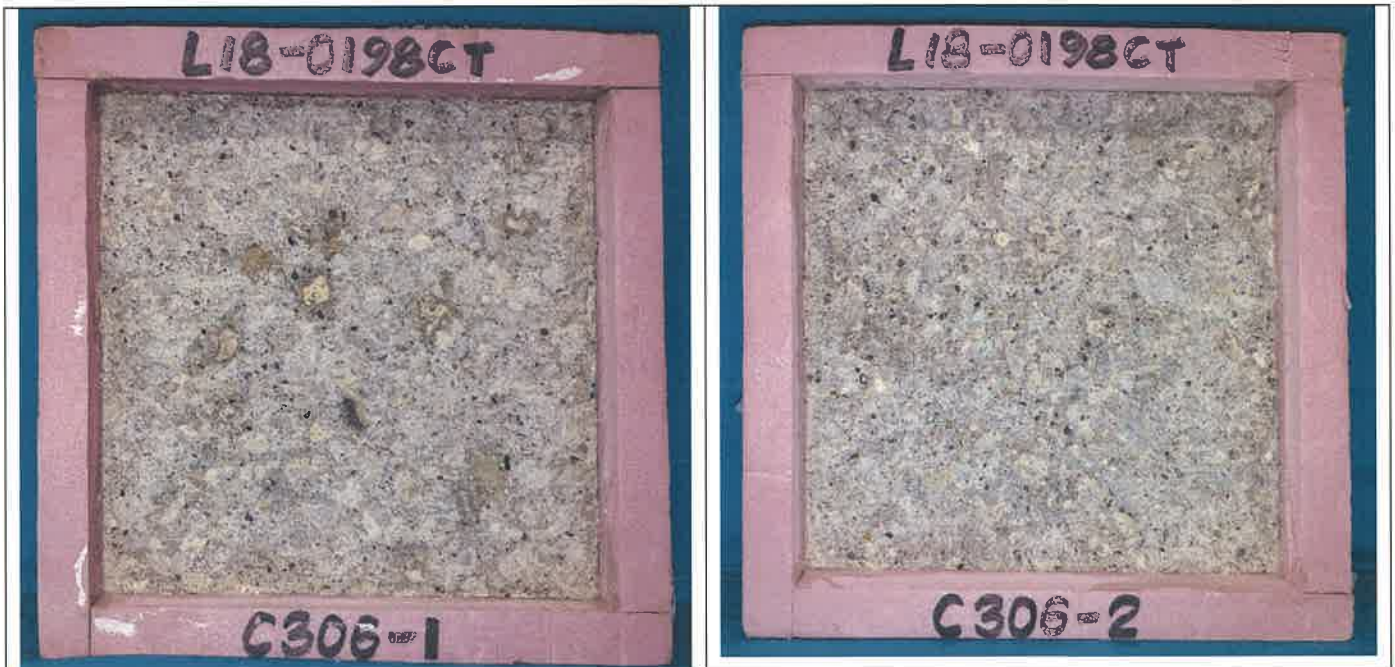
Slab C306-3 and Slab C306-4, Sealed test samples after completion of 10 freeze-thaw cycles.



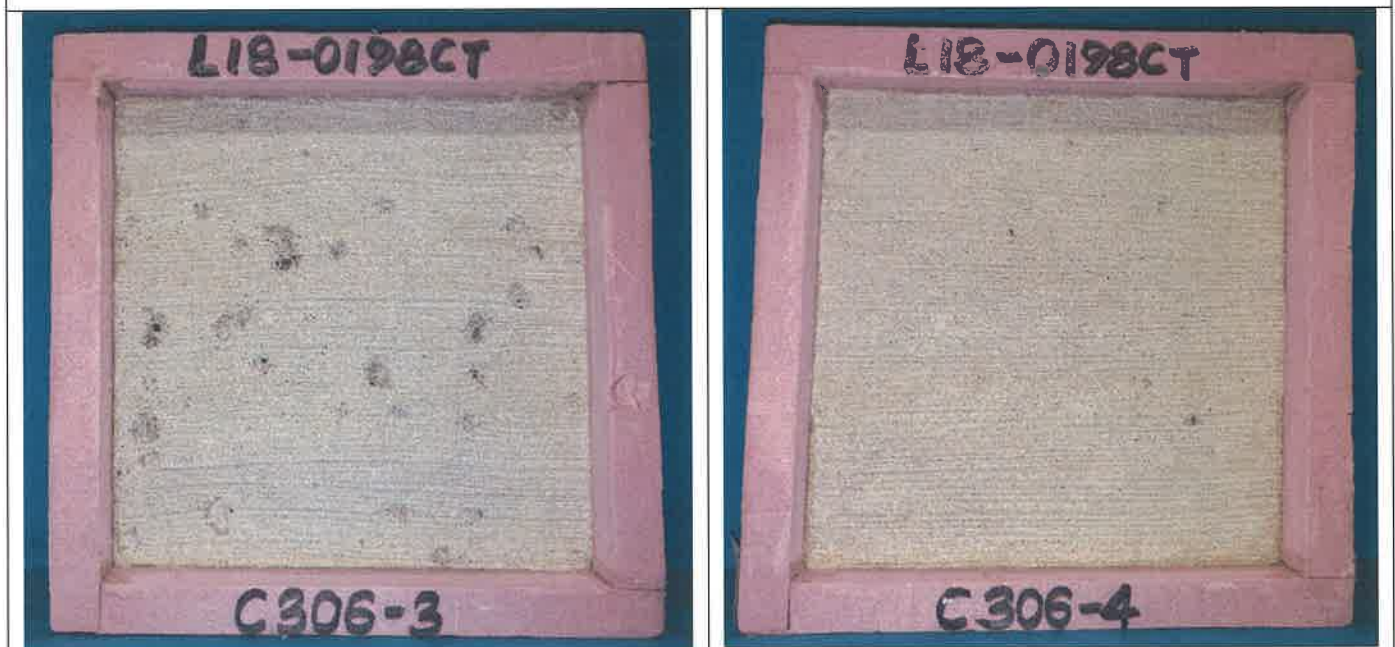
Slab C306-1 and Slab C306-1, Control samples after completion of 25 freeze-thaw cycles.



Slab C306-3 and Slab C306-4, Sealed test samples after completion of 25 freeze-thaw cycles.



Slab C306-1 and Slab C306-1, Control samples after completion of 50 freeze-thaw cycles.



Slab C306-3 and Slab C306-4, Sealed test samples after completion of 50 freeze-thaw cycles.

Appendix D

Absorption & Vapour Transmission Tests

Table No.'s 4, 5, 6 & 7

TABLE NO. 4
WATER ABSORPTION FOR SEALED AND UNSEALED CYLINDERS

Project Number:

L18-0198CT

Date: 8-Nov-18

Client/Project Name:

Thor & Partners

Sample Number: 462-5, 6, 7, 8

Sample Description:

100mmx200mm Conc. Cylinder

Sample No	→	462-5 Control 1		462-6 Control 2		462-7 Sealed 1		462-8 Sealed 2		Average Absorption	
Time (days)	↓	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Control (%)	Sealed (%)
0		3922.6	-	3921.0	-	3960.0	-	3950.9	-	-	-
1		3974.8	1.3	3972.9	1.3	3986.8	0.7	3977.7	0.7	1.3	0.7
3		3980.1	1.5	3979.0	1.5	3993.1	0.8	3983.4	0.8	1.5	0.8
7		3983.9	1.6	3982.5	1.6	3996.9	0.9	3987.3	0.9	1.6	0.9
14		3986.5	1.6	3985.2	1.6	3999.5	1.0	3990.5	1.0	1.6	1.0
21		3988.3	1.7	3987.5	1.7	4001.8	1.1	3992.6	1.1	1.7	1.1

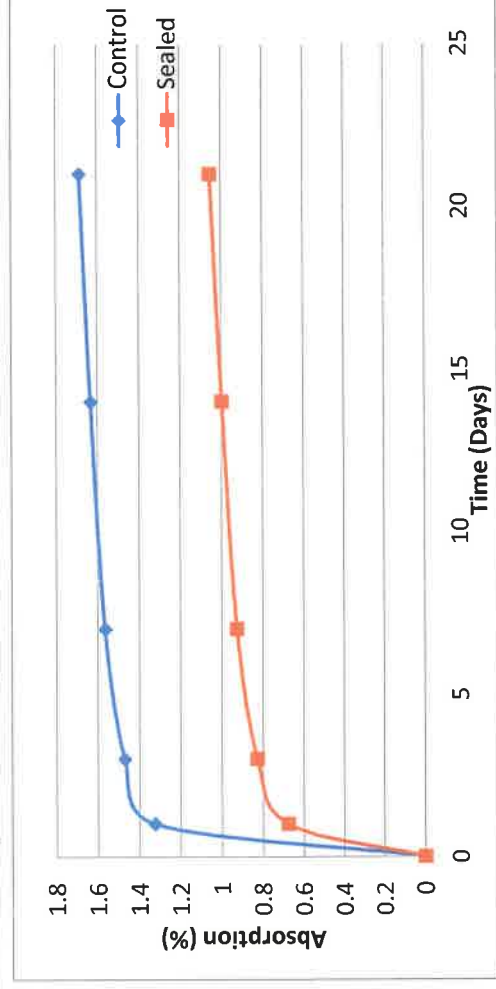


TABLE NO. 5
WATER VAPOUR TRANSMISSION FOR SEALED AND UNSEALED CYLINDERS

Project Number: L18-0198CT Date: 8-Nov-18

Client/Project Name: Thor & Partners Sample Number: 462-5, 6, 7, 8

Sample Description: 100mmx200mm Conc. Cylinder

Sample No	→	462-5 Control 1		462-6 Control 2		462-7 Sealed 1		462-8 Sealed 2		Average Vap. Trans.	
Time (days)	↓	Weight (g)	Vap.Tans. (%)	Weight (g)	Vap.Tans. (%)	Weight (g)	Vap.Tans. (%)	Weight (g)	Vap.Tans. (%)	Control (%)	Sealed (%)
0		3988.3	-	3987.5	-	4001.8	-	3992.6	-	-	-
1		3963.2	38.2	3963.4	36.2	3982.6	45.9	3971.9	49.6	37.2	47.8
3		3959.6	43.7	3954.4	49.8	3976.9	59.6	3967.5	60.2	46.7	59.9
7		3950.5	57.5	3949.2	57.6	3968.2	80.4	3958.9	80.8	57.6	80.6
14		3944.6	66.5	3944.0	65.4	3963.6	91.4	3954.5	91.4	66.0	91.4
21		3942.7	69.4	3942.7	67.4	3961.8	95.7	3953.9	92.8	68.4	94.2

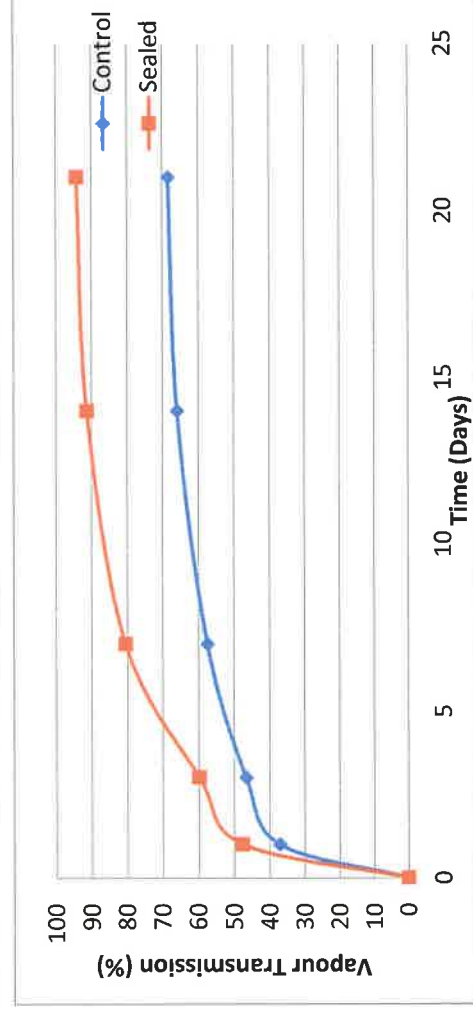


TABLE NO. 6
NaCl ABSORPTION FOR SEALED AND UNSEALED CYLINDERS

Project Number: L18-0198CT Date: 8-Nov-18

Client/Project Name: Thor & Partners Sample Number: 463-15, 16, 21, 22

Sample Description: 100mmx200mm Conc. Cylinder

Sample No	→	463-15 Control 1		463-16 Control 2		463-21 Sealed 1		463-22 Sealed 2		Average Absorption	
Time (days)	↓	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Weight (g)	Absorption (%)	Control (%)	Sealed (%)
0		3930.0	-	3931.7	-	3939.4	-	3941.1	-	-	-
1		3984.4	1.4	3990.3	1.5	3970.7	0.8	3970.5	0.7	1.4	0.8
3		3988.7	1.5	3993.8	1.6	3975.1	0.9	3974.8	0.9	1.5	0.9
7		3990.4	1.5	3995.5	1.6	3977.0	1.0	3976.6	0.9	1.6	0.9
14		3992.4	1.6	3997.6	1.7	3979.2	1.0	3979.1	1.0	1.6	1.0
21		3994.0	1.6	3998.8	1.7	3980.7	1.0	3980.6	1.0	1.7	1.0

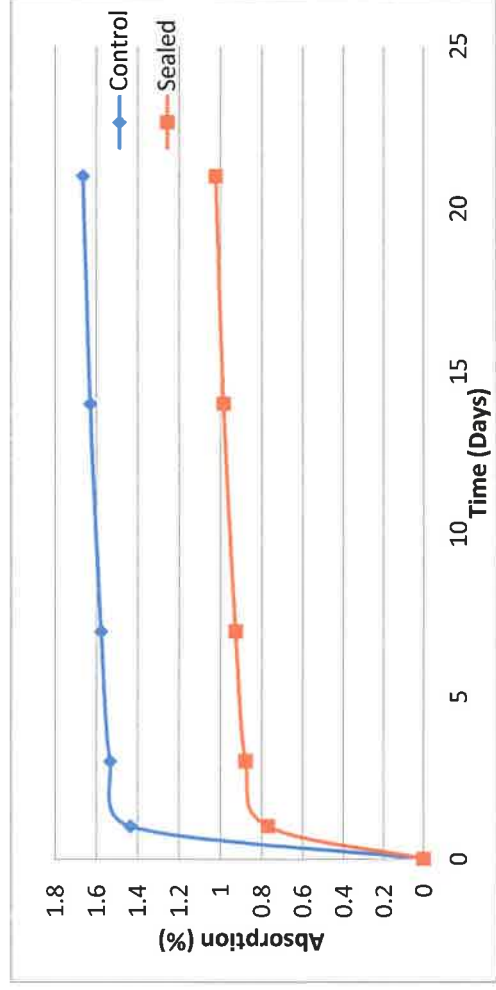


TABLE NO. 7
NaCl VAPOUR TRANSMISSION FOR SEALED AND UNSEALED CYLINDERS

Project Number: L18-0198CT Date: 8-Nov-18

Client/Project Name: Thor & Partners Sample Number: 463-15, 16, 21, 22

Sample Description: 100mmx200mm Conc. Cylinder

Sample No	→	463-15 Control 1		463-16 Control 2		463-21 Sealed 1		463-22 Sealed 2		Average Vap. Tran.	
Time (days)	↓	Weight (g)	Vap. Tran. (%)	Weight (g)	Vap. Tran. (%)	Weight (g)	Vap. Tran. (%)	Weight (g)	Vap. Tran. (%)	Control (%)	Sealed (%)
0		3994.0	-	3998.8	-	3980.7	-	3980.6	-	-	-
1		3983.6	16.3	3988.4	15.5	3969.7	26.6	3968.9	29.6	15.9	28.1
3		3975.8	28.4	3980.5	27.3	3963.6	41.4	3964.2	41.5	27.9	41.5
7		3967.2	41.9	3971.4	40.8	3955.8	60.3	3956.3	61.5	41.4	60.9
14		3962.8	48.7	3966.5	48.1	3951.6	70.5	3952.4	71.4	48.4	70.9
21		3961.6	50.6	3965.6	49.5	3951.1	71.7	3951.7	73.2	50.1	72.4

