

May 15, 2024



Rebotec USA
621 E. Princeton Dr.
Princeton, TX 75407

Attn: Ms. Melissa Kanjiravilyil

**Test Results of ASTM C1585 Rate of Absorption of Water by Hydraulic-Cement Concretes
AET Project No. P-0030708**

Dear Ms. Kanjiravilyil:

Attached are the referenced test results. Three 100-mm x 200-mm cylinder molds containing “Rebotec Admix Powder” arrived at American Engineering Testing, Inc. (AET) on February 27, 2024. For testing purposes, AET supplied laboratory stocked cement, aggregates and air-entraining admixture.

The constituent concrete materials supplied by AET were used to proportion two concrete mixtures using the proportions in ASTM C494/C494M – 19^{ε1}, “Standard Specification for Chemical Admixtures for Concrete.” Three 100-mm x 200-mm concrete cylinders were cast without Rebotec Admix Powder (control concrete) and three 100-mm x 200-mm concrete cylinders were cast with Rebotec Admix Powder (test concrete) using a dosage rate of 12.3 kg/m³ (20.7 lb/yd³). As requested, the cylinders were moist cured for 28 days at 23 ± 2°C, then prepared and tested in accordance with ASTM C1585 – 20, “Standard Test Method for Measurement of Rate of Absorption of Water by Hydraulic-Cement Concretes.”

At the age of 28 days, one 50-mm thick by 100-mm diameter puck (test specimen) was saw-cut from each of the six molded cylinders. The test specimens were then vacuum saturated by means of a vacuum desiccator and pump at no more than 50 mm Hg (6,650 Pa) absolute pressure for a period of three hours. At the end of the three-hour period, de-aerated water was introduced to the desiccator in sufficient volume to immerse the test specimens with the vacuum pump running and allowed to pump for an additional hour. The vacuum pump was then turned off and the test specimens allowed to soak for an additional 18 ± 2 hours. Following the vacuum saturation process, the test specimens were weighed, stored in an environmental chamber maintained at 50 ± 2°C and 80 ± 3% relative humidity for three days then placed inside individual sealable containers for at least 15 more days. During this 15-day moisture equilibrium period, the containers with test specimens were stored in laboratory air maintained at 23 ± 2°C.

The test specimens were then removed from their containers, measured for mass and dimensions and sealed around the sidewall perimeter with a rapid-setting impermeable sealant. Both ends of the test

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specimens were not sealed. The saw-cut interior ends of the test specimens were covered with plastic sheeting loosely attached with an elastic band. The finished ends of the test specimens were left as the exposed surfaces during absorption testing. Initial mass measurements were then recorded prior to placing the test specimens on supports inside a container filled with tap water to a level of approximately 3 mm above the supports. After exposure to water, mass measurements were recorded at 1, 5, 10, 20, 30 minutes, then every hour up to 6 hours, then daily up to 9 days.

The initial rate of water absorption is defined as the slope of the line that is best fit to the plot of absorption vs. the square root of time for the points between one minute and six hours. The secondary rate of water absorption is defined as the slope of the line that is best fit to the plot of absorption vs. the square root of time for the points between one day and seven days. For each set of data, the slope of the best fit lines and correlation coefficients (designated as R^2) are indicated on the plot.

The correlation coefficient is a measure of the linear relationship between two variables. For the purposes of this test method, we are seeking the linear relationship between average absorption and the square root of time. As stated in ASTM C1585, Sections 10.2 and 10.3, "if the data....do not follow a linear relationship (a correlation coefficient of less than 0.98) and show a systematic curvature, the rate of water absorption cannot be determined." A summary of test results is shown in Table 1 below.

Table 1. Summary of Rate of Absorption Test Results

Specimen	Control Concrete Rate of Absorption				Test Concrete Rate of Absorption			
	Initial, mm/√sec	Initial Correlation Coefficient	Secondary, mm/√sec	Secondary Correlation Coefficient	Initial, mm/√sec	Initial Correlation Coefficient	Secondary, mm/√sec	Secondary Correlation Coefficient
A	2.8 x 10 ⁻³	0.99	1.4 x 10 ⁻³	1.00	2.0 x 10 ⁻³	0.98	8.0 x 10 ⁻⁴	1.00
B	3.0 x 10 ⁻³	0.98	1.3 x 10 ⁻³	1.00	2.4 x 10 ⁻³	0.98	8.0 x 10 ⁻⁴	0.99
C	3.1 x 10 ⁻³	0.98	1.3 x 10 ⁻³	0.99	2.0 x 10 ⁻³	0.98	8.0 x 10 ⁻⁴	0.98
Average	3.0 x 10 ⁻³	0.98	1.3 x 10 ⁻³	1.00	2.1 x 10 ⁻³	0.98	8.0 x 10 ⁻⁴	0.99
Conclusion	Initial Rate of Absorption is Linear		Secondary Rate of Absorption is Linear		Initial Rate of Absorption is Linear		Secondary Rate of Absorption is Linear	
Decrease in Initial Rate of Absorption vs. Control: 30.0%								
Decrease in Secondary Rate of Absorption vs. Control: 38.5%								

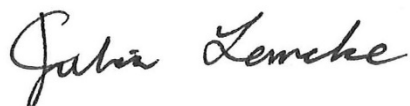
Test results indicate the test concrete made with Rebotec Admix Powder showed a decrease in both initial and secondary rates of absorption.

The remainder of the submitted materials and tested specimens will be retained for a period of thirty days from the date of this report. Unless written instructions are received by that time, the samples will be discarded. The test results represent specifically the samples tested and methods specified.

For further information, please contact me at the number listed below.

Sincerely,

American Engineering Testing
An AASHTO Accredited Laboratory – Aggregates, Cement & Concrete
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Client: Rebotec USA
Project: Admixture Evaluation
Contact: Ms. Melissa Kanjiravilyil
ate Received: February 27, 2024

AET Project No: P-0030708
AET Project Mgr.: Julia Lemcke
Technicians: D. Quinn, J. Lemcke
Approved: Jussara Tanesi
Report Date: May 15, 2024

**TEST RESULTS OF ASTM C1585,
 DETERMINATION OF MEASUREMENT OF RATE OF ABSORPTION OF WATER BY HYDRAULIC-CEMENT CONCRETES**
Concrete Tested: Control (without Rebotec Admix Powder)

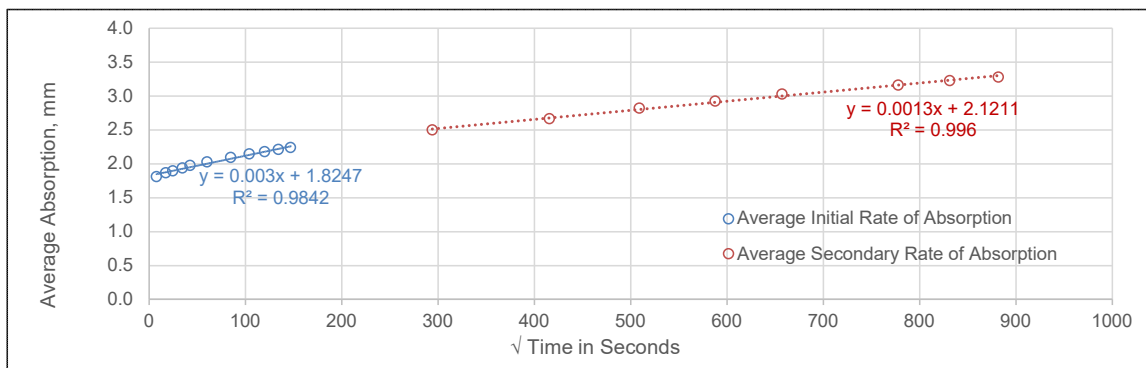
Specimen ID:	A	B	C
Average diameter of exposed surface of test specimen, mm:	102.18	102.24	102.57
Length of test specimen, mm:	51.30	51.30	52.82
Area of exposed face of specimen, mm ² :	8200.5	8209.0	8262.1
Mass before conditioning, g:	966.94	997.40	976.98
Mass before sealing, g:	946.68	997.45	957.86
Mass after sealing (initial), g:	953.64	984.27	964.02

Initial rate of absorption (up to 6 hours), mm/√sec:	2.8 x 10 ⁻³	3.0 x 10 ⁻³	3.1 x 10 ⁻³
Average initial rate of absorption (up to 6 hours), mm/√sec:	3.0 x 10⁻³		

Secondary rate of absorption (beyond 1 day), mm/√sec:	1.4 x 10 ⁻³	1.3 x 10 ⁻³	1.3 x 10 ⁻³
Average secondary rate of absorption (beyond 1 day), mm/√sec:	1.3 x 10⁻³		

Time in Contact with Water	Absorption (I), mm			
	Specimen A	Specimen B	Specimen C	Average
1 minute	0.16	3.89	1.39	1.81
5 minutes	0.21	3.94	1.45	1.87
10 minutes	0.22	3.97	1.49	1.89
20 minutes	0.26	4.02	1.53	1.93
30 minutes	0.29	4.05	1.57	1.97
1 hour	0.34	4.11	1.62	2.03
2 hours	0.41	4.18	1.69	2.09
3 hours	0.46	4.22	1.74	2.14
4 hours	0.50	4.26	1.78	2.18
5 hours	0.53	4.29	1.81	2.21

Time in Contact with Water	Absorption (I), mm			
	Specimen A	Specimen B	Specimen C	Average
6 hours	0.55	4.32	1.84	2.24
1 day	0.82	4.58	2.09	2.50
2 days	0.99	4.74	2.25	2.66
3 days	1.14	4.91	2.41	2.82
4 days	1.25	5.00	2.51	2.92
5 days	1.36	5.11	2.61	3.03
7 days	1.50	5.24	2.73	3.16
8 days	1.56	5.31	2.81	3.23
9 days	1.62	5.36	2.85	3.28



Notes:

- The test specimens are 4-in. diameter by 2-in. pucks which were saw cut from 4x8-in. concrete cylinders cast at AET on March 18, 2024.
- This report represents specifically the samples tested and the method specified.

Client: Rebotec USA
Project: Admixture Evaluation
Contact: Ms. Melissa Kanjiravilyil
ate Received: February 27, 2024

AET Project No: P-0030708
AET Project Mgr.: Julia Lemcke
Technicians: DQ, JL
Approved:
Report Date:

**TEST RESULTS OF ASTM C1585,
 DETERMINATION OF MEASUREMENT OF RATE OF ABSORPTION OF WATER BY HYDRAULIC-CEMENT CONCRETES**
Concrete Tested: Test (with Rebotec Admix Powder)

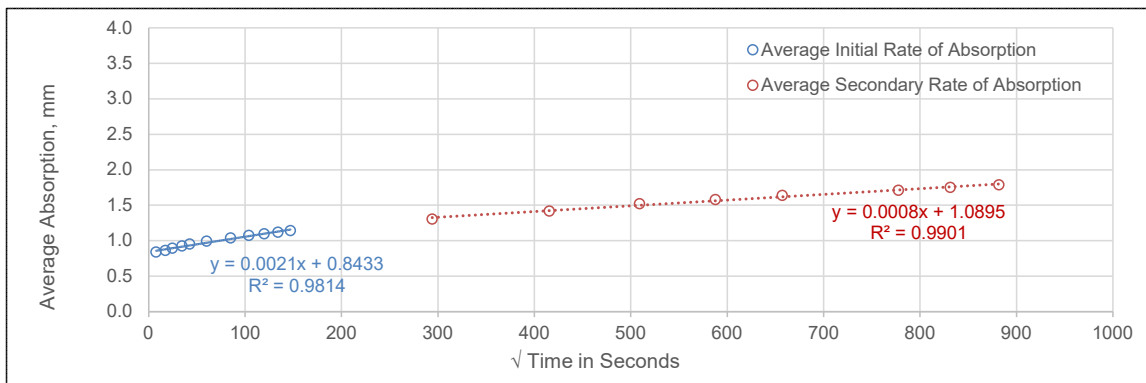
Specimen ID:	A	B	C
Average diameter of exposed surface of test specimen, mm:	101.96	101.94	102.13
Length of test specimen, mm:	51.25	51.25	51.38
Area of exposed face of specimen, mm ² :	8164.1	8161.3	8192.5
Mass before conditioning, g:	974.87	971.18	998.30
Mass before sealing, g:	954.64	948.81	978.09
Mass after sealing (initial), g:	960.62	955.60	984.32

Initial rate of absorption (up to 6 hours), mm/√sec:	2.0 x 10 ⁻³	2.4 x 10 ⁻³	2.0 x 10 ⁻³
Average initial rate of absorption (up to 6 hours), mm/√sec:	2.1 x 10⁻³		

Secondary rate of absorption (beyond 1 day), mm/√sec:	8.0 x 10 ⁻⁴	8.0 x 10 ⁻⁴	8.0 x 10 ⁻⁴
Average secondary rate of absorption (beyond 1 day), mm/√sec:	8.0 x 10⁻⁴		

Time in Contact with Water	Absorption (I), mm			
	Specimen A	Specimen B	Specimen C	Average
1 minute	0.07	-0.54	2.99	0.84
5 minutes	0.09	-0.52	3.02	0.86
10 minutes	0.12	-0.49	3.04	0.89
20 minutes	0.15	-0.45	3.08	0.92
30 minutes	0.18	-0.42	3.10	0.95
1 hour	0.21	-0.38	3.14	0.99
2 hours	0.26	-0.32	3.19	1.04
3 hours	0.29	-0.29	3.22	1.07
4 hours	0.31	-0.26	3.24	1.10
5 hours	0.33	-0.23	3.26	1.12

Time in Contact with Water	Absorption (I), mm			
	Specimen A	Specimen B	Specimen C	Average
6 hours	0.36	-0.21	3.28	1.14
1 day	0.53	-0.04	3.43	1.31
2 days	0.64	0.07	3.53	1.41
3 days	0.73	0.17	3.66	1.52
4 days	0.80	0.23	3.70	1.58
5 days	0.86	0.29	3.76	1.64
7 days	0.94	0.36	3.83	1.71
8 days	0.99	0.40	3.86	1.75
9 days	1.02	0.44	3.90	1.79



Notes:

1. The test specimens are 4-in. diameter by 2-in. pucks which were saw cut from 4x8-in. concrete cylinders cast at AET on March 18, 2024.
2. This report represents specifically the samples tested and the method specified.