



April 17, 2024

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

Attn: Ms. Melissa Kanjiravilyil

RE: **Interim Compliance Report: Rebotec Admix Powder, Type S**
ASTM C494/C494M – 19^ε1, “Standard Specification for Chemical Admixtures for Concrete”
AASHTO M194/M194 – 13(2021), “Standard Specification for Chemical Admixtures for Concrete”
AET Project No. P-0030708

Dear Ms. Kanjiravilyil:

American Engineering Testing, Inc. (AET) is pleased to present this report of our compliance verification testing of Rebotec Admix Powder. The attached report presents the interim test results of the referenced admixture. Three 4x8-in. cylinder molds of the admixture were received at AET on February 27, 2024.

All sample preparation and testing was performed in accordance with the applicable sections of AASHTO M194M/M194M – 13(2021), ASTM C494/C494M – 19^ε1, “Standard Specification for Chemical Admixtures for Concrete” and all referenced documents. Based on our results through 28 days, Rebotec Admix Powder, Type S complies with the requirements in AASHTO M194/M194 and Table 1 of ASTM C494 for a Type S, specific performance admixture.

Concrete batching and test specimen fabrication was conducted on three separate days. One control mixture and one test mixture containing Rebotec Admix Powder, both meeting the requirements of AASHTO M194 and ASTM C494 for fresh concrete properties, were produced each day. A commercially available vinsol resin air-entraining admixture was used for the concrete mixtures. Drake Type I/II/V cement from the Drake plant in Paulden, AZ was used for all concrete mixtures.

Product information and cement chemical and physical properties are presented in Tables 1 and 2. Aggregate properties and gradations are presented in Tables 3 and 4. Mixture proportions and results of testing are given in Tables 5 and 6.

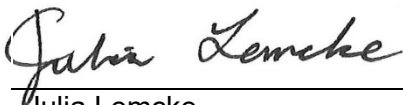
If there are any questions with regard to this report, please contact me.

Sincerely,

American Engineering Testing
An AASHTO Accredited Laboratory – Aggregates, Cement & Concrete

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TABLE 1. ADMIXTURE INFORMATION

	Reference Admixture	Test Admixture
Manufacturer	GCP Applied Technologies	Rebotec USA
Brand Name	Daravair M Vinsol Resin	Rebotec Admix Powder
Lot Number	Not Provided	Not Provided
Quantity Supplied	3-1/2 Gallons	Three 4x8-in. Cylinder Molds
Total Solids, %	14.1	99.6
Specific Gravity	1.039	Not Applicable
pH	11.8	12.6
Chloride, %	0.003	0.005

TABLE 2. PORTLAND CEMENT ANALYSIS – CHEMICAL AND PHYSICAL

ASTM C150 Type I/II/V Cement							
Brand Name: Paulden, AZ				Manufacturer: Drake Cement			
Chemical Analysis, Mass %							
Calcium oxide (CaO)	64.8	Tricalcium silicate (C ₃ S) (%)			53		
Silicon dioxide (SiO ₂)	21.1	Dicalcium silicate (C ₂ S) (%)			20		
Aluminum oxide (Al ₂ O ₃)	4.4	Tricalcium aluminate (C ₃ A) (%)			4		
Iron oxide (Fe ₂ O ₃)	4.5	Tetracalcium alumino ferrite (C ₄ AF) (%)			14		
Magnesium oxide (MgO)	1.1	C ₃ S + 4.75C ₃ A (%)			22		
Sulfur trioxide (SO ₃)	3.1	Loss on Ignition (%)			1.7		
Alkalies as Na ₂ O _{eq} (%)	0.43	Insoluble Residue (%)			0.82		
Physical Analysis							
Fineness, Blaine (cm ² /g)	4,330	Air Content (%)			6		
Vicat Time of Set Initial, hr:min	1:36	Autoclave Expansion (%)			0.05		
Mortar expansion (%) (C1038)	0.013	Mortar expansion (%) (C1038)			0.010		
Compressive Strength (psi)	3-day	3,750	7-day	4,690	28-day	6,400	

TABLE 3. PROPERTIES OF FINE AND COARSE AGREGATES

	Fine Aggregate	Coarse Aggregate
Manufacturer	Aggregate Industries	Martin Marietta
Aggregate type, ID	Natural Sand, Elk River	#57 Crushed Granite
Specific gravity, SSD	2.667	2.698
Absorption %	0.7	0.3

TABLE 4. GRADATIONS OF FINE AND COARSE AGGREGATES, ACCORDING TO ASTM C136

Fine Aggregate		
	Percent passing	ASTM C260/AASHTO M 154 Requirements
No. 4 [4.75 mm]	100	100
No. 16 [1.18 mm]	72	65 to 75
No. 50 [300 µm]	17	12 to 20
No. 100 [150 µm]	2	2 to 5

Coarse Aggregate		
	Percent passing	ASTM C260/AASHTO M 154 Requirements
1.5 in. [37.5 mm]	100	100
1.0 [25.0 mm]	96	95 to 100
0.50 in. [12.5 mm]	44	25 to 60
No. 4 [4.75 mm]	6	0 to 10
No. 8 [2.36 mm]	3	0 to 5

TABLE 5. Test Results for Concrete Made with Rebotec Admix Powder, Type S, Using 20.7 pcy

		Control Mixtures				Test Mixtures				ASTM C494/AASHTO
Mix Number		1	2	3	Average	1	2	3	Average	M 194 Requirements, Type S
Cast Date		3/18/2024	3/19/2024	3/20/2024		3/18/2024	3/19/2024	3/20/2024		
Mixture Proportions	Cement, pcy	517	517	517	517	517	517	517	517	517 ± 5
	Fine Aggregate, pcy	1,278	1,278	1,278	1,278	1,263	1,263	1,263	1,263	
	Coarse Aggregate, pcy	1,765	1,765	1,765	1,765	1,745	1,745	1,745	1,745	
	Water, pcy	286	286	286	286	283	283	283	283	
	Water Content, % of Control				99	99	99	99		
	Master Builders Daravair M				Master Builders Daravair M					
	AEA (Vinsol Resin)	1.4	1.3	1.5	1.4	1.6	1.6	1.8	1.6	
	AEA dose, oz/cwt	--	--	--	--	Rebotec Admix Powder				
	Test Admixture	--	--	--	--	20.7	20.7	20.7	20.7	
Admixture dose, pcy	--	--	--	--	0.55	0.55	0.55	0.55		
Water-to-Cement Ratio	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		
Plastic Properties	Slump, inches	4.00	3.75	3.50	3.75	3.75	3.50	4.00	3.75	3.50 ± 0.50 ± 0.5
	Air Content, %	6.2	6.5	6.1	6.3	6.4	5.9	6.8	6.4	
	Density, pcf	145.2	144.8	145.6	145.2	145.2	145.6	143.6	144.8	
Setting Time	Initial, hr:min	4:19	4:18	4:19	4:18	4:23	4:01	4:26	4:16	
	Final, hr:min	6:05	6:10	6:04	6:06	6:10	5:47	6:16	6:04	
					Initial, hr:min	0:04	-0:17	0:07	-0:02	Not More than 1:00 Earlier nor 1:30 Later
	Deviation from Reference				Final, hr:min	0:05	-0:23	0:12	-0:02	
Compressive Strength	3 Days, psi	2,908	2,911	3,284	3,030	2,844	3,420	3,077	3,110	≥ 90% ≥ 90% ≥ 90% N/A ≥ 90% ≥ 90%
	7 Days, psi	3,914	3,916	4,231	4,020	3,735	4,737	3,856	4,110	
	28 Days, psi	5,363	5,553	5,633	5,520	4,665	6,369	5,033	5,360	
	90 Days, psi									
	6 Months, psi									
	1 Year, psi									
					3 Days	98	117	94	103	
					7 Days	95	121	91	102	
	% Reference				28 Days	87	115	89	97	
					90 Days					
					6 Months					
					1 Year					
Flexural Strength	3 Days, psi	580	590	605	590	600	625	635	620	≥ 90% ≥ 90% ≥ 90%
	7 Days, psi	610	675	725	670	635	680	660	660	
	28 Days, psi	695	740	820	750	730	690	750	725	
					3 Days	103	106	105	105	
	% Reference				7 Days	104	101	91	99	
					28 Days	105	93	91	97	
Length Change, %		-0.022	-0.024	-0.021	-0.022	-0.024	-0.023	-0.025	-0.024	≤ 0.010 ^A
		Increase Over Control				0.002	-0.001	0.004	0.002	
Resistance to Freezing and Thawing	Relative Dynamic Modulus, %	0 cycles								In Progress ≥ 80%
		34 cycles								
		70 cycles								
		103 cycles								
		139 cycles								
		171 cycles								
		207 cycles								
		243 cycles								
		279 cycles								
		300 cycles								

^A Increased shrinkage over control.

TABLE 6. ASTM C494/AASHTO M 194 Test Results of Chemical Admixtures for Concrete
Rebotec Admix Powder, Type S, 20.7 pcy

Mixture Designation	Control	Rebotec Admix Powder	Change vs. Control	ASTM C494/AASHTO M 194 Requirements, Type S
Mixture Proportions				
Cement, pcy	517	517	0	517 ± 5
Fine Aggregate, pcy	1,278	1,263		
Coarse Aggregate, pcy	1,765	1,745		
Water, pcy	286	283		
AEA (Vinsol Resin), oz/cwt	1.4	1.6		
Test Admixture, pcy	--	20.7		
Ratio of Fine to Total Aggregate, %	42	42		
Water-to-Cement Ratio	0.55	0.55		
Plastic Properties				
Slump, inches	3.75	3.75	0.00	3.50 ± 0.50
Air Content, %	6.3	6.4	0.1	± 0.5
Density (Unit Weight), pcf	145.2	144.8		
Setting Time				
Initial, hr:min	4:18	4:16	-0:02	Not More than 1:00 Earlier nor 1:30 Later
Final, hr:min	6:06	6:04	-0:02	Not More than 1:00 Earlier nor 1:30 Later
Compressive Strength, psi				
3 Days, psi	3,030	3,110	103	≥ 90%
7 Days, psi	4,020	4,110	102	≥ 90%
28 Days, psi	5,520	5,360	97	≥ 90%
90 Days, psi				N/A
6 Months, psi				≥ 90%
1 Year, psi				≥ 90%
Flexural Strength, psi				
3 Days, psi	590	620	105	≥ 90%
7 Days, psi	670	660	99	≥ 90%
28 Days, psi	750	725	97	≥ 90%
Length Change by Drying Shrinkage				
Length Change, %	-0.022	-0.024	0.002	≤ 0.010 ^A
Resistance to Freezing and Thawing, Procedure A				
Relative Durability Factor, %			In Progress	≥ 80%

^A Increased shrinkage over control.