



April 16, 2019

Mr. Tim Yeiser
Dricrete
4469 Admiralty Way
Marina Del Rey, CA 90292

Interim Compliance Report: Dricrete™ - Intelligent/Integral Concrete Waterproofing, Type S
ASTM C494/C494M – 16, “Standard Specification for Chemical Admixtures for Concrete”
AASHTO M194/M194 – 13(2017), “Standard Specification for Chemical Admixtures for Concrete”
AET Project No. 29-20291

Dear Mr. Yeiser:

American Engineering Testing, Inc. (AET) is pleased to present this report of our compliance verification testing of Dricrete™ - Intelligent/Integral Concrete Waterproofing. The attached report presents the interim test results of the referenced admixture. One 12-lb. bag sample of the admixture was received on May 25, 2018.

All sample preparation and testing was performed in accordance with the applicable sections of AASHTO M194M/M194M – 13(2017), ASTM C494/C494M – 16, “Standard Specification for Chemical Admixtures for Concrete” and all referenced documents. Based on our results through 90 days, Dricrete™ - Intelligent/Integral Concrete Waterproofing, 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 one day. Three control mixtures and three test mixtures containing Dricrete™ - Intelligent/Integral Concrete Waterproofing, both meeting the requirements of AASHTO M194 and ASTM C494 for fresh concrete properties, were produced. A commercially available vinsol resin air-entraining admixture was used for the concrete mixtures. Holcim Type I/II portland cement from the St. Genevieve plant 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, Inc.

A handwritten signature in black ink that reads 'Willy Morrison'.

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Table 1. Admixture Information

	Reference Admixture	Test Admixture
Manufacturer	Sika Corporation	Dricrete
Brand Name	Sika AER-C	Dricrete™ - Intelligent/Integral Concrete Waterproofing
Lot Number	3002150496	3003307603
Quantity Supplied	Partially-Full One Gallon	12 lb. Bag
Total Solids, %	21.42	99.48
Specific Gravity	1.061	Not Applicable
pH	11.85	12.3 ^{See Note 1}
Chloride, %	0.004	0.016 ^{See Note 2}

Note 1: Testing conducted with 5% solution by weight of deionized water

Note 2: Testing conducted by European Standard EN 480-10, Method 1

Table 2. Portland Cement Analysis – Chemical and Physical

ASTM C150 Type I/II Cement			
Brand Name	St. Genevieve		
Manufacturer	Holcim (US) Inc.		
<i>Chemical Analysis, %</i>			
Silicon dioxide (SiO ₂)	19.8	Tricalcium silicate (C ₃ S) (%)	61
Aluminum oxide (Al ₂ O ₃)	4.5	Dicalcium silicate (C ₂ S) (%)	8
Iron oxide (Fe ₂ O ₃)	3.2	Tricalcium aluminate (C ₃ A) (%)	6
Magnesium oxide (MgO)	2.7	Tetracalcium alumino ferrite (C ₄ AF) (%)	9
Sulfur trioxide (SO ₃)	3.4	C ₃ S + 4.75C ₃ A (%)	90.7
Calcium oxide (CaO)	64.2		
Insoluble Residue (%)	0.47	Loss on Ignition (%)	2.6
Alkalies as Na ₂ O (%)	0.54		
<i>Physical Analysis</i>			
Fineness, Blaine (m ² /kg)	379	Air Content (%)	7
Vicat Time of Set (Initial), minutes	90	Autoclave Expansion (%)	0.04
Compressive Strength			
3 Day (psi)	4330	7 Day (psi)	5360
Mortar Bar Expansion (%) (C1038)	0.013		

Table 3. Properties of Fine and Coarse Aggregates

	Fine Aggregate	Coarse Aggregate
Manufacturer	Aggregate Industries	Martin Marietta
Aggregate type, ID	Natural Sand, Elk River	#57 Crushed Granite
Specific gravity, SSD	2.675	2.677
Absorption %	0.6	0.3

Table 4. Gradations of Fine and Coarse Aggregates

ASTM C136, Gradation of fine aggregate

Percent passing		
	Fine Aggregate	ASTM C494/AASHTO M194 Requirements
No. 4 [4.75 mm]	100	100
No. 16 [1.18 mm]	72	65 to 75
No. 50 [300 µm]	13	12 to 20
No. 100 [150 µm]	2	2 to 5

ASTM C136, Gradation of coarse aggregate

Percent passing		
	Coarse Aggregate	ASTM C494 Requirements
1.5 in. [37.5 mm]	100	100
1.0 in. [25.0 mm]	98	95 to 100
0.5 in. [12.5 mm]	45	25 to 60
No. 4 [4.75 mm]	6	0 to 10
No. 8 [2.36 mm]	4	0 to 5

Laboratory Data	Concrete Mixtures and Testing Results								Dricrete™ - Intelligent/Integral Concrete Waterproofing added at a rate of 10.3 pcy	
	Sika AER-C				Dricrete™					
	Batch No. Cast Date	Control #1 7/16/2018	Control #2 7/16/2018	Control #3 7/16/2018	AVER. (Test Value)	Test #1 7/16/2018	Test #2 7/16/2018	Test #3 7/16/2018	AVER. (Test Value)	ASTM C494, Type S AASHTO M194
Cement, pcy	519	517	517	518	514	516	516	515	517 ± 5	
Sand, pcy	1,282	1,278	1,278	1,279	1,271	1,275	1,275	1,274		
Gravel, pcy	1,770	1,765	1,765	1,767	1,755	1,760	1,760	1,758		
Water, pcy	285	284	284	284	282	283	283	283		
Water Content (Percent of Control)	---	---	---	---	99	100	100	99		
AEAName	Sika AER-C				Sika AER-C					
AEA Dosage, oz/cwt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
Admixture Name	---				Dricrete™					
Admixture Dosage, pcy	---	---	---	---	10.34	10.34	10.34	10.3		
WATER CEMENT RATIO	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		
Slump, inches	3.50	3.50	3.50	3.50	3.75	4.00	3.50	3.75	3.5 ± 0.5	
Air Content, %	6.0	6.1	6.0	6.0	6.5	5.7	6.0	6.1	± 0.5	
Density, pcf	142.8	142.4	142.4	142.5	141.6	142.0	142.0	141.9		
SETTING TIME										
Initial, hr:mn	3:41	3:37	3:38	3:38	3:41	3:36	3:47	3:41		
Final, hr:mn	5:05	4:56	5:03	5:01	5:11	5:01	5:21	5:11		
TIME of SETTING (deviation from reference)										
Initial, hr:mn	---	---	---	---	0:00	-0:01	0:09	0:03	Not more than 1:00 earlier nor 1:30 later	
Final, hr:mn	---	---	---	---	0:06	0:05	0:18	0:10	Not more than 1:00 earlier nor 1:30 later	
COMPRESSIVE STRENGTH										
3 Days, psi	3,550	3,140	3,010	3,230	3,180	3,240	3,080	3,170		
7 Days, psi	4,070	3,580	3,460	3,700	3,820	3,800	3,570	3,730		
28 Days, psi	5,070	4,530	4,600	4,730	4,810	4,880	4,540	4,740		
56 Days, psi	5,390	4,800	4,730	4,970	5,140	5,190	4,970	5,100		
90 Days, psi	5,820	5,230	5,020	5,360	5,450	5,370	5,130	5,320		
6 Months, psi										
1 Year, psi										
3 Days, % reference	---	---	---	---	90	103	102	98	≥90%	
7 Days, % reference	---	---	---	---	94	106	103	101	≥90%	
28 Days, % reference	---	---	---	---	95	108	99	100	≥90%	
56 Days, % reference	---	---	---	---	95	108	105	103	N/A	
90 Days, % reference	---	---	---	---	94	103	102	99	N/A	
6 Months, % reference	---	---	---	---					≥90%	
1 Year, % reference	---	---	---	---					≥90%	
FLEXURAL STRENGTH										
3 Days, psi	595	520	595	570	650	605	605	620		
7 Days, psi	695	675	720	695	725	710	670	700		
28 Days, psi	790	700	735	740	785	760	860	800		
56 Days, psi	820	760	755	780	790	780	900	825		
3 Days, % reference	---	---	---	---	109	116	102	109	≥90%	
7 Days, % reference	---	---	---	---	104	105	93	101	≥90%	
28 Days, % reference	---	---	---	---	99	109	117	108	≥90%	
56 Days, % reference	---	---	---	---	96	103	119	106	N/A	
LENGTH CHANGE, %										
Increase over control	-0.002	-0.008	-0.011	-0.007	-0.012	-0.009	-0.004	-0.008		
	---	---	---	---	0.010	0.001	-0.007	0.001	≤0.010 ^A	
RESISTANCE TO FREEZING AND THAWING										
Relative Dynamic Modulus, %										
	0	cycles								
	36	cycles								
	72	cycles								
	108	cycles								
	144	cycles								
	180	cycles								
	216	cycles								
	252	cycles								
	288	cycles								
	324	cycles								
RELATIVE DURABILITY FACTOR								In Progress	min 80	

A. Increased shrinkage over control.

TABLE 6
TESTS OF CHEMICAL ADMIXTURES FOR CONCRETE
DRICRETE™ - INTELLIGENT/INTEGRAL CONCRETE WATERPROOFING
ASTM SPECIFICATION C494 / AASHTO M194
TYPE S, SPECIFIC PERFORMANCE

MIXTURE DESIGNATION	<u>CONTROL</u>	<u>DRICRETE™</u>	<u>CHANGE vs. CONTROL</u>	<u>SPECIFICATION REQUIREMENT</u>
MIXTURE PROPORTIONS				
CEMENT, pcy	518	515	-3	517 ± 5
SAND, pcy	1,279	1,274		
GRAVEL, pcy	1,767	1,758		
NET WATER, pcy	284	283		
AEA (Vinsol Resin), oz/cwt	0.5	0.5		
ADMIXTURE DOSAGE, pcy	---	10.3		
RATIO OF FINE TO TOTAL AGG., %				
WATER/CEMENT RATIO, lb./lb.	42	42		
	0.55	0.55		
SLUMP, inches				
	3.50	3.75	0.25	3.5 ± 0.5
ENTRAINED AIR, %				
	6.0	6.1	0.1	± 0.5
UNIT WEIGHT, pcf				
	142.5	141.9		
SET TIME, hr:min				
INITIAL	3:38	3:41	0:03	Not more than 1:00 earlier nor 1:30 later
FINAL	5:01	5:11	0:10	Not more than 1:00 earlier nor 1:30 later
COMPRESSIVE STRENGTH, psi				
3 DAYS	3,230	3,170	98%	≥90%
7 DAYS	3,700	3,730	101%	≥90%
28 DAYS	4,730	4,740	100%	≥90%
56 DAYS	4,970	5,100	103%	N/A
90 DAYS	5,360	5,320	99%	N/A
180 DAYS				≥90%
365 DAYS				≥90%
FLEXURAL STRENGTH, psi				
3 DAYS	570	620	109%	≥90%
7 DAYS	695	700	101%	≥90%
28 DAYS	740	800	108%	≥90%
56 DAYS	780	825	106%	N/A
LENGTH CHANGE				
Increase over control	-0.007	-0.008	0.001	≤0.010^A
RELATIVE DURABILITY FACTOR, %				
			In Progress	≥80%

A. Increased shrinkage over control.