



September 22, 2021

Ms. Katheryn Malusky
NTPEP
444 N Capitol Street NW
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Washington DC, 20001

CADD-2020-01-055

Final Compliance Report: Fritz-Pak Corp., Supercizer 5, Type F

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. 29-20780

Dear Ms. Malusky:

American Engineering Testing, Inc. (AET) is pleased to present this report of our compliance verification testing of Supercizer 5. The attached report presents the final test results of the referenced admixture. One 20-lb bag of the admixture was received on July 21, 2020 and the NTPEP notification to proceed was received on June 30, 2020.

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 one year, Supercizer 5, Type F complies with the requirements in AASHTO M194/M194 and Table 1 of ASTM C494 for a Type F, water reducing high range admixture.

Concrete batching and test specimen fabrication was conducted on three separate days. One control mixture and one test mixture containing Supercizer 5, 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. 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	Mapei	Fritz-Pak Corp.
Brand Name	Vinsol Resin	Supercizer 5
NTPEP CADD Number	--	CADD-2020-01-055
Lot Number	E093014	95600
Quantity Supplied	1 Quart	One 20-lb Bag
Total Solids, %	15.01	90.61
Specific Gravity	1.044	N/A
pH	10.7	10.97
Chloride, %	0.009	0.040 note 1

Note 1: Testing conducted using 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: LafargeHolcim Inc.	
<i>Chemical Analysis, Mass %</i>			
Silicon dioxide (SiO ₂)	19.9	Tricalcium silicate (C ₃ S) (%)	67
Aluminum oxide (Al ₂ O ₃)	4.5	Dicalcium silicate (C ₂ S) (%)	3
Iron oxide (Fe ₂ O ₃)	3.1	Tricalcium aluminate (C ₃ A) (%)	6
Calcium oxide (CaO)	64.0	Tetracalcium alumino ferrite (C ₄ AF) (%)	9
Magnesium oxide (MgO)	2.3	C ₃ S + 4.75C ₃ A (%)	96.1
Sulfur trioxide (SO ₃)	3.3		
Insoluble Residue (%)	0.36	Loss on Ignition (%)	3.1
Alkalies as Na ₂ O _{eq} (%)	0.55		
<i>Physical Analysis</i>			
Fineness, Blaine (m ² /kg)	392	Air Content (%)	6.0
Vicat Time of Set	Initial, minutes	90	Autoclave Expansion (%)
			0.04
Mortar expansion (%) (C1038)	0.005		
Compressive Strength	3 Day (psi)	4,210	7 Day (psi) 5,250

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	2.667	2.698
Absorption %	0.7	0.3

TABLE 4. Gradations of Fine and Coarse Aggregates, According to ASTM C136

Fine Aggregate		
	Percent passing	ASTM C494/AASHTO M 194 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 C494/AASHTO M 194 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
0.375 in. [9.5 mm]	6	0 to 10
No. 4 [4.75 mm]	3	0 to 5
No. 8 [2.36 mm]	100	100

TABLE 5. Test Results for Concrete Made with Supercizer 5, Type F, Using 0.37 lb/cwt

Mix Number	Control Mixtures				Test Mixtures				ASTM C494/AASHTO M 194 Requirements, Type F		
	1	2	3	Average	1	2	3	Average			
Cast Date	8/4/2020	8/12/2020	8/18/2020		8/4/2020	8/12/2020	8/18/2020				
Mixture Proportions	Cement, pcy	519	521	520	520	520	520	515	518	517 ± 5	
	Fine Aggregate, pcy	1,282	1,289	1,285	1,285	1,328	1,328	1,313	1,323		
	Coarse Aggregate, pcy	1,770	1,780	1,775	1,775	1,833	1,833	1,813	1,826		
	Water, pcy	285	286	286	286	250	250	247	249		
	Water Content, % of Control					88	87	86	87		88%
	Mapei Vinsol Resin					Mapei Vinsol Resin					
	AEA (Vinsol Resin)										
	AEA dose, oz/cwt	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9		
	Test Admixture	--	--	--	--	Supercizer 5					
	Admixture dose, lb/cwt	--	--	--	--	0.37	0.37	0.37	0.37		
Water-to-Cement Ratio	0.55	0.55	0.55	0.55	0.48	0.48	0.48	0.48			
Plastic Properties	Slump, inches	4.00	3.75	3.75	3.75	4.00	3.75	3.75	3.75	3.50 ± 0.50 ± 0.5	
	Air Content, %	6.0	5.9	6.0	6.0	5.5	5.9	6.4	5.9		
	Density, pcf	142.8	143.6	143.2	143.2	145.6	145.6	144.0	145.1		
Setting Time	Initial, hr:min	4:04	3:47	4:31	4:07	3:52	3:46	4:09	3:55		
	Final, hr:min	5:40	5:22	6:21	5:47	5:08	5:16	5:44	5:22		
	Deviation from Reference				Initial, hr:min	-0:12	-0:01	-0:22	-0:12	Not More than 1:00 Earlier nor 1:30 Later	
					Final, hr:min	-0:32	-0:06	-0:37	-0:25	Not More than 1:00 Earlier nor 1:30 Later	
Compressive Strength	1 Day, psi	2,320	2,210	2,240	2,260	3,460	3,800	4,310	3,860		
	3 Days, psi	3,220	3,040	2,990	3,080	4,260	4,920	5,390	4,860		
	7 Days, psi	3,630	3,630	3,640	3,630	5,020	5,530	6,190	5,580		
	28 Days, psi	4,980	4,460	4,510	4,650	6,170	6,530	7,120	6,610		
	56 Days, psi	5,210	5,090	5,160	5,150	6,570	7,180	7,260	7,000		
	90 Days, psi	5,420	5,190	5,500	5,370	7,200	7,310	7,590	7,370		
	6 Months, psi	5,890	5,240	5,660	5,600	7,280	7,430	8,860	7,860		
	1 Year, psi	5,910	5,590	5,710	5,740	7,270	7,750	8,830	7,950		
					1 Day	149	172	192	171	≥ 140%	
					3 Days	132	162	180	158	≥ 125%	
					7 Days	138	152	170	154	≥ 115%	
	% Reference				28 Days	124	146	158	142	≥ 110% (≥ 120%)^A	
					56 Days	126	141	141	136	N/A	
				90 Days	133	141	138	137	(≥ 117%)^A		
				6 Months	124	142	157	140	≥ 100% (≥ 113%)^A		
				1 Year	123	139	155	139	≥ 100%		
Flexural Strength	3 Days, psi	605	590	560	585	605	690	715	670		
	7 Days, psi	605	700	580	630	655	705	725	695		
	28 Days, psi	675	730	630	680	780	735	785	765		
	56 Days, psi	700	625	635	655	745	710	870	775		
					3 Days	100	117	128	115	≥ 110%	
	% Reference				7 Days	108	101	125	110	≥ 100%	
				28 Days	116	101	125	113	≥ 100%		
				56 Days	106	114	137	118	N/A		
Length Change, %	-0.015	-0.003	0.000	-0.006	-0.013	-0.010	-0.017	-0.013			
				Increase Over Control	-0.002	0.007	0.017	0.007		≤ 0.010^B	
Resistance to Freezing and Thawing	Relative Dynamic Modulus, %	0 cycles	100/100	100/100	100/100	100	100/100	100/100	100/100	100	
		34 cycles	96/96	95/97	98/99	97	94/94	96/96	98/97	96	
		70 cycles	96/96	97/97	98/99	97	93/94	96/96	97/97	95	
		103 cycles	98/98	98/97	96/98	98	94/95	96/97	96/96	96	
		139 cycles	98/99	99/99	99/100	99	89/93	98/99	98/98	96	
		171 cycles	99/99	99/98	98/99	99	87/90	98/98	97/97	94	
		207 cycles	99/99	99/99	99/100	99	72/88	97/97	97/97	91	
		243 cycles	99/99	100/99	99/100	99	57/83	98/98	97/97	88	
		279 cycles	99/98	99/99	99/100	99	^(C) / 72	96/98	97/96	91	
		300 cycles	99/98	100/100	99/100	99	^(C) / 60	96/98	96/95	89	
									89	≥ 80%	

^A Alternative requirement. If any of the measured relative strengths are greater than the requirement in parentheses, the admixture shall be considered provisionally qualified until the 1-year strength results are obtained.

^B Increased shrinkage over control.

^C Relative dynamic modulus is below 60%, specimen discontinued.

**TABLE 6. ASTM C494/AASHTO M 194 Test Results of Chemical Admixtures for Concrete
 Supercizer 5, Type F, 0.37 lb/cwt**

Mixture Designation	Control	Supercizer 5	Change vs. Control	ASTM C494/AASHTO M 194 Requirements, Type F
Mixture Proportions				
Cement, pcy	520	518	-2	517 ± 5
Fine Aggregate, pcy	1,285	1,323		
Coarse Aggregate, pcy	1,775	1,826		
Water, pcy	286	249	87%	88%
AEA (Vinsol Resin), oz/cwt	0.8	0.9		
Test Admixture, lb/cwt	--	0.37		
Ratio of Fine to Total Aggregate, %	42	42		
Water-to-Cement Ratio	0.55	0.48		
Plastic Properties				
Slump, inches	3.75	3.75	0.00	3.50 ± 0.50
Air Content, %	6.0	5.9	-0.1	± 0.5
Density (Unit Weight), pcf	143.2	145.1		
Setting Time				
Initial, hr:min	4:07	3:55	-0:12	Not More than 1:00 Earlier nor 1:30 Later
Final, hr:min	5:47	5:22	-0:25	Not More than 1:00 Earlier nor 1:30 Later
Compressive Strength, psi				
1 Day, psi	2,260	3,860	171	≥ 140%
3 Days, psi	3,080	4,860	158	≥ 125%
7 Days, psi	3,630	5,580	154	≥ 115%
28 Days, psi	4,650	6,610	142	≥ 110% (≥ 120%)^A
56 Days, psi	5,150	7,000	136	N/A
90 Days, psi	5,370	7,370	137	(≥ 117%)^A
6 Months, psi	5,600	7,860	140	≥ 100% (≥ 113%)^A
1 Year, psi	5,740	7,950	139	≥ 100%
Flexural Strength, psi				
3 Days, psi	585	670	115	≥ 110%
7 Days, psi	630	695	110	≥ 100%
28 Days, psi	680	765	113	≥ 100%
56 Days, psi	655	775	118	N/A
Length Change by Drying Shrinkage				
Length Change, %	-0.006	-0.013	0.007	≤ 0.010^B
Resistance to Freezing and Thawing, Procedure A				
Relative Durability Factor, %			89	≥ 80%

^A Alternative requirement. If any of the measured relative strengths are greater than the requirement in parentheses, the admixture shall be considered provisionally qualified until the 1-year strength results are obtained.

^B Increased shrinkage over control.