



September 22, 2021

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

**CADD-2020-01-057**

**Final Compliance Report: Fritz-Pak Corp., Slick-Pak II, 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. 29-20780

Dear Ms. Malusky:

American Engineering Testing, Inc. (AET) is pleased to present this report of our compliance verification testing of Slick-Pak II. 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, Slick-Pak II, 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 Slick-Pak II, 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	Slick-Pak II
NTPEP CADD Number	--	CADD-2020-01-057
Lot Number	E093014	97136
Quantity Supplied	1 Quart	One 20-lb Bag
Total Solids, %	15.01	98.41
Specific Gravity	1.044	N/A
pH	10.7	11.71
Chloride, %	0.009	0.106 <sup>note 1</sup>

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 <sub>2</sub> )	19.9	Tricalcium silicate (C <sub>3</sub> S) (%)	67
Aluminum oxide (Al <sub>2</sub> O <sub>3</sub> )	4.5	Dicalcium silicate (C <sub>2</sub> S) (%)	3
Iron oxide (Fe <sub>2</sub> O <sub>3</sub> )	3.1	Tricalcium aluminate (C <sub>3</sub> A) (%)	6
Calcium oxide (CaO)	64.0	Tetracalcium alumino ferrite (C <sub>4</sub> AF) (%)	9
Magnesium oxide (MgO)	2.3	C <sub>3</sub> S + 4.75C <sub>3</sub> A (%)	96.1
Sulfur trioxide (SO <sub>3</sub> )	3.3		
Insoluble Residue (%)	0.36	Loss on Ignition (%)	3.1
Alkalies as Na <sub>2</sub> O <sub>eq</sub> (%)	0.55		
<i>Physical Analysis</i>			
Fineness, Blaine (m <sup>2</sup> /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**

	<b>Fine Aggregate</b>	<b>Coarse Aggregate</b>
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**

<b>Fine Aggregate</b>		
	<b>Percent passing</b>	<b>ASTM C494/AASHTO M 194 Requirements</b>
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

  

<b>Coarse Aggregate</b>		
	<b>Percent passing</b>	<b>ASTM C494/AASHTO M 194 Requirements</b>
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 Slick-Pak II, Type S, Using 0.02 lb/cwt

Mix Number	Control Mixtures				Test Mixtures				ASTM C494/AASHTO M 194 Requirements, Type S		
	1	2	3	Average	1	2	3	Average			
<b>Cast Date</b>	8/4/2020	8/12/2020	8/18/2020		8/4/2020	8/12/2020	8/18/2020				
<b>Mixture Proportions</b>	Cement, pcy	519	521	520	<b>520</b>	520	519	521	<b>520</b>	<b>517 ± 5</b>	
	Fine Aggregate, pcy	1,282	1,289	1,285	<b>1,285</b>	1,285	1,282	1,289	<b>1,285</b>		
	Coarse Aggregate, pcy	1,770	1,780	1,775	<b>1,775</b>	1,775	1,770	1,780	<b>1,775</b>		
	Water, pcy	285	286	286	<b>286</b>	286	285	286	<b>286</b>		
		Water Content, % of Control				100	100	100	<b>100</b>		
	AEA (Vinsol Resin)	Mapei Vinsol Resin				Mapei Vinsol Resin					
	AEA dose, oz/cwt	0.8	0.8	0.8	<b>0.8</b>	1.0	1.0	1.0	<b>1.0</b>		
	Test Admixture	--	--	--	--	Slick-Pak II					
	Admixture dose, lb/cwt	--	--	--	--	0.02	0.02	0.02	<b>0.02</b>		
	Water-to-Cement Ratio	0.55	0.55	0.55	<b>0.55</b>	0.55	0.55	0.55	<b>0.55</b>		
<b>Plastic Properties</b>	Slump, inches	4.00	3.75	3.75	<b>3.75</b>	4.00	4.00	3.75	<b>4.00</b>	<b>3.50 ± 0.50 ± 0.5</b>	
	Air Content, %	6.0	5.9	6.0	<b>6.0</b>	6.5	6.0	5.6	<b>6.0</b>		
	Density, pcf	142.8	143.6	143.2	<b>143.2</b>	143.2	142.8	143.6	<b>143.2</b>		
<b>Setting Time</b>	Initial, hr:min	4:04	3:47	4:31	<b>4:07</b>	4:12	4:13	4:34	<b>4:19</b>		
	Final, hr:min	5:40	5:22	6:21	<b>5:47</b>	5:48	5:49	6:28	<b>6:01</b>		
		Deviation from Reference				Initial, hr:min	0:08	0:26	0:03	<b>0:12</b>	<b>Not More than 1:00 Earlier nor 1:30 Later</b>
						Final, hr:min	0:08	0:27	0:07	<b>0:14</b>	<b>Not More than 1:00 Earlier nor 1:30 Later</b>
<b>Compressive Strength</b>	3 Days, psi	3,220	3,040	2,990	<b>3,080</b>	3,190	3,420	2,990	<b>3,200</b>		
	7 Days, psi	3,630	3,630	3,640	<b>3,630</b>	3,830	3,670	3,820	<b>3,770</b>		
	28 Days, psi	4,980	4,460	4,510	<b>4,650</b>	5,130	4,830	4,720	<b>4,890</b>		
	56 Days, psi	5,210	5,090	5,160	<b>5,150</b>	5,180	5,070	5,470	<b>5,240</b>		
	90 Days, psi	5,420	5,190	5,500	<b>5,370</b>	5,330	5,110	5,760	<b>5,400</b>		
	6 Months, psi	5,890	5,240	5,660	<b>5,600</b>	5,410	5,690	5,790	<b>5,630</b>		
	1 Year, psi	5,910	5,590	5,710	<b>5,740</b>	5,610	5,660	5,750	<b>5,670</b>		
						3 Days	99	113	100	<b>104</b>	<b>≥ 90%</b>
						7 Days	106	101	105	<b>104</b>	<b>≥ 90%</b>
						28 Days	103	108	105	<b>105</b>	<b>≥ 90%</b>
					56 Days	99	100	106	<b>102</b>	<b>N/A</b>	
					90 Days	98	98	105	<b>101</b>	<b>N/A</b>	
					6 Months	92	109	102	<b>101</b>	<b>≥ 90%</b>	
					1 Year	95	101	101	<b>99</b>	<b>≥ 90%</b>	
<b>Flexural Strength</b>	3 Days, psi	605	590	560	<b>585</b>	580	600	595	<b>590</b>		
	7 Days, psi	605	700	580	<b>630</b>	620	645	605	<b>625</b>		
	28 Days, psi	675	730	630	<b>680</b>	650	655	705	<b>670</b>		
	56 Days, psi	700	625	635	<b>655</b>	660	725	785	<b>725</b>		
						3 Days	96	102	106	<b>101</b>	<b>≥ 90%</b>
						7 Days	102	92	104	<b>99</b>	<b>≥ 90%</b>
					28 Days	96	90	112	<b>99</b>	<b>≥ 90%</b>	
					56 Days	94	116	124	<b>111</b>	<b>N/A</b>	
<b>Length Change, %</b>	-0.015	-0.003	0.000	<b>-0.006</b>	-0.005	-0.007	-0.009	<b>-0.007</b>			
	Increase Over Control				-0.010	0.004	0.009	<b>0.001</b>		<b>≤ 0.010<sup>B</sup></b>	
<b>Resistance to Freezing and Thawing</b>	<b>Relative Dynamic Modulus, %</b>	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	96/96	96/96	96/96	96	
		70 cycles	96/96	97/97	98/99	97	96/96	98/98	98/98	97	
		103 cycles	98/98	98/97	96/98	98	96/96	99/99	96/96	97	
		139 cycles	98/99	99/99	99/100	99	98/98	99/99	96/96	98	
		171 cycles	99/99	99/98	98/99	99	96/96	99/99	96/96	97	
		207 cycles	99/99	99/99	99/100	99	99/99	99/99	98/98	98	
		243 cycles	99/99	100/99	99/100	99	98/99	99/98	99/98	98	
		279 cycles	99/98	99/99	99/100	99	99/98	99/99	99/99	99	
		300 cycles	99/98	100/100	99/100	99	98/98	99/99	98/99	98	
								<b>99</b>	<b>≥ 80%</b>		

<sup>A</sup> 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.

<sup>B</sup> Increased shrinkage over control.

**TABLE 6. ASTM C494/AASHTO M 194 Test Results of Chemical Admixtures for Concrete  
 Slick-Pak II, Type S, 0.02 lb/cwt**

Mixture Designation	Control	Slick-Pak II	Change vs. Control	ASTM C494/AASHTO M 194 Requirements, Type S
<b>Mixture Proportions</b>				
Cement, pcy	520	520	0	<b>517 ± 5</b>
Fine Aggregate, pcy	1,285	1,285		
Coarse Aggregate, pcy	1,775	1,775		
Water, pcy	286	286		
AEA (Vinsol Resin), oz/cwt	0.8	1.0		
Test Admixture, lb/cwt	--	0.02		
Ratio of Fine to Total Aggregate, %	42	42		
Water-to-Cement Ratio	0.55	0.55		
<b>Plastic Properties</b>				
Slump, inches	3.75	4.00	0.25	<b>3.50 ± 0.50</b>
Air Content, %	6.0	6.0	0.0	<b>± 0.5</b>
Density (Unit Weight), pcf	143.2	143.2		
<b>Setting Time</b>				
Initial, hr:min	4:07	4:19	0:12	<b>Not More than 1:00 Earlier nor 1:30 Later</b>
Final, hr:min	5:47	6:01	0:14	<b>Not More than 1:00 Earlier nor 1:30 Later</b>
<b>Compressive Strength, psi</b>				
3 Days, psi	3,080	3,200	104	<b>≥ 90%</b>
7 Days, psi	3,630	3,770	104	<b>≥ 90%</b>
28 Days, psi	4,650	4,890	105	<b>≥ 90%</b>
56 Days, psi	5,150	5,240	102	N/A
90 Days, psi	5,370	5,400	101	N/A
6 Months, psi	5,600	5,630	101	<b>≥ 90%</b>
1 Year, psi	5,740	5,670	99	<b>≥ 90%</b>
<b>Flexural Strength, psi</b>				
3 Days, psi	585	590	101	<b>≥ 90%</b>
7 Days, psi	630	625	99	<b>≥ 90%</b>
28 Days, psi	680	670	99	<b>≥ 90%</b>
56 Days, psi	655	725	111	N/A
<b>Length Change by Drying Shrinkage</b>				
Length Change, %	-0.006	-0.007	0.001	<b>≤ 0.010<sup>B</sup></b>
<b>Resistance to Freezing and Thawing, Procedure A</b>				
Relative Durability Factor, %			99	<b>≥ 80%</b>

<sup>A</sup> 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.

<sup>B</sup> Increased shrinkage over control.