Concrete Admixture (CADD) Evaluation of:

Fritz-Pak Corporation

Fritz-Pak Delayed Set, Standard & Mini

(CADD-2025-01-030)

April 29, 2026

Submitted to:

AASHTO Product Evaluation & Audit Solutions
555 12th St NW, Suite 1000
Washington, DC 20004

Attn: Keegan Visser
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Submitted by:

SGS TEC Services
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James G. McCants III
General Manager, Chemist

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Product Information

Product Name: Delayed Set, Standard & Mini

Product Type: Type D

DataMine Number: CADD-2025-01-030

Manufacturer: Fritz-Pak Corporation

Manufacturer Address: 4821 Eastover Circle, Mesquite, Texas 75149

Manufacturer Contact: David Ojeda

Manufacturer Email/Phone: (214) 221-9494 / dot@fritzpak.com

Date Received by Laboratory: April 4, 2025

NOTE: AASHTO Product Evaluation & Audit Solutions makes no judgement on evaluated products. AASHTO Product Evaluation & Audit Solutions conducts independent third party testing and provides the results of this testing to our state members. Any decision on product acceptability will be made by the individual state agencies, based upon their own internal specifications. Participation in the program does not guarantee acceptance to any state APL/QPLs.

Summary

Dear Mr. Visser:

SGS TEC Services is an AASHTO R18, ANS/ISO/IEC 17025:2017 and Army Corps of Engineers accredited laboratory. SGS TEC Services is pleased to present this report of our compliance verification testing of Delayed Set, Standard & Mini an ASTM C494-19 *Standard Specification for Chemical Admixtures* for Concrete, Type D (Water Reducing & Retarding) admixture. Our services were performed in accordance with CADD Testing Agreement AS 25-0029 dated November 21, 2024.

Sample preparation and testing was performed in accordance with applicable sections of AASHTO M194-23 *Standard Specifications for Chemical Admixtures for Concrete*, ASTM C494 and documents referenced therein. Material and procedures outlined in AASHTO M194 were used. Based on our results to date, Delayed Set, Standard & Mini complies with the requirements in AASHTO M194 and Table 1 of ASTM C494. These test results pertain only to the samples tested.

The compliance verification was performed by SGS TEC Services in Lawrenceville, Georgia. Concrete batching was performed on three different days in April of 2025. One control mixture and one test mixture containing Delayed Set, Standard & Mini both meeting the requirements of AASHTO M194 and ASTM C494 for fresh concrete properties, were produced each day. A 2-bags of Delayed Set, Standard & Mini was supplied to SGS TEC Services by Fritz-Pak Corporation. The air-entraining agent used in this testing was a vinsol resin, meeting the requirements of AASHTO M154-12(2020) *Standard Specification for Air-Entraining Admixtures for Concrete*.

Testing of the concrete's plastic properties, time of setting, compressive strengths, flexural strengths, length change, and freeze thaw resistance were performed by SGS TEC Services. Mixture proportions and results of our testing are given in Tables 1 to 3. Information and test data on fine and coarse aggregates are listed in Tables 4 to 6. Table 7 contains information on Delayed Set, Standard & Mini. Product information and test data on the Type I/II cement is included in Table 8. Test results for each of the six batches prepared for this report are included in Tables 9 thru 12.

We appreciate the opportunity to provide our services to you on this project. Should you have any questions or comments regarding this report, please feel free to contact us at your convenience.

Sincerely,

SGS TEC Services, Inc.

James G. McCants III
General Manager, Chemist

Testing Results

Table 1: Delayed Set, Standard & Mini performance and ASTM C494 requirements for a Type D admixture.

Test Results	Delayed Set, Standard & Mini	Specification Requirements
Water content (percent of control)	93	95 (max)
Time of setting, deviation of control		
Initial (hr:min)	+1:15	+1:00 to +3:30
Final (hr:min)	+1:25	+3:30 (max)
Compressive strength (percent of control)		
3 days	121	110 (min)
7 days	120	110 (min)
28 days	114	110, 120* (min)
56 days	121	110 (min)
90 days	112	117* (min)
6 months	111	100, 113* (min)
1 year	113	100 (min)
Flexural strength (percent of control)		
3 days	108	100 (min)
7 days	104	100 (min)
28 days	113	100 (min)
56 days	114	100 (min)
Length change (increase over control)	-0.002	+0.010 (max)
Relative durability factor	97	80 (min)

*Provisional Requirement

Table 2: Mixture proportions, fresh concrete properties, and ASTM C494 requirements for a Type D admixture.

Average of Three Separate Tests	Control Mixture	Delayed Set, Standard & Mini	Specification Requirements
Cement factor (lb/yd^3)	514	514	517 ± 5
Water (lb/yd^3)	285	265	
Water-cement ratio	0.553	0.515	
Coarse aggregate	1841	1839	
Fine aggregate	1149	1200	
Fine aggregate-total aggregate ratio	0.38	0.39	
Delayed Set, Standard & Mini (%/cwt)	0.0000	0.1880	
Vinsol Resin (oz/cwt)	0.85	0.19	
Slump (in.)	3.50	3.75	3 ½ ± ½
Air content (%)	6.0	6.1	5-7 (± 0.5 of control)
Density (lb/ft^3)	140.3	141.4	
Time of setting			
Initial (hr:min)	4:04	5:19	
dev. of control (hr:min)		+1:15	+1:00 to +3:30
Final (hr:min)	5:43	7:08	
dev. of control (hr:min)		+1:25	+3:30 (max)

Table 3: Properties of hardened concrete.

Test Performed	Control Mixture	Delayed Set, Standard & Mini
Compressive strength (psi)		
3 days	2810	3410
7 days	3820	4580
28 days	4910	5600
56 days	5330	6450
90 days	5460	6090
6 months	5490	6110
1 year	5580	6300
Flexural strength (psi)		
3 days	520	560
7 days	600	625
28 days	630	710
56 days	660	750
Length change (%)	-0.037	-0.035
Durability factor (%)	96	93

Table 4: Properties of fine and coarse aggregates.

Aggregate Information	Fine aggregate	Coarse aggregate
Manufacturer	**Lambert Sand, Shorter**	**Vulcan, Lithonia**
Aggregate Type	Natural sand	Crushed Granite
Specific Gravity $_{SSD}$	2.628	2.631
Absorption (%)	0.62	0.37

Table 5: Gradation of fine aggregate and ASTM C494 requirements.

Percent passing		
Sieve	**Fine Aggregate**	**Specifications 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)	3	2 to 5

Table 6: Gradation of coarse aggregate and ASTM C494 requirements.

Percent passing		
Sieve	**Coarse Aggregate**	**Specifications Requirements**
1.5 in. (37.5 mm)	100	100
1.0 in. (25.4 mm)	98	95 to 100
0.5 in. (12.5 mm)	36	25 to 60
No. 4 (4.75 mm)	1	0 to 10
No. 8 (2.36 mm)	0	0 to 5

Table 7: Admixture information.

Information	Admixture Information
Brand Name	Delayed Set, Standard & Mini
Manufacturer	Fritz-Pak Corporation
Lot Size	500 pounds
Solid content (%)	93.208
pH	8.42
Chloride Content (%) per BS EN 480-10:2009)	0.028

Table 8: Cement information and test data.

ASTM C 150 Type I/II cement			
Brand name		Portland Type I/II	
Manufacturer		Cemex Clinchfield Plant	
Chemical Analyses by Mass (%)			
Silicon dioxide (SiO_2)	20.4	Sulfur trioxide (SO_3)	3.3
Aluminum oxide (Al_2O_3)	4.8	Loss on ignition (950ºC)	2.5
Iron oxide (Fe_2O_3)	3.3	Insoluble residue	0.29
Calcium oxide (CaO)	65.0	Alkalies as Na_2O	0.46
Magnesium oxide (MgO)	0.9		
Calculated Potential Compounds as per ASTM C 150-05 (%)			
Tricalcium silicate (C_3S)	62	Tricalcium aluminate (C_3A)	7.0
Dicalcium silicate (C_2S)	11	Tetracalcium aluminoferrite (C_4AF)	10
Physical Testing and Results			
Fineness Specific Surface (Blaine)	426 m^2/Kg	Air Content (%)	6.5
Setting Times (Vicat) Initial	88 minutes	Autoclave Expansion (%)	0.00
Compressive 3 Day Strength (psi)	3640	Compressive 7 Day Strength (psi)	4970
C1038 Expansion @ 4.20% SO_3 (%)	-0.019	Density of Hydraulic Cement (g/cm^3)	3.13

Table 9: Yield adjusted mixture proportions, fresh concrete properties, and time of set for three control batches.

Materials & Plastic Properties	Control 1	Control 2	Control 3	Average
Cement factor (lb/yd^3)	515	513	515	**514**
Water (lb/yd^3)	283	285	286	**285**
Water-cement ratio	0.550	0.555	0.555	**0.553**
Coarse aggregate (lb/yd^3)	1843	1837	1843	**1841**
Fine aggregate (lb/yd^3)	1155	1144	1147	**1149**
Fine aggregate-total aggregate ratio	0.385	0.384	0.384	**0.38**
Delayed Set, Standard & Mini (%/cwt)	0.0000	0.0000	0.0000	**0.0000**
Vinsol Resin (oz/cwt)	0.85	0.85	0.85	**0.85**
Slump (in.)	3.50	3.75	3.50	**3.50**
Air content (%)	5.9	6.2	5.9	**6.0**
Density (lb/ft^3)	140.6	140.0	140.4	**140.3**
Time of setting				
Initial (hr:min)	4:00	4:05	4:08	**4:04**
Final (hr:min)	5:40	5:45	5:44	**5:43**

Table 10: Yield adjusted mixture proportions, fresh concrete properties, and time of set for three test batches containing Delayed Set, Standard & Mini.

Materials & Plastic Properties	Test 1	Test 2	Test 3	Average
Cement factor (lb/yd^3)	514	514	514	**514**
Water (lb/yd^3)	263	265	267	**265**
Water-cement ratio	0.511	0.515	0.520	**0.515**
Coarse aggregate (lb/yd^3)	1840	1839	1838	**1839**
Fine aggregate (lb/yd^3)	1206	1200	1193	**1200**
Fine aggregate-total aggregate ratio	0.396	0.395	0.394	**0.39**
Delayed Set, Standard & Mini (%/cwt)	0.1880	0.1880	0.1880	**0.1880**
Vinsol Resin (oz/cwt)	0.20	0.16	0.20	**0.19**
Slump (in.)	4.00	3.25	4.00	**3.75**
Air content (%)	6.1	6.1	6.1	**6.1**
Density (lb/ft^3)	141.6	141.4	141.2	**141.4**
Time of setting				
Initial (hr:min)	5:36	5:10	5:12	**5:19**
Final (hr:min)	7:11	6:57	7:17	**7:08**

Table 11: Properties of hardened concrete from three control test batches.

Test Age	Control 1	Control 2	Control 3	Average
Compressive strength (psi)				
3 days	2710	2780	2940	**2810**
7 days	3740	3880	3840	**3820**
28 days	4550	4870	5320	**4910**
56 days	5180	5030	5770	**5330**
90 days	5360	5440	5580	**5460**
6 months	5640	6690	5990	**5490**
1 year	6060	6980	5860	**5580**
Flexural strength (psi)				
3 days	535	490	540	**520**
7 days	590	565	640	**600**
28 days	580	610	695	**630**
56 days	620	645	715	**660**
Length change (%)	-0.038	-0.035	-0.037	**-0.037**
Durability Factor (%)	96	96	96	**96**

Approximate Total Cycles Completed	Fundamental Transverse Frequency, kHz			Relative Dynamic Modulus, (%) Average of 2 Beams per Mix			Average
	Control 1	Control 2	Control 3	Control 1	Control 2	Control 3	
0 cycles	2.086	2.041	2.041	NA	NA	NA	NA
32 cycles	2.086	2.041	2.041	100	100	100	100
66 cycles	2.086	2.041	2.041	100	100	100	100
96 cycles	2.086	2.041	2.041	100	100	100	100
128 cycles	2.086	2.041	1.997	100	100	96	99
162 cycles	2.086	2.041	1.997	100	100	96	99
192 cycles	2.086	2.041	1.997	100	100	96	99
220 cycles	2.086	1.997	1.997	100	96	96	97
253 cycles	2.041	1.997	1.997	96	96	96	96
287 cycles	2.041	1.997	1.997	96	96	96	96
300 cycles	2.041	1.997	1.997	96	96	96	96

Table 12: Properties of hardened concrete from three batches containing Delayed Set, Standard & Mini.

Test Age	Test 1	Test 2	Test 3	Average
Compressive strength (psi)				
3 days	3200	3900	3120	**3410**
7 days	4010	5110	4620	**4580**
28 days	5090	6080	5620	**5600**
56 days	5530	6870	6950	**6450**
90 days	5500	6950	5810	**6090**
6 months	5640	6690	5990	**6110**
1 year	6060	6980	5860	**6300**
Flexural strength (psi)				
3 days	515	555	610	**560**
7 days	585	680	610	**625**
28 days	655	735	745	**710**
56 days	725	715	815	**750**
Length change (%)	-0.038	-0.034	-0.033	**-0.035**
Durability Factor (%)	96	88	96	**93**

Approximate Total Cycles Completed	Fundamental Transverse Frequency, kHz			Relative Dynamic Modulus, (%) Average of 2 Beams per Mix			Average
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	
0 cycles	2.086	2.130	2.086	NA	NA	NA	NA
32 cycles	2.086	2.130	2.086	100	100	100	100
66 cycles	2.086	2.086	2.086	100	96	100	99
96 cycles	2.086	2.086	2.086	100	96	100	99
128 cycles	2.086	2.086	2.086	100	96	100	99
162 cycles	2.086	2.041	2.086	100	92	100	97
192 cycles	2.086	2.041	2.086	100	92	100	97
220 cycles	2.086	1.997	2.086	100	88	100	96
253 cycles	2.086	1.997	2.086	100	88	100	96
287 cycles	2.041	1.997	2.041	96	88	96	93
300 cycles	2.041	1.997	2.041	96	88	96	93