AASHTO / Concrete Admixture (CADD) Evaluation of:

Fritz-Pak Corporation
Air Plus
CADD-2025-01-054

Batch Date 05/06/2025
Final Report

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

Attn: KEEGAN VISSER
kvisser@aashto.org

Submitted by:
Applied Testing & Geosciences, LLC
401 E Fourth St , Bldg 12B
Bridgeport, PA 19405

Thomas C. Smith
Testing Services Mananger

©Copyright 2024. American Association of State Highway and Transportation Officials (AASHTO), Washington, DC, U.S.A. All rights reserved under both international and Pan American copyright conventions. All rights are reserved. This report is the confidential and proprietary property of AASHTO and may only be utilized by laboratories licensed by AASHTO to participate in the AASHTO Product Evaluation & Audit Solutions Program. Any unauthorized use of this report or portions thereof shall be subject to the enforcement of legal rights and remedies under federal and state law.

Table of Contents

Product Information.....2

Testing Results.....3

Product Information

Product Name: Air Plus

Product Type: C260 AEA Air Entraining Admixture

DataMine Number: CADD-2025-01-054

Manufacturer: Fritz-Pak Corporation

Manufacturer Address: 4821 Eastover Circle
Mesquite, Texas, 75149

Manufacturer Contact: Cheryl Flores

Manufacturer Email/Phone: dot@fritzpak.com
12142219494

Date Received by Laboratory: 4/22/2025

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.

Testing Results

Table 1. Admixture performance

Test Results	Air Plus	Specification Requirements
Water content (percent of control)	102%	NA
Time of setting, deviation of control		
Initial (hr:min)	0:09	-1:15 to +1:15
Final (hr:min)	0:19	-1:15 to +1:15
Compressive strength (percent of control)		
1 day	90%	NA
3 days	97%	>/=90%
7 days	93%	>/=90%
28 days	101%	>/=90%
56 days	95%	>/=90%
Flexural strength (percent of control)		
3 days	91%	>/=90%
7 days	94%	>/=90%
28 days	91%	>/=90%
56 days	101%	>/=90%
Length change, max shrinkage	80	</=120%
Relative durability factor	104%	>80 %
Bleeding of the net amount of mix water (% of control)	-0.05%	</=2

*Provisional Requirement

Table 2. Mixture proportions and fresh concrete properties

Average of Three Separate Tests	Control	Air Plus	Specification Requirements
Cement factor (lb/yd^3)	517	517	517 +/- 5
Water (lb/yd^3)	238	244	NA
Water-cement ratio	0.461	0.472	NA
Coarse aggregate	1918	1918	NA
Fine aggregate	1205	1192	NA
Fine aggregate-total aggregate ratio	0.386	0.383	NA
Air Plus % by weight	0.0	0.037	NA
Vinsol Resin (oz/cwt)	0.33	0.00	NA
Slump (in.)	3.25	3.5	3 ½ ± ½
Air content (%)	5.6	5.5	5-7 (± 0.5 of control)
Density (lb/ft^3)	143.6	143.3	NA
Time of setting			
Initial (hr:min)	4:24	4:33	
dev. of control (hr:min)	NA	0:09	-1:15 to +1:15
Final (hr:min)	5:51	6:10	
dev. of control (hr:min)	NA	0:19	-1:15 to +1:15

Table 3. Properties of hardened concrete

Test Performed	Control Mixture	Air Plus
Compressive strength (psi)		
1 day	2290	2060
3 days	3230	3120
7 days	4100	3830
28 days	4830	4860
56 days	5530	5260
Flexural strength (psi)		
3 days	635	580
7 days	770	720
28 days	1010	920
56 days	810	820
Length change (%)	-0.035	-0.031
Durability factor (%)	95	99

Table 4: Properties of fine and coarse aggregates

Aggregate Information	Fine aggregate	Coarse aggregate
Manufacturer	State Rd	Harleysville
Aggregate Type	Fine	Coarse
Specific Gravity SSD	2.654	2.762
Absorption (%)	0.48%	1.20%

Table 5: Gradation of fine aggregate and ASTM C260 requirements

Percent passing		
Sieve	Fine Aggregate	Specifications Requirements
3/8"	100%	100
No. 4 (4.75 mm)	100%	95-100
No. 8 (2.375 mm)	92%	80-100
No. 16 (1.18 mm)	75%	50-85
No. 30	49%	25-60
No. 50 (300 µm)	20%	5-30
No. 100 (150 µm)	2%	0-10
No. 200 (75 µm)	1%	0-3

Table 6: Gradation of coarse aggregate and ASTM C260 requirements

Percent passing		
Sieve	Coarse Aggregate	Specifications Requirements
1.5 in. (37.5 mm)	100%	100
1.0 in. (25.4 mm)	95%	95 to 100
0.5 in. (12.5 mm)	28%	25 to 60
No. 4 (4.75 mm)	4%	0 to 10
No. 8 (2.36 mm)	3%	0 to 5

Table 7: Admixture information

Information	Admixture Information
Brand Name	Air Plus
Manufacturer	Fritz-Pak Corporation
Lot Size	Not Provided
Lot Number	Not Provided
Specific Gravity	NA
Solid content (%)	97.8
pH	NA
Chloride Content (% per BS EN 480-10:2009)	0.023

Table 8: Cement information and test data

ASTM C 150 Type I/II cement			
Brand name	I/II Low Alk		
Manufacturer	Silvi Riverside		
Chemical Analyses by Mass (%)			
Silicon dioxide (SiO2)	18.9	Sulfur trioxide (SO3)	2.6
Aluminum oxide (Al2O3)	4.7	Loss on ignition (950ºC)	1.7
Iron oxide (Fe2O3)	3.822	Insoluble residue	0.05
Calcium oxide (CaO)	65.2	Alkalies as Na2O	0.51
Magnesium oxide (MgO)	1.5		
Calculated Potential Compounds as per ASTM C 150-05 (%)			
Tricalcium silicate (C3S)	77	Tricalcium aluminate (C3A)	6
Dicalcium silicate (C2S)	5.05	Tetracalcium aluminoferrite (C4AF)	12
Physical Testing and Results			
Fineness Specific Surface (Blaine) m2/kg	382	Air Content (%)	8
Setting Times (Vicat) Initial (minutes)	129	Autoclave Expansion (%)	-0.024
Compressive 3 Day Strength (psi)	4420	Compressive 7 Day Strength (psi)	5180
C1038 Expansion (%)	0.004	Density of Hydraulic Cement (g/cm3)	Not Reported

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/yd3)	517	517	517	517
Water (lb/yd3)	236	239	239	238
Water-cement ratio	0.458	0.463	0.463	0.461
Coarse aggregate (lb/yd3)	1918	1918	1918	1918
Fine aggregate (lb/yd3)	1250	1193	1171	1205
Fine aggregate-total aggregate ratio	0.395	0.383	0.379	0.386
Air Plus	0.00	0.00	0.00	0.00
Vinsol Resin (oz/cwt)	0.29	0.35	0.35	0.33
Slump (in.)	3	3.5	3.5	3.25
Air content (%)	5	5.8	5.9	5.6
Density (lb/ft3)	145.2	143.2	142.4	143.6
Time of setting				
Initial (hr:min)	4:11	4:15	4:44	4:24
Final (hr:min)	5:28	5:48	6:16	5:51
Bleed				
Bleed (%)	0.25%	0.39%	0.49%	0.38%

Table 10: Yield adjusted mixture proportions, fresh concrete properties, and time of set for three test batches containing Admixture

Materials & Plastic Properties	Test 1	Test 2	Test 3	Average
Cement factor (lb/yd3)	517	517	517	517
Water (lb/yd3)	244	244	244	244
Water-cement ratio	0.472	0.472	0.472	0.472
Coarse aggregate (lb/yd3)	1918	1918	1918	1918
Fine aggregate (lb/yd3)	1209	1199	1167	1192
Fine aggregate-total aggregate ratio	0.387	0.385	0.378	0.383
Air Plus (% by weight of cement)	0.037	0.037	0.037	0.037
Vinsol Resin (oz/cwt)	0.00	0.00	0.00	0.00
Slump (in.)	3.5	3.5	3.5	3.5
Air content (%)	5.3	5.5	5.8	5.5
Density (lb/ft3)	144	143.6	142.4	143.3
Time of setting				
Initial (hr:min)	4:34	4:26	4:37	4:33
Final (hr:min)	6:06	6:06	6:15	6:10
Bleed				
Bleed (%)	0.25%	0.37%	0.36%	0.33%

Table 11 Properties of hardened concrete from three control test batches

Test Age	Control 1	Control 2	Control 3	Average
Compressive strength (psi)				
1 day	2390	2110	2360	2290
3 days	3260	3140	3300	3230
7 days	3960	3980	4350	4100
28 days	4740	4840	4910	4830
56 days	5550	5280	5770	5530
Flexural strength (psi)				
3 days	695	470	735	635
7 days	865	725	720	770
28 days	1055	885	1085	1010
56 days	865	710	850	810
Length change (%)	-0.032	-0.039	-0.033	-0.035
Durability Factor (%)	96	96	93	95

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	2188	2188	2227	NA	NA	NA	NA
30 cycles	2188	2188	2188	100%	100%	97%	99%
60 cycles	2188	2148	2188	100%	96%	97%	98%
90 cycles	2148	2148	2188	96%	96%	97%	96%
120 cycles	2188	2188	2188	100%	100%	97%	99%
150 cycles	2188	2188	2188	100%	100%	97%	99%
180 cycles	2148	2148	2148	96%	96%	93%	95%
210 cycles	2148	2148	2148	96%	96%	93%	95%
240 cycles	2188	2188	2188	100%	100%	97%	99%
270 cycles	2188	2148	2188	100%	96%	97%	98%
300 cycles	2148	2148	2148	96%	96%	93%	95%

Table 12 Properties of hardened concrete from three test batches.

Test Age	Test 1	Test 2	Test 3	Average
Compressive strength (psi)				
1 day	2080	2360	1740	2060
3 days	3250	3090	3010	3120
7 days	3880	3970	3640	3830
28 days	5160	4700	4710	4860
56 days	5450	5340	5000	5260
Flexural strength (psi)				
3 days	605	550	590	580
7 days	700	760	700	720
28 days	960	905	900	920
56 days	890	795	770	820
Length change (%)	-0.034	-0.028	-0.032	-0.031
Durability Factor (%)	96	100	100	99

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	2148	2148	2148	NA	NA	NA	NA
30 cycles	2148	2148	2148	100%	100%	100%	100%
60 cycles	2109	2148	2148	96%	100%	100%	99%
90 cycles	2109	2148	2148	96%	100%	100%	99%
120 cycles	2109	2148	2148	96%	100%	100%	99%
150 cycles	2109	2148	2148	96%	100%	100%	99%
180 cycles	2109	2148	2148	96%	100%	100%	99%
210 cycles	2109	2148	2148	96%	100%	100%	99%
240 cycles	2109	2148	2148	96%	100%	100%	99%
270 cycles	2109	2148	2148	96%	100%	100%	99%
300 cycles	2109	2148	2148	96%	100%	100%	99%