



Ash Grove Technical Center

11011 Cody Street, Suite 125
Overland Park, Kan. 66210

Work Request Number: WR-230316

Report Issue Date: May 25, 2023

Subject: conduct ASTM C618 and MOC testing on the submitted fly ash samples from Medcem in Istanbul, Turkey for import into Port Manatee, Florida.

Customer	On Behalf of	WR Issue Date
Ash Grove Sales - South (Florida), Sumterville, Florida	Chad Melita, Vice President Sales and Logistics and Justin Gaither, Logistics Manager	04/27/2023

Sample No.	Qty	Packaging	Description	Received Date
S-212466	2	5-gal. bucket	Type I/II cement, 09/16/2021, silo 5, Branford, Florida	09/24/2021
S-223230	40	box	50-lbs. boxes of ASTM C778 standard graded sand, AGTC std. lot, AGSCO, Libertyville, Illinois	11/04/2022
S-230891	1	large bag	Medcem Global fly ash, M/V Sea Dolphin	04/27/2023

CONCLUSION

Test results are included in the report.

TEST RESULTS

ASTM-C311 Fly Ash or Natural Pozzolans, Fineness by No. 325 Sieve

45-µm % Retained: 18.6

ASTM-C604 True Specific Gravity by Helium Pycnometer

True Specific Gravity, g/cm ³ : 2.24

XRF, %

S-230891

Medcem Global fly ash, M/V Sea Dolphin

SiO ₂	55.52
Al ₂ O ₃	25.25
Fe ₂ O ₃	5.74
CaO	3.84
MgO	1.70
SO ₃ (Eltra)	0.41
Na ₂ O	0.63
K ₂ O	1.62
TiO ₂	1.01
P ₂ O ₅	1.03
Mn ₂ O ₃	0.05
SrO	0.14
Cl	0.29
CuO	0.06
<u>LOI</u>	<u>2.59</u>
Total	99.88
Eq. Alk.	1.69
Moisture	0.07

ASTM-C618 Strength Activity Index

Description: 80% Branford I/II, 20% Medcem fly ash

Mix ID: D-042723-1

Cast date: 04/27/2023

Samples	Sample description	Amount	Unit
S-230891	Medcem Global fly ash, M/V Sea Dolphin	100	g
S-212466	Type I/II cement, 09/16/2021, silo 5, Branford, Florida	400	g
S-223230	50-lbs. boxes of ASTM C778 standard graded sand, AGTC std. lot, AGSCO, Libertyville, Illinois	1375	g
	Water	249	mL
	Flow	112	%

Age, days	Strength, psi	Control Strength, psi	Strength Activity Index (SAI), %
7	3850	4560	84
28	5610	6330	89

ASTM-C151/C187 Autoclave Expansion

Normal Consistency (NC), %: 26.5
Autoclave Expansion, %: 0.00

EPA-EPA TOC

TOC, %: 2.04

EPA-Mercury (Hg) Thermal Decomp

Hg, ppm: 0.265

AASHTO-T 260 Total Chloride Content of Concrete

Chloride Content, ppm: <50

AGTC-ICP Metals 16+ Ag**ARM Total ICP Metals**

<u>Element</u>	<u>MDL (ppm)</u>	<u>TCLP Limit (ppm)</u>	<u>20X TCLP Limit (ppm)</u>	<u>S-230891 Result (ppm)</u>
Ag	0.5	5.0	100	<0.5
As	2.5	5.0	100	24.0
Ba	2.5	100.0	2000	739
Be	2.5	N/A	N/A	<2.5
Cd	2.5	1.0	20	<2.5
Co	2.5	N/A	N/A	10.1
Cr	2.5	5.0	100	30.6
Cu	2.5	N/A	N/A	24.4
Mn	2.5	N/A	N/A	228
Ni	2.5	N/A	N/A	30.2
Pb	2.5	5.0	100	8.67
Sb	2.5	N/A	N/A	<2.5
Se	2.5	1.0	20	<2.5
Sn	2.5	N/A	N/A	<2.5
Tl	2.5	N/A	N/A	<2.5
V	2.5	N/A	N/A	63.1
Zn	2.5	N/A	N/A	42.4

METHODOLOGY

Total SO₃ with Eltra Analyzer – Total SO₃ analysis was performed by Eric Masden, Chemist II

XRD Quantitative Analysis using the Rietveld Method performed by Joshua Wester, Geologist

XRF Fused Bead – XRF analyses were done on a lithium borate bead was performed by Eric Masden, Chemist II

C311 Fly Ash or Natural Pozzolans, Fineness by No. 325 Sieve was performed by Bruce Payne, Physical Tester II.

C109 Compressive Strength of Hydraulic Cement Mortars (Cubes) was performed by Bruce Payne, Physical Tester II.

ASTM C151 Autoclave Expansion was performed by Bruce Payne, Physical Tester II.

ICP Metals 16+ Ag was performed by Darrell Hamilton, Chemist II.

Mercury was analyzed by thermal decomposition by Darrell Hamilton, Chemist II.

TOC analyses were performed in accordance with EPA Method 9060 by Darrell Hamilton, Chemist II.

Chloride analyses were performed in accordance with AASHTO T 260, by Darrell Hamilton, Chemist II.

Submitted by,



Xiuping Feng
Technical Center Lab Manager

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Ash Grove Cement Technical Center

Project: Ash Grove Sales - South (Florida)

T.C. Sample Numbers: S-212466 | S-223230 | S-230891

Analyses	Value (\$)	Qty	Total (\$)
ASTM-C311 Fly Ash or Natural Pozzolans, Loss on Ignition (urgent)	200	1	200
ASTM-C311 Fly Ash or Natural Pozzolans, Moisture Content (urgent)	160	1	160
AGTC-Total SO3 with Eltra Analyzer (urgent)	160	1	160
ASTM-C311 Fly Ash or Natural Pozzolans, Fineness by No. 325 Sieve (urgent)	160	1	160
AGTC-XRF Pressed Pellet (urgent)	660	1	660
ASTM C151/C187 Autoclave Expansion (urgent)	820	1	820
ASTM C618 SAI (urgent)	2050	2	2050
ASTM C604 Density (urgent)	410	1	410
EPA-EPA TOC (urgent)	250	1	250
EPA-Mercury (Hg) Thermal Decomp (urgent)	350	1	350
AASHTO-T 260 Total Chloride Content of Concrete (urgent)	160	1	160
AGTC-ICP Metals 16+ Ag (urgent)	1920	1	1920

Project Total: \$ 7300

CERTIFICATE OF ANALYSIS: PORT MANATEE, FL (Zonguldak, Turkey)

ASTM: FLY ASH, CLASS F (FA-54)



ASTM C618 & AASHTO M295 REQUIREMENTS		LIMITS ASTM (AASHTO)	RESULTS	ANALYSIS OF: May-2023 TEST METHOD
PHYSICAL	Fineness; Retained when wet-sieved 45 µm (No. 325) Sieve, max. %	34	19	ASTM C311
	Strength Activity Index			
	7 day; min. percent of control	75 [†]	84	ASTM C311
	28 day, min. percent of control	75 [†]	89	ASTM C311
	Water Requirement; max. percent of control	105	103	ASTM C311
	Soundness, autoclave expansion, max. %	--	0.00	ASTM C311
	Density, specific gravity (g/cm ³)	--	2.24	ASTM C311
	Density; max. variation from average, %	5	NA	ASTM C311
	Fineness, max. variation from average, %	5	NA	ASTM C311

CHEMICAL	Sum of SiO ₂ , Al ₂ O ₃ , and Fe ₂ O ₃ , min. %	50.0	86.5	ASTM C311
	Sulphur Trioxide (SO ₃), max. %	5.0	0.4	ASTM C311
	Moisture content, max. %	3.0	0.1	ASTM C311
	Loss on ignition, max, %	6.0	2.6	ASTM C311
	Silica Oxide (SiO ₂) (%)	--	55.5	ASTM C311
	Alumina Oxide (Al ₂ O ₃) (%)	--	25.3	ASTM C311
	Iron Oxide (Fe ₂ O ₃) (%)	--	5.7	ASTM C311
	Calcium Oxide (CaO) (%)	C >18.0/F 18.0 max	3.8	ASTM C311
	Magnesium Oxide (MgO) (%)	--	1.7	ASTM C311
	Sodium Oxide (Na ₂ O) (%)	--	0.6	ASTM C311
	Potassium Oxide (K ₂ O) (%)	--	1.6	ASTM C311
	Total alkalis (Na ₂ O) eq. = Na ₂ O + 0.658 K ₂ O (%)	--	1.7	ASTM C311
Available alkalis, Na ₂ O eq., (%)	‡		ASTM C311	

COMMENTS:

Parameters with no limit listed are included for information purposes only, and are not requirements of the standards.
 † Meeting the 7 day or the 28 day strength activity index indicates compliance with the specification.
 ‡ Not a requirement of ASTM C618 or AASHTO M295. Required only when requested by purchaser to limit alkali content in concrete containing reactive aggregate.

This certifies compliance with the most current editions of ASTM C 618 and AASTHO M 295 standards.

REPORT PREPARED BY:	PRINT DATE:
Xiuping Feng - Tech Center Lab Manager 	5/25/2023
Tests performed by Ash Grove Cement - Technical Center	