Client: **VHSC Cement LLC**
Project: **ASTM C989 Testing**

Contact: **David McNitt**
Submitter: **David McNitt**
Date Received: **10-Feb-21**

CTL Project No: **382836**
CTL Project Mgr.: **Xiuping Feng**
Analyst: **PS, WD, AP, JB**
Approved: ***X. Feng***
Date Analyzed: **26-Feb-21 to 19-Mar-21**
Date Reported: **22-Mar-21**

Report of Analysis - ASTM C989-18a Standard Chemical and Physical Requirements

Sample Identification:
CTL ID 5233501
Client ID Poz2.0 Jan21

Standard Physical Requirements	Slag Admixture Class Grade 80	Grade 100	Grade 120	Test Results
Fineness:				
Amount retained when wet screened on a 45-µm (No. 325) sieve, maximum %	20	20	20	--
Specific surface by Air permeability, m^2/kg	----	----	----	
Air Content of Slag Mortar, max %	12	12	12	--
Compressive Strength, psi				
at 7 days, Portland cement mortar	----	----	----	**5220**
Slag cement-reference cement mortar	----	----	----	**5580**
at 28 days, Portland cement mortar, minimum	5000	5000	5000	**6590**
Slag cement-reference cement mortar	----	----	----	**8600**
Slag Activity Index: (Limits for individual samples)				
at 7 days[A], Percent of Control	----	----	----	**107**
at 28 days, minimum percent of control	70	90	110	**131**
Density, g/cc, (Helium Pycnometer)	----	----	----	**2.75**

Optional Physical Requirements	Grade 80	Grade 100	Grade 120	Results
Effectiveness in Contributing to Sulfate Resistance				
Expansion of test mixture at 6 months				
For moderate sulfate exposure, max %	0.10	0.10	0.10	--
For high sulfate exposure, max %	0.05	0.05	0.05	

Standard Chemical Requirements	Grade 80	Grade 100	Grade 120	Results
Sulfide Sulfur (S), max, %	2.5	2.5	2.5	--
Sulfate reported as SO_3, max, %	----	----	----	--
Chloride, %	----	----	----	--
Total alkalis, eq. Na_2O, %	----	----	----	--
Na_2O, %	----	----	----	--
K_2O, %	----	----	----	--

Notes:
A. 7-day slag activity index shall be determined on Grades 100 and 120, and reported for informational purposes.
B. A client supplied cement identified as CtrlCem-5233502 with an unknown alkali content (not provided) was used for the SAI testing.
C. This report may not be reproduced except in its entirety.

Client:	**VHSC Cement LLC**	CTL Project No.:	**382836**
Project:	**Poz2.0 Jan21**	CTL Proj. Mgr.:	**Xiuping Feng**
		Analyst:	**Kevin Arias**
Contact:	**David McNitt**	Approved:	**Sai Vaidya**
Submitter:	**David McNitt**	Date Analyzed:	**February 18, 2021**
Date Received:	**February 10, 2021**	Date Reported:	**February 19, 2021**

REPORT OF CHEMICAL ANALYSIS

Client's Sample ID:	Poz2.0 Jan21
Material type:	Fly ash
CTL Sample ID:	5233501

Analyte	Weight %
SiO_2	35.73
Al_2O_3	15.84
Fe_2O_3	6.04
CaO	27.16
MgO	5.42
SO_3	3.25
Na_2O	1.84
K_2O	0.54
TiO_2	1.16
P_2O_5	0.66
Mn_2O_3	0.05
SrO	0.38
Cr_2O_3	<0.01
ZnO	0.02
BaO	0.69
L.O.I. (950°C)²	0.78
Total	99.57

T-Alk (Na_2O + 0.658K_2O)	2.20

Thermogravimetric Analysis - Loss on Ignition on As Received Basis (C311-13)

Free moisture (Ambient-110° C)	0.59
L.O.I. (110° C - 750° C)	0.74
L.O.I. (750° C - 950° C)	0.04

Calculations per ASTM C618-12a

SiO_2+Al_2O_3+Fe_2O_3	57.6
L.O.I. 750° C (dry 110° C basis)	0.74

Notes:

1. This analysis represents specifically the sample submitted.
2. Sample results reported on an dry 110°C weight basis.
3. Oxide analysis by X-ray fluorescence spectrometry. Samples fused at 1000°C with $Li_2B_4O_7$/$LiBO_2$.
4. Elemental sulfur and sulfide sulfur may be lost during high temperature ignition and fusion.
5. Analysis conducted in accordance with test methods referenced in ASTM C618-12a.
6. This report may not be reproduced except in its entirety.

Client:	**VHSC Cement LLC**	CTL Project No:	**382836**
Project:	**Poz2.0 Jan21**	CTL Project Mgr.:	**Xiuping Feng**
	PO No. : Lab 2021	Analyst:	**Eric Engstrom**
Contact:	**David McNitt**	Approved:	Sai Vaidya
Submitter:	**David McNitt**	Date Analyzed:	**March 17, 2021**
Date Received:	**February 10, 2021**	Date Reported:	**March 18, 2021**

REPORT OF ASTM C311 AVAILABLE ALKALI ANALYSIS

(Reported as Weight % of Sample)

Sample Identification					Calculated Available Alkali
CTL ID	Client ID	Description	Na_2O	K_2O	as Na_2O
5233501	Poz2.0 Jan21	Fly ash	1.35	0.26	1.52

Notes:

1. This analysis represents specifically the sample submitted as received.
2. Available alkali was determined following ASTM C311-17.
3. This report may not be reproduced except in its entirety.