



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

CTL Project No: **382836**
 CTL Project Mgr.: **Xiuping Feng**
 Analyst: **PS, WD, KA**
 Approved: **X. Feng**
 Date Analyzed: **15-Nov-21 to 06-Dec-21**
 Date Reported: **10-Dec-21**

Contact: **David McNitt**
 Submitter: **David McNitt**
 Date Received: **05-Nov-21**

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

Sample Identification:

CTL ID 5369101
 Client ID Poz2.0-Oct 21

<u>Standard Physical Requirements</u>	<u>Slag Admixture Class</u>			<u>Test Results</u>
	<u>Grade 80</u>	<u>Grade 100</u>	<u>Grade 120</u>	
Fineness:				
Amount retained when wet screened on a 45- μ m (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	---	---	---	4890
Slag cement-reference cement mortar	---	---	---	5670
at 28 days, Portland cement mortar, minimum	5000	5000	5000	6470
Slag cement-reference cement mortar	---	---	---	7970
Slag Activity Index: (Limits for individual samples)				
at 7 days ^A , Percent of Control	---	---	---	116
at 28 days, minimum percent of control	70	90	110	123
Density, g/cc, (Helium Pycnometer)	---	---	---	2.68
<u>Optional Physical Requirements</u>	<u>Grade 80</u>	<u>Grade 100</u>	<u>Grade 120</u>	<u>Results</u>
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	
<u>Standard Chemical Requirements</u>	<u>Grade 80</u>	<u>Grade 100</u>	<u>Grade 120</u>	<u>Results</u>
Sulfide Sulfur (S), max, %	2.5	2.5	2.5	--
Sulfate reported as SO ₃ , max, %	---	---	---	--
Chloride, %	---	---	---	--
Total alkalis, eq. Na ₂ O, %	---	---	---	--
Na ₂ O, %	---	---	---	--
K ₂ O, %	---	---	---	--

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-5255502 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**
 Project: **Poz2.0Oct21 Testing**
 Contact: **David McNitt**
 Submitter: **David McNitt**
 Date Received: **November 5, 2021**

CTL Project No.: **382836**
 CTL Proj. Mgr.: **Xiuping Feng**
 Analyst: **Kevin Arias**
 Approved: **Don Broton**
 Date Analyzed: **November 10, 2021**
 Date Reported: **November 11, 2021**

REPORT OF CHEMICAL ANALYSIS

Client's Sample ID: Poz2.0Oct21
 Material type: Pozzolan
 CTL Sample ID: 5369101

<u>Analyte</u>	<u>Weight %</u>
SiO ₂	36.87
Al ₂ O ₃	16.28
Fe ₂ O ₃	6.10
CaO	26.40
MgO	5.25
SO ₃	2.92
Na ₂ O	1.52
K ₂ O	0.52
TiO ₂	1.11
P ₂ O ₅	0.71
Mn ₂ O ₃	0.06
SrO	0.38
Cr ₂ O ₃	0.01
ZnO	0.02
BaO	0.68
L.O.I. (950°C) ²	0.73
Total	99.55

T-Alk (Na₂O + 0.658K₂O) 1.86

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

Free moisture (Ambient-110° C)	0.42
L.O.I. (110° C - 750° C)	0.69
L.O.I. (750° C - 950° C)	0.03

Calculations per ASTM C618-12a

SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	59.2
L.O.I. 750° C (dry 110° C basis)	0.70

- 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 Li₂B₄O₇/LiBO₂.
 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.