

# LEHIGH

## HEIDELBERGCEMENT Group

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**PERMANENTE PLANT**

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### CEMENT TEST REPORT

**Cement:** Permanente Type III, low alkali

**Production Period:** June 2011

**Report Date:** 8/31/2011

STANDARD CHEMICAL REQUIREMENTS ASTM C 114	TEST RESULTS	ASTM C 150-09 SPECIFICATIONS TYPE III
Silicon Dioxide (SiO <sub>2</sub> ), %	21.5	----
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> ), %	3.7	----
Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> ), %	2.6	----
Calcium Oxide (CaO), %	66.1	----
Magnesium Oxide (MgO), %	1.3	6.0 Max
Sulfur Trioxide (SO <sub>3</sub> ), %	3.8	3.5 Max
Loss on Ignition (LOI), %	0.9	3.0 Max
Insoluble Residue, %	0.21	0.75 Max
Alkalies (Na <sub>2</sub> O equivalent), %	0.30	0.60 Max
Tricalcium Silicate (C <sub>3</sub> S), % <sup>a</sup>	66	----
Dicalcium Silicate (C <sub>2</sub> S), % <sup>a</sup>	12	----
Tricalcium Aluminate (C <sub>3</sub> A), % <sup>a</sup>	5	15 Max
Tetracalcium Aluminoferrite (C <sub>4</sub> AF), % <sup>a</sup>	8	----
2 (C <sub>3</sub> A) + C <sub>4</sub> AF, %	19	----
PHYSICAL REQUIREMENTS		
(ASTM C 1038) Expansion @ 14 days, %	0.002	0.020 Max
(ASTM C 204) Blaine Fineness, m <sup>2</sup> /gm	618	280 Min
(ASTM C 430) -325 Mesh, %	99.8	----
(ASTM C114) Limestone, max, %	0.0	5 Max
(ASTM C 191) Time of Setting - Initial (Vicat)	68	45 Min
(ASTM C 191) Time of Setting - Final (Vicat)	160	375 Max
(ASTM C 451) False Set, %	83	----
(ASTM C 185) Air Content, %	8.2	12 Max
(ASTM C 151) Autoclave Expansion, %	-0.04	0.80 Max
(ASTM C 187) Normal Consistency, %	31.4	----
(ASTM C 109) Compressive Strength, psi (MPa)		
1 Day	3985	1740 (12.0)
3 Day	5408	3480 (24.0)
7 Day	6403	----
28 Day (previous month)	7901	----

This cement meets the requirements of specification:

Alan Sabawi, Quality Control Manager

ASTM C150-09 Type III, Low Alkali

<sup>a</sup> Adjusted per ASTM C-150-09 Section A1.6

Federal Specification

SS-C190/3 for Type III

Caltrans Section 90-2.01 for Type III, low alkali Portland cement

ASTM C 1157 Portland Cement Type HE (MS)

AASHTO Practice R18 accredited laboratory