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CEMENT TEST REPORT

Cement: Permanente Type II-V, Low Alkali; ASTM C 150-09

Production Period: April 2012

Report Date: 5/16/2012

STANDARD CHEMICAL REQUIREMENTS ASTM C 114	TEST RESULTS	ASTM C 150-09 SPECIFICATIONS	
		TYPE II	TYPE V
Silicon Dioxide (SiO ₂), %	21.2	20.0 Min	----
Aluminum Oxide (Al ₂ O ₃), %	3.8	6.0 Max	----
Ferric Oxide (Fe ₂ O ₃), %	3.8	6.0 Max	----
Calcium Oxide (CaO), %	65.4	----	----
Magnesium Oxide (MgO), %	1.4	6.0 Max	6.0 Max
Sulfur Trioxide (SO ₃), %	3.4	3.0 Max	2.3 ^B Max
Loss on Ignition (LOI), %	1.4	3.0 Max	3.0 Max
Insoluble Residue, %	0.43	0.75 Max	0.75 Max
Alkalies (Na ₂ O equivalent), %	0.34	0.60 Max	0.60 Max
Tricalcium Silicate (C ₃ S), %	65	----	----
Dicalcium Silicate (C ₂ S), %	12	----	----
Tricalcium Aluminate (C ₃ A), %	4	8 Max	5 Max
Tetracalcium Aluminoferrite (C ₄ AF), %	11	----	----
2 (C ₃ A) + C ₄ AF, %	19	----	25 Max
PHYSICAL REQUIREMENTS			
(ASTM C 1038) Expansion @ 14 days, %	0.003	0.020 Max	0.020 Max
(ASTM C 452) Expansion @ 14 days, %	0.021	----	0.04 Max
(ASTM C 430) -325 Mesh, %	98.9	----	----
(ASTM C 204) Blaine, m ² /kg	387	280 Min	280 Min
(ASTM C114) Limestone, max, %	2.1	5 Max	5 Max
(ASTM C114) Limestone, %CaCO ₃	75.8	----	----
(ASTM C114) Cement, %CO ₂	0.71	----	----
(ASTM C 191) Time of Setting - Initial (Vicat)	144	45 Min	45 Min
(ASTM C 191) Time of Setting - Final (Vicat)	271	375 Max	375 Max
(ASTM C 451) False Set, %	89	50 Min	50 Min
(ASTM C 185) Air Content, %	6.6	12 Max	12 Max
(ASTM C 151) Autoclave Expansion, %	0.00	0.80 Max	0.80 Max
(ASTM C 187) Normal Consistency, %	25.6	----	----
(ASTM C 109) Compressive Strength, psi (MPa)			
1 Day	1717	----	----
3 Day	3215	1500 (10.3) Min	1160 (8.0) Min
7 Day	4281	2500 (17.2) Min	2180 (15.0) Min
28 Day (previous month)	6298	----	3050 (21.0) Min

This cement meets the requirements of specification:

ASTM C150-09 Type II-V, Low Alkali

^a Adjusted per ASTM C-150-09 Section A1.6

Caltrans Section 90-2.01 - Type II-V Modified

ASTM C 1157 Portland Cement Type HS

AASHTO Practice R18 accredited laboratory

Alan Sabawi, Quality Control Manager

Applicable ASTM C 150 Notes:

Note B: There are cases where the optimum SO₃ (using Test Method C563) for a particular cement is close to or in excess of the limit in this specification. In such cases where properties of a cement can be improved by exceeding the SO₃ limit stated in this table it is permissible to exceed the values in the table, provided it has been demonstrated by Test Method C1038 that the cement with the increased SO₃ will not develop expansion in water exceeding 0.020% at 14 days. When the manufacturer supplies cement under this provision, he shall, upon request, supply supporting data to the purchaser.

Note C: Limestone addition as per C 150-09 Item 5.1.3