



# MITSUBISHI CEMENT CORPORATION

## CERTIFICATE OF TEST

Portland Cement - Type I, II, II (MH) & V

Date: 3/8/2017

Source: Cushenbury Plant, 5808 State Highway 18, Lucerne Valley, CA 92356

ASTM designation: C 150 - 16 for Type I, II, II (MH) & V low alkali Cement	Production Period
CALTRANS Specification: Section 90 – 2.01 for Type II modified and V (2006)	From: 2/1/2017
Specification: Section 90 – 1.02B(2) (2015)	
NDOT Specification: Section 701.03.01 for Type II and V	To: 2/28/2017
AZDOT Specifications Subsection 1006-2.01 for Type II and V	

### Chemical Composition:

	ASTM C-150 Limits				Test Results
	Type I	Type II	Type V		
Silicon Dioxide (SiO <sub>2</sub> ), %	----	20.0	----	Min.	21.1
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> ), %	----	6.0	----	Max.	4.1
Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> ), %	----	6.0	----	Max.	3.9
Calcium Oxide (CaO), %	----	----	----		63.3
Magnesium Oxide (MgO), %	6.0	6.0	6.0	Max.	2.5
Sulfur Trioxide (SO <sub>3</sub> ), %	3.0	3.0	2.3	Max.	2.1
Loss on Ignition (LOI), %	3.5	3.5	3.5	Max.	2.0
Insoluble Residue	1.5	1.5	1.5	Max.	0.22
Total Alkali (%Na <sub>2</sub> O + 0.658 * %K <sub>2</sub> O)	0.60	0.60	0.60	Max.	0.54
Tricalcium Silicate (C <sub>3</sub> S), [b] %	----	----	----		55
Tricalcium Aluminate (C <sub>3</sub> A), [b] %	----	8	5	Max.	4
C <sub>4</sub> AF + 2*C <sub>3</sub> A [b]	----	----	25	Max.	19
C <sub>3</sub> S + 4.75*C <sub>3</sub> A [b]	----	100	----	Max.	73
CO <sub>2</sub> , %	----	----	----		1.3
Limestone, %	5.0	5.0	5.0	Max.	3.5
CaCO <sub>3</sub> Limestone Purity, %	70	70	70	Min.	87

### PHYSICAL RESULTS:

Blaine Fineness (m <sup>2</sup> /kg)	260 / ---	260 / 430	260 / ---	Min / Max	388
325 Mesh (% Passing)	----	----	----		98.6
Autoclave Expansion (%)	0.80	0.80	0.80	Max.	0.03
Time of Set Initial Vicat (minutes)	45 / 375	45 / 375	45 / 375	Min / Max	130
Air Entrainment (% Volume)	12	12	12	Max.	6.4
Heat of Hydration at 7 Days (kJ/kg)	----	----	----	[a]	357
False Set, %	50	50	50	Min.	88
Color, (L value)	----	----	----		56

### Compressive Strength Test:

	Type I		Type II		Type V		MPA	PSI
	MPA	psi	MPA	psi	MPA	psi		
1 Day	----	----	----	----	----	----	13.5	1956
3 Day	12.0	1740	10.0	1450	8.0	1160	Min.	23.8 3449
7 Day	19.0	2760	17.0	2470	15.0	2180	Min.	31.2 4525
28 Day	----	----	----	----	21.0	3050	Min.	41.0 5942

This cement has been sampled and tested in accordance with ASTM standard methods and procedures. All tests results are certified to comply with the type specification designated above. No other warranty is made or implied. We are not responsible for improper use or workmanship. [a] For information only. [b] Adjusted per ASTM C150 A1.6

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Tom Gepford  
Quality Control Manager



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From: 2/1/2017

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To: 2/28/2017

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### Additional Data

#### Limestone Addition

% Addition:	3.5
SiO <sub>2</sub> (%)	6.3
Al <sub>2</sub> O <sub>3</sub> (%)	2.2
Fe <sub>2</sub> O <sub>3</sub> (%)	0.7
CaO (%)	49.5
SO <sub>3</sub> (%)	1.0

#### Base Cement Phase Composition

C <sub>3</sub> S	57
C <sub>2</sub> S	19
C <sub>3</sub> A	4
C <sub>4</sub> AF	12

We certify that the above described data represents the material used in the cement manufactured during the production period indicated.

MITSUBISHI CEMENT CORPORATION  
Cushenbury plant

Tom Gepford  
Quality Control Manager