

 **MITSUBISHI CEMENT CORPORATION**
CERTIFICATE OF TEST

Portland Cement Rail - Type I, II, II (MH) & V Date: 05/12/2020
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: 04/11/2020
Specification: Section 90 – 1.02B(2) (2015)	
NDOT Specification: Section 701.03.01 for Type II and V	To: 04/19/2020
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 ₂), %	----	----	----	Min.	21.0
Aluminum Oxide (Al ₂ O ₃), %	----	6.0	----	Max.	4.3
Ferric Oxide (Fe ₂ O ₃), %	----	6.0	----	Max.	4.0
Calcium Oxide (CaO), %	----	----	----		62.5
Magnesium Oxide (MgO), %	6.0	6.0	6.0	Max.	3.0
Sulfur Trioxide (SO ₃), %	3.0	3.0	2.3	Max.	2.0
Loss on Ignition (LOI), %	3.5	3.5	3.5	Max.	2.0
Insoluble Residue	1.5	1.5	1.5	Max.	0.56
Total Alkali (%Na ₂ O + 0.658 * %K ₂ O)	0.60	0.60	0.60	Max.	0.49
Tricalcium Silicate (C ₃ S), [b] %	----	----	----		56
Tricalcium Aluminate (C ₃ A), [b] %	----	8	5	Max.	4
C ₄ AF + 2*C ₃ A [b]	----	----	25	Max.	20
C ₃ S + 4.75*C ₃ A [b]	----	100	----	Max.	77
CO ₂ , %	----	----	----		1.1
Limestone, %	5.0	5.0	5.0	Max.	2.9
CaCO ₃ Limestone Purity, %	70	70	70	Min.	85

PHYSICAL RESULTS:

Blaine Fineness (m ² /kg)	260 / ---	260 / 430	260 / ---	Min / Max	387
325 Mesh (% Passing)	----	----	----		98.7
Autoclave Expansion (%)	0.80	0.80	0.80	Max.	0.09
Time of Set Initial Vicat (minutes)	45 / 375	45 / 375	45 / 375	Min / Max	99
Air Entrainment (% Volume)	12	12	12	Max.	7.5
C1702 Heat of Hydration at 7 Days (J/g)	----	----	----	[a]	352
False Set, %	50	50	50	Min.	77
Color, (L value)	----	----	----		55

Compressive Strength Test:

	Type I		Type II		Type V		MPA	PSI
	MPA	psi	MPA	psi	MPA	psi		
1 Day	----	----	----	----	----	----	12.3	1777
3 Day	12.0	1740	10.0	1450	8.0	1160	Min.	22.2 3220
7 Day	19.0	2760	17.0	2470	15.0	2180	Min.	30.3 4395
28 Day March 2020	----	----	----	----	21.0	3050	Min.	39.5 5730

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. The MCC laboratory is AASHTO accredited. [a] For information only. [b] Adjusted per ASTM C150 A1.6.

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Tom Gepford
Quality Control Manager

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NDOT Specification: Section 701 – 3.01 for Type II and V	To: 04/19/2020
AZDOT Specifications Subsection 1006-2.01 for Type II and V	

Additional Data

Limestone Addition

% Addition:	2.9
SiO ₂ (%)	7.6
Al ₂ O ₃ (%)	2.0
Fe ₂ O ₃ (%)	0.7
CaO (%)	47.8
SO ₃ (%)	0.5

Base Cement Phase Composition

C ₃ S	58
C ₂ S	17
C ₃ A	4
C ₄ 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



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