

 **mitsubishi cement corporation**
CERTIFICATE OF TEST

Portland Cement - Type I, II, II (MH) & V Date: 12/09/2022
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: 11/02/2022 |
| Specification: Section 90 – 1.02B(2) (2015) | |
| NDOT Specification: Section 701.03.01 for Type II and V | To: 11/30/2022 |
| 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. | 20.8 |
| Aluminum Oxide (Al ₂ O ₃), % | ---- | 6.0 | ---- | Max. | 4.1 |
| Ferric Oxide (Fe ₂ O ₃), % | ---- | 6.0 | ---- | Max. | 3.8 |
| Calcium Oxide (CaO), % | ---- | ---- | ---- | | 62.6 |
| Magnesium Oxide (MgO), % | 6.0 | 6.0 | 6.0 | Max. | 2.0 |
| Sulfur Trioxide (SO ₃), % | 3.0 | 3.0 | 2.3 | Max. | 2.1 |
| Loss on Ignition (LOI), % | 3.5 | 3.5 | 3.5 | Max. | 1.9 |
| Insoluble Residue | 1.5 | 1.5 | 1.5 | Max. | 0.9 |
| Total Alkali (%Na ₂ O + 0.658 * %K ₂ O) | 0.60 | 0.60 | 0.60 | Max. | 0.50 |
| Tricalcium Silicate (C ₃ S), [b] % | ---- | ---- | ---- | | 52 |
| 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. | 73 |
| CO ₂ , % | ---- | ---- | ---- | | 1.0 |
| Limestone, % | 5.0 | 5.0 | 5.0 | Max. | 2.9 |
| CaCO ₃ Limestone Purity, % | 70 | 70 | 70 | Min. | 78 |

PHYSICAL RESULTS:

| | | | | | |
|---|-----------|-----------|-----------|-----------|------|
| Blaine Fineness (m ² /kg) | 260 / --- | 260 / 430 | 260 / --- | Min / Max | 389 |
| 325 Mesh (% Passing) | ---- | ---- | ---- | | 98.6 |
| 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 | 106 |
| Air Entrainment (% Volume) | 12 | 12 | 12 | Max. | 8.1 |
| C1702 Heat of Hydration at 7 Days (J/g) | ---- | ---- | ---- | [a] | 321 |
| False Set, % | 50 | 50 | 50 | Min. | 90 |
| Color, (L value) | ---- | ---- | ---- | | 55 |

Compressive Strength Test:

| | Type I | | Type II | | Type V | | MPA | PSI |
|----------------------|--------|------|---------|------|--------|------|------|-----------|
| | MPA | psi | MPA | psi | MPA | psi | | |
| 1 Day | ---- | ---- | ---- | ---- | ---- | ---- | 12.8 | 1860 |
| 3 Day | 12.0 | 1740 | 10.0 | 1450 | 8.0 | 1160 | Min. | 25.1 3640 |
| 7 Day | 19.0 | 2760 | 17.0 | 2470 | 15.0 | 2180 | Min. | 34.2 4970 |
| 28 Day Oct 2022 | ---- | ---- | ---- | ---- | 21.0 | 3050 | Min. | 43.8 6350 |

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.

MITSUBISHI CEMENT CORPORATION
Cushenbury plant



Evan Coss
Quality Control Superintendent

 **MITSUBISHI CEMENT CORPORATION**
CERTIFICATE OF TEST

Source: Cushenbury Plant

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

Date: 12/09/2022

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
Specification: Section 90 – 1.02B(2) (2010)

From: 11/02/2022

NDOT Specification: Section 701 – 3.01 for Type II and V

To: 11/30/2022

AZDOT Specifications Subsection 1006-2.01 for Type II and V

Additional Data

Limestone Addition

| | |
|------------------------------------|------|
| % Addition: | 2.9 |
| SiO ₂ (%) | 9.3 |
| Al ₂ O ₃ (%) | 2.9 |
| Fe ₂ O ₃ (%) | 0.1 |
| CaO (%) | 47.1 |
| SO ₃ (%) | 0.7 |

Base Cement Phase Composition

| | |
|-------------------|----|
| C ₃ S | 53 |
| C ₂ S | 21 |
| C ₃ A | 5 |
| C ₄ AF | 12 |

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

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