

 **MITSUBISHI CEMENT CORPORATION**
CERTIFICATE OF TEST

Source: Cushenbury Plant

Date: 10/02/2019

ASTM designation: C – 150 for Type I, II & V low alkali Cement

CALTRANS Specification: Section 90 – 2.01 for Type II modified and V.

Lot #: 266 - Silo 7

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

Chemical Composition:

| | ASTM C-150 Limits | | | | Test Results |
|--|-------------------|---------|--------|------|--------------|
| | Type I | Type II | Type V | | |
| Silicon Dioxide (SiO ₂), % | ---- | 20.0 | ---- | Min. | 21.7 |
| Aluminum Oxide (Al ₂ O ₃), % | ---- | 6.0 | ---- | Max. | 4.2 |
| Ferric Oxide (Fe ₂ O ₃), % | ---- | 6.0 | ---- | Max. | 4.0 |
| Calcium Oxide (CaO), % | ---- | ---- | ---- | | 63.7 |
| 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, % | 3.0 | 3.0 | 3.0 | Max. | 0.9 |
| Insoluble Residue, % | 0.75 | 0.75 | 0.75 | Max. | 0.10 |
| Total Alkali (%Na ₂ O + 0.658 * %K ₂ O), % | 0.60 | 0.60 | 0.60 | Max. | 0.49 |
| Tricalcium Silicate (C ₃ S), % | ---- | ---- | ---- | | 55 |
| Tricalcium Aluminate (C ₃ A), % | ---- | 8 | 5 | Max. | 4 |
| C ₄ AF + 2*C ₃ A | ---- | ---- | 25 | Max. | 21 |
| C ₃ S + 4.75*C ₃ A | ---- | 100 | ---- | Max. | 75 |
| Limestone, % | 5.0 | 5.0 | 5.0 | Max. | 0.0 |
| Free Lime, % | ---- | ---- | ---- | | 1.4 |

PHYSICAL RESULTS:

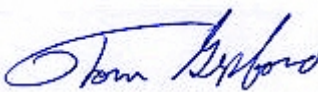
| | | | | | |
|---|----------|----------|----------|-------------|------|
| Blaine Fineness (m ² /kg) | 280 | 280 | 280 | Min. | 348 |
| 325 Mesh (% Passing) | ---- | ---- | ---- | | 92.3 |
| Autoclave Expansion (%) | 0.80 | 0.80 | 0.80 | Max. | 0.09 |
| Time of Set Initial Vicat (minutes) | 45 / 375 | 45 / 375 | 45 / 375 | Min. / Max. | 120 |
| Air Entrainment (% by Volume) | 12 | 12 | 12 | Max. | 5.7 |
| C1702 Heat of Hydration at 7 Days (J/g) | ---- | ---- | ---- | (a) | 303 |
| False Set (%) | 50 | 50 | 50 | Min. | 67 |

Compressive Strength Test:

| | Type I | | Type II | | Type V | | MPA | PSI |
|--------|--------|------|---------|------|--------|------|-----------|-------|
| | MPA | psi | MPA | psi | MPA | psi | | |
| 1 Day | ---- | ---- | ---- | ---- | ---- | ---- | 9.5 | 1,380 |
| 3 Day | 12.0 | 1740 | 10.0 | 1450 | 8.0 | 1160 | Min. 18.9 | 2,740 |
| 7 Day | 19.0 | 2760 | 17.0 | 2470 | 15.0 | 2180 | Min. 27.9 | 4,040 |
| 28 Day | ---- | ---- | ---- | ---- | 21.0 | 3050 | Min. 39.4 | 5,710 |

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.

MITSUBISHI CEMENT CORPORATION
Cushenbury plant



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