



MITSUBISHI CEMENT CORPORATION

CERTIFICATE OF TEST

Source: Cushenbury Plant

Limestone Modified Portland Cement - Block

Date: 11/09/2018

ASTM designation: C 1157 – 11 for Type HE.

Production Period

UBC Standard: Section 21.303.1 Vol. 3

From: 10/03/2018

To: 10/25/2018

Chemical Composition:

| | ASTM Limits | UBC Limits | Test Results |
|--|-------------|------------|--------------|
| Silicon Dioxide (SiO ₂), % | --- | --- | 19.6 |
| Aluminum Oxide (Al ₂ O ₃), % | --- | --- | 4.8 |
| Ferric Oxide (Fe ₂ O ₃), % | --- | --- | 1.2 |
| Calcium Oxide (CaO), % | --- | --- | 63.0 |
| Magnesium Oxide (MgO), % | --- | --- | 2.3 |
| Sulfur Trioxide (SO ₃), % | --- | --- | 3.2 |
| Loss on Ignition, % | --- | 7.0 Max. | 5.5 |
| Insoluble Residue, % | --- | 1.5 Max. | 1.3 |
| Total Alkali (%Na ₂ O + 0.658 * %K ₂ O), % | --- | --- | 0.41 |
| Tricalcium Silicate (C ₃ S), [b] % | --- | --- | 48 |
| Tricalcium Aluminate (C ₃ A), [b] % | --- | --- | 10 |
| CO ₂ , % | --- | --- | 4.8 |
| Limestone, % | 15 Max. | --- | 12.0 |
| Limestone Purity, % | --- | 85 Min. | 91 |
| Free Lime, % | --- | --- | 0.9 |

PHYSICAL RESULTS:

| | ASTM Limits | UBC Limits | Test Results |
|--|----------------------|------------|--------------|
| Blaine Fineness Average (m ² /kg) | --- | --- | 548 |
| 325 Mesh (% Passing) | --- | --- | 97.6 |
| Autoclave Expansion (%) | 0.80 Max. | --- | 0.06 |
| Mortar Bar Expansion (%) September 2018 | 0.020 Max. | --- | 0.008 |
| Time of Set Initial Vicat (minutes) | 45 / 420 Min. / Max. | --- | 90 |
| Air Content (% by Volume) | 12 Max | 22 Max. | 6.8 |
| C1702 Heat of Hydration (J/g) | (a) | --- | 401 |
| Color (L value) | (a) | --- | 77 |

Compressive Strength Test:

| | ASTM Limits | | MPA | PSI |
|-----------------------|-------------|-----------|------|------|
| | MPA | psi | | |
| 1 Day | 12.0 | 1740 Min. | 19.3 | 2800 |
| 3 Day | 24.0 | 3480 Min. | 29.9 | 4333 |
| 7 Day | --- | --- | 36.3 | 5268 |
| 28 Day September 2018 | --- | --- | 41.5 | 6017 |

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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Additional Data

Limestone Addition

| | |
|------------------------------------|------|
| % Addition: | 12.0 |
| SiO ₂ (%) | 4.6 |
| Al ₂ O ₃ (%) | 1.3 |
| Fe ₂ O ₃ (%) | 0.4 |
| CaO (%) | 49.5 |
| SO ₃ (%) | 0.0 |

Base Cement Phase Composition

| | |
|-------------------|----|
| C ₃ S | 54 |
| C ₂ S | 18 |
| C ₃ A | 12 |
| C ₄ AF | 4 |

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

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