



MITSUBISHI CEMENT CORPORATION

CERTIFICATE OF TEST

Source: Cushenbury Plant

Limestone Modified Portland Cement - Block

Date: 10/06/2020

ASTM designation: C 1157 – 20 for Type HE.

Production Period

From: 09/02/2020

To: 09/20/2020

Chemical Composition:

| | ASTM Limits | Test Results |
|--|-------------|--------------|
| Silicon Dioxide (SiO ₂), % | ---- | 19.5 |
| Aluminum Oxide (Al ₂ O ₃), % | ---- | 5.2 |
| Ferric Oxide (Fe ₂ O ₃), % | ---- | 1.2 |
| Calcium Oxide (CaO), % | ---- | 62.3 |
| Magnesium Oxide (MgO), % | ---- | 2.5 |
| Sulfur Trioxide (SO ₃), % | ---- | 3.1 |
| Loss on Ignition, % | ---- | 4.8 |
| Total Alkali (%Na ₂ O + 0.658 * %K ₂ O), % | ---- | 0.37 |
| Tricalcium Silicate (C ₃ S), [b] % | ---- | 54 |
| Tricalcium Aluminate (C ₃ A), [b] % | ---- | 11 |
| CO ₂ , % | ---- | 3.7 |
| Limestone, % | 15 Max. | 9.1 |
| Limestone Purity, % | ---- | 94 |
| Free Lime, % | ---- | 1.3 |

PHYSICAL RESULTS:

| | | |
|--|----------------------|-------|
| Blaine Fineness Average (m ² /kg) | ---- | 551 |
| 325 Mesh (% Passing) | ---- | 98.5 |
| Autoclave Expansion (%) | 0.80 Max. | 0.11 |
| Mortar Bar Expansion (%) August 2020 | 0.020 Max. | 0.012 |
| Time of Set Initial Vicat (minutes) | 45 / 420 Min. / Max. | 97 |
| Air Content (% by Volume) | 12 Max. | 7.4 |
| Early Stiffening (Final Penetration %) | 50 Max. | 81 |
| C1702 Heat of Hydration at 3 Days (J/g) | (a) | 355 |
| Color (L value) | (a) | 77 |

Compressive Strength Test:

| | ASTM Limits | | MPA | PSI |
|--------------------|-------------|-----------|------|------|
| | MPA | psi | | |
| 1 Day | 12.0 | 1740 Min. | 20.2 | 2930 |
| 3 Day | 24.0 | 3480 Min. | 29.8 | 4320 |
| 7 Day | ---- | ---- | 33.3 | 4830 |
| 28 Day August 2020 | ---- | ---- | 41.1 | 5960 |

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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Additional Data

Limestone Addition

| | |
|------------------------------------|------|
| % Addition: | 9.1 |
| SiO ₂ (%) | 2.4 |
| Al ₂ O ₃ (%) | 0.6 |
| Fe ₂ O ₃ (%) | 0.3 |
| CaO (%) | 53.2 |
| SO ₃ (%) | 0.0 |

Base Cement Phase Composition

| | |
|-------------------|----|
| C ₃ S | 60 |
| C ₂ S | 14 |
| C ₃ A | 12 |
| C ₄ AF | 3 |

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

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