

 **MITSUBISHI CEMENT CORPORATION**
CERTIFICATE OF TEST

Source: Cushenbury Plant

Limestone Modified Portland Cement - Block

Date: 12/10/2019

ASTM designation: C 1157 – 11 for Type HE.

Production Period

UBC Standard: Section 21.303.1 Vol. 3

From: 11/13/2019

To: 11/29/2019

Chemical Composition:

	ASTM Limits	UBC Limits	Test Results
Silicon Dioxide (SiO ₂), %	----	----	19.4
Aluminum Oxide (Al ₂ O ₃), %	----	----	4.9
Ferric Oxide (Fe ₂ O ₃), %	----	----	1.1
Calcium Oxide (CaO), %	----	----	64.0
Magnesium Oxide (MgO), %	----	----	1.9
Sulfur Trioxide (SO ₃), %	----	----	3.2
Loss on Ignition, %	----	7.0 Max.	5.3
Insoluble Residue, %	----	1.5 Max.	1.2
Total Alkali (%Na ₂ O + 0.658 * %K ₂ O), %	----	----	0.34
Tricalcium Silicate (C ₃ S), [b] %	----	----	51
Tricalcium Aluminate (C ₃ A), [b] %	----	----	11
CO ₂ , %	----	----	4.5
Limestone, %	15 Max.	----	11.1
Limestone Purity, %	----	85 Min.	91
Free Lime, %	----	----	0.9

PHYSICAL RESULTS:

	ASTM Limits	UBC Limits	Test Results
Blaine Fineness Average (m ² /kg)	----	----	551
325 Mesh (% Passing)	----	----	98.5
Autoclave Expansion (%)	0.80 Max.	----	0.09
Mortar Bar Expansion (%) October 2019	0.020 Max.	----	0.008
Time of Set Initial Vicat (minutes)	45 / 420 Min. / Max.	----	76
Air Content (% by Volume)	12 Max	22 Max.	7.3
C1702 Heat of Hydration (J/g)	(a)	----	387
Color (L value)	(a)	----	78

Compressive Strength Test:

	ASTM Limits	MPA	PSI
	MPA psi		
1 Day	12.0 1740 Min.	21.4	3105
3 Day	24.0 3480 Min.	30.1	4360
7 Day	----	35.0	5075
28 Day October 2019	----	41.1	5962

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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Quality Control Manager

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Additional Data

Limestone Addition

% Addition:	11.1
SiO ₂ (%)	4.8
Al ₂ O ₃ (%)	1.0
Fe ₂ O ₃ (%)	0.3
CaO (%)	50.8
SO ₃ (%)	0.1

Base Cement Phase Composition

C ₃ S	57
C ₂ S	16
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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