



# Cement Mill Test Report

Date of Issue: March 11, 2022

Plant: Exshaw, AB  
 Product: Portland Cement Type I/II/V  
 Mill Test Report Number: MTR-I/II/V-2022-02  
 Manufactured: February 1-28, 2022

## ASTM C 150-20 and AASHTO M 85-18 Standard Requirements

| CHEMICAL ANALYSIS  |            |             | PHYSICAL ANALYSIS                           |                 |             |
|--|------------|-------------|---|-----------------|-------------|
| Item   | Spec limit | Test Result | Item  | Spec limit      | Test Result |
| Rapid Method, X-Ray (C114)                               |            |             | Air content of mortar (%) (C185)            | 12 max          | 5           |
| SiO <sub>2</sub> (%)                                     | ---        | 19.9        | Blaine Fineness (m <sup>2</sup> /kg) (C204) | 260 min         | 423         |
| Al <sub>2</sub> O <sub>3</sub> (%)                       | 6.0 max    | 4.0         | Passing 45 μm (%) (C430)                    | ---             | 99.3        |
| Fe <sub>2</sub> O <sub>3</sub> (%)                       | 6.0 max    | 3.8         | Autoclave Expansion (%) (C151)**            | 0.80 max        | 0.06        |
| CaO (%)  | ---        | 62.0        | Compressive strength (MPa, [psi]) (C 109)   |                 |             |
| MgO (%)  | 6.0 max    | 4.5         | 3 days                                      | 12.0 [1740] min | 31.9 [4630] |
| SO <sub>3</sub> (%)                                      | 2.3 max *  | 2.8         | 7 days                                      | 19.0 [2760] min | 37.4 [5420] |
| Loss on Ignition (%)                                     | 3.5 max    | 2.5         | 28 days (Reflects previous month's data)    |                 | 46.2 [6700] |
| Insoluble Residue (%)                                    | 1.5 max    | 0.20        | Time of setting (minutes)                   |                 |             |
| CO <sub>2</sub> (%)                                      | ---        | 1.9         | Vicat Initial (C191)                        | 45 - 375        | 116         |
| Limestone (%)  | 5.0 max    | 4.6         | Sulfate Resistance (%) (C452)               | 0.040 max       | 0.028 **    |
| CaCO <sub>3</sub> in Limestone (%)                       | 70 min     | 72          | Mortar Bar Expansion (%) (C1038)            | 0.020 max       | 0.012**     |
| Inorganic Process Addition<br>(Lafarge Cement Kiln Dust) | 5.0 max    | -           |   |                 |             |
| Adjusted Potential Phase Composition (C 50)              |            |             |   |                 |             |
| C <sub>3</sub> S (%)                                     | ---        | 55          |   |                 |             |
| C <sub>2</sub> S (%)                                     | ---        | 15          |   |                 |             |
| C <sub>3</sub> A (%)                                     | 5 max      | 4           |   |                 |             |
| C <sub>4</sub> AF (%)                                    | ---        | 12          |   |                 |             |
| C <sub>4</sub> AF + 2(C <sub>3</sub> A)                  | 25 max     | 19          |   |                 |             |
| C <sub>3</sub> S+4.75*C <sub>3</sub> A (%)               | 100 max    | 74          |   |                 |             |
| ASTM C 150-17 and AASHTO M 85-17 Optional Requirements:  |            |             |   |                 |             |
| NaEq (%)   | 0.60 max   | 0.56        | False set (%) (C451)                        | 50 min          | 71          |

\* May exceed the SO<sub>3</sub> maximum based on C 1038 results of <0.020% expansion at 14 days.

\*\* Current Production run not available - most recent provided

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C 150-20 & AASHTO M 85-18 STANDARD SPECIFICATIONS FOR TYPES I, II & V CEMENTS; and ASTM C 150-20 & AASHTO M 85-18 OPTIONAL CHEMICAL REQUIREMENTS FOR TYPES I, II & V LOW ALKALI CEMENT.

Certified By:

*Lorraine Richards*

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 Quality Control Coordinator

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#### Additional Data

| Item                               | Test Result |  |
|------------------------------------|-------------|--|
|                                    | Limestone   | Inorganic Process Addition<br>Lafarge Cement Kiln Dust |
| Amount (%)                         | 4.6         | -  |
| SiO <sub>2</sub> (%)               | 2.1         | n/a  |
| Al <sub>2</sub> O <sub>3</sub> (%) | 0.6         | n/a  |
| Fe <sub>2</sub> O <sub>3</sub> (%) | 0.2         | n/a  |
| CaO (%)                            | 47.8        | n/a  |
| SO <sub>3</sub> (%)                | 0.2         | n/a  |
| CO <sub>2</sub> (%)                | 42.2        | n/a  |

#### Base Cement Phase Composition

| Item                  | Test Result |
|-----------------------|-------------|
| C <sub>3</sub> S (%)  | 57          |
| C <sub>2</sub> S (%)  | 16          |
| C <sub>3</sub> A (%)  | 4           |
| C <sub>4</sub> AF (%) | 12          |

We certify that the data above reflects the materials used in cement manufacture during the production period indicated.

Note: Specific Gravity for Portland Cements is 3.14

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