## Cement Mill Test Report

**Month of Issue:** November-2014

**Plant:** Davenport Plant, Buffalo, IA  
**Product:** Portland Cement Type I/II(MH)  
**Shipped:** October-2014  
**Manufactured:** October-2014

### ASTM C 150 and AASHTO M 85 Standard Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Spec limit</th>
<th>Test Result</th>
<th>Item</th>
<th>Spec limit</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Method, X-Ray (C 114)</td>
<td></td>
<td>19.9</td>
<td>Air content of mortar (%) (C 185)</td>
<td>12 max</td>
<td>7</td>
</tr>
<tr>
<td>SiO2 (%)</td>
<td>---</td>
<td>6.0</td>
<td>Blaine Fineness (m2/kg) (C 204)</td>
<td>280 - 430</td>
<td>370</td>
</tr>
<tr>
<td>Al2O3 (%)</td>
<td>6.0 max</td>
<td>4.5</td>
<td>Fineness, Residue passing on a 45 um sieve (%)</td>
<td>---</td>
<td>92.4</td>
</tr>
<tr>
<td>Fe2O3 (%)</td>
<td>6.0 max</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CaO (%)</td>
<td>---</td>
<td>62.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MgO (%)</td>
<td>6.0 max</td>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss on ignition (%)</td>
<td>3.0 max *</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insoluble residue (%)</td>
<td>0.75 max</td>
<td>0.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2 (%)</td>
<td>---</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone (%)</td>
<td>5.0 max</td>
<td>4.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CaCO3 in Limestone (%)</td>
<td>70 min</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CHEMICAL ANALYSIS

- **Adjusted Potential Phase Composition (C 150)**
  - **C3S (%)** --- 54
  - **C2S (%)** --- 16
  - **C3A (%)** 8 max 7
  - **C4AF (%)** --- 9
  - **C3S+4.75*C3A (%)** 100 max 86

### PHYSICAL ANALYSIS

- **Compressive strength (MPa, [PSI]) (C 109)**
  - 1 day --- 15.4 [2240 ]
  - 3 days 12.0 [1740] min 25.4 [3690 ]
  - 7 days 19.0 [2760] min 31.8 [4620 ]
  - 28 days (Reflects previous month’s data) --- 45.7 [6630 ]

- **Time of setting (minutes)**
  - Vicat Initial (C 191) 45 - 375 107

- **Mortar Bar Expansion (%) (C 1038)**
  - 0.02 max 0.007

- **Heat of Hydration (KJ/Kg, [cal/g]) (C 186)**
  - 7 days (for information only)** --- 344 [82.2]

- **Density (C188)**
  - --- 3.15

### ASTM C 150 and AASHTO M 85 Optional Chemical Requirements:

- **NaEq (%)** 0.60 max 0.54

* May exceed 3.0% SO3 maximum based on our quarterly C 1038 results of <0.02% expansion at 14 days.

** Current Production run not available - most recent provided

We certify that the above described cement meets the chemical and physical requirements of current
ASTM C 150 & AASHTO M 85 Standard Specifications for Type I and Type II(MH) Cement;
ASTM C 150 & AASHTO M 85 Optional Chemical Requirements for Type I & II(MH) Low Alkali Cement.

Certified By:

Scott Derhammer - Quality Manager

11/10/2014
Cement Mill Test Report

Month of Issue: November-14

Plant: Davenport Plant, Buffalo, IA
Product: Portland Cement Type I/II(MH)
Shipped: Oct-14
Manufactured: Oct-14

Additional ASTM C 150 and AASHTO M 85 Standard data

Base Cement Phase Composition

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3S (%)</td>
<td>57</td>
</tr>
<tr>
<td>C2S (%)</td>
<td>16</td>
</tr>
<tr>
<td>C3A (%)</td>
<td>7</td>
</tr>
<tr>
<td>C4AF (%)</td>
<td>10</td>
</tr>
</tbody>
</table>

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C 150 & AASHTO M 85 Standard Specifications for Type I-II Cement; ASTM C 150 & AASHTO M 85 Optional Chemical Requirements for Type I-II Low Alkali Cement.

Certified By:

Scott Derhammer - Quality Manager

11/10/2014