



# The Monarch Cement Company

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## Certified Mill Test Report - Type I/II

Production Period: January 1, 2019 through January 31, 2019

Silo (Bin) No. 681

The following is based on average test data during the production period. The data is typical of cement produced at The Monarch Cement Company, Humboldt, KS. Individual shipments may vary.

### PHYSICAL

	Reported	Spec Limit		Reported	Spec Limit
325 Sieve, % Passing	95	-	Air Content of Mortar (volume %)	10.5	<b>12.0 max</b>
Blaine fineness, specific surface			Autoclave Expansion (%)	-0.021	<b>0.80 max</b>
Air Permeability (cm <sup>2</sup> /g)	3490	<b>2600 min</b>	Compressive Strength (psi)		
Time of Setting, Gilmore test:			1 Day	1945	-
Initial (hrs:min)	2:40	<b>60 min</b>	3 Days	3217	<b>1740 min</b>
Final (hrs:min)	4:10	<b>600 max</b>	7 Days	3987	<b>2760 min</b>
Specific Gravity	3.13				

### CHEMICAL

	Reported	Spec Limit		Reported	Spec Limit
SiO <sub>2</sub> - Silicon dioxide (%)	21.37	-	Loss on ignition (%)	1.60	<b>3.0 max</b>
Fe <sub>2</sub> O <sub>3</sub> - Ferric oxide (%)	2.83	<b>6.0 max</b>	Insoluble residue (%)	0.46	<b>1.50 max</b>
Al <sub>2</sub> O <sub>3</sub> - Aluminum oxide (%)	4.05	<b>6.0 max</b>	Free lime (%)	0.92	-
CaO - Calcium oxide (%)	64.13	-	Na <sub>2</sub> O - Sodium oxide (%)	0.22	-
MgO - Magnesium oxide (%)	1.65	<b>6.0 max</b>	K <sub>2</sub> O - Potassium oxide (%)	0.54	-
SO <sub>3</sub> - Sulphur trioxide (%)	2.74	<b>3.0 max</b>	Equivalent Alkalies (%)	0.58	<b>0.60 max</b>
			Inorganic Processing Addition (%)	2.10	<b>5.0 max</b>

### POTENTIAL CALCULATED COMPOUNDS

C <sub>3</sub> S - Tricalcium silicate (%)	59.5	-
C <sub>2</sub> S - Dicalcium silicate (%)	16.4	-
C <sub>3</sub> A - Tricalcium aluminate (%)	6.0	<b>8 max</b>
C <sub>4</sub> AF - Tetracalcium aluminoferrite (%)	8.6	-

### INORGANIC PROCESS ADDITON (C150)

Process Dust (%)	2.10
SiO <sub>2</sub> - Silicon dioxide (%)	12.2
Fe <sub>2</sub> O <sub>3</sub> - Ferric oxide (%)	3.39
Al <sub>2</sub> O <sub>3</sub> - Aluminum oxide (%)	4.17
CaO - Calcium oxide (%)	58.7
SO <sub>3</sub> - Sulphur trioxide (%)	0.28

The cement in this shipment meets standard requirements in the current specifications of the Federal Government and the American Society for Testing and Materials for Type I and for Type II Portland Cement. Also as prescribed by the Highway Division of the Iowa DOT. All tests conform to ASTM Test Methods: Chemical C-114, Blaine C-204, Soundness C-151, Gillmore C-266, Compressive Strength C-109, Air Content C-185, C-465 and C-150.

Date: 2/13/2019

Sean D. Bowman  
 Quality Control Supervisor