



The Monarch Cement Company

449 1200 Street · PO Box 1000 · Humboldt, KS 66748
 Phone: 620-473-2222 · Fax: 620-473-2447

Certified Mill Test Report - Type I

Production Period: February 1, 2020 through February 29, 2020

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

	<u>Reported</u>	<u>Spec Limit</u>		<u>Reported</u>	<u>Spec Limit</u>
325 Sieve, % Passing	97.5	-	Air Content of Mortar (volume %)	8.2	12.0 max
Blaine fineness, specific surface			Autoclave Expansion (%)	0.03	0.80 max
Air Permeability (cm ² /g)	3673	2600 min	Compressive Strength (psi)		
Time of Setting, Gilmore test:			1 Day	2287	-
Initial (minutes)	145	60 min	3 Days	3487	1740 min
Final (minutes)	220	600 max	7 Days	4543	2760 min
Specific Gravity	3.13				

CHEMICAL

	<u>Reported</u>	<u>Spec Limit</u>		<u>Reported</u>	<u>Spec Limit</u>
SiO ₂ - Silicon dioxide (%)	21.23	-	Loss on ignition (%)	1.49	3.0 max
Fe ₂ O ₃ - Ferric oxide (%)	2.87	6.0 max	Insoluble residue (%)	0.23	1.50 max
Al ₂ O ₃ - Aluminum oxide (%)	4.18	6.0 max	Free lime (%)	1.33	-
CaO - Calcium oxide (%)	63.71	-	Na ₂ O - Sodium oxide (%)	0.20	-
MgO - Magnesium oxide (%)	1.76	6.0 max	K ₂ O - Potassium oxide (%)	0.56	-
SO ₃ - Sulphur trioxide (%)	2.80	3.0 max	Equivalent Alkalies (%)	0.57	-
			Inorganic Processing Addition (%)	2.10	5.0 max

POTENTIAL CALCULATED COMPOUNDS

C ₃ S - Tricalcium silicate (%)	57.9	-
C ₂ S - Dicalcium silicate (%)	16.6	-
C ₃ A - Tricalcium aluminate (%)	6.2	8 max
C ₄ AF - Tetracalcium aluminoferrite (%)	8.7	-

INORGANIC PROCESS ADDITON (C150)

Process Dust (%)	2.10
SiO ₂ - Silicon dioxide (%)	11.2
Fe ₂ O ₃ - Ferric oxide (%)	3.21
Al ₂ O ₃ - Aluminum oxide (%)	3.78
CaO - Calcium oxide (%)	59.0
SO ₃ - Sulphur trioxide (%)	0.52

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 Portland Cement. All tests conform to AASHTO M-85 and 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: 3/17/2020

Mitchell R. King
 Quality Control Supervisor