



The Monarch Cement Company

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Certified Mill Test Report - Type V

Production Period: November 2021

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	96.3	-	Air Content of Mortar (volume %)	7.4	12.0 max
Blaine fineness, specific surface					
Air Permeability (cm ² /g)	3870	2600 min	Compressive Strength (psi)		
Time of Setting, Vicat test:			1 Day	2426	-
Initial (minutes)	125	60 min	3 Days	3603	1160 min
Final (minutes)	180	600 max	7 Days	4439	2180 min
			28 Days		3050 min
Specific Gravity	3.13		Sulfate Resistance (%)	0.012	< 0.040
			Mortar Bar Expansion at 14 days (%)	0.004	< 0.020

CHEMICAL

	Reported	Spec Limit		Reported	Spec Limit
SiO ₂ - Silicon dioxide (%)	21.36	-	Loss on ignition (%)	0.91	3.0 max
Fe ₂ O ₃ - Ferric oxide (%)	2.88	6.0 max	Insoluble residue (%)	0.15	1.50 max
Al ₂ O ₃ - Aluminum oxide (%)	4.25	6.0 max	Free lime (%)	1.48	-
CaO - Calcium oxide (%)	64.13	-	Na ₂ O - Sodium oxide (%)	0.21	-
MgO - Magnesium oxide (%)	1.80	6.0 max	K ₂ O - Potassium oxide (%)	0.53	-
SO ₃ - Sulphur trioxide (%)	2.74	2.3 max ¹	Equivalent Alkalies (%)	0.56	-
			Inorganic Processing Addition (%)	NA	5.0 max

POTENTIAL CALCULATED COMPOUNDS

C ₃ S - Tricalcium silicate (%)	58.2	-
C ₂ S - Dicalcium silicate (%)	17.3	-
C ₃ A - Tricalcium aluminate (%)	6.4	5 max ²
C ₄ AF - Tetracalcium aluminoferrite (%)	8.8	-

1. May exceed 2.3% maximum based on C 1038 results of <0.020% expansion at 14 days.

2. May exceed limits when Sulfate Resistance (C 452) is <0.040% at 14 days.

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 V 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, C-150, C-1038, and C-452.

We certify that the above described cement meets the chemical and physical requirements for Type V per ASTM C-150 and AASHTO M-85.

Date: 3/25/2024

Mitchell R. King
Quality Control Manager