



**MATERIAL CERTIFICATION REPORT**

**Plant:** Trident  
**Address:** 4070 Trident Road  
Three Forks, MT 59752  
**Contact:** Zach Gill  
**Phone:** (406)285-3988

**Cement Type:** I-II-V, Low Alkali, GU  
**Date Issued:** 6-May-19  
**Production Period:** 1-Mar-19  
**To:** 30-Apr-19

**STANDARD REQUIREMENTS ASTM C150/ASTM C1157**

Trident Plant is an ISO 9001:2015 Certified Facility

CHEMICAL			
Item	ASTM Test Method	ASTM C150 Spec. Limit	Test Result
SiO <sub>2</sub> (%)	C114	-	20.5
Al <sub>2</sub> O <sub>3</sub> (%)	C114	6.0 max	3.8
Fe <sub>2</sub> O <sub>3</sub> (%)	C114	6.0 max	3.0
CaO (%)	C114	-	64.3
MgO (%)	C114	6.0 max	2.6
SO <sub>3</sub> (%)	C114	2.3 max <sup>A</sup>	2.8
Loss On Ignition (%)	C114	3.5 max <sup>B</sup>	2.5
Na <sub>2</sub> O (%)	C114	-	0.09
K <sub>2</sub> O (%)	C114	-	0.38
Insoluble Residue (%)	C114	1.5 max	0.4
CO <sub>2</sub> (%)	C114	-	
Limestone (%)	C150	5.0 max	2.8
CaCO <sub>3</sub> in Limestone (%)	C150	70 min	99
Inorganic Processing Addition	C150	5.0 max	-
Potential Phase Composition			
C <sub>3</sub> S (%)	C150	-	61
C <sub>2</sub> S (%)	C150	-	13
C <sub>3</sub> A (%)	C150	5 max	5
C <sub>4</sub> AF (%)	C150	-	9
C <sub>4</sub> AF + 2 C <sub>3</sub> A (%)	C150	25 max	19

PHYSICAL				
Item	ASTM Test Method	ASTM C150 Spec. Limit	ASTM C1157 Spec. Limit	Test Result
Air Content (%)	C185	12 max	12 max	7
Blaine Fineness (m <sup>2</sup> /kg)	C204	260 min / 430 max	-	406
Residue 45 μm (No.325) Sieve (%)	C430	-	-	2.1
Autoclave Expansion (%)	C151	0.80 max	0.80 max	0.03
Compressive Strength				
3 days, MPa (psi)	C109	12.0 (1740) min	13.0 (1890) min	28.0 (3790)
7 days, MPa (psi)	C109	19.0 (2760) min	20.0 (2900) min	33.5 (4860)
28 days, MPa (psi) <sup>C</sup>	C109	28.0 (4060) min	28.0 (4060) min	46.6 (6760)
Time of Setting, Initial Vicat (min)	C191	45 min / 375 max	45 min / 420 max	133
Mortar Bar Expansion (%)	C1038	0.020 max	0.020 max	-0.010

ADDITIONAL DATA					
Type	Limestone	Test Method	Base Phase Composition	ASTM Test Method	Test Result
SiO <sub>2</sub> (%)	0.7	Internal	C <sub>3</sub> S (%)	C150	63
Al <sub>2</sub> O <sub>3</sub> (%)	0.1	Internal	C <sub>2</sub> S (%)	C150	13
Fe <sub>2</sub> O <sub>3</sub> (%)	0.2	Internal	C <sub>3</sub> A (%)	C150	5
CaO (%)	59.8	Internal	C <sub>4</sub> AF (%)	C150	9
SO <sub>3</sub> (%)	0.3	Internal			

**OPTIONAL REQUIREMENTS ASTM C150/ASTM C1157**

CHEMICAL			
Item	ASTM Test Method	ASTM C150 Spec. Limit	Test Result
Equivalent Alkalies (%)	C114	0.60 max	0.34

PHYSICAL				
Item	ASTM Test Method	ASTM C150 Spec. Limit	ASTM C1157 Spec. Limit	Test Result
False Set (%)	C451	50 min	50 min	--

<sup>A</sup> It is permissible to exceed the specification limit provided that ASTM C1038 Mortar Bar Expansion does not exceed 0.020 % at 14 days.

<sup>B</sup> Loss on ignition, max: 3.0 % when limestone is not an ingredient; Loss on ignition, max: 3.5 % when limestone is an ingredient

<sup>C</sup> Test result of prior month

GCC of America Cement is warranted to conform at the time of shipment with current ASTM C150/ASTM C1157. No other warranty is made or implied. Having no control over the use of its cements, GCC of America does not guarantee finished work.