



### MATERIAL CERTIFICATION REPORT

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

**Cement Type:** V, Low Alkali, HS  
**Date Issued:** 8-Mar-19  
**Production Period:** 1-Feb-19  
**To:** 28-Feb-19

#### STANDARD REQUIREMENTS ASTM C150/ASTM C1157/CSA A3001-13

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	-	20.8
Al <sub>2</sub> O <sub>3</sub> (%)	C114	6.0 max	3.9
Fe <sub>2</sub> O <sub>3</sub> (%)	C114	6.0 max	3.0
CaO (%)	C114	-	64.4
MgO (%)	C114	6.0 max	2.5
SO <sub>3</sub> (%)	C114	2.3 max <sup>A</sup>	2.8
Loss On Ignition (%)	C114	3.5 max <sup>B</sup>	2.4
Na <sub>2</sub> O (%)	C114	-	0.10
K <sub>2</sub> O (%)	C114	-	0.41
Insoluble Residue (%)	C114	1.5 max	0.3
CO <sub>2</sub> (%)	C114	-	-
Limestone (%)	C150	5.0 max	3.5
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	-	58
C <sub>2</sub> S (%)	C150	-	16
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 (%)	C204	260 min / 430 max	-	395
Residue 45 µm (No.325) Sieve (%)	C430	-	-	1.7
Autoclave Expansion (%) CSA A3004-B4	C151	0.80 max	0.80 max	0.08
Compressive Strength				
3 days, MPa (psi)	C109	12.0 (1740) min	13.0 (1890) min	27.7 (4010)
7 days, MPa (psi)	C109	19.0 (2760) min	20.0 (2900) min	35.7 (5180)
28 days, MPa (psi) <sup>C</sup>	C109	28.0 (4060) min	28.0 (4060) min	45.3 (6570)
Time of Setting, Initial Vicat (min)	C191	45 min / 375 max	45 min / 420 max	140
Mortar Bar Expansion (%) CSA A3004-C5	C1038	0.020 max	0.020 max	-0.007
Sulfate Resistance (%) CSA A3004-C6	C452	0.050 max	0.040 max	0.030

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	60
Al <sub>2</sub> O <sub>3</sub> (%)	0.1	Internal	C <sub>2</sub> S (%)	C150	17
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	0.37

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.