



February 24, 2017

Mr. Urs Fuchs  
GCC Rio Grande, Inc.  
3372 Lime Rd  
Pueblo, CO 81004  
E-mail: [ufuchs@gcc.com](mailto:ufuchs@gcc.com)

**ASTM C 452 Test Results for One Cement Sample Identified as “GCC Pueblo Cement Dec 2016”**  
**CTLGroup Identification: 4373501**  
**CTLGroup Project No. 382399**

Dear Mr. Fuchs,

Following are the sulfate resistance test results for the submitted cement sample. The sample was submitted and identified by Anne Miller, GCC Rio Grande, Inc., and arrived at CTL on January 23, 2017.

As requested, sulfate resistance testing was performed in accordance with ASTM C452-10/ C452M-10, *Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate*. You indicate that the SO<sub>3</sub> content of cement sample is 3.34%. This value was used to determine mix proportions for the mortar bars.

Final results indicate the average expansion at 14-day is 0.009%, the referenced cement sample meets the optional sulfate resistance requirement of ASTM C150-16, *Standard Specification for Portland Cement*, for Type V portland cement. According to footnote E of Table 4 in ASTM C150-16, cement meeting the high sulfate resistance limit for Type V is deemed to meet the moderate sulfate resistance requirement of Type II and Type II(MH). Individual results are attached.

Thank you for choosing CTLGroup for your testing needs. Should you have any questions, please contact me.

Sincerely yours,

**CTLGroup, Inc.**  
**An AASHTO Accredited Laboratory – Aggregate, Cement and Concrete**

A handwritten signature in black ink, appearing to read "Xiuping Feng".

Xiuping Feng, PhD  
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Attachments



**Client:** GCC Rio Grande  
**Project:** Cement Testing

**CTLGroup Proj. No.:** 382399  
**CTLGroup Proj. Mgr.:** Xiuping Feng

**Contact:** Anne Miller  
**Submitter:** Anne Miller  
**Date Received:** January 23, 2017

**Technicians:** PS, WD  
**Approved:** X. Feng  
**Report Date:** February 24, 2017

**ASTM C452**  
**Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate**

**Client's Sample ID:** GCC Pueblo Cement Dec 2016  
**Material Type:** Non-Air-Entrained Cement  
**CTLGroup Sample ID:** 4373501  
**Cast Date:** February 10, 2017

Sulfate Resistance, 14 Day Expansion, %: **0.009**

| Date     | Age, days | Test Condition | Length Change, % |       |       |       |       |       | Average |
|----------|-----------|----------------|------------------|-------|-------|-------|-------|-------|---------|
|          |           |                | A                | B     | C     | D     | E     | F     |         |
| 02/11/17 | 1         | moist          | 0.000            | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000   |
| 02/24/17 | 14        | moist          | 0.010            | 0.009 | 0.009 | 0.008 | 0.009 | 0.009 | 0.009   |

Specimen Set, Range of Length Change : **0.002**

**Notes:**

1. For testing purposes, a laboratory stocked high grade natural gypsum (CTLGroup ID 2068501) having an SO<sub>3</sub> content of 46.39% was used to fabricate test specimens.
2. For testing purposes, it was assumed that the submitted cement sample is non-air-entrained. A flow of 118% was recorded.
3. As provided by you, the SO<sub>3</sub> content of the submitted cement sample is 3.34%.
4. Sulfate expansion limit per ASTM C150/C150M-12 for Type V high sulfate resistance cement: maximum 0.040% at 14 days.  
Cement meeting the limit for Type V is deemed to meet the moderate sulfate resistance requirement of Type II and Type II(MH).
5. This report may not be reproduced except in its entirety.