

## Certificate of Conformity

This is to certify that the cement sample

**Solid Plus (CEM II/A-P 42.5 N) Cement, CTLGroup ID 4840601**

submitted and identified by: **Holcim (Azerbaijan)**  
received at CTLGroup on February 14, 2019

meets the sulfate resistance requirements of ASTM C1157-17, *Standard Performance Specification for Hydraulic Cement*, for **Type HS (high sulfate Resistance) cement**.

Test method: ASTM C1012/C1012M-18b, *Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution*.



Xiuping Feng, CTLGroup project manager

April 13, 2020

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B u i l d i n g   K n o w l e d g e .   D e l i v e r i n g   R e s u l t s .

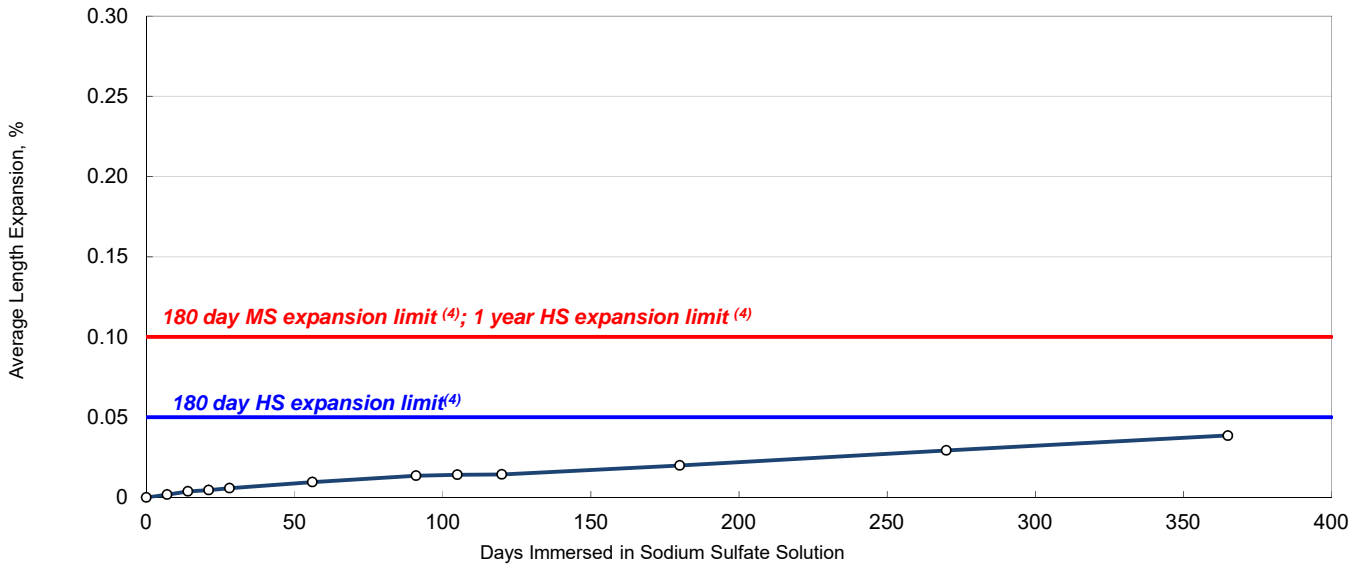


Client: **Holcim (Azerbaijan) OJSC**  
 Project: **ASTM C1012 Testing**  
 Contact: **Sabir Hasanov**  
 Submitter: **Sabir Hasanov**  
 Date Received: **February 14, 2019**

CTL Project No.: **382643**  
 CTL Proj. Mgr.: **Xiuping Feng**  
 Analyst: **PS, WD**  
 Approved: **X. Feng**  
 Date Analyzed: **April 13, 2020**  
 Date Reported: **April 13, 2020**

**REPORT OF SULFATE RESISTANCE (ASTM C1012)**

CTL Sample ID: 4840601  
 Client's Sample ID: Solid Plus Cement  
 Material type: Blended



| Date     | Days in Solution | Specimen Expansion, % |       |       |       |       |       | Standard Deviation | Coefficient of Variation | Average Expansion, % |
|----------|------------------|-----------------------|-------|-------|-------|-------|-------|--------------------|--------------------------|----------------------|
|          |                  | A                     | B     | C     | D     | E     | F     |                    |                          |                      |
| 02/15/19 | 0                | 0.000                 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000              | --                       | 0.00                 |
| 02/22/19 | 7                | 0.002                 | 0.001 | 0.002 | 0.002 | 0.001 | 0.002 | 0.001              | 0.310                    | 0.00                 |
| 03/01/19 | 14               | 0.005                 | 0.004 | 0.004 | 0.003 | 0.003 | 0.003 | 0.001              | 0.223                    | 0.00                 |
| 03/08/19 | 21               | 0.006                 | 0.004 | 0.005 | 0.004 | 0.003 | 0.005 | 0.001              | 0.233                    | 0.00                 |
| 03/15/19 | 28               | 0.007                 | 0.004 | 0.007 | 0.006 | 0.004 | 0.006 | 0.001              | 0.241                    | 0.01                 |
| 04/12/19 | 56               | 0.011                 | 0.009 | 0.011 | 0.010 | 0.007 | 0.009 | 0.002              | 0.160                    | 0.01                 |
| 05/17/19 | 91               | 0.014                 | 0.013 | 0.015 | 0.014 | 0.012 | 0.013 | 0.001              | 0.078                    | 0.01                 |
| 05/31/19 | 105              | 0.014                 | 0.013 | 0.016 | 0.015 | 0.013 | 0.013 | 0.001              | 0.090                    | 0.01                 |
| 06/15/19 | 120              | 0.015                 | 0.014 | 0.016 | 0.015 | 0.013 | 0.013 | 0.001              | 0.084                    | 0.01                 |
| 08/14/19 | 180              | 0.018                 | 0.018 | 0.021 | 0.022 | 0.020 | 0.020 | 0.002              | 0.081                    | 0.02                 |
| 11/12/19 | 270              | 0.028                 | 0.026 | 0.032 | 0.032 | 0.029 | 0.028 | 0.002              | 0.082                    | 0.03                 |
| 02/15/20 | 365              | 0.036                 | 0.035 | 0.043 | 0.042 | 0.038 | 0.037 | 0.003              | 0.085                    | 0.04                 |

- Notes:
1. Testing conducted in accordance with ASTM C1012-18b.
  2. Sulfate exposure was started after reaching an average compressive strength of 3740 psi at 1 day(s).
  3. A water/cementitious ratio of 0.485 was used to fabricate test specimens. A flow of 103% was recorded.
  4. Sulfate expansion limits per ASTM C1157-17, Standard Performance Specification for Hydraulic Cement:  
 Type MS (moderate sulfate resistance): maximum 0.10% at six months.  
 Type HS (high sulfate resistance): maximum 0.05% at six months, maximum 0.10% at one year.
  5. This report may not be reproduced except in its entirety.