
Standard Method of Test for Quantifying Calcium Oxychloride Formation Potential of Cementitious Pastes Exposed to Deicing Salts

AASHTO Designation: T 365-20 (2024)¹

Technically Revised: 2020

Reviewed but Not Updated: 2024

Editorially Revised: 2024

Technical Subcommittee: 3c, Hardened Concrete



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004**

Quantifying Calcium Oxychloride Formation Potential of Cementitious Pastes Exposed to Deicing Salts

AASHTO Designation: T 365-20 (2024)¹



Technically Revised: 2020

Reviewed but Not Updated: 2024

Editorially Revised: 2024

Technical Subcommittee: 3c, Hardened Concrete

1. SCOPE

- 1.1. This test method covers the procedure for quantitative determination of the formation potential of calcium oxychloride amounts formed in cement pastes exposed to chloride-based deicing salts, particularly calcium and magnesium chloride. The amount of calcium oxychloride that forms is an indicator for potential susceptibility of these mixtures to undergo damage when exposed to chloride-based deicing salts in the field.
- 1.2. The values stated in SI units are to be regarded as the standard.
- 1.3. *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
- 1.4. *The quality of the results produced by this standard is dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
 - M 231, Weighing Devices Used in the Testing of Materials
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- 2.2. *ASTM Standards:*
 - C125, Standard Terminology Relating to Concrete and Concrete Aggregates
 - C305, Standard Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
 - D1193, Standard Specification for Reagent Water
 - E11, Standard Specification Woven Wire Test Sieve Cloth and Test Sieves

- E1269, Standard Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry

2.3. *Other Standard:*

- Reagent Chemicals, Specifications and Procedures for Reagents and Standard-Grade Reference Materials, Committee on Analytical Reagents of the American Chemical Society

2.4. *Other Documents:*

- Farnam, Y., C. Villani, T. Washington, M. Spence, J. Jain, and W. J. Weiss. Performance of Carbonated Calcium Silicate Based Cement Pastes and Mortars Exposed to NaCl and MgCl₂ Deicing Salt. *Construction and Building Materials*, Vol. 111. ScienceDirect, Elsevier, Amsterdam, The Netherlands, May 2016, pp. 63–71.
- Monical, J., E. Unal, T. Barrett, Y. Farnam, and W. J. Weiss. Reducing Joint Damage in Concrete Pavements: Quantifying Calcium Oxychloride Formation for Concrete Made Using Portland Cement, Portland Limestone Cement, Supplementary Cementitious Materials, and Sealers. In *Transportation Research Record No. 2577*. Transportation Research Board, National Research Council, Washington, DC, 2016, pp. 17–24.
- Suraneni, P., V. J. Azad, O. B. Isgor, and W. J. Weiss. Calcium Oxychloride Formation in Pastes Containing Supplementary Cementitious Materials: Thoughts on the Role of Cement and Supplementary Cementitious Materials Reactivity. *RILEM Technical Letters*, Vol. 1. ScienceDirect, Elsevier, Amsterdam, The Netherlands, 2016a. Available from <https://letters.rilem.net/index.php/rilem/search/authors/view?firstName=Prannoy&middleName=&lastName=Suraneni&affiliation=Oregon%20State%20University&country=US>
- Suraneni, P., V. J. Azad, O. B. Isgor, and W. J. Weiss. Use of Fly Ash to Minimize Deicing Salt Damage in Concrete Pavements. *Transportation Research Record*, Vol. 2629. Transportation Research Board, National Research Council, Washington, DC, 2016b, pp. 24–32.
- Suraneni, P., J. Monical, E. Unal, Y. Farnam, and W. J. Weiss. Calcium Oxychloride Formation Potential in Cementitious Pastes Exposed to Blends of Deicing Salt. *ACI Materials Journal*, American Concrete Institute, Farmington Hills, MI, July 2017, pp. 631–641. Available from <https://doi.org/10.14359/51689607>
- Suraneni, P., J. Monical, E. Unal, Y. Farnam, C. Villani, T. J. Barrett, and W. J. Weiss. Performance of Concrete Pavement in the Presence of Deicing Salts and Deicing Salt Cocktails. FHWA/IN/JTRP-2016/25. Purdue University, West Lafayette, IN, 2016. Available from <https://doi.org/10.5703/1288284316350>
- Suraneni, P., and W. J. Weiss. Extending Low-Temperature Differential Scanning Calorimetry from Paste to Mortar and Concrete to Quantify the Potential for Calcium Oxychloride Formation. *Advances in Civil Engineering Materials*, Vol. 7, No. 1. ASTM International, West Conshohocken, PA, 2018.

3. TERMINOLOGY

3.1. *Definition:*

- #### 3.1.1.
- calcium oxychloride*—an expansive material that forms when calcium hydroxide reacts with calcium chloride or magnesium chloride deicing salts.

4. SUMMARY OF TEST METHOD

- ### 4.1.
- This test method provides a quantitative measure of the amount of calcium oxychloride that is formed in cementitious pastes exposed to deicing salts. This amount is an indicator of the potential