Standard Method of Test for

Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials

AASHTO Designation: T 260-21

Technically Revised: 2021 **Editorially Revised: 2021**

Technical Subcommittee: 3c, Hardened Concrete

AASHTO

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1. SCOPE

1.1. This method covers procedures for the determination of the acid-soluble chloride ion content or the water-soluble chloride ion content of aggregates, portland cement, mortar, or concrete.

1.2. The total amount of chloride is usually equal to the acid-soluble chloride. However, organic additives or minerals that contain acid-insoluble chloride may be present in concrete and concrete raw materials. These constituents may become acid soluble during long-term exposure to the alkaline environment in concrete or mortar.

1.3. The age of concrete mortar or hydrated portland cement at the time of sampling will have an effect on the water-soluble chloride ion content. Therefore, unless early age studies are desired, it is recommended that the material be well cured and at least 28 days of age before sampling.

1.4. This standard provides for the determination of chloride ion content by two procedures: Procedure A, Determination of Acid-Soluble Chloride Ion Content and Water-Soluble Chloride Ion Content by Potentiometric Titration or Ion-Selective Electrode (Laboratory Test Method); and Procedure B, Acid-Soluble Chloride Ion by Atomic Absorption (Laboratory Test Method).

1.5. Sulfides are known to interfere with the determination of chloride content. Blast-furnace slag aggregates and cements contain sulfide sulfur in concentrations that can cause such interference, which can be eliminated by treatment as noted in the test procedures. Other materials that produce a strong odor of H_2S when acid is added to them should be similarly treated.

1.6. The values stated in SI units are to be regarded as the preferred standard.

1.7. *The quality of the results produced by this standard are 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
- R 71, Sampling and Amount of Testing of Hydraulic Cement
- R 76, Reducing Samples of Aggregate to Testing Size
- R 90, Sampling Aggregate Products

2.2. *ASTM Standard*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

2.3. *Other Documents*:

- Clear, K. C. *Evaluation of Portland Cement Concrete for Permanent Bridge Deck Repair*. Report FHWA-RD-74-5. Federal Highway Administration, U.S. Department of Transportation, February 1974.
- Clemena, G. C., J. W. Reynolds, and R. M. McCormick. *Comparative Studies of Chloride in Hardened Concrete*. Report No. FHWA-RD-77-84 77-R7. Virginia Highway and Transportation Research Council, August 1976.

PROCEDURE A—ACID-SOLUBLE CHLORIDE ION CONTENT AND WATER-SOLUBLE CHLORIDE ION CONTENT BY POTENTIOMETRIC TITRATION OR ION-SELECTIVE ELECTRODE (LABORATORY TEST METHOD)

3. APPARATUS

3.1. *Sampling Equipment for Procedures A and B*:

3.1.1. Core drill.

3.1.2. Rotary impact-type drill with a depth indicator and drill or pulverizing bits of sufficient diameter to provide a representative sample of sufficient size for testing.

3.1.2.1. Sample containers capable of maintaining the sample in an uncontaminated state.

3.1.2.2. Spoons of adequate size to collect the sample from the drilled holes.

3.1.2.3. A "blow out" bulb or other suitable means of removing excess pulverized material from the hole prior to redrilling operations.

3.1.2.4. A device capable of determining the location and depth of steel reinforcement to ±3 mm (±$^1/_8$ in.).

3.2. *Equipment for Chemical Testing*:

3.2.1. Chloride ion or silver/sulfide ion selective electrode and manufacturer-recommended filling solutions.

Note 1—Suggested electrodes are the Orion 96-17 Combination Chloride Electrode or the Orion 94-6 Silver/Sulfide Electrode or equivalents. The Silver/Sulfide Electrode requires use of an appropriate reference electrode (Orion 90-02 or equivalent).