Standard Method of Test for

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

AASHTO Designation: T 358-19[1]

Technical Subcommittee: 3c, Hardened Concrete

Release: Group 1 (April)

AASHTO

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1. SCOPE

1.1. This test method covers the determination of the electrical resistivity of water-saturated concrete to provide a rapid indication of its resistance to the penetration of chloride ions. This test method is applicable to types of concrete where correlations have been established between this test procedure and long-term chloride diffusion procedures such as those described in ASTM C1556. Examples of such correlations are discussed in the reference shown in Section 15.2.

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 concerns, 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*.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- R 39, Making and Curing Concrete Test Specimens in the Laboratory
- T 23, Making and Curing Concrete Test Specimens in the Field
- T 277, Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

2.2. *ASTM Standards*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- C1556, Standard Test Method for Determining the Apparent Chloride Diffusion Coefficient of Cementitious Mixtures by Bulk Diffusion

3. SUMMARY OF TEST METHOD

3.1. This test method consists of measuring the resistivity of 200-mm (8-in.) or 300-mm (12-in.) nominal length and 100-mm (4-in.) or 150-mm (6-in.) nominal diameter cylinders or cores by use of a 4-pin Wenner probe array. An alternating current (AC) potential difference is applied by the

surface resistivity apparatus at the outer pins of the Wenner array generating current flow in the concrete. The resultant potential difference between the two inner pins is measured. The current used and resultant potential along with the affected sample area are used to calculate the resistivity of the concrete. The resistivity, in kilohms-centimeters (kΩ-cm), has been found to be related to the resistance of the specimen to chloride ion penetration.

4. SIGNIFICANCE AND USE

4.1. This test method covers the laboratory evaluation of the electrical resistivity of concrete samples to provide a rapid indication of their resistance to chloride ion penetration. Wenner probe measurements have shown good correlations with other electrical indication tests such as the T 277 and the ASTM C1202 tests. In most cases, the electrical resistivity results have shown good correlation with chloride exposure tests, such as ASTM C1556, on companion cylinders cast from the same concrete mixtures (see references in Sections 15.2, 15.4, and 15.5).

4.2. This test method is suitable for evaluation of materials and material proportions for design purposes, as well as for research and development.

4.3. The qualitative terms in the left-hand column of Table 1 should be used in most cases unless otherwise noted by the specifying agency. The numerical results (resistivity, in kΩ-cm) from this test method must be used with caution, especially in applications such as quality control and acceptance testing.

Table 1—Chloride Ion Penetration

	Surface Resistivity Test	
Chloride Ion Penetration	100-by-200-mm (4-by-8-in.) Cylinder (kΩ-cm) a = 1.5	150-by-300-mm (6-by-12-in.) Cylinder (kΩ-cm) a = 1.5
High	<12	<9.5
Moderate	12–21	9.5–16.5
Low	21–37	16.5–29
Very low	37–254	29–199
Negligible	>254	>199

a = Wenner probe tip spacing

4.4. The details of the test method apply to 100-mm (4-in.) and 150-mm (6-in.) nominal diameter specimens. Other specimen diameters may be tested with appropriate changes to the Wenner probe tip spacing and the correction factor in the calculating equation. (See reference in Section 15.3.)