Standard Specification for

Accelerated Determination of Potentially Deleterious Expansion of Concrete Cylinder Due to Alkali–Silica Reaction (Accelerated Concrete Cylinder Test, ACCT)

AASHTO Designation: TP 142-21[1]

First Published: 2021

Technical Subcommittee: 3c, Hardened Concrete

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1. SCOPE

1.1. This test method covers the determination of the susceptibility of an aggregate or combination of an aggregate with supplementary cementitious materials (SCMs) for participation in expansive alkali–silica reaction by measurement of length change of concrete cylinders.

1.2. This standard does not purpose 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. A specific precautionary statement is given in the section on reagents.

Note 1—The values stated in SI units are to be regarded as standard. The values in inch-pound units are shown in parentheses and are for informational purposes only.

1.3. *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 STANDARDS

2.1. *AASHTO Standards*:

- M 85, Portland Cement
- M 201, Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- M 205M/M 205, Molds for Forming Concrete Test Cylinders Vertically
- 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 39, Making and Curing Concrete Test Specimens in the Laboratory
- R 76, Reducing Samples of Aggregates to Testing Size

- R 80, Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction
- R 90, Sampling Aggregate Products
- T 160, Length Change of Hardened Hydraulic Cement Mortar and Concrete
- T 19M/T 19, Bulk Density ("Unit Weight") and Voids in Aggregate
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 336, Coefficient of Thermal Expansion of Hydraulic Cement Concrete
- T 380, Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures (Miniature Concrete Prism Test, MCPT)

2.2. *ASTM Standards*:

- A182, Standard Specification for Forged or Rolled Ally and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-temperature Service
- C295, Guide for Petrographic Examination of Aggregates for Concrete
- C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
- C33, Standard Specification for Concrete Aggregates
- C778, Standard Specification for Standard Sand
- D1193, Standard Specification for Reagent Water

3. SIGNIFICANCE AND USE

3.1. Alkali–silica reaction (ASR) in concrete is a chemical reaction between alkali hydroxides in pore solution and the reactive form of silica in aggregates that produces an ASR gel. The concentration of hydroxyl ions within the concrete is predominantly controlled by the concentration of sodium and potassium ions derived from portland cement, even though other alkali sources can potentially elevate hydroxyl and alkali ion concentration in the pore solution.

3.2. This test method is intended to detect the alkali silica reactivity of an aggregate or assess the effectiveness of mitigation measures of SCMs in terms of measuring length change of a cylindrical concrete specimen immersed in a soak solution with a chemistry equal to the pore solution of the tested concrete specimen at 60ºC (140ºF). SCMs from a specific source can be tested individually or in combination with SCMs from other sources.

3.3. When selecting a sample or deciding on the number of samples for testing, it is important to recognize the variability in lithology of material from a given source, whether a deposit of sand, gravel, or a rock formation of any origin. For specific advice, see ASTM C295.

3.4. This test (ACCT) is intended to provide results similar to the concrete prism test (CPT, ASTM C1293) or modified concrete prism test (MCPT, T 380). This test is performed differently than the CPT or MCPT method; the differences are briefly described below:

3.4.1. Aggregates directly from stockpiles are used to make concrete for the ACCT method. As the ACCT method uses concrete specimens of 76.2 x 152.4 mm (3 x 6 in.) dimension, coarse aggregate with maximum aggregate size up to 25.4 mm (1 in.) can be directly used to make concrete without involving any additional aggregate sample preparation (e.g., aggregate crushing).

Note 2—In the CPT method, the size of the particles of the tested coarse aggregate need to be between the 19 mm (0.75 in.) and 4.75 mm (0.2 in.) sieve. Similarly, the aggregate particles need to be between the 12.5 mm (0.5 in.) and 4.75 mm (0.2 inch) sieve in the MCPT method (T 380). Therefore, some amount of crushing of aggregate particles (e.g., particles with size > 19 mm (0.75