Standard Practice for

Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction

AASHTO Designation: R 80-17[1]

Technical Section: 3c, Hardened Concrete

Release: Group 1 (April 2017)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

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1. SCOPE

1.1. This practice describes approaches for identifying potentially deleteriously reactive aggregates and selecting appropriate preventive measures to minimize the risk of expansion when such aggregates are used in concrete. Both alkali–silica reactive and alkali–carbonate reactive aggregates are covered. Preventive measures for alkali–silica reactive aggregates include avoiding the reactive aggregate, limiting the alkali content of the concrete, using blended cement, using supplementary cementitious materials, using lithium nitrate as an admixture, or a combination of these measures. Preventive measures for alkali–carbonate reactive rocks are limited to avoiding the reactive aggregate.

1.2. The values stated in SI units are the preferred standard.

1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 240M/M 240, Blended Hydraulic Cement
- M 295, Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- M 302, Slag Cement for Use in Concrete and Mortars
- M 307, Silica Fume Used in Cementitious Mixtures
- T 303, Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction

2.2. *ASTM Standards*:

- C295/C295M, Standard Guide for Petrographic Examination of Aggregates for Concrete
- C586, Standard Test Method for Potential Alkali Reactivity of Carbonate Rocks as Concrete Aggregates (Rock-Cylinder Method)

- C856, Standard Practice for Petrographic Examination of Hardened Concrete
- C1105, Standard Test Method for Length Change of Concrete Due to Alkali-Carbonate Rock Reaction
- C1157/C1157M, Standard Performance Specification for Hydraulic Cement
- C1260, Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
- C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
- C1567, Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

2.3. *Canadian Standards*:

- CSA A23.2-14A, Potential Expansivity of Aggregates (Procedure for Length Change Due to Alkali-Aggregate Reaction in Concrete Prisms)
- CSA A23.2-26A, Determination of Potential Alkali-Carbonate Reactivity of Quarried Carbonate Rocks by Chemical Composition

2.4. *RILEM Recommendation*:

- RILEM TC 191-ARP, Alkali-Reactivity and Prevention—Assessment, Specification, and Diagnosis of Alkali-Reactivity

3. TERMINOLOGY

3.1. *accelerated mortar-bar test (AMBT)*—test method used to determine aggregate reactivity (AASHTO T 303) or to evaluate the effectiveness of measures to prevent deleterious expansion when reactive aggregates are used (ASTM C1567).

3.2. *alkali–aggregate reaction (AAR)*—chemical reaction in either mortar or concrete between alkalis (sodium and potassium) present in the concrete pore solution and certain constituents of some aggregates; under certain conditions, deleterious expansion of concrete or mortar may result. Two types of AAR are considered in this standard practice; these are alkali–carbonate reaction (ACR) and alkali–silica reaction (ASR).

3.3. *alkali–carbonate reaction (ACR)*—the reaction between the alkalis (sodium and potassium) present in the concrete pore solution and certain carbonate rocks, particularly argillaceous calcitic dolomite and argillaceous dolomitic limestone, present in some aggregates; the products of the reaction may cause deleterious expansion and cracking of concrete.

3.4. *alkali–silica reaction (ASR*)—the reaction between the alkalis (sodium and potassium) present in the concrete pore solution and certain siliceous rocks or minerals, such as opaline chert, strained quartz, and acidic volcanic glass, present in significant quantities in some aggregates; the products of the reaction may cause deleterious expansion and cracking of concrete.

3.5. *class of structure*—in this guideline, structures are classified on the basis of the severity of the consequences should ASR occur.

3.6. *concrete prism test (CPT)*—test method (ASTM C1293) used to determine aggregate reactivity or to evaluate the effectiveness of measures to prevent deleterious expansion when reactive aggregates are used. Another version of this test, ASTM C1105, can be used with a limited alkali content to determine the potential for alkali–carbonate reactivity.