Designation: C 1260 – 01

Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)[1]

This standard is issued under the fixed designation C 1260; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This test method permits detection within 16 days of the potential for deleterious alkali-silica reaction of aggregate in mortar bars.

1.2 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 *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.* A specific precautionary statement is given in the section on Reagents.

2. Referenced Documents

2.1 *ASTM Standards:*

C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)[2]
C 150 Specification for Portland Cement[2]
C 151 Test Method for Autoclave Expansion of Portland Cement[2]
C 227 Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)[3]
C 295 Guide for Petrographic Examination of Aggregates for Concrete[3]
C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency[2]
C 490 Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete[3]
C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes[2,3]
C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[3]
C 856 Practice for Petrographic Examination of Hardened Concrete[3]
C 1293 Test Method for Concrete Aggregates by Determination of Length Change of Concrete Due to Alkali-Silica Reaction[3]
D 1193 Specification for Reagent Water[4]
E 11 Specification for Wire-Cloth and Sieves for Testing Purposes[5]

3. Significance and Use

3.1 This test method provides a means of detecting the potential of an aggregate intended for use in concrete for undergoing alkali-silica reaction resulting in potentially deleterious internal expansion. It is based on the NBRI Accelerated Test Method **(1-4)**.[6] It is especially useful for aggregates that react slowly or produce expansion late in the reaction. However, it does not evaluate combinations of aggregates with cementitious materials nor are the test conditions representative of those encountered by concrete in service.

3.2 Because the specimens are exposed to a NaOH solution, the alkali content of the cement is not a significant factor in affecting expansions.

3.3 When excessive expansions (see Appendix X1) are observed, it is recommended that supplementary information be developed to confirm that the expansion is actually due to alkali-silica reaction. Sources of such supplementary information include: (1) petrographic examination of the aggregate (Guide C 295) to determine if known reactive constituents are present; (2) examination of the specimens after tests (Practice C 856) to identify the products of alkali reaction; and (3) where available, field service records can be used in the assessment of performance.

3.4 When it has been concluded from the results of tests performed using this test method and supplementary information that a given aggregate should be considered potentially

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[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregatesand is the direct responsibility of Subcommittee C09.26 on Chemical Reactions.

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[2] *Annual Book of ASTM Standards*, Vol 04.01.

[3] *Annual Book of ASTM Standards*, Vol 04.02.

[4] *Annual Book of ASTM Standards*, Vol 11.01.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

[6] The boldface numbers in parentheses refer to a list of references at the end of the text.

***A Summary of Changes section appears at the end of this standard.**

deleteriously reactive, the use of mitigative measures such as low-alkali portland cement, mineral admixtures, or ground granulated blast-furnace slag should be evaluated (see last sentence of 3.1).

4. Apparatus

4.1 The apparatus shall conform to Specification C 490, except as follows:

4.2 *Sieves*—Square hole, woven-wire cloth sieves, shall conform to Specification E 11.

4.3 *Mixer, Paddle, and Mixing Bowl*—Mixer, paddle, and mixing bowl shall conform to the requirements of Practice C 305, except that the clearance between the lower end of the paddle and the bottom of the bowl shall be 5.1 ± 0.3 mm (0.20 ± 0.01 in.).

4.4 *Tamper and Trowel*—The tamper and trowel shall conform to Test Method C 109.

4.5 *Containers*—The containers shall be of such a nature that the bars can be totally immersed in either the water or 1N NaOH solution. The containers shall be made of material that can withstand prolonged exposure to 80°C (176°F) and must be resistant to a 1N NaOH solution (see Note 1). The containers must be so constructed that when used for storing specimens, the loss or gain of moisture is prevented by tight-fitting covers, by sealing, or both (see Note 2). The bars in the solution must be placed and supported so that the solution has access to the entire surface of the bar; therefore, it should be ensured that the specimens do not touch the sides of the container or each other. The specimens, if stood upright in the solution, shall not be supported by the metal gage stud.

NOTE 1—The NaOH solution will corrode glass or metal containers.

NOTE 2—Some microwave-proof food storage containers made of polypropylene or high-density polythylene have been found to be acceptable.

4.6 *Oven, or Water Bath*—A convection oven or water bath with temperature control maintaining 80.0 ± 2.0°C (176 ± 3.6°F).

5. Reagents

5.1 *Sodium Hydroxide (NaOH)*—USP or technical grade may be used, provided the Na^+ and OH^- concentrations are shown by chemical analysis to lie between 0.99N and 1.01N.

5.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Type IV of Specification D 1193.

5.3 *Sodium Hydroxide Solution*—Each litre of solution shall contain 40.0 g of NaOH dissolved in 900 mL of water, and shall be diluted with additional distilled or deionized water to obtain 1.0 L of solution. The volume proportion of sodium hydroxide solution to mortar bars in a storage container shall be 4 ± 0.5 volumes of solution to 1 volume of mortar bars. The volume of a mortar bar may be taken as 184 mL. Include sufficient test solution to ensure complete immersion of the mortar bars.

5.3.1 **Warning**—Before using NaOH, review: (1) the safety precautions for using NaOH; (2) first aid for burns; and (3) the emergency response to spills, as described in the manufacturer's Material Safety Data Sheet or other reliable safety literature. NaOH can cause very severe burns and injury to unprotected skin and eyes. Suitable personal protective equipment should always be used. These should include full-face shields, rubber aprons, and gloves impervious to NaOH. Gloves should be checked periodically for pin holes.

6. Conditioning

6.1 Maintain the temperature of the molding room and dry materials at not less than 20°C (68°F) and not more than 27.5°C (81.5°F). The temperature of the mixing water, and of the moist closet or moist room, shall not vary from 23°C (73.4°F) by more than 1.7°C (3°F).

6.2 Maintain the relative humidity of the molding room at not less than 50 %. The moist closet or room shall conform to Specification C 511.

6.3 Maintain the storage oven or water bath in which the specimens are stored in the containers at a temperature of 80.0 ± 2.0°C (176 ± 3.6°F).

7. Sampling and Preparation of Test Specimens

7.1 *Selection of Aggregate*—Process materials proposed for use as fine aggregate in concrete as described in the section on Preparation of Aggregate with a minimum of crushing. Process materials proposed for use as coarse aggregate in concrete by crushing to produce as nearly as practical a graded product from which a sample can be obtained. Grade the sample as prescribed in Table 1. The sample shall represent the composition of the coarse aggregate as proposed for use.

7.1.1 When a given quarried material is proposed for use both as coarse and as fine aggregate, test it only by selection of an appropriate sample crushed to the fine aggregates sizes, unless there is reason to expect that the coarser size fractions have a different composition that the finer sizes and that these differences might significantly affect expansion due to reaction with the alkalies in cement or from the environment of service. In this case test the coarser size fractions in a manner similar to that employed in testing the fine aggregate sizes.

7.2 *Preparation of Aggregate*—Grade all aggregates to which this test method is applied in accordance with the requirements given in Table 1. Crush aggregates in which sufficient quantities of the sizes specified in Table 1 do not exist until the required material has been produced. In the case of aggregates containing insufficient amounts of one or more of the larger sizes listed in Table 1, and if no larger material is available for crushing, the first size in which sufficient material is available shall contain the cumulative percentage of material down to that size as determined from the grading specified in Table 1. When such procedures are required, make a special note thereof in the test report. After the aggregate has been

TABLE 1 Grading Requirements

Sieve Size		Mass, %
Passing	Retained on	
4.75 mm (No. 4)	2.36 mm (No. 8)	10
2.36 mm (No. 8)	1.18 mm (No. 16)	25
1.18 mm (No. 16)	600 µm (No. 30)	25
600 µm (No. 30)	300 µm (No. 50)	25
300 µm (No. 50)	150 µm (No. 100)	15