



Designation: C 586 – 99

Standard Test Method for Potential Alkali Reactivity of Carbonate Rocks as Concrete Aggregates (Rock-Cylinder Method)¹

This standard is issued under the fixed designation C 586; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of the expansion of a specimen of carbonate rock while immersed in a solution of sodium hydroxide (NaOH) at room temperature. The length changes occurring during such immersion indicate the general level of reactivity of the rock and whether tests should be made to determine the effect of aggregate prepared from the rock upon the volume change in concrete.

1.2 *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.*

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound units in parentheses are provided for information only.

2. Referenced Documents

2.1 ASTM Standards:

- C 294 Descriptive Nomenclature for Constituents of Natural Mineral Aggregates²
- C 295 Guide for Petrographic Examination of Aggregates for Concrete²
- C 1105 Test Method for Length Change of Concrete Due to Alkali-Carbonate Rock Reaction²
- D 75 Practice for Sampling Aggregates³
- D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials⁴
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁵

¹ This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C 09.26 on Chemical Reactions.

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² *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 04.03.

⁴ *Annual Book of ASTM Standards*, Vol 08.01.

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

3. Summary of Test Method

3.1 Small rock cylinders are immersed in a solution of NaOH except when removed for determination of length change. The length change of each specimen is periodically determined.

4. Significance and Use

4.1 This test method is intended to give a relatively rapid indication of the potential expansive reactivity of certain carbonate rocks that may be used as concrete aggregates. The test method has been successfully used in (1) research and (2) preliminary screening of aggregate sources to indicate the presence of material with a potential for deleterious expansion when used in concrete.

4.2 The test method is intended as a research and screening method rather than as the basis of a specification requirement. It is intended to supplement data from field service records, petrographic examinations according to Guide C 295, and tests of aggregate in concrete according to Test Method C 1105.

4.3 Alkalies participating in the expansive reactions with aggregate constituents in concrete usually are derived from the hydraulic cement; under certain circumstances they may be derived from other constituents of concrete or from external sources. Two types of alkali reactivity of aggregates are recognized: (1) alkali-silica reaction involving certain siliceous rocks, minerals, and artificial glasses, and (2) alkali carbonate reaction involving dolomite in certain calcitic dolomites, dolomitic limestones, and dolostones (see Terminology C 294). This test method is not suitable as a means to detect alkali-silica reaction.

5. Apparatus and Reagents

5.1 *1 N Sodium Hydroxide Solution*—Dissolve 40 ± 1 g of reagent-grade sodium hydroxide (NaOH) in distilled water, dilute to 1 L and store in a polyethylene bottle.

5.2 *Sawing, Drilling, and Grinding Equipment*, suitable for preparing test specimens of the dimensions given in Section 7. This will require one or more rock saws, depending upon the size of the original sample, a drill press equipped with a small

diamond core barrel for removing the cylindrical core, and a lap, grinder, or suitable modified lathe for shaping the ends of the specimens.

5.3 *Storage Bottles*, approximately 50 to 100-mL capacity with caps and openings of sufficient size to facilitate removal of specimens. The polyethylene bottle shall be selected to ensure that the solution will not be modified by reaction with the material composing the container, including pigments or other additives or by transpiration of phases through the walls of the container. Bottles with wall thickness not less than 0.50 mm (0.020 in.) and composed of high density polyethylene

meeting the requirements of Specification D 1248 for materials of Type III, Class A, are suitable.

5.4 *Length Comparator*, for convenient and rapid measurement of lengths of specimens, the comparator shall be of such design as to provide, permit, or include the following characteristics. One type of comparator which has been found satisfactory is shown in Fig. 1.

5.4.1 A positive means of contact with the conical ends of the specimen to ensure reproducible measurement of length. A variety of contact points have been used successfully. Care should be exercised to ensure that when using specimens with



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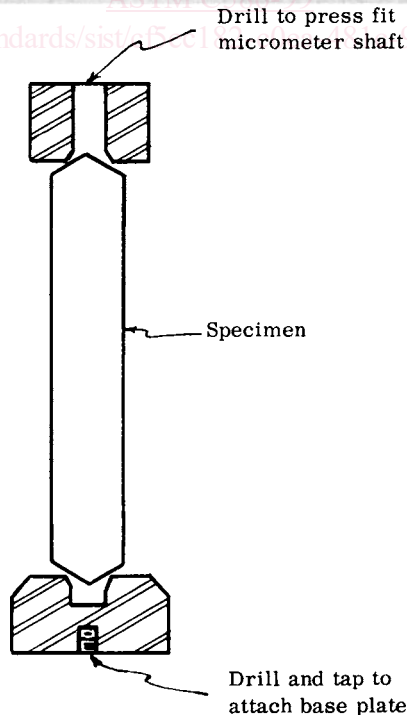


FIG. 1 A Typical Length Comparator