Designation: C 1560 – 03

Standard Test Method for Hot Water Accelerated Aging of Glass-Fiber Reinforced Cement-Based Composites[1]

This standard is issued under the fixed designation C 1560; 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 provides a way of accelerating the aging of glass fiber reinforced cementitious composites in order to develop data that will indicate real-life natural weathering performance.

1.2 The coupons prepared for this test method will be tested using Test Method C 947.

1.3 This test method can be used to age coupons for other test methods.

1.4 *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 *ASTM Standards:*

C 947 Test Method for Flexural Properties of Thin Section Glass-Fiber Reinforced Concrete (Using Simple Beam With Third-Point Loading)[2]

C 1228 Practice for Preparing Coupons for Flexural and Wash-out Tests on Glass-Fiber Reinforced Concrete[2]

3. Significance and Use

3.1 The basis for this test as an indicator of the long term behavior of fiber reinforced composites is that elevated temperature and moisture content accelerate the formation of the products of hydration of the cement in the matrix, particularly calcium hydroxide.

3.1.1 It is known that the interaction of these products of hydration, particularly calcium hydroxide, with the fibers can have a major effect on the long-term properties of the composites.

3.1.2 The principal mechanism that occurs is that the calcium hydroxide forms within the bundles of filaments that form the glass fiber strand. This gradually bonds the filaments together, which reduces filament pull-out. This causes a reduction in the strain capacity of the composite, thereby reducing the strength of the composite and changing the composite from a ductile material to an increasingly brittle material.

3.1.3 Accelerating the formation of the hydration products accelerates their interaction with the fibers, hence accelerating the aging of the composite.

3.2 The data developed from this test are used by researchers and manufacturers to evaluate the long-term performance of different mixtures, reinforcements, mixture components, and to provide data for the development of design procedures for products made from these composites.

3.2.1 The recorded data also provides screening information as new matrices and reinforcements are developed.

3.3 The usefulness of the test as an indicator of long term composite performance is valid if the only reactions that are accelerated are those that occur more slowly under natural weathering, hot water can induce effects in some composites, for instance those containing acrylic polymer, that may not occur in natural weathering. This test method may not be a valid indicator of long-term performance of such composites.

4. Apparatus

4.1 *Aging Tanks*—Tank material can be but not limited to, plastic, insulated to maintain a stable temperature. Insulation should cover all exterior surfaces including the cover. Insulation can be a foam product as used in building construction.

4.1.1 The size of the tank is typically 12 in. deep (300 mm), 18 in. wide (450 mm), and 20 to 36 in. (600 to 900 mm), in length. Size is determined by the amount of coupons to be processed and the ability to maintain stable temperatures. Water temperature in several medium sized tanks is easier to control than one large tank.

4.2 *Heating Unit*—An immersion unit with rheostat for controlling temperature, such as those used for aquariums, has been found to be satisfactory.

4.3 *Thermometer*—A standard immersion, laboratory thermometer is used to monitor temperature. More sophisticated recorders can also be used.

[1] This test method is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.40 on Glass Fiber Reinforced Concrete Made by the Spray-Up Process .

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[2] *Annual Book of ASTM Standards*, Vol 04.05.