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Standard Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to a Sodium Hydroxide Solution[1]

This standard is issued under the fixed designation E2098/E2098M; 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 covers procedures for determining the breaking force of glass fiber mesh following their conditioning in an alkali solution. The method is applicable to glass fiber mesh used in Class PB Exterior Insulation and Finish Systems (EIFS) with base coats that contain portland cement as an ingredient.

1.2 Breaking force is expressed both as force per unit width of mesh and as a percentage of the breaking force of the mesh that has not been exposed to alkali conditioning.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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:*[2]

D76/D76M Specification for Tensile Testing Machines for Textiles

D579/D579M Specification for Greige Woven Glass Fabrics

D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)

E631 Terminology of Building Constructions

E2110 Terminology for Exterior Insulation and Finish Systems (EIFS)

2.2 *Other Documents:*[3]

EIFS Industry Members Association (EIMA) Guideline Specification for Exterior Insulation and Finish Systems (EIFS), Class PB

3. Terminology

3.1 For general terminology regarding EIFS and building in general, see Terminology E2110 (for EIFS terms) and Terminology E631 (for buildings in general).

4. Summary of Test Method

4.1 Specimens are tested for breaking force with and without conditioning. Conditioning is immersion for 28 days in an aqueous solution of 5 % sodium hydroxide.

4.2 Breaking force is determined by mounting a test specimen in a tensile testing machine and applying a force to the specimen until it breaks.

5. Significance and Use

5.1 Glass fiber reinforcing meshes are used to strengthen EIFS. The reinforcing meshes are embedded into base coats that contain portland cement, which potentially exposes the glass fibers in the reinforcing meshes to weakening by the action of alkali. The breaking force following alkali exposure as determined by this method, is a factor used to comparatively evaluate the alkali resistance of EIFS glass fiber reinforcing meshes in the laboratory.

5.2 This test method does not purport to simulate the conditions that may be encountered in service. The performance of an EIFS is a function of many factors, such as proper installation, rigidity of supporting construction and resistance of the EIFS to deterioration by other causes.

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.58 on Exterior Insulation and Finish Systems (EIFS).

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from the EIFS Industry Members Association (EIMA), 513 West Broad Street, Suite 210, Falls Church, VA 22046-3257, http://www.eima.com.

6. Apparatus and Reagents

6.1 *Tensile Testing Machine,* of the controlled rate of extension type, as defined in Specification D76/D76M, clumps and jaw faces conforming to those in Test Method D5035.

6.2 *Container and container cover for alkali solution*—material inert to alkali of suitable dimensions to permit unbent mesh specimens to be fully covered with a depth of 25 mm [1 in.] of alkali solution. The cover for the container shall be of suitable design to prevent evaporative loss from the solution which would increase its concentration.

6.3 *Distilled water*

6.4 *Reagent Grade Sodium Hydroxide*

7. Sampling

7.1 *Laboratory Sample*—from a sample roll, cut 30 specimens 50 ± 3 mm [2 in.] wide at least 600 mm ± 13 mm [24 in.] long; 15 specimens with their long dimensions parallel to the machine (warp) direction, and 15 specimens with their long dimensions parallel to the cross (fill) direction.

7.2 The actual number of yarns shall be equal within the width dimensional tolerance allowed (±3 mm [⅛ in.]), and the actual number of yarns shall be reported.

7.3 Specimens shall be spaced across the width of the fabric to ensure representation of different warp yarns. Fill specimens shall be from widely spaced locations within the sample roll.

8. Preparation of Specimens

8.1 Number each specimen at both ends and then cut the specimens in half crosswise to provide one set for determining the conditioned breaking force and another set for determining the unconditioned breaking force. This allows for breaks on paired specimens which leads to more direct comparison of alkali conditioned versus unconditioned breaking force.

9. Alkali Conditioning of Specimens

9.1 Record the number of and placement of each specimen so that, following conditioning, the breaking force value of each conditioned specimen may be associated with the breaking force value of the unconditioned specimen from the same 50 by 600 mm [2 by 24 in.] strip. Markings may be destroyed by the alkali exposure. Any specimen tags used shall not be reactive with the alkali solution.

9.2 Prepare a 5 % (50 g/L [6.68 oz/gal]) sodium hydroxide solution and place it in the conditioning container to a depth sufficient to cover the specimens with 25 mm [1 in.] of solution. Maintain the solution at 22 ± 3°C [72 ± 5°F].

9.3 Immerse in the solution one 50 by 300 mm [2 by 12 in.] specimen strip from each pair cut from the 50 by 600 mm [2 by 24 in.] strips. Cover the strips by 25 mm [1 in.] of solution. The strips shall be straight. If the strips have a tendency to curl, they may be weighted at the ends by small weights inert to the solution, such as ceramic tile fragments. Cover the solution container with a tight cover and mark the solution level on the container. Self clinging plastic wrap may be used. If the solution level drops from evaporative loss, discontinue test.

9.4 Condition specimens in the solution for 28 days.

9.5 Following the 28 day conditioning, remove specimens, rinse briefly in distilled water, and dry for 7 days at 22 ± 3°C [72 ± 5°F] and relative humidity of 50 ± 5 %.

9.6 Maintain the specimens not being conditioned at ambient laboratory room temperature of 22 ± 3°C [72 ± 5°F] and a relative humidity of 50 ± 5 %.

10. Preparation of Tensile Testing Machine

10.1 Prepare tensile testing machine in accordance with Test Method D5035 Section 10.

11. Procedure

11.1 A resin may be applied to the ends of the specimens to make "tabs" to prevent slippage and jaw breaks during breaking as defined in Specification D579/D579M.

11.2 Mount the specimen securely with 200 mm [8 in.] of separation between the grips.

11.3 Operate the machine to extend the specimen at the rate of 100 mm [4 in.] per minute until the specimen breaks.

11.4 Record the breaking force (N/50 mm [lbf/2 in.]).

11.5 If specimen slips in the jaw, or breaks at the edge of, or in the jaws, discard the result and take another specimen. Continue until five acceptable breaks have been obtained for each of:

(a) Unconditioned specimens with their long direction parallel to the warp.

(b) Conditioned specimens with their long direction parallel to the warp.

(c) Unconditioned specimens with their long direction parallel to the fill.

(d) Conditioned specimens with their long direction parallel to the fill.

NOTE 1—The fragile nature of the specimens and the resultant test variability will make it obvious to the operator when a sample is itself defective or has been damaged by the testing process. Results of such samples should not be used.

12. Calculation or Interpretation of Results

12.1 *Breaking Force*—for each of the four test configurations from 11.5 calculate the average breaking force observed for the five acceptable specimens. Calculate average breaking force as the ratio of conditioned to unconditioned breaking force, for both the warp and fill directions separately as follows:

$$\left(\frac{C1}{U1}\right)+\left(\frac{C2}{U2}\right)+\left(\frac{C3}{U3}\right)+\left(\frac{C4}{U4}\right)+\left(\frac{C5}{U5}\right)\div 5\times 100\% \quad (1)$$

where:

C1 through C5 are the breaking forces for five acceptable conditioned specimens, and U1 through U5 are the breaking forces for the five acceptable unconditioned specimens.

13. Report

13.1 Report the following information:

13.1.1 Date(s) of test and date of report.

13.1.2 Identification of specimen by manufacturers brand or trade name.

13.1.3 Number of yarns for each sample.

13.1.4 Weight in g/m^2 [oz/yd^2] of glass fiber mesh prior to alkali conditioning.

13.1.5 Average breaking force in N/50 mm [lbf/2 in.] for:

(a) Unconditioned warp direction specimens

(b) Conditioned warp direction specimens

(c) Unconditioned fill direction specimens

(d) Conditioned fill direction specimens

13.1.6 Breaking force of the conditioned warp direction as a percentage of the breaking force of the unconditioned warp direction.

13.1.7 Breaking force of the conditioned fill direction as a percentage of the breaking force of the unconditioned fill direction.

13.1.8 A statement that the tests were conducted in accordance with this method, or a complete description of any deviation from this method.

14. Precision and Bias

14.1 The precision and bias of this test method have not been established.

15. Keywords

15.1 alkali; breaking strength; exterior insulation and finish systems; glass fiber reinforcing mesh; tensile