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Standard Specification for Structural Cementitious Panels[1]

This standard is issued under the fixed designation C1705/C1705M; 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 specification covers structural cementitious panels. Structural cementitious panels are non-combustible, water durable, fiber reinforced inorganic composite panels intended for use as structural panels. Structural cementitious panels can be used as floor, roof and wall sheathing when fastened to supports spaced in accordance with the appropriate span rating.

1.2 This specification defines minimum performance requirements for structural cementitious sheathing panels with respect to structural performance, dimensional stability performance, dimensional tolerance, noncombustibility, surface burning characteristics, long-term durability, water durability, mold resistance, density, moment capacity and bending stiffness.

1.3 This specification also defines a policy to assure ongoing product quality by detecting changes in panel properties that may adversely affect panel performance. Required audits of quality activities by a third party quality assurance agency are also defined.

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C1185 Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards

C1704/C1704M Test Method for Sampling and Testing Structural Cementitious Panels

D1037 Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

D1761 Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials

D3273 Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

E84 Test Method for Surface Burning Characteristics of Building Materials

E136 Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C

E330/E330M Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

E661 Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads

G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *cross machine direction (XMD), n*—the direction perpendicular to the machine direction.

3.1.2 *edge, n*—edges of a panel refer to the long side of a rectangular panel. For example, on a 4 by 8 ft panel, the edges refer to the sides of the panel that are 8 ft long.

[1] This specification 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.

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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.

3.1.3 *end, n*—the end of a panel refers to the short side of a rectangular panel. For example, on a 4 by 8 ft panel, the end refers to the side of the panel that is 4 ft long.

3.1.4 *fiber reinforced inorganic composite, n*—a composite material composed primarily of inorganic matrix materials reinforced primarily with inorganic fibers. Inorganic aggregates may be combined with the inorganic matrix.

3.1.5 *machine direction (MD), n*—the direction the board travels during manufacture.

3.1.6 *noncombustibility, n*—term intended to describe products that do not ignite and/or burn when subjected to fire. Test methods are generally specified by reputable agencies such as ASTM, Factory Mutual, Underwriters Lab Inc., etc.

3.1.7 *performance standard, n*—a standard for products based on performance. Performance is measured by tests that approximate end-use conditions.

3.1.8 *plant specification, n*—the plant specification is unique to each qualified product under a given performance standard. The specification is used in the plant quality program as audited under the approved quality control program.

3.1.9 *qualification policy, n*—policy that describes the procedures by which a plant may obtain span rating privileges for performance-rated products policy.

3.1.10 *quality assurance policy, n*—policy covering the third-party auditing of plant's quality control program.

3.1.11 *reference value, n*—the numerical value established for the plant specification for a given mechanical or physical property.

3.1.12 *sample average, n*—the average test value, obtained by summing the observations and dividing by the number of tests.

3.1.13 *sample panel, n*—a structural cementitious panel from which test specimens are cut and conditioned as necessary.

3.1.14 *sample standard deviation, n*—a measure of test variation. Calculated as:

$$S = \sqrt{\left[\sum x^2 - \left(\sum x\right)^2/n\right]/n - 1} \quad (1)$$

where:

S = sample standard deviation,
x = test observation, and
n = number of observations.

3.1.15 *span rating, n*—the recommended maximum center-to-center support spacing in inches for the specified end use under normal use conditions.

3.1.16 *specimen, n*—the individual test piece cut from a sample panel.

3.1.17 *structural cementitious panel, n*—non-combustible, water durable, fiber-reinforced inorganic composite panels intended for use as structural panels.

3.1.18 *test exposure condition, n*—the condition to which a panel is subjected prior to test. Generally, such conditions are referred to as the dry or wet conditions.

3.1.19 *test specimen, n*—specimens cut from a sample panel that are used for testing.

3.1.20 *water durability, n*—performance of a product after sustained immersion in water for a specified period of time.

4. Performance Specifications for Structural Cementitious Panels

4.1 Structural cementitious panels are fiber-reinforced inorganic composite panels intended for use as structural panels. When used as a floor sheathing panel, structural cementitious panels can be used as a combination subfloor and underlayment (single floor grade) or as a sheathing grade panel, which when used as a floor requires an underlayment panel on top of it. In either case, panels must be fastened to supports spaced in accordance with the panel's span rating. Sections 5 through 13 describe qualification procedures and initial testing required to demonstrate that the panel's performance characteristics meet the requirements of this standard.

5. Structural Performance

5.1 *Concentrated Loads*—Panels shall be tested according to the procedures of Test Method E661 for concentrated static and impact loads. Panels shall conform to the criteria of Tables 1 and 2 for the end use and span shown on the panel.

TABLE 1 Sheathing Grade Sheets—Concentrated Static and Impact Test Performance Criteria for Panels Tested According to Test Method E661

Span Rating, in.	Test Exposure Conditions[A]	Performance Requirements		
		Minimum Ultimate Load, lb [kN]		Maximum Deflection, in. [mm] Under 200-lb Load [0.89 kN]
		Static	Following Impact	
16 [406 mm]	Dry	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]
	Wet	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]
20 [508 mm]	Dry	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]
	Wet	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]
24 [610 mm]	Dry	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]
	Wet	400 lb [1.78 kN]	400 lb[B] [1.78 kN]	0.125 in.[C] [3.18 mm]

[A] Wet conditioning is exposure to seven days continuous wetting and tested wet.
[B] Impact shall be 75 ft-lb [102 J] for span ratings up to 24 in. o.c [610 mm o.c.].
[C] Criteria apply under both static concentrated load and following impact.