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A subsidiary corporation of the International Conference of Building Officials

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ACCEPTANCE CRITERIA FOR PHENOLIC GYPSUM CORE PANELS USED AS EXTERIOR WALL COVERINGS (Proprietary)

AC82

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PREFACE

Evaluation reports issued by the ICBO Evaluation Service, Inc. (ICBO ES), are based upon performance features of the *Uniform Building Code*[™], *ICBO Uniform Mechanical Code*[™] and related codes. Section 104.2.8 of the *Uniform Building Code* is the primary charging section upon which evaluation reports are issued. Section 104.2.8 reads as follows:

The provisions of this code are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

The attached acceptance criteria for the general code sections noted has been issued to provide all interested parties with guidelines on implementing performance features of the codes. The attached acceptance criteria was developed and adopted following public hearings conducted by the Evaluation Committee. If the criteria is an updated version from a previous edition, solid vertical lines (■) in the outer margin within the criteria indicate a technical change or addition from the previous edition. Deletion indicators (◆) are provided in the outer margins where a paragraph or item has been deleted if the deletion resulted from a technical change. This criteria may be revised from time to time as the need dictates.

ICBO ES may consider alternate criteria, provided the proponent submits valid data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a material, type or method of construction, or equipment, meets the attached acceptance criteria, or that it can be demonstrated that valid alternate criteria are equivalent and otherwise meet the applicable performance requirements of the codes, if the material, product, system or equipment is such that either unusual care in its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use thereof, ICBO ES retains the right to refuse to issue or renew an evaluation report.

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1.0 SCOPE

The purpose of this document is to specify the conditions under which phenolic gypsum core panels can be recognized in an ICBO Evaluation Service, Inc. (ICBO ES), evaluation report for use as exterior wall coverings under the 1994 *Uniform Building Code*[™] (code). Basis of recognition is Section 104.2.8 of the code.

2.0 DEFINITIONS

2.1 Core: Proprietary expanded phenolic gypsum with a density of 11.25 pounds per cubic foot (180.2 kg/m³). Thickness ranges from ⁵/₈ inch to 6 inches (15.9 mm to 152 mm).

2.2 Acrylic Gypsum Facer: A modified glass fiber reinforced gypsum that may contain additional fillers.

2.3 Panel: A core with reinforced acrylic gypsum bonded to both faces. It serves as a structural exterior panel that resists transverse loads and racking shear loads due to wind and seismic conditions. The panel can be applied to either bearing or nonbearing wood or metal-wall framing.

2.4 Fastening System: Method used to mechanically attach the panel to the framing. The system can include nails, staples or screws.

3.0 BASIC INFORMATION

3.1 General information on material and manufacturing process.

3.2 Thickness, size, fastening method, joint treatments and any special precautions required for installation.

3.3 Installation instructions, method of packaging and field identification.

3.4 Method of field cutting, trimming or forming and treatment of cut edges and cut ends.

4.0 EXTERIOR WALL CONSTRUCTION

4.1 Noncombustible Construction: The panel can be recognized for application to walls required to be of noncombustible construction, provided data showing compliance with Section 2602.5.2.1 is provided.

4.2 Required Testing:

1. Accelerated-weathering tests as set forth in Section 5.3.
2. Freeze-thaw tests as set forth in Section 5.4.
3. Bond-strength tests after weatherometer and freeze-thaw tests as set forth in Section 5.5.
4. Flexural-strength tests as set forth in Section 5.6.
5. Physical properties tests as set forth in Section 5.7.
6. Structural-performance tests as set forth in Section 5.8.
7. Salt-spray resistance tests as set forth in Section 5.9.
8. Water-resistance tests as set forth in Section 5.10.

4.3 Weather-resistive Considerations: A weather-resistive barrier complying with Section 1402.1 of the code is required.

4.4 Thermal Barrier: A thermal barrier complying with Section 2602.4 of the code is required to separate the interior of the building from the board.

Exception: Installation justified by room fire test in accordance with UBC Standard 26-3.

4.5 Plans, details, specifications, etc., concerning proper installation of the wall system, that are applicable to the specific building under consideration, must be a part of plans submitted to the building department for approval.

5.0 TESTING

5.1 Testing laboratories shall comply with the ICBO ES Acceptance Criteria for Laboratory Accreditation (AC89).

5.2 Test reports and test specimen sampling shall comply with the ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85).

As an alternate, testing may be conducted at the proponent's facility, under the following conditions:

1. Only those tests which do not require aging or cycling may be conducted.

2. Tests are conducted under the direct supervision of a laboratory recognized in an NES evaluation report or accredited by ICBO ES. The supervising laboratory is required to record and retain details of its investigation into the capabilities of the manufacturer's test facility. The detailed records must show the test facility to be fully qualified to do the testing, and the laboratory's test procedures must be shown to be in compliance with all applicable provisions of the ICBO ES acceptance criteria and the standards under which the tests are conducted. The supervising laboratory must retain a report of its investigation on file and provide the report to ICBO ES upon request. All test reports utilizing data generated in a manufacturer's test facility must be issued and signed by the sponsoring laboratory.

3. The test facility is subject to ICBO ES staff inspection and approval prior to testing.

5.3 Accelerated Weathering Test (Weatherometer):

1. Five 3-inch-by-9-inch (76 mm by 229 mm) specimens are prepared, and the procedure outlined in ASTM G 23-81 "Operation Light and Water Exposure Apparatus (Carbon-Arc Type) for Exposure of nonmetallic Materials" is used. Model D or DH, with the operating schedule set forth under Method 1, Section 5, of the referenced ASTM procedure, must be used.

2. The test shall be for 2,000 hours, with cycles of 102 minutes of light followed by 18 minutes of light and water-spray. Black panel temperature shall be 145°F ± 5°F (62.7°C ± 2.77°C).

3. Condition of acceptance is that after exposure, there shall be no cracking, checking, crazing, erosion or other characteristics that might affect performance as an exterior wall covering in any specimen, when viewed under minimum 5× magnification.

5.4 Freeze-thaw Test:

1. Five 6-inch-square (152 mm) specimens and five 6-inch-by-12-inch (152 mm by 305 mm) specimens are prepared and subjected to 10 freeze-thaw cycles. Specimens are coated on the sides with a nonpermeable material, and the exterior face is left uncoated. Each cycle consists of air-drying in a temperature of 120°F ± 5°F (49°C ± 2.77°C) for a minimum of eight hours, followed by total immersion in 70°F to 80°F (21.1°C to 26.7°C) water for a minimum of eight hours, followed by exposure to -20°F (-28.9°C) for a minimum of 16 hours.

2. Condition of acceptance is that after exposure there shall be no cracking, checking, crazing, erosion, or other characteristics that might affect performance as an exterior wall covering in any specimen, when viewed under minimum 5× magnification. Delamination, or indications of same, between component materials or layers are also defined as failure.

3. The 6-inch-square (152 mm) specimens are subjected to bond-strength tests in accordance with procedures described in Section 5.5.

4. The 6-inch-by-12-inch (152 mm by 305 mm) specimens are subjected to the flexural-strength test described in Section 5.6.

5. The freeze-thaw test is not required if the products are limited to areas where the average of the daily lows for any month is at least 30°F (−1°C).

5.5 Bond-strength Tests After Weatherometer and Freeze-thaw Tests:

1. Five control specimens, five 6-inch-square (152 mm) specimens subjected to freeze-thaw, and five specimens subjected to weatherometer tests are prepared for the flatwise-tension test by cutting specimens to obtain 3-inch-square (76 mm) specimens by sawing off all four edges. Specimens are maintained at 45 to 55 percent relative humidity and 70°F to 80°F (21.1°C to 26.7°C) until weight equilibrium has been attained.

2. A 3-inch-square (76 mm) steel plate is adhered with epoxy to faces of each specimen. The plate should have a clevis or other means of installation in a tensile-testing machine.

3. After epoxy has cured, each specimen is tested in tension perpendicular to surface in a displacement-controlled test machine. Displacement rate should not exceed 0.05 inch (1.27 mm) per minute.

4. Condition of acceptance is that the average ultimate flatwise-tensile stress for all specimens shall be at least 10 psi (69 kPa). If failure occurs between the steel plates and specimens below 10 psi (69 kPa), results should be disregarded and specimens retested.

5.6 Flexural-strength Tests: Ten dry and ten wet specimens, composed of five specimens in the machine direction and five specimens in the cross-machine direction, shall be prepared. The specimen size is 6 inches by 12 inches (152 mm by 305 mm). Prior to testing, specimens are conditioned at 75°F ± 5°F (23.8°C ± 2.77°C) and 50 ± 10 percent relative humidity (RH) for 7 days. In addition, wet specimens are conditioned in water and maintained at 75°F ± 5°F (23.8°C ± 2.77°C) for 48 hours before testing. The test span is 10 inches (254 mm). Specimens are placed on roller-type supports with a length equal to the specimen width, and have a minimum 1/8-inch (3.2 mm) to maximum 1/2-inch (12.7 mm) radius. The load is applied at mid span through a similar roller, at a rate such that failure of the specimen occurs after approximately one minute. Results are reported as average of loads at which the specimen breaks.

The flexural strength tests are also conducted on the 6-inch-by-12-inch (152 mm by 305 mm) specimens subjected to the freeze-thaw test as noted in Section 5.4, and results reported.

5.7 Physical Properties Tests:

5.7.1 Core: The product must comply with Table 1.

5.7.2 Panel: The product must comply with Table 2.

5.8 Structural Performance Tests:

5.8.1 Transverse Load Tests:

1. Testing shall be done in accordance with ASTM E 330-84, Procedure B. At least three positive and three negative load tests must be conducted with the panel fastened to the framing system in accordance with the published installation instructions.

Test assemblies shall be minimum 4 feet by 8 feet (1219 mm by 2438 mm) [4 feet by 4 feet (1219 mm by 1219 mm) specimens may be used if the panel spans between framing members without bearing on the top and bottom headers]. Application of loads to failure shall be in at least six increments, with a 10-second load duration for each increment.

2. Test assemblies shall be mounted in accordance with ASTM E 330-84. Framing supporting the panel must be located at the maximum spacing for which recognition is desired. In most instances, this will result in triple 16-inch (406 mm) spans or double 24-inch (610 mm) spans. The ICBO ES staff must be contacted if the spans vary from those required herein.

3. Load deflection readings at the midpoint of panel spans must be reported.

4. Condition of acceptance will be based on the following:

a. Allowable loading will be based on a factor of safety of 3 applied to the ultimate load, if all of the following are satisfied:

(i) No single test result varies by more than 15 percent from the average of three tests. Variations exceeding this limit will result in larger safety factors.

(ii) The allowable load does not exceed established values for mechanical connectors such as nails, screws, and staples.

b. Other factors of safety can be considered based on unique conditions of installation or material used.

5. Tests must be conducted for each combination of core and facing thicknesses for which recognition is sought.

5.8.2 Racking-shear Test: The intent of this test is to determine the racking shear capacity of the panel.

1. Test setup, measurements and application of loads must comply with ASTM E 72-80. Test must be conducted on a minimum of three identical specimens with the substrate prepared and installed in accordance with the published instructions. Specimen construction shall be based on minimum conditions, since test specimens establish the basis of acceptance.

2. Application of load shall be in increments as described in the test method.

3. Allowable shear load is the lowest of the ultimate load divided by a safety factor of 3; the load at which 1/8-inch (3.2 mm) net deflection occurs; or allowable fastener loads.

4. Tests must be conducted for each combination of core and facing thicknesses for which recognition is sought.

5.9 Salt Spray Resistance: Testing must be in accordance with ASTM B 117-85. Three 4-inch-by-5-inch (102 mm by 127 mm) specimens are prepared in a manner similar to that for the freeze-thaw test specimens. Specimens must be periodically inspected, and the results reported. The testing period is 300 hours. Condition of acceptance is that at the end of the test there are no deleterious effects from salt spray, such as any cracking, checking, crazing, erosion, rusting or other distress, that might affect performance as an exterior wall covering.

5.10 Water Resistance: Testing must be in accordance with ASTM D 2247-87. Three 4-inch-by-6-inch (102 mm by 152 mm) samples are prepared in a manner similar to that for the freeze-thaw test specimens. Specimens must be periodically inspected, and the results reported. The testing period is 14 days. Condition of acceptance is that, at the end of the test, there are no deleterious effects, such as any cracking, checking, crazing, erosion, rusting or other distress, that might affect performance as an exterior wall covering.

6.0 QUALITY CONTROL

6.1 The panels must be manufactured under an approved quality control program with inspections by an agency accredited/recognized by ICBO ES or the NES as a quality control or compliance assurance agency, respectively.

6.2 A quality control manual complying with the ICBO ES Acceptance Criteria for Quality Control Manuals (AC10) must be submitted.

TABLE 1—PHYSICAL PROPERTIES REQUIREMENT OF CORE¹

NO.	PROPERTY	TEST METHOD	PHYSICAL PROPERTY REQUIREMENT
1	Modulus of Rupture	ASTM C 203-85 Procedure A	Minimum 51 psi average
2	Modulus of Elasticity	ASTM C 203-85 Procedure A	Minimum 9,800 psi average
3	Density	ASTM C 271-53	Minimum 11.25 pcf average
4	Flame Spread	UBC Standard 8-1	25 or less
5	Smoke Density	UBC Standard 8-1	450 or less
6	Internal Bond	ASTM C 209-84	Minimum 10 psi average

For **SI**: 1 psi = 6.89 kPa, 1 pcf = 16.018 kg/m³.

¹Required for maximum and minimum thickness, except for density tests.

TABLE 2—PHYSICAL PROPERTY REQUIREMENT OF PANEL

NO.	PROPERTY	TEST METHOD	PHYSICAL PROPERTY REQUIREMENT
1	Nail Head Pull-through Resistance	ASTM D 1037-87	Minimum 150 pounds average
2	Lateral Nail Resistance	ASTM D 1037-87	Minimum 150 pounds average
3	Flexural Strength	ASTM D 1037-87	Average strength of wet and freeze-thaw specimens must be at least 60 percent of average strength of dry specimens ¹
4	Hardness	ASTM D 1037-87	Minimum 200 pounds
5	Impact	ASTM D 1037-87	Minimum 90 inches
6	Linear Variation with Change in Moisture Content	ASTM D 1037-87	Maximum 0.4 percent
7	Flatwise-tension	ASTM C 297-61	Minimum 10 psi. ²
8	Tension Exposed Face Skin	ASTM D 638-87b	Minimum 3,100 psi
9	Tension Back Face Skin	ASTM D 638-87b	Minimum 4,300 psi

For **SI**: 1 pound = 4.45 N, 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

¹If values obtained for wet and/or freeze-thaw specimens are less than 90 percent of dry control specimens, allowable positive and negative transverse load capacity determined in Section 5.8 of the criteria will be reduced proportionately.

²For each of the control specimens, specimens subjected to weatherometer, and specimens subjected to freeze-thaw tests.