

Standard for Air Barrier Material – Non-Insulating Sheathing - Gypsum Based - Material Specification

1. Scope

1.1 This document provides the material property requirements and test methods to determine these properties for *non-insulating sheathing- gypsum based* air barrier material that is used in building assemblies, whether installed on a building site or in a prefabrication facility.

1.2 The test methods listed in this document are used to determine the values for the material properties. These values are intended for use in specifications, product evaluations and quality control. They are not intended to predict in situ end-use product performance.

1.3 This document only covers material requirements for that is 16 mm (5/8 inch) thick material to be used in an air barrier application.

1.4 This document does not include material requirements for using this material in a water resistive barrier application.

1.5 Only metric SI units of measurement are used in this document. If a value for measurement is followed by a value in other units in parentheses, the second value is approximate. The first stated value is the requirement.

1.6 The testing and evaluation of a product against this document may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this document has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any existing applicable regulatory requirements prior to its use.

2. Referenced Documents

The documents shown below are referenced in the text of this document. Unless otherwise stated elsewhere in this document such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this Standard.

Documents Published by the American Society for Testing and Materials (ASTM)
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ASTM C22, Standard Specification for Gypsum

ASTM C473, Standard Test Methods for Physical Testing of Gypsum Panel Products

ASTM C471, Standard Test Methods for Chemical Analysis of Gypsum and Gypsum Products

ASTM C550, Standard Test Method for Measuring Trueness and Squareness of Rigid Block and Board Thermal Insulation

ASTM C1264, Standard Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products

ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dams

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

ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials

ASTM E2178, Standard Test Method for Air Permeance of Building Materials

ISO 16536, Thermal insulating products for building application – Determination of long-term water absorption by diffusion

3. Terminology

3.1 For definitions of general terms related to building construction used in this document, refer to ASTM C11 Terminology. Specific definitions and symbols used in this document have been listed below.

3.1.1 *non-insulating sheathing- gypsum based* air barrier material, n – panel products consisting of a noncombustible core primarily of gypsum with glass mat facers or paper facers with low air leakage rate

4. Requirements

4.1 General

4.1.1 The *non-insulating sheathing- gypsum based* air barrier material is intended to be a substrate that is used as the primary air barrier material to create a plane of airtightness. The surfaces of gypsum board shall be true and free from imperfections that would render it unfit for finishing.

4.1.2 The *non-insulating sheathing- gypsum based* air barrier material shall consist of a noncombustible core of gypsum complying with Specification C22/C22M, surfaced with glass mat facers or paper facers bonded to the core.

4.1.3 The edges and ends of the *non-insulating sheathing- gypsum based* air barrier material shall be straight.

4.1.4 The edges of the *non-insulating sheathing- gypsum based* air barrier material shall be either tapered edge, square or V-tongue and groove.

4.2 Detailed requirements

4.2.1 *Non-insulating sheathing- gypsum based* air barrier material shall meet the physical properties values specified in Table 1.

4.3 Health and Safety requirements

4.3.1 The *supplier* shall ensure that the material covered by this document shall not present any know health hazards to installers or the occupants of buildings. The *supplier's* installation instructions shall ensure that the material does not present any health and safety hazards either during the installation process or to the occupants after installation.

5. Sampling

5.1 The accredited testing laboratory determining compliance to this document shall be responsible for the random sampling of the *material*. Sampling shall be performed in accordance with the principles of ASTM C1264 except that samples of the gypsum panel products shall be taken at the place of manufacturer or at a place of distribution. Enough boards shall be selected on a single occasion from a single lot to complete all testing to determine compliance with this document.

For use in these test methods, a sample shall consist of not less than 0.25 % of the number of gypsum panel products in a typical shipment, and not less than three gypsum panel products. Test specimens shall be taken from the sample lot as indicated in each method.

5.2 For testing purposes, the accredited testing laboratory shall randomly select boards from a single lot.

5.3 Unless otherwise specified, the number of sample panels (boards) shall be left to the discretion of the organization determining compliance with this document.

6. Sample Panels

6.1 Sample panels of the *material* shall be either the full boards or panels cut from the boards that were selected.

7. Conditioning of Sample Panels

7.1 Unless otherwise specified, sample panels / boards shall be conditioned to constant weight at a temperature of 30 ± 9 °C (85 ± 15 °F) and relative humidity of 50 ± 5 %.

8. Preparation of Specimens

8.1 Unless otherwise specified in the test method, the specimens shall be cut from the sample panels described in Subsection 6.1. The edge of any specimen shall not be less than 50 mm (2 inches) from the edge of the sample panel except for air permeance testing. Unless specified otherwise, specimens shall be the standard thickness produced.

8.2 All specimens shall be obtained from the conditioned sample panels by cutting the specimen to the size required for the testing equipment.

8.3 The opposing faces of the test specimens shall be sufficiently flat and parallel to be used in the test apparatus. The test specimens shall not be warped.

8.4 Test specimens individually after constant weight is reached and within 10 min upon removal from the conditioning chamber prior to cutting and testing for material properties.

9. Test Methods

9.1 Air Leakage Rate

9.1.1 The air leakage rate of the material shall be determined in accordance with ASTM E2178 using five specimens with minimum dimensions of 1200 mm x 1200 mm x 16 mm (48 inch x 48 inch x 5/8 inch thick).

9.1.2 The results shall be reported as the average of the five specimens.

9.2 Compressive Strength

9.2.1 The compressive strength shall be determined in accordance with ASTM C473, Appendix X3.

9.2.2 The results shall be reported as the average of the specimens.

9.3 Core, End, and Edge Hardness

9.3.1 The hardness of the material shall be determined in accordance with ASTM C473 either with Method A or Method B.

9.3.2 The results shall be reported as the average of the three specimens.

9.4 End Squareness

9.4.1 The squareness of the corners shall be determined in accordance with ASTM C473 Section 15 using three full boards.

9.4.2 The results shall be reported as the average of the three boards.

9.5 Fastener Air Leakage

9.5.1 The fastener leakage shall be determined in accordance with ASTM E2178 as follows. The specimen preparation shall be constructing a metal frame having outermost dimensions the same as the test specimen and made of steel studs and track with four studs: one on each end and two spaced equidistant between. The gypsum material shall be installed on the steel frame at the perimeter only and in such a manner that the locations of the perimeter fasteners will be cover within the perimeter seal of the test apparatus – not contributing to the measured air leakage of the test specimen Determine the extraneous leakage in accordance with ASTM E2178 as well as the total leakage of the “unfastened” board. Once the extraneous leakage and total leakage are determined and without disrupting the test specimen or its mounting in the apparatus, install fasteners into through the gypsum panel test specimen and into the two central framing members behind. Then determine the assembly leakage with the fasteners installed. The edges of the frame and material shall be sealed so that the air can only go through the fastened material.

9.5.2 The results shall be reported as the difference between the averages of the three specimens tested before and tested after the installation of fasteners.

9.6 Flexural Strength

9.6.1 The flexural strength of the material shall be determined in accordance with ASTM C473 using Method B. The specimens shall be tested face up and face down.

9.6.2 The results shall be reported as the average breaking load for each test condition: Parallel, Face Up; Parallel Face Down; Perpendicular Face Up; and Perpendicular Face Down.

9.7 Fungi Resistance

9.7.1 The fungi resistance shall be determined in accordance with ASTM D3273 using three specimens measuring 75 mm x 100 mm (3 inch x 4 inch).

9.7.2 The results shall be reported as the average percentage of fungal growth on the surface area being tested.

9.8 Humidified Deflection

9.8.1 The humidified deflection shall be determined in accordance with ASTM C473.

9.8.2 The results shall be reported as an average of the three specimens.

9.9 Length

9.9.1 The length of the boards shall be determined in accordance with ASTM C473.

9.9.2 The results shall be reported as the average of the three boards.

9.10 Nail Pull Resistance

9.10.1 The nail pull resistance shall be determined in accordance with ASTM C473 Method B.

9.10.2 The results shall be reported as an average of the three specimens.

9.11 Pull Adhesion

9.11.1 The adhesion of the facing of the gypsum board to the gypsum shall be determined in accordance with ABAA 0002 without cutting through the facing to the gypsum core.

9.11.2 The results shall be reported as an average of the three specimens.

9.12 Tapered Edge Depth

9.12.1 The average thickness of the edge of recessed or tapered edge gypsum board shall be determined in accordance with ASTM C473 and compared to the average thickness of the gypsum board.

9.12.2 The results shall be reported as the average of the three boards.

9.13 Tensile Strength

9.13.1 The tensile strength shall be determined in accordance with ASTM C297.

9.13.2 The results shall be reported as the average of the three specimens.

9.14 Thickness

9.14.1 The thickness shall be determined in accordance with ASTM C473 using three full board specimens.

9.14.2 The results shall be reported as the difference between the measured thickness and the manufacturer's stated thickness of the five specimens.

9.15 Volatile Sulfur Compounds

9.15.1 The volatile sulfur compounds [orthorhombic cyclooctasulfur (S₈)] of the gypsum board shall be determined in accordance with ASTM C471M.

9.15.2 The results shall be reported as the average of the five specimens.

9.16 Width

9.16.1 The nominal width determined in accordance with ASTM C473 using five specimens.

9.16.2 The results shall be reported as the difference between the measured thickness and the manufacturer's stated thickness of the five specimens.

9.17 Water Absorption by Immersion

9.17.1 The water absorption by immersion shall be determined in accordance with C473 Section 20 using three specimens for a two-hour immersion.

9.17.2 The results shall be reported as the average of the three specimens.

9.18 Water Absorption by Diffusion

9.18 The water adsorption shall be determined in accordance with ISO 16536.

9.18.2 The results shall be reported as the average of three specimens.

9.19 Water Resistance – Surface

9.19.1 The surface water absorption shall be determined in accordance with ASTM C473 Section 21.

9.19.2 The results shall be reported per panel as the average of three specimens per panel.

9.20 Water Vapor Transmission Rate

9.20.1 The water vapor transmission rate of three specimens shall be determined in accordance with both the desiccant method and the water method of ASTM E 96 at a temperature of (23 ± 2) °C [(73 ± 5) °F].

9.20.2 The results shall be reported as the mean value of the three specimens.

10. Reporting Requirements

10.1 Test data shall be reported in the form of a table with test method, property, result and pass/fail columns including results for all properties listed in this document followed by a statement on whether the product met the requirements of this document.

10.2 The *supplier* shall allow publication of the results in material evaluation reports or listing of each physical property test required by this document when claiming to meet this document.

10.3 In addition to the information specified in the individual test methods, all reports describing the testing of the material in accordance with this document shall include the following information:

- a. The *supplier's* name, address, production facility address and product designation;
- b. The type and name of the *material* and other material description;
- c. Lot number and manufactured date;
- d. Sampling information, including information on the place of manufacturer or place of distribution where the samples were obtained;
- e. Name and location of laboratory performing the tests and the accreditation agency for the laboratory;
- f. Size of specimens used for each test;
- g. Report of the average for the test result of all specimens tested for each test method in accordance with the test method reporting section.
- h. The values reported shall have the same precision as the requirements listed in Table 1;

- i. List in a table the reported results compared to the requirements of this document and state whether that material requirement has either passed or failed;
- j. Declaration of conformity with this document; and
- k. An appendix to the report shall contain the data used to generate the above items.

11. Labeling

11.1 Each board shall be clearly marked with the following information:

- a. Supplier's name;
- b. Product name;
- c. Type of material (e.g. air barrier);
- d. Country of manufacturer; and
- e. Lot number.

12. Supplier Documentation

12.1 The *supplier* shall provide the *contractor*, upon request, with the following:

- a. Description of the material including their properties;
- b. Safety data sheet;
- c. Instructions for safe handling, use and disposal of the material;
- d. Physical properties for the *material*;
- e. Limitations for use of the *material*;

13. Keywords

13.1 air barrier material, gypsum board

**TABLE 1
 REQUIREMENTS FOR PHYSICAL PROPERTIES**

| Property | Unit | Requirements | | Test Method |
|---|---|--|--|--------------------------|
| | | Min. | Max. | |
| Air Leakage Rate | L/(s·m ²) @ 75 Pa | - | 0.0200 | ASTM E2178 |
| | CFM/ft ² @ 1.57 psf | - | 0.0040 | |
| Compressive Strength | Pa | 2750 | - | ASTM C473 Appendix X3 |
| | psi | 400 | - | |
| Core, End, and Edge Hardness Method A | N | 67 | - | ASTM C473 |
| | lbf | 15 | - | |
| Method B | N | 49 | - | |
| | lbf | 11 | - | |
| End Squareness in the Full Width of the Board | mm | - | ± 3 | ASTM C473 |
| | inch | - | ± 1/8 | |
| Fastener Air Leakage | L/(s·m ²) @ 75 Pa CFM/ft ² @ 1.57 psf | Report difference between air leakage rate (9.1) and fastener leakage (9.5) | - - | ASTM E2178 |
| Flexural Strength Method B Bearing Edges Perpendicular to Panel Length | N | 654 | - | ASTM C473 |
| | lbf | 147 | - | |
| Method B Bearing Edges Parallel to Panel | N | 205 | - | ASTM C473 |
| | lbf | 46 | - | |
| Humidified Deflection | mm | - | 3 | ASTM C473 |
| | inch | - | 1/8 | |
| Fungi Resistance | - | - | 20 % mold growth, based on surface area coverage | ASTM C3273 |
| Length | mm | 6 | 6 | ASTM C473 |
| | inch | 1/4 | 1/4 | |

| | | | | |
|---|------------------------------------|----------------------|---------|----------------------|
| Nail Pull Resistance Method B | N | 387 | - | ASTM C473 |
| | lbf | 87 | - | |
| Pull Adhesion | kPa | 110 | - | ABAA 0002 |
| | psi | 16 | - | |
| Tapered Edge Depth as compared to the average thickness of the gypsum board | mm | 0.51 | 2.29 | ASTM C473 |
| | inch | 0.020 | 0.090 | |
| Thickness | mm | | ± 0.38 | ASTM C473 |
| | inch | | ± 0.015 | |
| Volatile Sulphur Compounds | ppm | - | 10 | ASTM C471M |
| Water Absorption (full immersion) by Weight | % | - | 10.0 | ASTM C473 Section 20 |
| Water Absorption - Surface | G | - | 1.6 | ASTM C473 Section 21 |
| | oz | - | 0.06 | |
| Water Vapor Absorption by Diffusion | % | Declare | | ISO 16536 |
| Water Vapor Transmission Rate – water and desiccant method | ng/(Pa·s·m ²) Perms | Declared both values | | ASTM E96 |
| Width | mm | - | ± 3.2 | ASTM C473 |
| | inch | - | ±1/8 | |