Designation: E1677 – 23

Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls[1]

This standard is issued under the fixed designation E1677; 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 minimum performances and specification criteria for an air barrier (AB) material or system for framed walls of low-rise buildings. The intended users are purchasers of the AB, specifiers of the AB and regulatory groups. The provisions contained in this specification are intended to allow the user to design the wall performance criteria and increase AB specifications to accommodate a particular climate location, function, or design of the intended building. Air barrier performance and specification minimums were selected with the service life of the building wall in mind.

1.2 This specification focuses on ABs for opaque walls. Other areas of the exterior envelope, such as roofs, floors, and interfaces between these areas are not included in this specification.

1.3 This specification does not address air leakage into the wall cavity, that is, windwashing. No standardized test has been developed that adequately identifies all of the influencing factors and measures the impact of this effect on the wall's thermal performance.

1.4 The specifications in this standard are not intended to be utilized for energy load calculations and are not based on an expected level of energy consumption.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The following safety hazards caveat pertains only to the test method portion, Annex A1, of this specification. *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.*

1.7 *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]

C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation

E96/E96M Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

E241 Guide for Limiting Water-Induced Damage to Buildings

E283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

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

E331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

E631 Terminology of Building Constructions

E1424 Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen

2.2 *ASCE Standard:*[3]

ASCE 7-88 1990, Minimum Design Loads for Buildings and Other Structure, Fig. 1, Basic Wind Speed (mph)

[1] This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.41 on Air Leakage and Ventilation Performance.

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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 American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

2.3 *ASHRAE Standard:*[4]
ASHRAE 62 Acceptable Indoor Air Quality
2.4 *CSA Standard:*[5]
Air Barrier Systems for Walls of Low-Rise Buildings: Performance and Assessment

3. Terminology

3.1 *Definitions*—For definitions of general terms related to building construction used in this specification, refer to Terminology E631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *air barrier (AB)*—a material or system in building construction that is designed and installed to reduce air leakage either into or through the opaque wall.

3.2.2 *air exfiltration*—air leakage out of the building driven by negative pressure.

3.2.2.1 *negative pressure*—air pressure on the outdoor side of a building envelope lower than on the indoor side.

3.2.3 *air infiltration*—air leakage into the building driven by positive pressure.

3.2.3.1 *positive pressure*—air pressure on the outdoor side of a building envelope higher than on the indoor side.

3.2.4 *air leakage*—the movement/flow of air through the building envelope, which is driven by either positive (infiltration) or negative (exfiltration) pressure differences, or both, across the envelope.

3.2.4.1 *Discussion*—These pressure differences are caused by wind, mechanical systems, and temperature differences (stack effect).

3.2.5 *air leakage rate*—the time rate of air flow across the air barrier.

3.2.5.1 *Discussion*—Expressed as cubic feet per minute per square foot of AB surface at a stated pressure differential across the AB expressed in inches of H_2O. (Cubic metres per second per square metre of AB surface at a pressure differential in Pascals.)

3.2.6 *opaque wall*—all exposed areas of a wall that enclose conditioned space, except openings for windows, doors, and building service systems.

3.2.7 *structural integrity*—for the purpose of this specification, it is the ability of the AB to maintain air leakage performance after exposure to elevated positive and negative pressure (see 5.1.2 for performance).

3.2.8 *ultraviolet*—radiation lying in the ultraviolet range; wavelengths shorter than visible light, but longer than X-rays; ultraviolet light can effect the durability of some building materials.

3.2.9 *vapor retarder*—a material or system that adequately impedes the transmission of water vapor under specified conditions.

3.2.9.1 *Discussion*—For practical purposes it is assumed that the permeance of a vapor retarder will not exceed one perm in inch-pound units (57.4 ng/(s · m^2 · Pa)), although at present this value may only be appropriate for residential construction. For certain other types of construction, the permeance must be lower.

3.2.10 *water leakage*—penetration of water onto the exterior plane of framing or cavity insulation under specified conditions of air pressure difference across the AB during a test period.

3.2.11 *water resistance*—the capability of a material or system to retard water leakage.

3.2.12 *water vapor diffusion*—the process by which water vapor spreads or moves through permeable materials caused by a difference in water vapor pressure.

3.2.13 *water vapor permeance*—the time rate of water vapor transmission through unit area of flat material or construction induced by unit vapor pressure difference between two specific surfaces, under specified temperature and humidity conditions.

3.2.13.1 *Discussion*—Permeance is a performance evaluation and not a property of a material. An acceptable unit of permeance is the perm: expressed in the units grain/h · ft^2 in. Hg (metric perm = expressed in the units ng/(s · m^2 · Pa)).

4. Classification

4.1 This specification covers two types of ABs. The performance requirements are shown in Table 1.

5. Performance Requirements

5.1 This specification does not prohibit a user from increasing a specification performance requirement; however, the specification shown shall not be reduced. The user shall consult Annex A1 for additional mandatory requirements, for example, test specimen and procedure. Appendix X1 – Appendix X3 contain additional considerations. The performance requirements are not intended to be used to predict specific levels of performance in the field, however they are intended to be used in the evaluation of ABs.

5.1.1 *Air Leakage*—AB shall be tested in accordance with Test Method E283. Air leakage rate shall not exceed 0.04 cfm/ft^2 at 0.3 in. H_2O. (0.3×10^{-3} m^3/(s · m^2) at 75 Pa.)

5.1.2 *Structural Integrity*—Air barrier shall be tested in accordance with Test Method E330/E330M, Procedure A—no deflection information is required. The AB shall withstand sustained minimum pressure of 2 in. H_2O (500 Pa) (equivalent wind speed of approximately 65 mph or 29 m/s) for 1 h. The

TABLE 1 AB Classifications

Performance Properties	Classifications	
	Type I	Type II
Air leakage	in accordance with 5.1.1	in accordance with 5.1.1
Structural integrity	in accordance with 5.1.2	in accordance with 5.1.2
Water resistance	in accordance with 5.1.3	not required
Water vapor permeance	in accordance with 5.1.4	in accordance with 5.1.4
Supplemental requirements	in accordance with Section 6	in accordance with Section 6

[4] Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, http://www.ashrae.org.

[5] Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON M9W 1R3, Canada, http://www.csagroup.org.