

1. **Design Criteria:**

- a. The air and moisture management system is an integral part of the building envelope. The design consultant is responsible for designing the continuity of the floor, wall, and roof systems to be continuous and connected in a constructible way.
 - i. To effectively control air and moisture in and out of a building, its conditioned space must be surrounded by an air barrier system.
 - ii. Construction sequencing needs to be considered to simplify detailing of the connections between different planes of the envelope.
 - iii. Attention to the design and details and quality of construction is required to create a complete air and moisture management system.
 - iv. All potential gaps, laps, transitions, penetrations, movement joints, windows and doors, and junctions at walls and roofs must meet air leakage resistance requirements found in the applicable building code or LEED requirement (when applicable).
- b. Air and moisture management systems shall be designed to accommodate the vapor profile of the exterior wall system.
 - i. The design consultant shall determine the appropriate permeability of the air and moisture system to allow inward and/or outward drying of the wall assembly based on design temperatures, dew point temperatures, and the insulation system.
- c. The design consultant is responsible for selecting the type of air and moisture management system to be used in the exterior envelope.
 - i. Membrane, integrated, and fluid-applied types are acceptable.
 - ii. Using the insulation layer as an air and moisture management layer is not preferred because shrinkage, seam seal failures, and penetration leakage are likely to compromise the performance of the systems.
- d. The permeability of exterior insulation systems shall be considered in conjunction with the permeability of the air and moisture management system so one does not compromise the breathability of the wall system.
- e. Interior vapor retarder systems that rely on the interior gypsum drywall layer alone shall be prohibited.
 - i. Future modifications to this layer are likely to compromise the performance of such an air barrier system.

Revision Date: 07/29/2021

- ii. The interior gypsum drywall layer may contribute to the air and moisture management system but may not be the primary line of management.
 - iii. Interior vapor retarder systems shall allow drying to the interior during summer.
- f. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
 - i. The crack-bridging, elongation, and tear resistance qualities of selected products shall be appropriate for the expected movement of the substrates and structural system being covered.
- g. Design Consultant shall coordinate with the UVM BECx requirements.
- h. Design Consultant shall provide a complete system (i.e., coordination of different products by different manufacturers for compatibility).
- i. Design of Air & Moisture management systems may be peer reviewed by third party consultant employed by university at the discretion of the UVM PM.

2. References

- a. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
- b. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials
- c. ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- d. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- e. See “Required Submittals/Quality Assurance” below for other standards.

3. Required Submittals:

- a. Product Data:
 - i. Manufacturer’s data including instructions, recommendations, and restrictions.
 - ii. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

Revision Date: 07/29/2021

- iii. Submittals shall indicate the tensile and elongation characteristics of the submitted barrier systems.
- iv. Submittals shall indicate the length of time the air and moisture management system can be exposed to UV light without degradation.
- b. Shop drawings: For air-barrier assemblies.
 - i. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - ii. Include details of interfaces with other materials that form part of air barrier.
- c. Quality Assurance:
 - i. Confirm with the UVM project manager that at least three local installers that meet ABAA certification requirements are available to bid prior to including ABAA certification for installers in the specifications. Without local bidders, project costs rise to train local installers or to transport ABBA certified installers to the job site. Review this list with the UVM project manager to confirm the available and ABAA-certified installers are acceptable.
 - ii. Guidelines and test standards for detailing and testing the installed air and moisture barrier with cladding attachments can be limited, and installation practices are not consistent from project to project. Test methods that are currently being used by manufacturers and industry professionals often reflect only lab conditions and not actual built ones.
 - iii. Field testing of adhesion and barrier performance can help determine the quality of the installation. The design consultant shall consider these issues while specifying performance of cladding and insulation fasteners through the air and moisture barrier.
 - iv. Many field-testing consultants use the following ASTM test methods to quantify the success of the air barrier system.
 - 1. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 2. ASTM E783, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
 - 3. ASTM E1186, Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

Revision Date: 07/29/2021

4. ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
5. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies (available to test the air barrier system with and without fasteners but does not address specific fastener types).
6. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (used to test adhered roof membranes on plywood with nails perpendicular to the substrate, a condition the desk consultant should not consistently expect in the field).
7. ASTM D7349, Standard Test Method for Determining the Capability of Roofing and Waterproofing Materials to Seal around fasteners (similar to ASTM D1970 but includes a few allowable variables such as test duration, water depth, and whether an intervening material is used between the fastener and waterproofing material. It also provides guidance on which method can be used based on the specific roofing application. Just like ASTM D1970, this method provides limited value with respect to replicating real-life conditions of the vertical enclosure and does not address the many other types of fasteners).
8. Manufacturers Association (AAMA) 711, Voluntary Specification for Self-Adhering Flashing Used for the Installation of Exterior Wall Fenestration Products. (Section 5.2, "Water Penetration Resistance Around Nails," addresses two test methods related to nails but not screws or other fasteners).

4. **Products, Materials & Equipment:**

- a. Air and/or moisture management systems from single manufacturers are preferred over ones made of assemblies of products from multiple makers because material incompatibility is less likely, and warranties are easier to maintain.

Revision Date: 07/29/2021

- i. When systems from multiple manufacturers are necessary, the design consultant shall confirm that materials in contact with each other are compatible.
 - b. Long term performance of the air and moisture management system is important because materials will become inaccessible after they are covered by other parts of the envelope.
 - c. Air and moisture management systems must be properly detailed at all openings, changes in planes, penetrations, and transitions to different sides of the envelope.
- 5. **Installation, Fabrication, and Construction:**
 - a. A preconstruction conference shall be required prior to installation of air and moisture management systems as part of the exterior wall assembly. The meeting shall be held prior to the installation of exterior sheathing so that acceptable tolerances in sheathing joints can be determined ahead of time. The meeting shall involve the air and moisture management system installer and the exterior envelope commissioning agent in addition to representatives of the GC, Design team, owner, cladding, and insulation installers.
 - b. Air and management system testing, and field quality control will be conducted by the Owner.
 - c. Detail air barrier perimeter terminations and penetrations with redundant lines of protection to increase the longevity of the system's performance.
 - i. Repairs are often impossible due to the concealed location of most air and moisture management systems.
- 6. **Warranties:**
 - a. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - i. Warranty Period: Two years from date of Substantial Completion.
 - b. Air and moisture management system manufacturer's standard warranty on parts and equipment
 - c. Installer's standard one-year warranty on installation and craftsmanship.