INSULATION CONTRACTORS ASSOCIATION OF AMERICA

Technical Bulletin

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No. 29: House Wraps and Air Retarders

In all cases, consult with the project architect, engineer, or building code official prior to the use of vapor retarders. ICAA Technical Bulletins are provided as a convenience for informational purposes only. ICAA and/or its members are not responsible for loss or damage caused by errors or omissions or any other cause.

An air retarder can be defined as any material or system of materials that helps to control unwanted air leakage into or out of a building. As a practical definition, air retarder materials are usually provided as continuous membranes, like polyethylene films and house wrap products that are applied to the envelope of the building.

An air retarder is generally not a vapor retarder, although in a few cases they can be one and the same. For example, in northern climates, vapor retarders are commonly installed on the interior of an envelope assembly, while a house wrap is typically applied to the exterior. In southern climates, a vapor retarder may not be used at all, while a house wrap is typically applied to the exterior of the envelope assembly.

House wrap systems serve several functions within an envelope assembly:

1. The house wrap system is intended to limit air leakage. To do this, a house wrap material must demonstrate that air does not easily pass through it.
2. When used on the exterior of an envelope assembly, a vapor-permeable house wrap system is not intended to act as a vapor retarder. House wrap materials are tested to assure that the water vapor permeance of the house wrap material is greater than or equal to that of builders paper.
3. House wrap systems are commonly expected to act as weather resistant barriers when applied to the exterior surface of wall assemblies. House wraps are tested to determine how well they resist liquid water penetration.
4. House wrap systems are expected to resist sustained and fluctuating air pressure loading. Since house wrap systems are commonly installed some time before the exterior cladding or finish is applied, a house wrap material is also expected to resist ripping and tearing in the wind.

Building Code Requirements

Most energy codes, such as the International Energy Conservation Code (IECC), have provisions for controlling energy waste by sealing air leaks in the envelope of a building. The 1998 IECC states: exterior joints, seams, or penetrations in the building envelope, that are sources of air leakage, shall be sealed with durable caulking materials, closed with gasketing systems, taped or covered with moisture vapor-permeable house wrap.

Most building codes, such as the International Building Code (IBC), defines what weather resistance is needed on the exterior of a wall assembly. The 2000 IBC states: *The exterior wall envelop shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer...asphalt saturated felt...or other approved weather-resistant*

material shall be applied over studs or sheathing of all exterior walls... Materials demonstrating equivalency to asphalt saturated felt, such as house wraps, can be used as weather-resistive barriers.

Product Standards

The American Society for Testing and Materials(ASTM) has developed a performance standard for air retarder materials and systems designated E 1677-95 "Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls." The criteria cover:

1. Air leakage. A representative wall assembly (8 ft. x 8 ft. minimum) is tested under an air pressure difference of 0.3 in. H_2O (equivalent to a wind speed of approximately 25 mph), and the air leakage is measured. Products conforming to the standard cannot exceed 0.06 cfm/ft^2 leakage at the test condition.
2. Structural Integrity. The representative wall assembly is tested under a pressure difference to determine whether it can withstand the pressure. Products conforming to the standard must withstand sustained 2 in. H_2O (equivalent to a wind speed of approximately 65 mph) for one hour.
3. Water Resistance. The representative wall assembly is tested under an air pressure difference of 0.11 in. H_2O (equivalent to a wind speed of 15 mph) and sprayed with water at a rain equivalent rate of 5.0 inches per hour to determine whether water will penetrate past the retarder system. Products conforming to the standard must incur no water penetration.
4. Water Vapor Permeance. The product material is tested by ASTM E 96 Test Methods for Water Vapor Transmission of Materials, using Procedure A, and the results are reported. No performance level is specified. However, an analysis of the moisture control design for the envelope system at the local climatic conditions is recommended prior to construction.

Applications

To effectively keep water out of a wall, house wraps must be installed correctly. Follow the manufacturer's recommendations for specific details including exposure to the elements.

A house wrap system works best at blocking air leakage when the joints and seams are taped. Follow the manufacturer's direction for appropriate tapes and preparations.

Any horizontal seams must be shiplapped, with the upper section overlapping (3 inch minimum) the section below it. Vertical joints must be overlapped by at least 6 inches. Overlapping is important to allow liquid water to exit the envelope. Please follow manufacturer's instructions related to UV exposure and the product.

Special care must be exercised when detailing the openings around doors and windows. While the house wrap can be installed under the unit flashing on the sides and bottom, the unit flashing must go under the house wrap at the top of the opening. When recommended by the manufacturer, the flashing may be taped to the house wrap as an alternative.

Window and Door Flashing Details

The flashing around doors and windows is extremely important to the durability of the house being built. Prevention of water damage due to poor flashing is a must. The window and door installer shall follow the flashing instructions presented in the Section 5.4 during the installation of these building components.

Graphic I

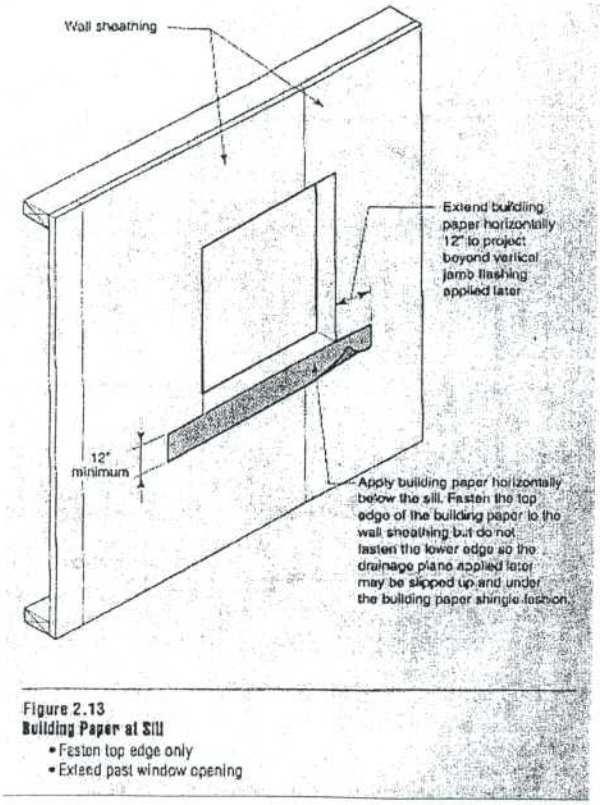

Figure 2.13
Building Paper at Sill
- Fasten top edge only
- Extend past window opening

1. Install the house wrap on the exterior of the walls, covering all openings. Be sure that the house wrap is installed to maintain an outward flowing, shingle fashion drainage plane.

2. At the windows and doors, cut the house wrap in a modified I pattern and tuck the house wrap into the opening.

3. Instal a 12" wide layer of self-sticking membrane to the front of the opening sill so that it extends horizontally 12" to project beyond vertical jamb edge.

Graphic II

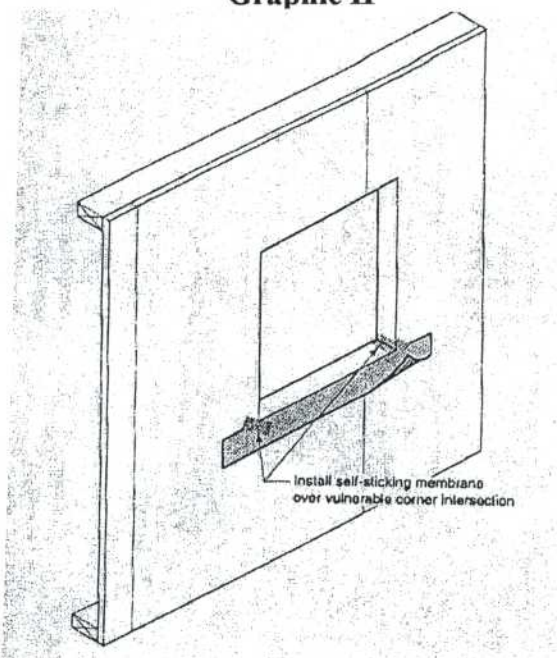

Figure 2.14
Corner Patch
- Use membrane to seal rough opening corners

4. Install a 6" wide piece of self-sticking membrane into the corners of the opening. Ensure that the membrane extends over the edge by at least 3" and is sealed to the facing layer.

Note: Use a self-sealing membrane material that is compatible with the house wrap used on the house.

Graphic III

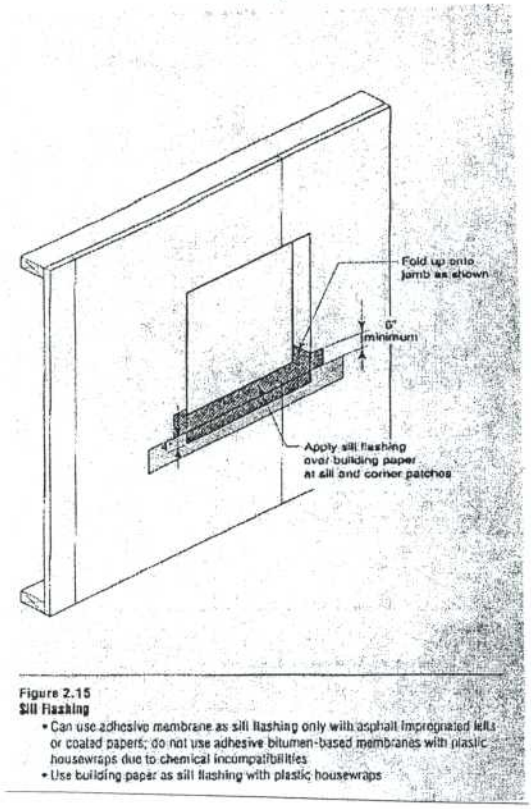

Figure 2.15
Sill Flashing
- Can use adhesive membrane as sill flashing only with asphalt impregnated felts or coated papers; do not use adhesive bitumen-based membranes with plastic housewraps due to chemical incompatibilities
- Use building paper as sill flashing with plastic housewraps

5. Apply the self-sticking membrane over the sill and corner-sealing layer such that the layer extends at least 6" up the jamb sides of the opening and 4" down over the exterior.

Note: Use adhesive type membranes as sill flashing only with asphalt impregnated felts or coated papers; do not use adhesive bitumen-based membranes with plastic house wraps, unless otherwise approved, due to potential chemical incompatibilities.

Graphic IV

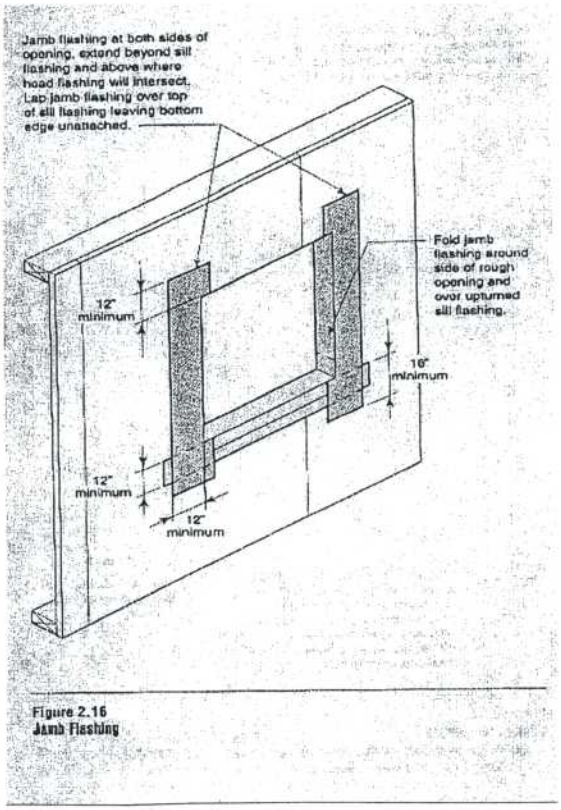

Figure 2.16
Jamb Flashing

6. At the head, cut the house wrap horizontally for 12" beyond the jamb edges of the opening.

7. Install jamb flashings at both sides of the opening. The jamb flashing is sized to extend at least 12" beyond the edge of the opening. Extend the flashing beyond the sill flashing at least 12" and at least 12" above the head of the opening.

8. Tuck the jamb flashing under the house wrap and seal it against the sheathing.

Note: This treatment maintains the shingle overlap for the house wrap.

9. Seal the jamb flashing around the side of the opening and seal over the upturned sill flashing.

GraphicV

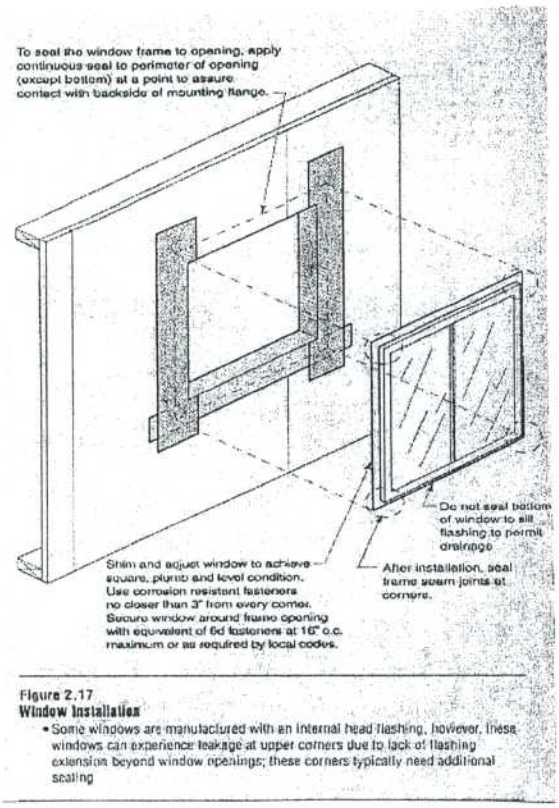

Figure 2.17
Window Installation
• Some windows are manufactured with an internal head flashing, however, these windows can experience leakage at upper corners due to lack of flashing extension beyond window openings; these corners typically need additional sealing

10. To seal the window frame to the envelope, prior installing the window, apply a continuous seal bead of flexible caulking to the sides and top of the window.

11. Install the window into the rough opening. Shim and adjust the window to achieve a square, plumb, and level installation. Use corrosion resistant fasteners no closer than 3" from every corner. Secure window around the frame opening with the equivalent of 6d fasteners at 16"oc spacing maximum or as required by the manufacturer's recommendation or local codes.

12. After window installation, seal the frame seam joints at the corners

Note: Do not seal the bottom of the window to the sill flashing so the sill drains can remain functional.

Graphic VI

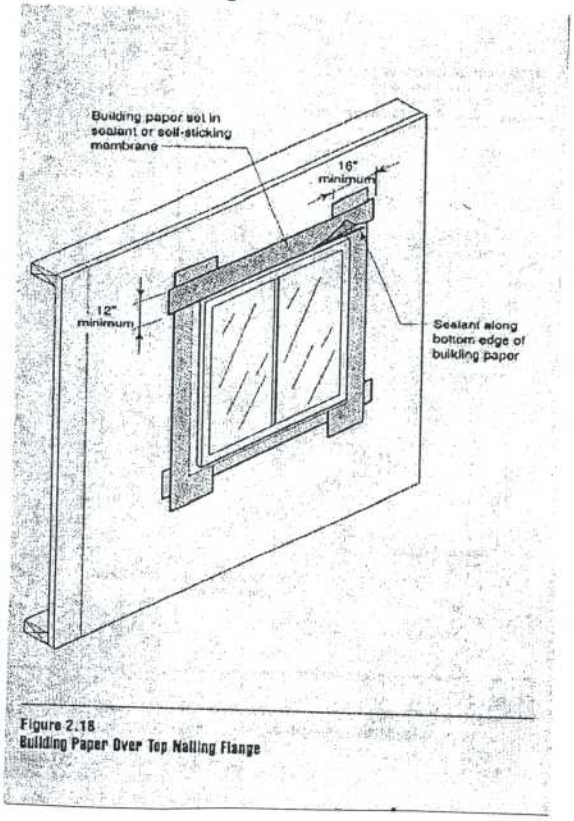

Figure 2.18
Building Paper Over Top Nailing Flange

Note: Some windows are manufactured with an internal head flashing; however, these windows can experience leakage at the upper corners due to a lack of flashing extension beyond the window opening. These corners typically need additional sealing.

13. Install a 12" wide strip of self-sticking membrane to the top of the window, sealing against the window head. This lay should also be tucked up under the house wrap.

14. The head opening membrane shall extend at least 16" beyond the rough opening.

15. Install an additional 6" wide strip of self-sticking membrane centered over the house wrap cut opening to seal the house wrap against the flashing detail. This strip of membrane shall extend at least 6" beyond the width of the opening.