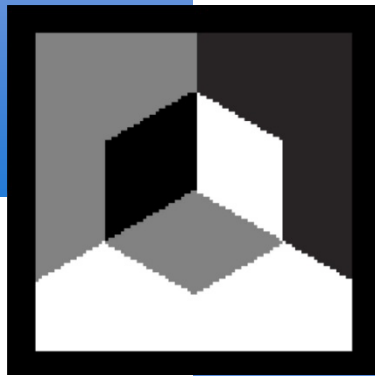


AAMA 2400-10

**Standard Practice for
Installation of Windows
with a Mounting Flange in
Open Stud Frame
Construction for Low
Wind/Water Exposure**



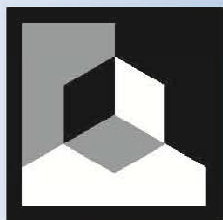


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American Architectural Manufacturers Association
1827 Walden Office Square, Suite 550, Schaumburg, IL 60173
PHONE (847) 303-5664 FAX (847) 303-5774
EMAIL webmaster@amaanet.org WEBSITE www.amaanet.org

INTRODUCTION

This practice addresses the recommended methods and/or sequences used to apply/modify the water-resistive barrier or other flashing and sealing materials to the open-framed opening. For sheathed wall installations refer to ASTM E2112, “Standard Practice for Installation of Exterior Windows, Doors and Skylights”.

The techniques demonstrated in this standard practice have been developed specifically to create a moisture barrier to incidental liquid water penetration at the external interface between the window and rough opening. Any water intrusion; whether through the external interface between the window and rough opening, the window joinery, or the installation joints around the perimeter of the window will not have a means to exit to the building exterior. As a result, this standard is recommended for buildings/installations considered at low risk of water intrusion (e.g., southwestern U.S.).

1.0 SCOPE

1.1 This practice covers the installation of windows in new construction detached one- and two-family dwellings and townhouses not more than three stories above-grade in height with a separate means of egress. It does not cover retrofit/replacement.

1.2 This practice applies only to windows with a mounting flange where the flange is employed for securing the window into a vertical stud frame wall.

1.3 This practice covers the installation process from pre-installation procedures through post-installation procedures. It does not cover the fabrication or assembly of units whether such fabrication takes place in a factory or at the intended installation site.

1.4 This practice covers aspects of installation relating to installation effectiveness and reasonable durability in service. It does not cover aspects of installation relating to window handling and storage or the safety of the person installing the units.

1.5 This practice provides minimum requirements that will help to ensure the installation of windows in an effective manner. Actual conditions in buildings vary greatly, and in some cases substantial additional care and precaution will have to be taken.

1.6 This practice does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.7 This practice is not intended to replace a manufacturer’s installation instructions or federal, state, or local building codes. In all cases follow manufacturer’s instructions and applicable building codes for any special procedures, applications, or requirements.

1.8 Installation and flashing details that do not fall under this standard are the responsibility of the engineer or architect of the project.

EXAMPLE: *This practice does not address window installation into recessed openings.*

1.9 This practice may not apply to windows whose mounting flange has been bent, cracked, cut, or removed. If such damage or modification has occurred, consult the manufacturer for repair or special installation instructions.

1.10 The primary units of measure in this document are metric. The values stated in SI units are to be regarded as the standard. The values given in parentheses are for reference only.

2.0 REFERENCED DOCUMENTS

References to the standards listed below shall be to the edition indicated. Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

2.1 American Architectural Manufacturers Association (AAMA)

AAMA 711-07, Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products

AAMA 713-08, Voluntary Test Method to Determine Chemical Compatibility of Sealants and Self-Adhered Flexible Flashings

AAMA 800-10, Voluntary Specifications and Test Methods for Sealants

AAMA TIR A9-91, Metal Curtain Wall Fasteners

IM-TM, Installation Masters Training Manual

2.2 ASTM International (ASTM)

ASTM B456-03 (2009), Standard Specification for Electroplated Coatings of Copper plus Nickel plus Chromium and Nickel plus Chromium

ASTM B633-07, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B766-86 (2008), Standard Specification for Electrodeposited Coatings of Cadmium

ASTM D779-03, Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method

ASTM E2112-07, Standard Practice for Installation of Exterior Windows, Doors and Skylights

3.0 DEFINITIONS

3.1 FLASHING: Flexible sheet materials with water resistive properties that are used to bridge the joint (gap) between exterior wall penetrations such as window and door framing members and adjacent water-resistive barriers or sealed drainage plane material. The purpose of flashing is to drain water away from the exterior wall penetration and help prevent intrusion of water into the wall assembly.

3.1.1 MECHANICALLY ATTACHED FLASHING: Flexible sheet materials which depend upon mechanical fasteners for permanent attachment.

3.1.2 SELF ADHERING FLASHING: Flexible sheet materials coated completely, or partially, on at least one side with an adhesive material and which do not depend on mechanical fasteners for permanent attachment.

3.2 GALVANIC CORROSION: A form of deterioration of metal resulting from the electrochemical reaction that occurs when certain dissimilar metals are in contact in the presence of moisture.

3.3 MOUNTING FLANGE: A fin projecting from the window frame parallel to the plane of the wall, also known as a nailing fin, for the purpose of securing the frame to the structure.

3.4 OPEN STUD FRAMING: A building framing system comprised of unsheathed structural components (studs, headers, sills, plates, etc.) and areas of shear wall framing

3.5 RESIDENTIAL BUILDING: Any building used or intended primarily for a single or multiple family dwelling.

3.6 SEALANT: Any of a variety of compounds used to fill and seal joints or openings in wood, metal, masonry, and other materials, as contrasted to a sealer; which is a liquid used to seal a porous surface.

NOTE 1: Some common types of sealants are: polysulfide rubber, silicone, acrylic latex, butyl rubber and polyurethane.

3.7 SHIM: A thin, flat or wedge shaped piece of suitable material used to level or plumb a window frame during installation.

3.8 WATER-RESISTIVE BARRIER: The surface or surfaces of a wall responsible for preventing water infiltration into the building interior.

4.0 SIGNIFICANCE AND USE

4.1 This practice recognizes that the effectiveness and durability of installed units depend not only on the choice and quality of materials, design, adequacy of assembly, and support system, but also on their proper installation.

4.2 Improper installation of units may reduce their effectiveness, lead to excessive air, water and sound leakage, condensation, and may promote the deterioration of wall constructions, windows and their respective finishes.

4.3 The application of this practice also requires a working knowledge of applicable Federal, State, and local codes and regulations regarding windows, specifically, but not limited to:

- a) a required means of egress or rescue;
- b) requirements for safety glazing; and
- c) minimum grades of water-resistive barrier materials.

Consult with local building codes prior to installation.

4.4 The application of this practice also requires a working knowledge of the tools, equipment, and methods necessary for the installation of windows. It further assumes familiarity with caulking and sealing and with glass handling procedures, painting where applicable, and an understanding of the fundamentals of residential construction that affect the installation of these units.

4.5 FINISH AND SEALANT PROTECTION

4.5.1 Caution shall be used to avoid damage to windows during and after installation. Prior to installation, store windows in a near vertical position in a clean area, free of circulating dirt or debris and protected from exposure to weather elements.

4.5.2 Field-applied protective coatings may damage window sealants and gaskets and may not be recommended. Contact the window manufacturer before applying any such coatings.

4.6 This standard practice recognizes that the coordination of trades and proper sequencing are essential for effective installation.

5.0 PROCEDURE

5.1 FRAMING REQUIREMENTS

The rough framed opening to receive the window shall be sufficiently larger in width and height than the actual frame dimensions of the window. To assure adequate clearance, the framer shall follow the manufacturer's literature for the recommended rough opening dimensions. Per ASTM E2112, the framing members comprising the rough opening shall be within 6 mm (1/4 in) of plumb, level, square and true prior to the installation of the window. Manufacturer's installation instructions may supersede these tolerance ranges. The studs shall be free of voids, holes, chipping, twisting, or other conditions that will not allow the sealant to maintain continuous contact (see Figure 1).

If self-adhered flashing material is used the wall framing needs to be covered by backing support before the flashing can be applied. The flashing will be applied onto the backing support (see Figure 1A) and the window will be mounted with the nailing fin flush against the applied backing support. The backing support must be applied before the building wrap.

5.2 COMPATIBILITY

All materials such as, but not limited to, coatings, flashings and sealants that come into contact with each other shall exhibit chemical compatibility for the intended purpose (see AAMA 713).

5.3 CORROSION RESISTANCE

5.3.1 Metal products shall be isolated from dissimilar or corrosive materials with a nonconductive coating or sealant material.

5.3.2 All fasteners shall be corrosive resistant, in accordance with ASTM B456, B633, or B766 as indicated in AAMA TIR-A9.

5.4 FLASHING REQUIREMENTS

Proper flashing and/or sealing is necessary as a barrier to prevent water from infiltrating into the building. Flashing and/or an appropriate method of sealing shall be designed as a part of an overall water-resistive barrier system.

NOTE 2: *The general contractor, or his designated agent, should ensure that the flashing material is protected from damage by weather, other trades, or vandalism. The general contractor, or his designated agent, should also ensure that the flashing system be properly integrated into the water-resistive barrier for the entire building.*

5.4.1 Flashing material shall carry continuous manufacturer identification.

5.4.2 When mechanically attached flashing is used, a roll width dimension of not less than 230 mm (9 in) shall be required. Mechanically attached flashing material shall provide twenty-four (24) hour minimum protection from water penetration when tested in accordance with ASTM D779.

5.4.3 Self adhering flashing shall meet the performance requirements of AAMA 711. They are used to bridge the joint (gap) between fenestration framing members and the adjacent water-resistive barriers.

5.5 JOINTS AND ANCHORAGES

Joints and anchorages between the building envelope (WRB assembly) and fenestration product shall be designed to accommodate differential thermal expansion and contraction, as well as the structural requirements within the window/wall assembly.

5.6 SEALANT REQUIREMENTS

5.6.1 Sealing/caulking required between the window and the flashing can be accomplished with sealant material conforming to AAMA 808.3 within AAMA 800. Use sealant recommended and approved by the sealant/flashing manufacturer. To ensure compatibility, follow the sealant manufacturer's printed application procedures and precautions. ASTM E2112 gives guidance on sealant selection and application.

5.6.2 Where sealant is required in this standard, an application of a nominal 10 mm (3/8 in) diameter sealant bead or an equivalent butyl mastic sealant tape as recommended by the sealant manufacturer is intended.

5.6.3 Where wet sealant is used, the installer shall look for the sealant to "squeeze out" or appear along the edge of the flange/flashing to assure a continuous seal. "Squeeze out" shall be promptly troweled smooth.

5.6.4 Install the window immediately after sealant application, before a skin forms or contamination occurs on the sealant surface.

5.7 FLASHING AND SEALANT APPLICATION

5.7.1 One of the two following methods shall be selected as the application to be followed. Once a method is selected, all procedures of that method shall be performed in the described sequence. Substitution of a procedure from one method to the other is not permitted.

5.7.2 If the water-resistive barrier is applied to the wall prior to the window installation, the water-resistive barrier may need to be modified. See Appendix A for recommended water-resistive barrier modification.

5.7.3 Method A (flashing over the face of the mounting flange)

5.7.3.1 A strip of approved mechanically-attached or self-adhered flashing material shall be applied in a weatherboard fashion around the full perimeter of the opening according to the following procedures:

5.7.3.2 Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later (see Figure 2).

NOTE 3: *Coordinate between horizontal and vertical flashing applications to ensure that no gaps remain at the transition between components. One way to do this is to cut head and sill flashings to exactly the width of the window opening plus twice the width of the jamb flashing, and then install them with precision so that the edges of the jamb flashing, which is applied later, align with the edges of the head and sill flashing. In addition, free ends of mechanically-attached flashing components should be secured to prevent curling prior to installing the exterior facade. One way to do this is to extend the head and sill flashing past the next framing stud in the wall, and mechanically attach the flashings to the stud.*

5.7.3.3 Fasten or adhere the top edge of the sill flashing to the framing. For mechanically attached flashing, place fasteners along the edge of the rough opening where they will be covered by the mounting flange of the window later. Fasten or adhere the top edge of the sill flashing, but do not fasten or adhere the lower edge or the last 230 mm (9 in) of each end, so the water-resistive barrier applied later may be slipped up and underneath the flashing in a weatherboard fashion (see Figure 2).

5.7.3.4 For mechanically joined window frames, apply sealant at corners the full length of the seam where mounting flanges meet and to the outside of the frame corner joints (see Figure 3A). Apply a continuous seal to the backside (interior) of the window mounting flange in line with any pre-punched holes or slots in the mounting flange (see Figure 3A). The window shall then be installed in accordance with Section 5.8 Window Installation.

5.7.3.5 Next, apply a continuous seal to the exposed mounting flange at the top (head) and sides (jamb) of the installed window. Apply sealant in line with any pre-punched holes or slots on the mounting flange and over the heads of the fasteners. Continue jamb sealant vertically approximately 215 mm (8 1/2 in) above the top of the window. The sealant applied horizontally across the head should not extend beyond the jamb sealant (see Figure 4A).

NOTE 4: *The application of sealant to the exterior surface of the mounting flange may not be necessary if using a self-adhesive type flashing over the mounting flange. Consult the flashing manufacturer.*

5.7.3.6 Starting at each jamb, embed the jamb flashing into the seal and fasten or adhere in place. Do not fasten or adhere the bottom 230 mm (9 in) of the jamb flashing, so the water-resistive barrier applied later may be slipped up and underneath the flashing in a weatherboard fashion. Extend this flashing to approximately 13 mm (1/2 in) less than the bottom of the sill flashing and beyond the top of the window to approximately 13 mm (1/2 in) less than the top of the head flashing (see Figures 4A and 5).

5.7.3.7 Finally, embed the flashing into the sealant on the mounting flange at the window head. Cut this flashing sufficiently long so that it will extend approximately 25 mm (1 in) beyond each jamb flashing. Fasten or adhere flashing in place (see Figure 5).

5.7.4 Method B (flashing behind the face of the mounting flange)

5.7.4.1 A strip of approved mechanically-attached or self-adhered flashing material shall be applied in a weatherboard fashion around the full perimeter of the opening according to the following procedures:

5.7.4.2 Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later (see Figure 2).

NOTE 5: *Coordinate between horizontal and vertical flashing applications to ensure that no gaps remain at the transition between components. One way to do this is to cut head and sill flashings to exactly the width of the window opening plus twice the width of the jamb flashing, and then install them with precision so that the edges of the jamb flashing, which is applied later, align with the edges of the head and sill flashing. In addition, free ends of mechanically-attached flashing components should be secured to prevent curling prior to installing the exterior facade. One way to do this is to extend the head and sill flashing past the next framing stud in the wall, and mechanically attach the sill flashing to the stud.*

5.7.4.3 Fasten or adhere the top edge of the sill flashing to the framing. For mechanically attached flashing place fasteners along the edge of the rough opening where they will be covered by the mounting flange of the window later. Fasten or adhere the top edge of the sill flashing, but do not fasten or adhere the lower edge or the last 230 mm (9 in) of each end, so the water-resistive barrier applied later may be slipped up and underneath the flashing in a weatherboard fashion (see Figure 2).

5.7.4.4 Next, fasten or adhere strips of flashing along each vertical edge (jamb) of the opening. For mechanically attached flashing position fasteners along the edge of the rough opening where they will be covered by the mounting flange of the window later. Extend this flashing to approximately 13 mm (1/2 in) less than the bottom of the sill flashing and beyond the top of the window to approximately 13 mm (1/2 in) less than the top of the head flashing (see Figure 3B). Do not fasten or adhere the bottom 230 mm (9 in) of the jamb flashing, so the water-resistive barrier applied later may be slipped up and underneath the flashing in weatherboard fashion.

5.7.4.5 Apply a continuous seal to the backside (interior) of the mounting flange near the outer edge or a continuous seal to the perimeter of the opening at a point to assure contact with the backside (interior) of the mounting flange. Apply sealant in line with any pre-punched holes or slots on the mounting flanges (see Figure 4B).

NOTE 6: *Caution shall be taken to avoid disrupting the continuous seal.*

5.7.4.6 For mechanically joined window frames, apply sealant at corners the full length of the seam where mounting flanges meet and the outside of the frame corner joints (see Figure 4B).

5.7.4.7 The window shall be installed in accordance with Section 5.8, Window Installation.

5.7.4.8 Next, apply a continuous seal to the exterior face of the mounting flange at the window head in line with any pre-punched holes or slots on the mounting flange and over the heads of the fasteners. Cut the head flashing sufficiently long so that it will extend approximately 25 mm (1 in) beyond each jamb flashing. For mechanically attached flashing, embed the bottom of the flashing over the sealant and the mounting flange and fasten or adhere in place (see Figure 5).

5.8 WINDOW INSTALLATION

5.8.1 Shim window as necessary to insure a square, level and plumb installation. The sill must be supported in a straight and level position to prevent sagging, deflection and sill rotation.

Some manufacturers require a continuous shim under the window sill. Follow the manufacturer's recommendations.

5.8.2 Close and lock the window. Shim and adjust the window as necessary to achieve a plumb, square and level condition, as well as centering the window in the frame opening. Secure the full perimeter with the minimum equivalent of 6d fasteners on a maximum of 405 mm (16 in) centers using pre-punched holes, if provided. Hinged and pivoted windows may require additional fasteners located near the hinge or pivot point. For certain windows it may be appropriate to fasten the head in a manner to allow for possible movement. In all cases follow the manufacturer's instructions for any special procedures or applications.

NOTE 7: *Avoid overdriving fasteners. Use an appropriately sized fastener to cover the width of any pre-punched hole and adequately secure the window to the structure.*

5.8.3 In each direction from all corners there shall be a fastener within 250 mm (10 in), but no closer than 75 mm (3 in) to prevent frame distortion or fracture of joint seals.

NOTE 8: *If any damage to window frame joint seals or mounting flanges is observed during installation, the installer shall repair it or consult the manufacturer.*

5.8.4 The Owner/General Contractor is responsible to ensure that the water-resistive barrier is effectively integrated around the window frame in a weatherboard fashion (see Figure 6).

6.0 POST-INSTALLATION PROCEDURES

6.1 After installation is complete, check the window for proper operation and locking.

6.2 Ensure that flashing materials are covered (installation of exterior wall surface) in a time frame recommended by the flashing manufacturers.

6.3 Damaged flashings or water-resistive barriers shall be repaired prior to installation of exterior wall surface in order to ensure the continuity between the water-resistive barrier and the new materials.

6.4 Maintain a minimum 6 mm (1/4 in.) joint between the window frame and the final exterior wall surface (siding, stucco, etc.)

6.5 Install appropriate sized open-cell backer rod in the joint between the window frame and the final exterior wall surface (siding, stucco, etc.) then apply sealant per the sealant manufacturer's recommendations.

7.0 DRAWINGS

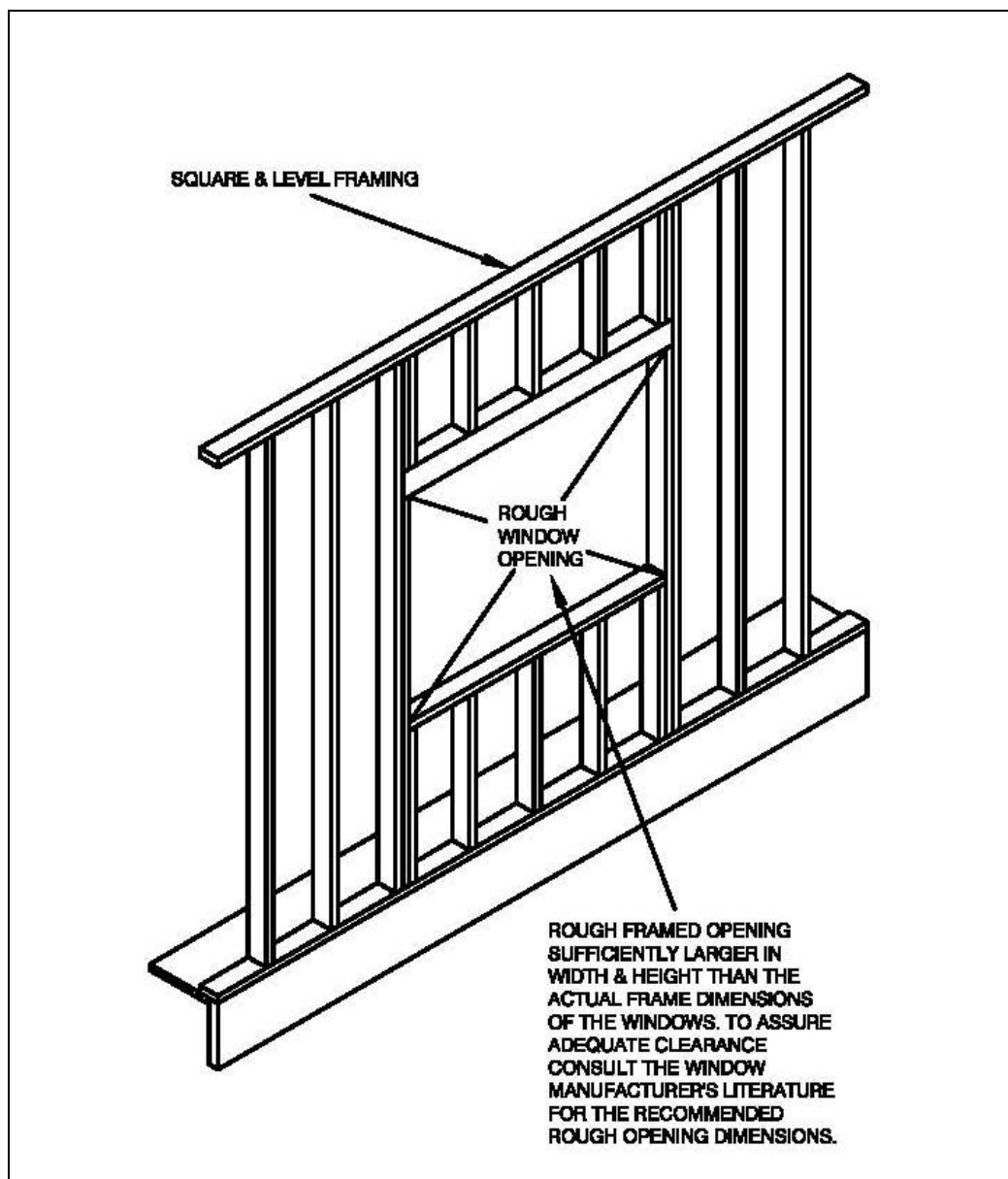


FIGURE 1: Rough Window Opening

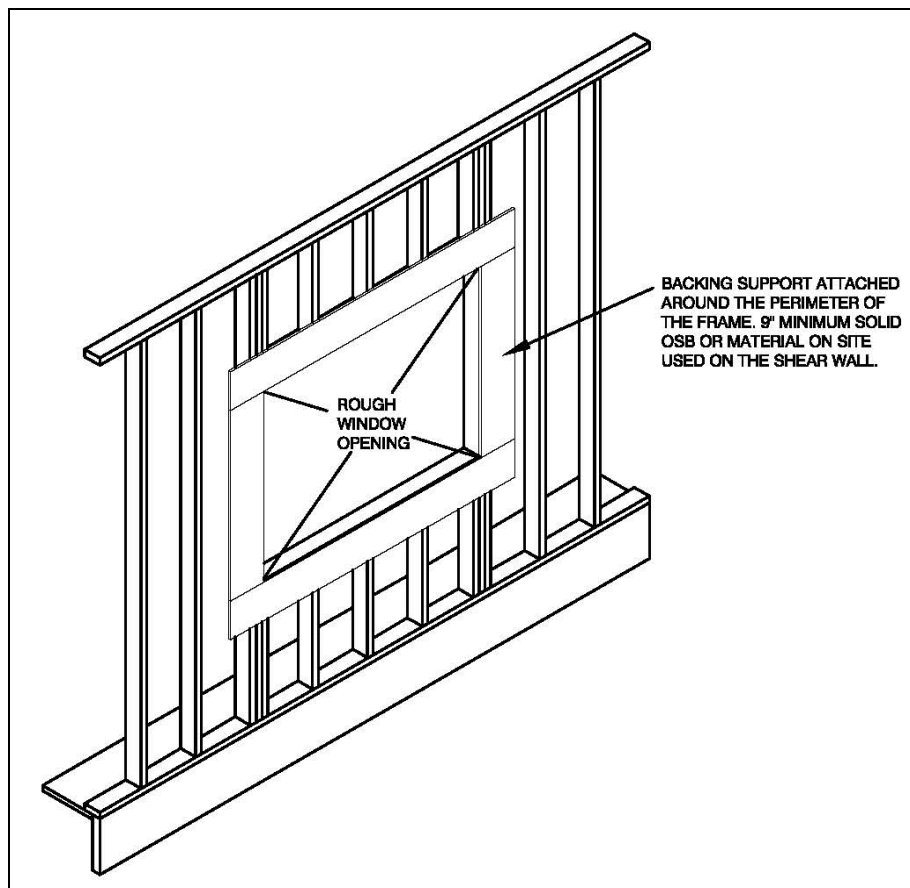


FIGURE 1A: Backing Support Attached Around the Perimeter of the Rough Window Opening

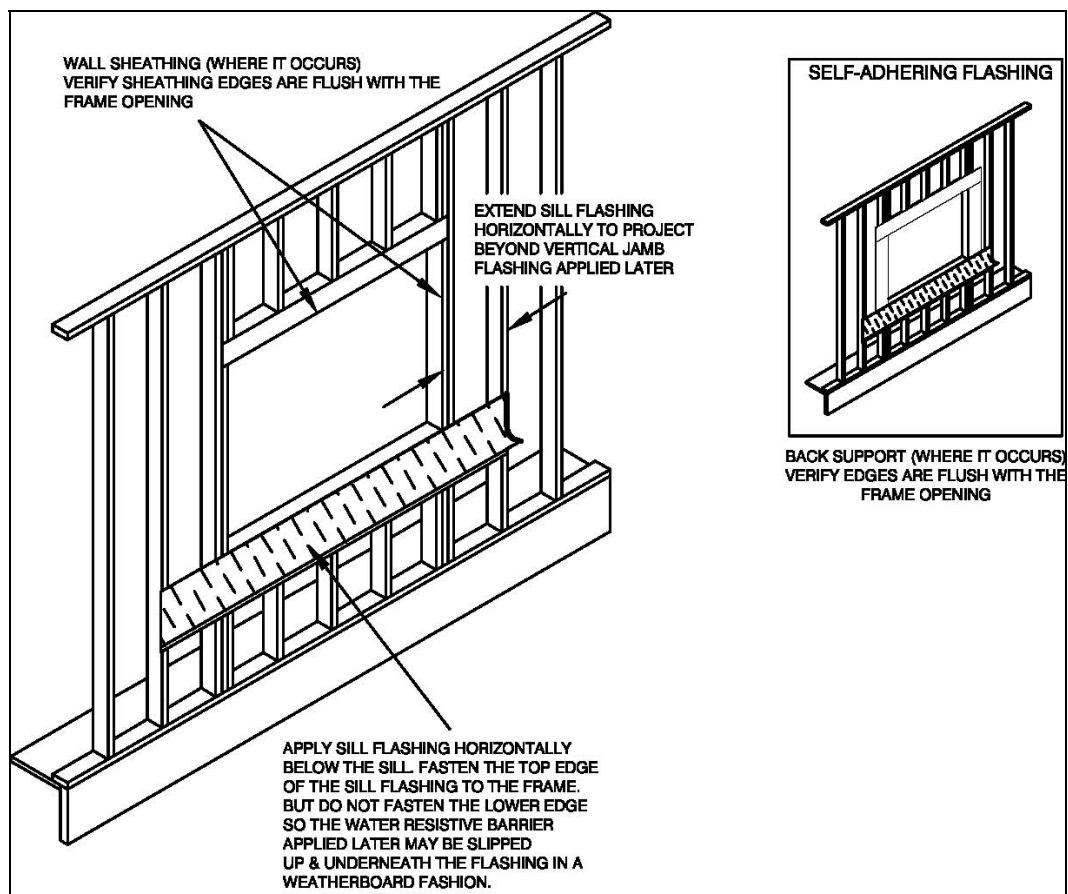


FIGURE 2: Sill Flashing

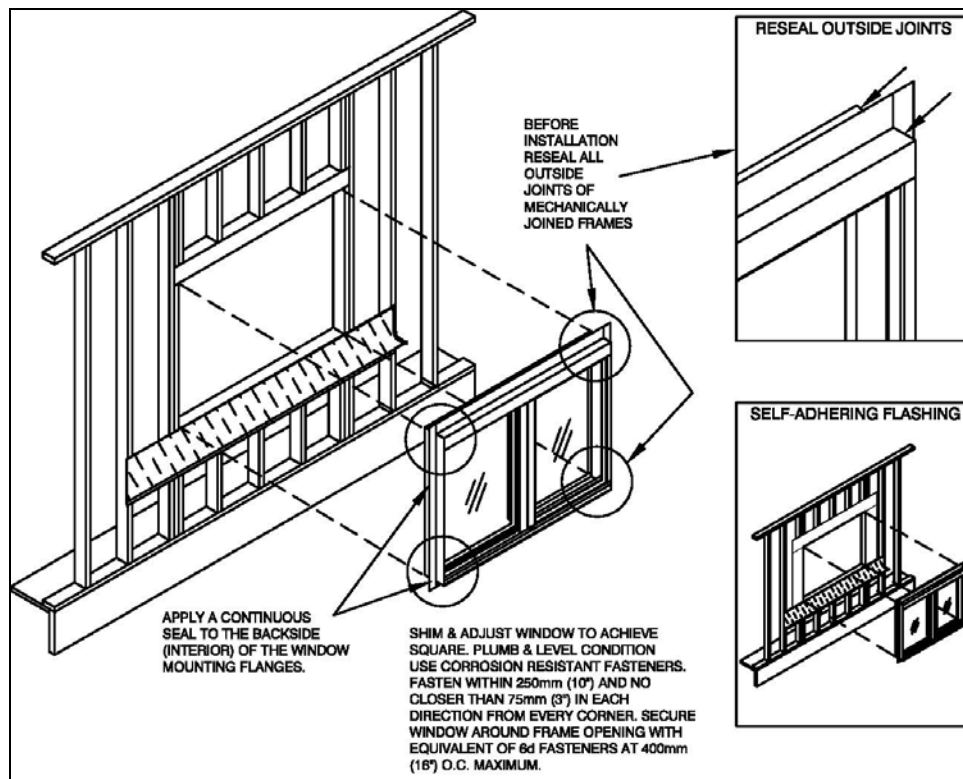


FIGURE 3A: Window Installation (Method "A")

NOTE 9: In applications where wall sheathing is used, sheathing shall be applied prior to flashing and window installation.

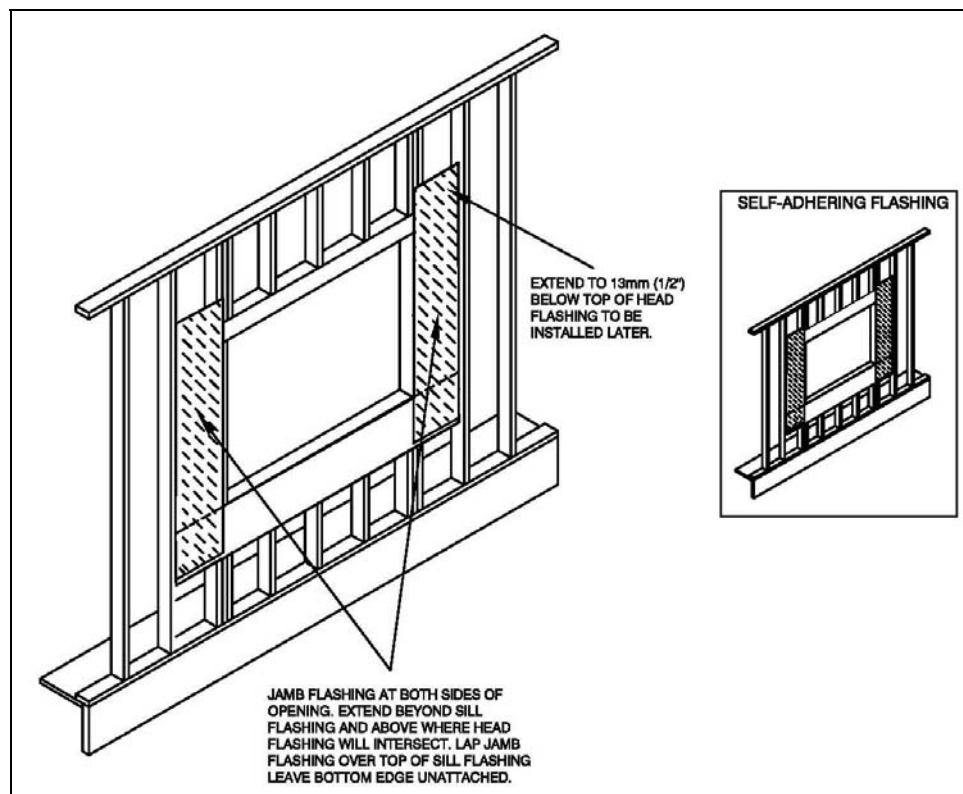


FIGURE 3B: Jamb Flashing (Method "B")

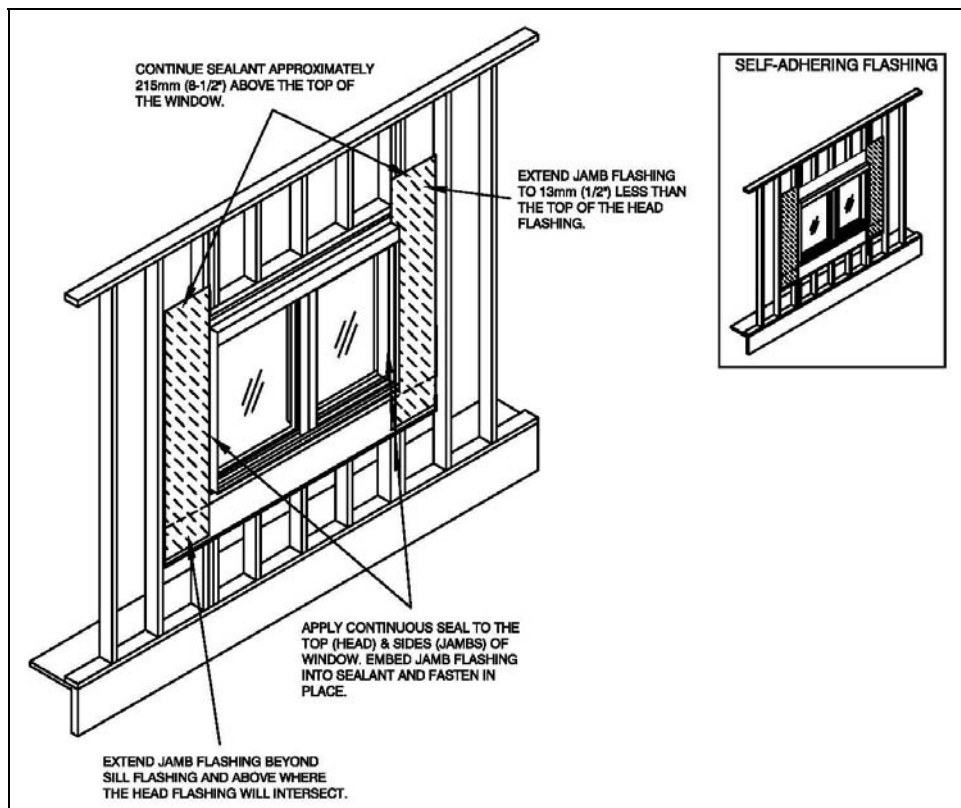


FIGURE 4A: Jamb Flashing (Method "A")

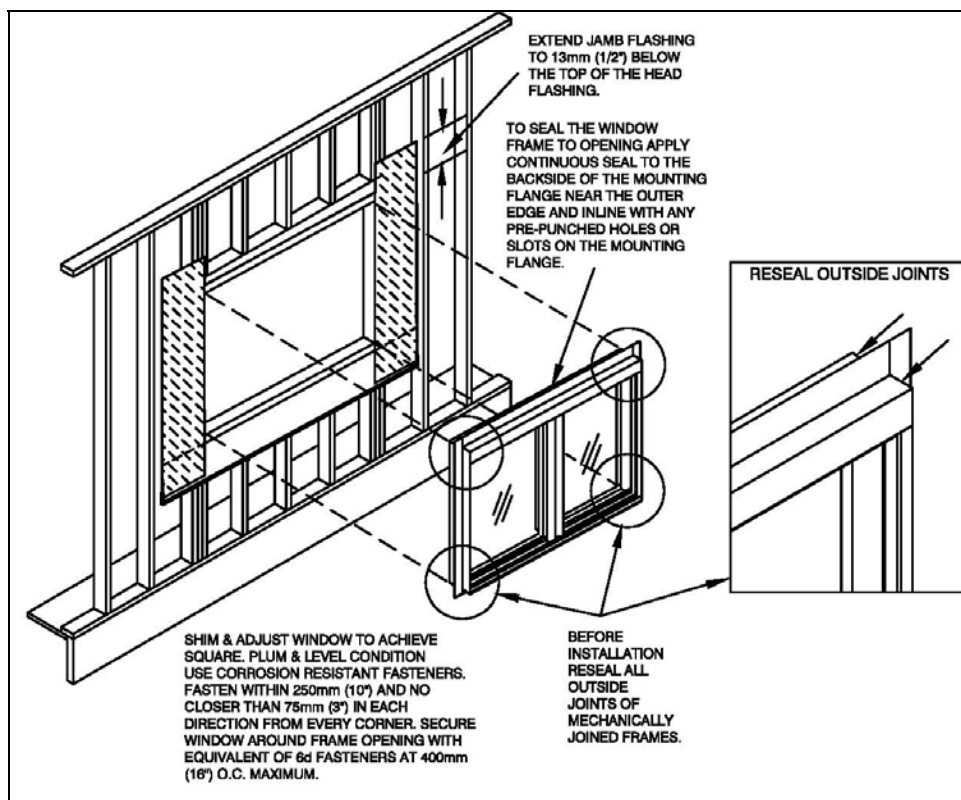


FIGURE 4B: Window Installation (Method "B")

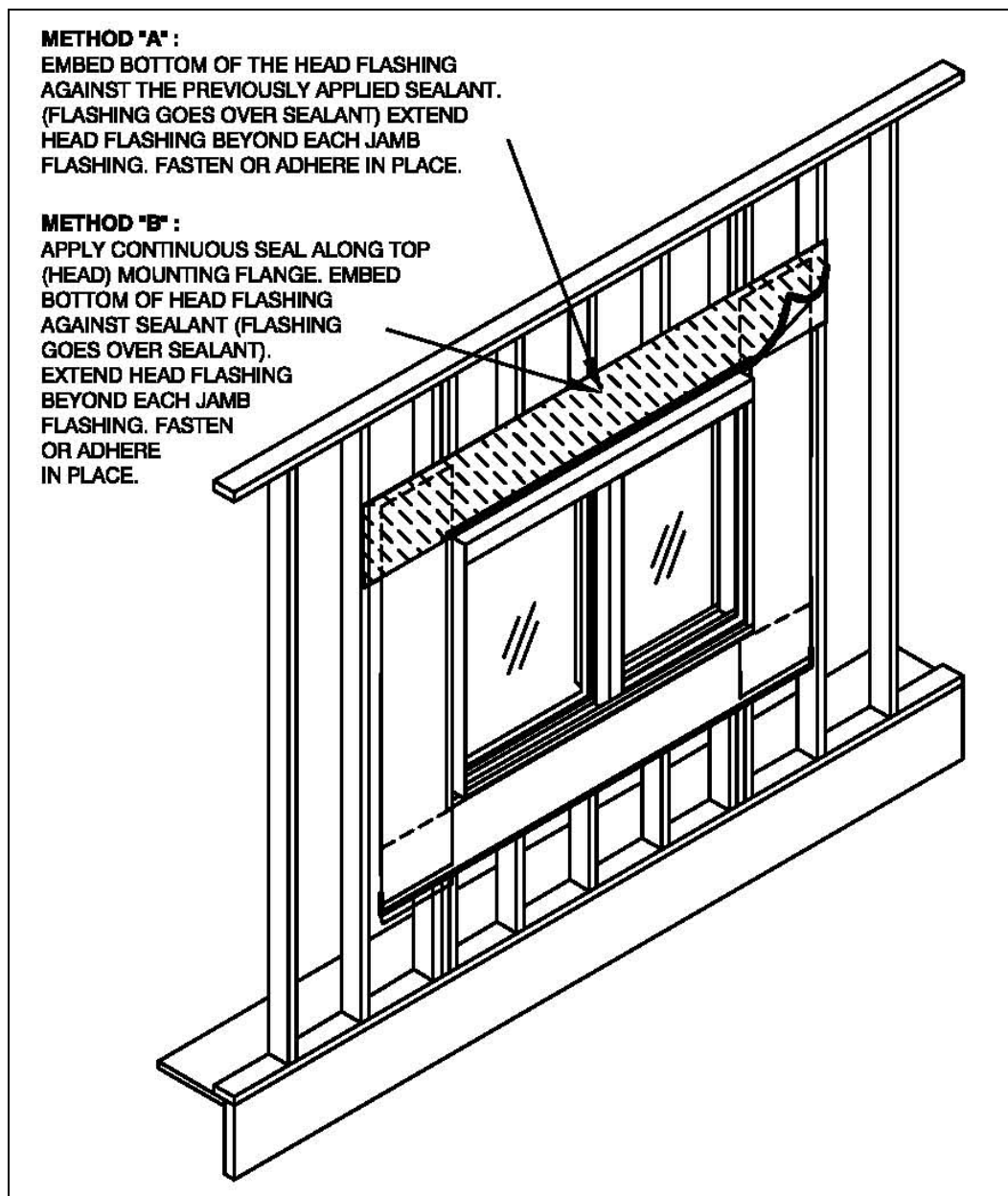


FIGURE 5: Head Flashing

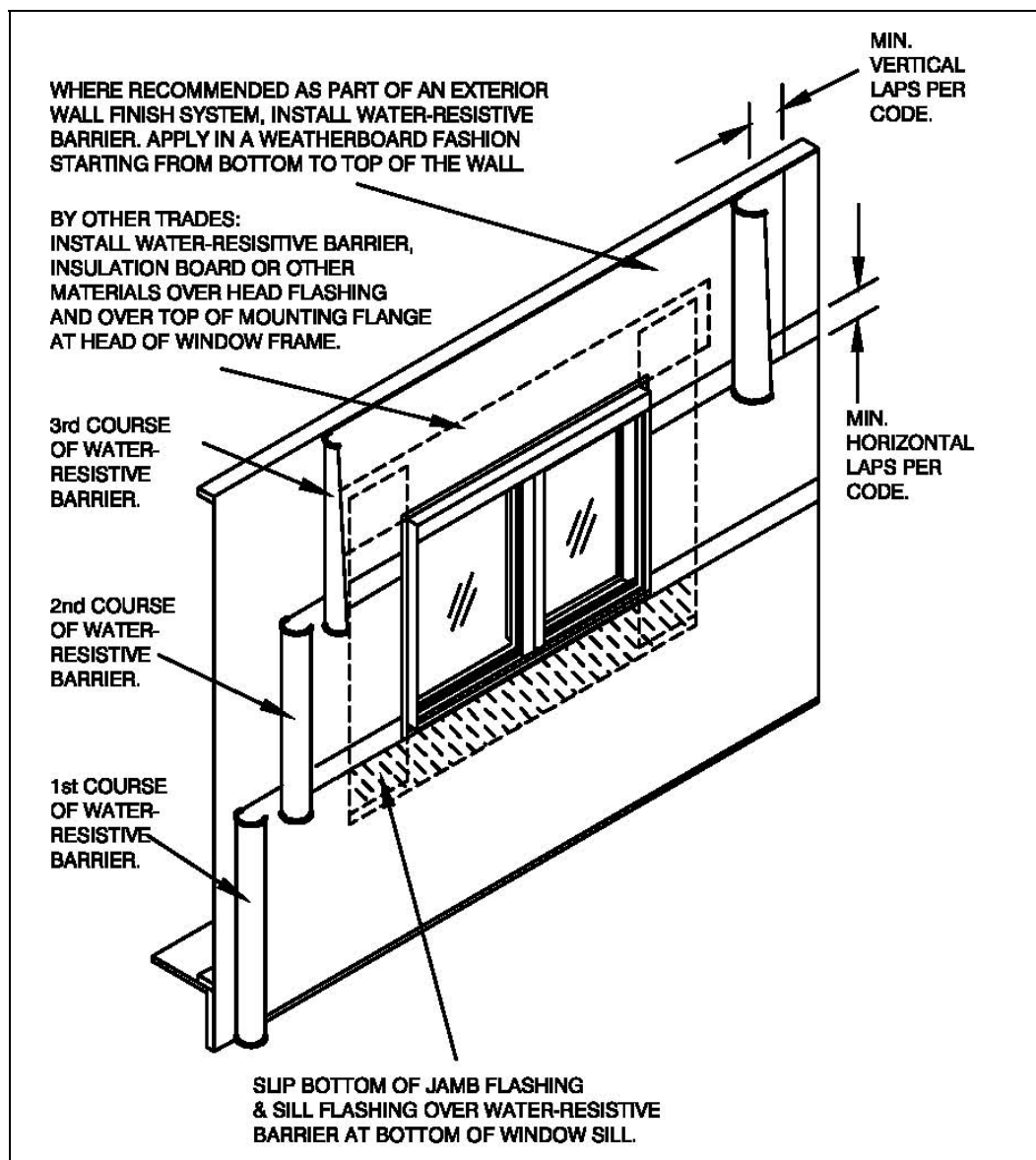


FIGURE 6: Primary Water-Resistive Barrier Application by Others

APPENDIX A – MODIFY WATER-RESISTIVE BARRIER

(Excerpted and modified from the IM-TM, InstallationMasters™ Training Manual)

If the water-resistive barrier has already been installed, some modifications will be necessary. Modify the water-resistive barrier in the following manner:

1. When the water-resistive barrier covers the window opening, make a modified “I-Cut” in the barrier as shown in Figure A1.
2. Fold bottom and side flaps over and behind the interior sides of the rough framing.
3. Fasten flaps on interior with staples set every 300 mm to 400 mm (12 in to 16 in) (see Figure A2).
4. Measure for diagonal cuts at top of window corners for both building paper or house wrap (see Figure A3).
 - Measure from the former 225 mm (9 in) up and 225 mm (9 in) over, and mark (45° diagonal).
 - Cut on the diagonal from marked point to the rough opening corner.
 - Measure and cut the other upper corner.
5. Gently raise the top edge of the water-resistive barrier and tape the corners and center to the barrier surface above. This will allow for later installation of the window and flashing.

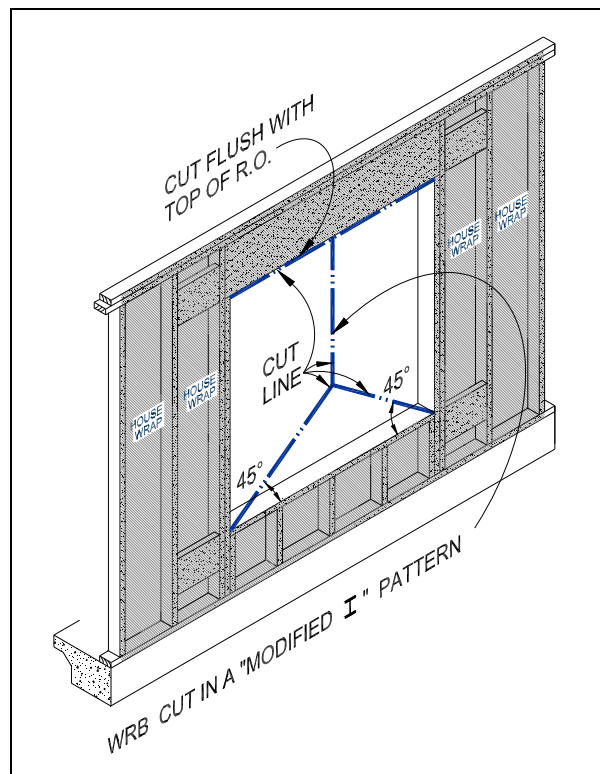


FIGURE A1: Modify Water-Resistive Barrier

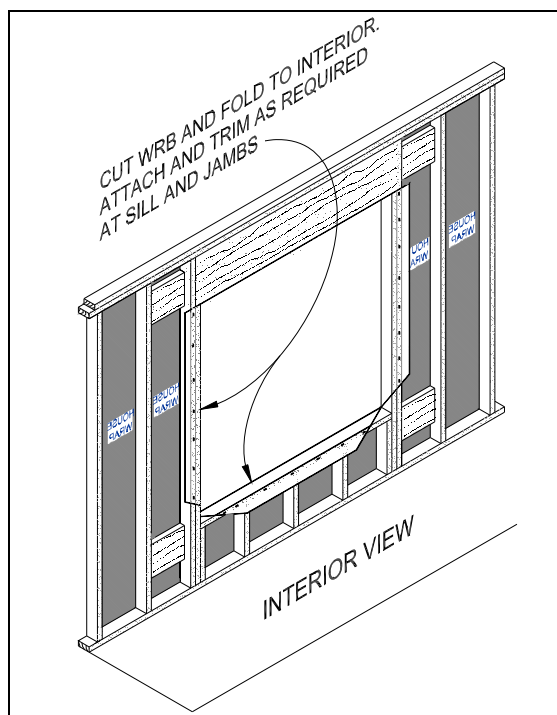


FIGURE A2: Water-Resistive Barrier - Interior

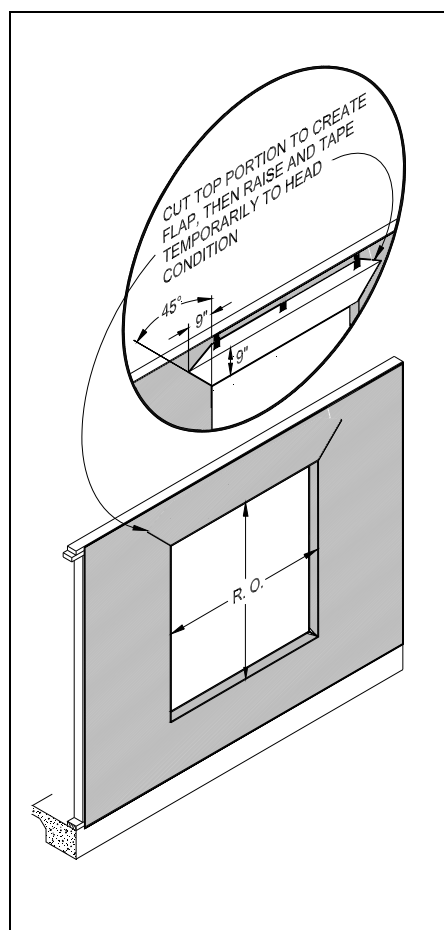


FIGURE A3: Cut Flap at Head and Tape

Changes from AAMA 2400-02 to AAMA 2400-10

- Various editorial changes were made
- Changed title to be “Open Stud” and specific to “Low Wind/Water Exposure”
- Added new “Introduction” Section
- Changed coverage from not more than four stories to not more than three stories
- Added new Section 1.8
- Removed old Section 1.9
- Added/revised definitions for “Flashing”, “Mechanically Attached Flashing”, “Self Adhering Flashing”, “Open Stud Framing” and “Water-Resistive Barrier”
- Changed “weather resistant barrier” to “water-resistive barrier” throughout the document
- Added reference to ASTM E2112 in Section 5.1
- Added requirement for self-adhered flashing in Section 5.1
- Added new Section 5.2
- Changed reference to “mechanically attached flashing” in Section 5.4.2
- Added new Section 5.5
- Added new Note 3
- Added new Note 5
- Added new Section 6.0
- Updated all figures in Section 7.0
- Added new Figure 2
- Added new “Appendix A”



American Architectural Manufacturers Association

1827 Walden Office Square, Suite 550

Schaumburg, IL 60173

PHONE (847)303-5664 FAX (847)303-5774

EMAIL webmaster@aamanet.org

WEBSITE www.aamanet.org