

AAMA 2400-21

Standard Practice for Installation of Windows with a Mounting Flange in Wood-Frame Construction Using Exterior Barrier Methods

an FGIA publication

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Fenestration and Glazing Industry Alliance

U.S. Headquarters: 1900 E. Golf Rd., Suite 1250, Schaumburg, IL 60173, Phone: (847) 303-5859

Canada Office: 1769 St. Laurent Blvd., Suite 104, Ottawa, ON, Canada K1G 5X7, Phone: (613) 238-1510

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0.0 INTRODUCTION

This practice addresses the recommended methods and/or sequences used to apply/modify the water-resistive barrier (WRB) or other flashing and sealing materials to the opening. For a drainage method solution refer to FMA/AAMA 100. The techniques demonstrated in this standard practice establish an air and moisture barrier at the exterior interface between the window and rough opening.

NOTE 1: For purposes of this standard practice, an air and moisture barrier refers to window installation and not the wall construction.

This standard is recommended for buildings/installations considered at low risk of water intrusion (e.g., southwestern U.S.). The user is responsible for determining the appropriateness of this standard practice for their installation.

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 windows 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 or the safety of the person installing the windows.

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 issues 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. In the event of any conflict between this practice and the manufacturer's installation instructions, the manufacturer's installation instructions shall prevail.

1.8 Complex installation and flashing details such as installations in recessed openings are not covered by this standard and are the responsibility of the engineer or architect for the project.

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

1.10 Terminology

In this specification, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the specification; "shall be permitted to be" is used to express an option or that which is permissible within the limits of the specification; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express possibility or capability. Notes accompanying sections do not include requirements or alternative requirements; the purpose of a note accompanying a section is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and shall be permitted to be written as requirements.

Section 0.0 and any Notes not attached to figures and tables are non-mandatory.

1.11 The primary units of measure in this document are Inch-Pound (IP). The values stated in IP units are to be regarded as the standard. The values given in parentheses are for reference only.

1.12 This document was developed in an open and consensus process and is maintained by representative members of FGIA as advisory information.

2.0 SIGNIFICANCE AND USE

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

2.2 Improper installation of windows 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.

2.3 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 WRB materials.

Refer to local building codes prior to installation.

2.4 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 joint sealing and glass handling procedures, painting where applicable, and an understanding of the fundamentals of residential construction that affect the installation of windows.

2.5 Finish and Sealant Protection

2.5.1 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 direct sunlight and other weather elements.

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

2.5.3 Windows installed in walls that are sheathed with weather resistive cladding without an underlying WRB shall be sealed so as to perform in a surface barrier application.

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

3.0 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.

3.1 AAMA, Fenestration and Glazing Industry Alliance (FGIA) Standards

AAMA 711-13, Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products

AAMA 712-14, Voluntary Specification for Mechanically Attached Flexible Flashing

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

AAMA 714-19, Voluntary Specification for Liquid Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings

AAMA 800-16, Voluntary Specifications and Test Methods for Sealants

AG-13, AAMA Glossary

AAMA TIR-A9-14, Design Guide for Metal Cladding Fasteners

3.2 ASTM International (ASTM)

ASTM B456-17, Standard Specification for Electroplated Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

4.0 DEFINITIONS

Please refer to the most current AAMA Glossary for all definitions.

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. The framing members comprising the rough opening shall be plumb, level, square and true prior to the installation of the window (see Figure 1). The studs and sheathing shall be free of voids, holes, chipping, twisting, or other conditions that will not allow the sealant to maintain continuous contact.

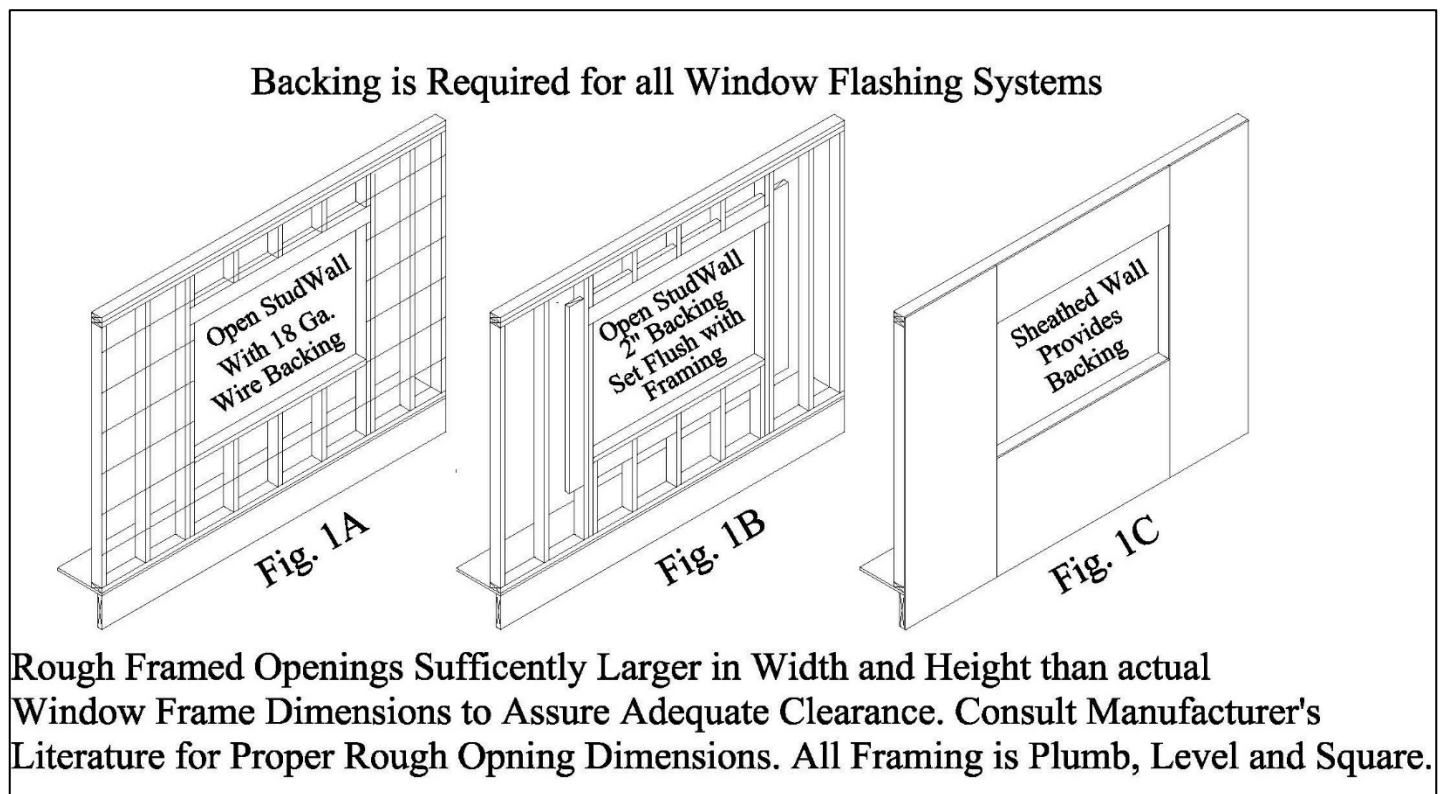


FIGURE 1: Rough Window Opening and Support

Flashing material used on an open stud wall requires the openings between the framing members to be filled or covered with a material sufficient to support the flashing material. The flashing material will be applied onto the backing support and the window will be mounted with the mounting flange flush against the applied backing support.

5.2 Compatibility

All materials such as, but not limited to, coatings, flashings and sealants 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.

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

Flashing and/or an appropriate method of sealing shall be designed as a part of an overall WRB system.

NOTE 2: The general contractor, or their designated agent, should ensure that the flashing material is protected from damage by weather, other trades, or vandalism. The general contractor, or their designated agent, should also ensure that the flashing system is properly integrated into the WRB for the entire building.

5.4.1 Flashing material shall carry continuous manufacturer identification.

5.4.2 Mechanically attached flashing material shall meet the requirements of AAMA 712.

5.4.3 Self adhering flashing shall meet the performance requirements of AAMA 711.

5.4.4 Fluid applied flashing shall meet the requirements of AAMA 714.

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 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.

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.

NOTE 3: Where wet sealant is used, a small amount of “squeeze out” is favorable to indicate a continuous seal. Any “squeeze out” should be promptly troweled smooth.

5.6.3 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 Mounting Flange windows are installed, sealed and flashed in accordance with one of two methods, Method A and Method B.

Both methods start at the rough sill, where the sill flashing is fitted flush to the bottom of the opening and extends past the opening a distance equal to the width of the flashing. (see Figure 2).

The lengths of all the pieces of flashing can be calculated using Table 1. In some open stud applications, the sill and head flashings may have to be extended to reach the first stud beyond the opening in order to be properly supported.

FLASHING LENGTHS AND CUT FORMULAS	
Sill Flashing	= RO ^W + (2 x Flashing Width)
Jamb Flashing	= RO ^H + (2 x Flashing Width) – 1 in
Head Flashing	= RO ^W + (2 x Flashing Width) + 2 in
LEGEND	
RO = Rough Opening	
RO ^H = Rough Opening Vertical Height	
RO ^W = Rough Opening Horizontal Width	

TABLE 1: Flashing Lengths and Cut Formulas

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

5.7.3 Method A and Method B differ only with regard to the placement and sealing of the jamb (side) flashings. In Method A, the jamb flashings are applied “after” the window is installed within the opening. In Method B, the jamb flashings are applied “before” the window is installed within the opening.

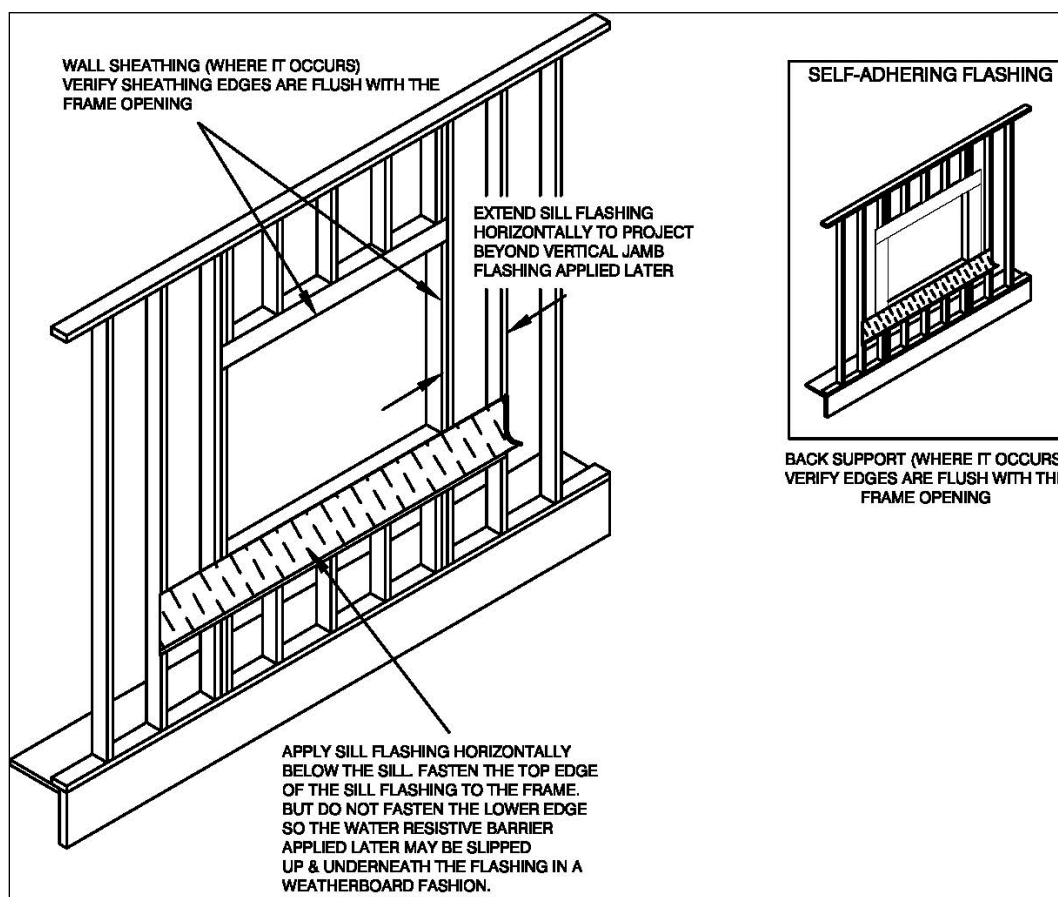


FIGURE 2: Sill Flashing

NOTE 4: Coordinate between horizontal and vertical flashing applications to ensure that no gaps remain at the transition between components. 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.

5.7.3.1 Installation of Sill Flashing

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 any flashing that extends beyond the rough sill, so the WRB applied later may be slipped up and underneath the flashing in a weatherboard fashion (see Figure 2).

5.7.3.2 Any applied (non-integral) mounting flanges shall be sealed to the window frame.

5.7.3.3 Apply sealant at corners the full length of any seam where mounting flanges meet and to the outside of the frame corner joints (see Figure 3). Apply a continuous 3/8 in bead of sealant to the backside (interior) of the window mounting flange around the entire perimeter of the window in line with any pre-punched holes or slots in the mounting flange (see Figure 3). The window shall then be installed in accordance with Section 5.8 Window Installation.

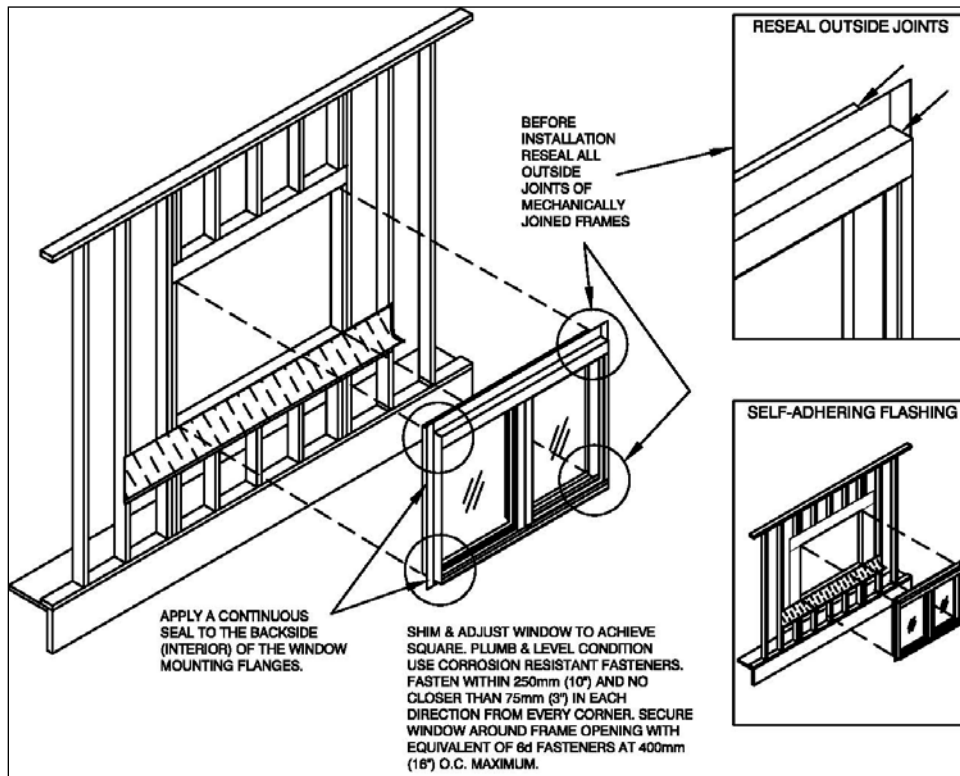


FIGURE 3: Window Installation (Method “A”)

NOTE 5: In applications where wall sheathing is used, sheathing shall be applied prior to flashing and window installation.

5.7.3.4 For mechanically attached flashing, apply a continuous 3/8 in bead of sealant to the exposed mounting flange at the top (head) and sides (jambs) 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 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 4).

NOTE 6: For Method A installations using self-adhered flashing, sealant is not required on the exterior side of the mounting flange.

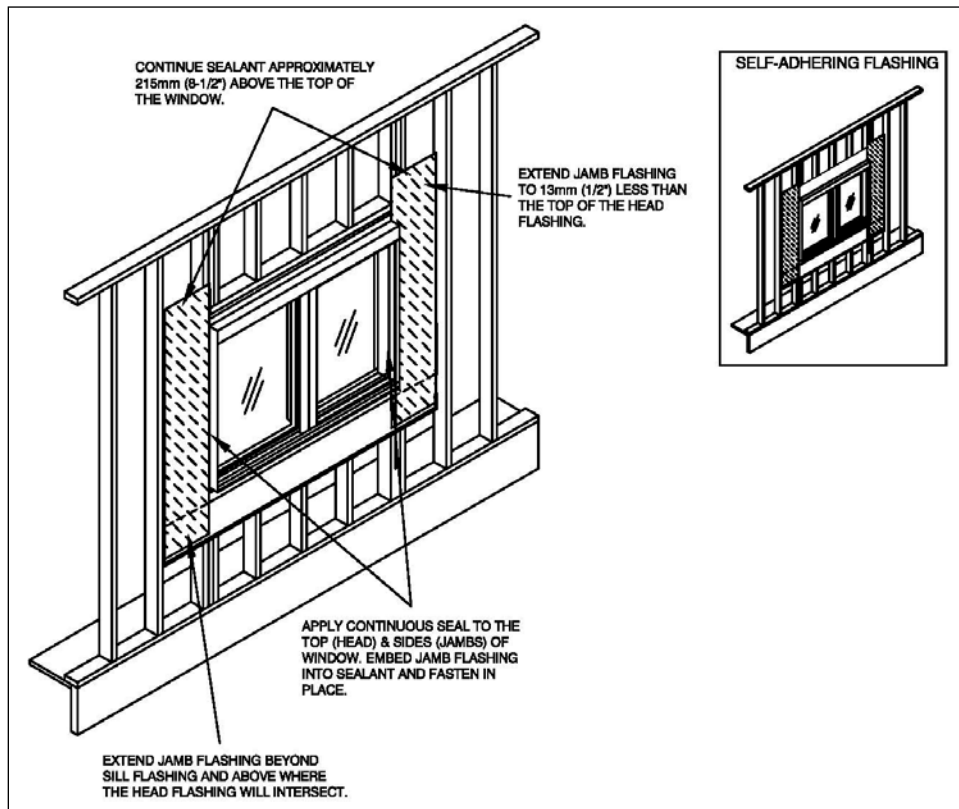


FIGURE 4: Jamb Flashing (Method “A”)

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

5.7.3.6 Method B. Method B jamb flashings are applied in weatherboard fashion after the sill flashing is applied and “Before” the window is installed, as described above. If Method B is selected the bead of sealant applied to the interior side of the mounting flange will contact the face of the jamb flashings instead of the framing or sheathing.

Method B jamb flashings are fastened or adhered 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 1/2 in less than the bottom of the sill flashing and beyond the top of the window to approximately 1/2 in less than the top of the head flashing. Do not fasten or adhere the bottom 9 in of the jamb flashing, so the WRB applied later may be slipped up and underneath the flashing in weatherboard fashion.

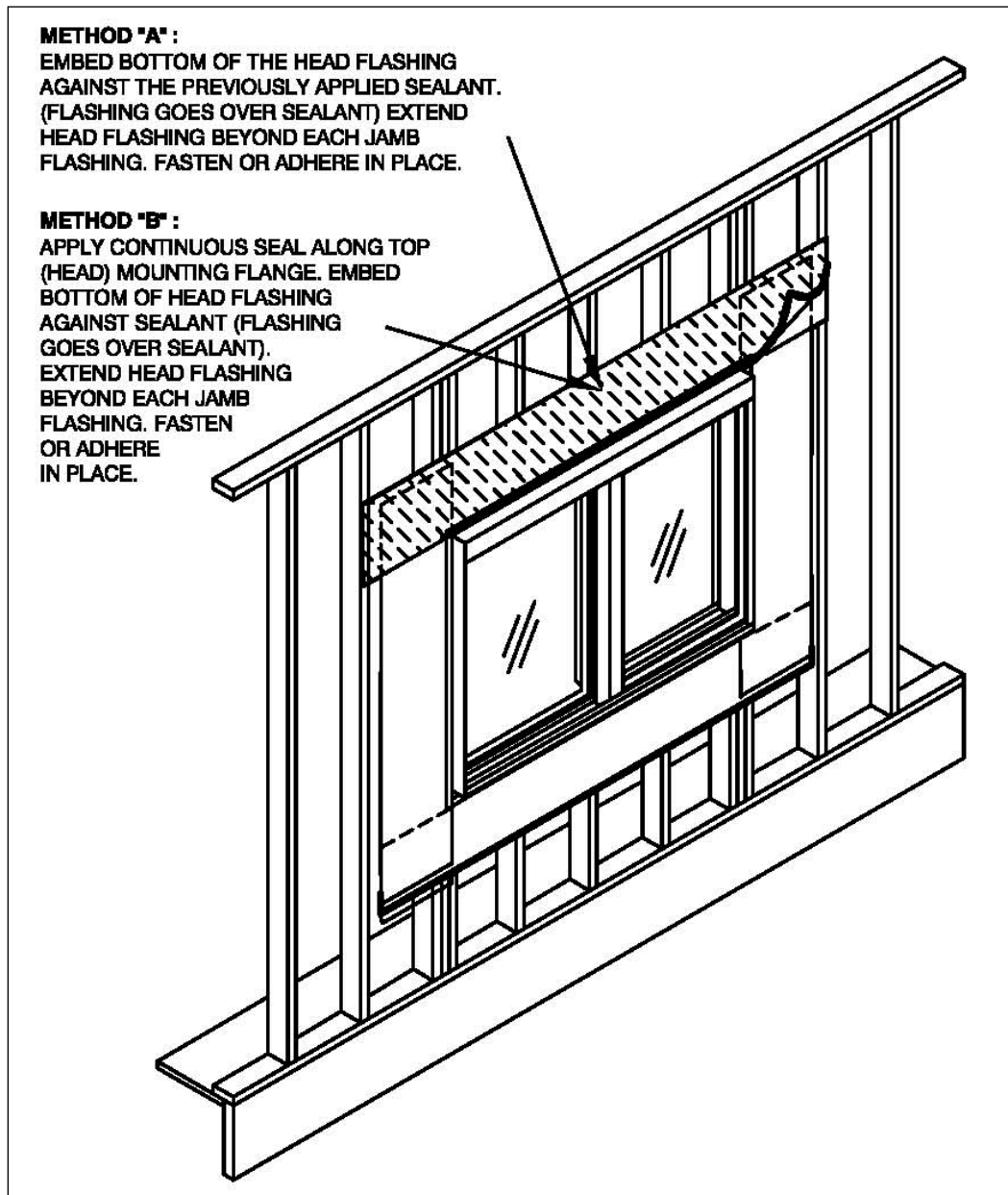


FIGURE 5: Head Flashing

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

5.8 Window Installation

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

NOTE 7: 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. When manufacturer's installations instructions do not specify the fasteners and spacing to be used, secure the full perimeter with the minimum equivalent of 6d fasteners on a maximum of 16 in (405 mm) 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.

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 When manufacturer's installations instructions do not specify the location of fasteners in relation to the corners, in each direction from all corners there shall be a fastener within 10 in, but no closer than 3 in to prevent frame distortion or fracture of joint seals.

If any damage to window frame joint seals or mounting flanges is observed during installation, the installer shall consult the manufacturer for guidance.

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

6.0 BEST PRACTICES POST WINDOW INSTALLATION

The following is a list of post window installation recommendations. The list of recommendations is not all-inclusive for all possible cladding scenarios, and in all cases, manufacturers' recommendations and any code requirements must be followed. In many cases these steps are completed after the window installer has left the property and may be the responsibility of other trades including owner/contractor.

- Repair damaged flashing(s) or WRB prior to installation of exterior wall cladding.
- Maintain a minimum 1/4 in joint between the window frame and the final exterior wall surface (siding, stucco, etc.) to accept sealant.
- Install backer rod which is approximately 1/3 larger in size than the joint between the window frame and the final exterior wall surface (siding, stucco, etc.) then apply sealant per the sealant manufacturer's recommendations.
- For insulation purposes a low-pressure aerosol foam, tested in accordance with AAMA 812, may be used between the window frame and rough opening.
- Ensure that the WRB is effectively integrated around the window frame in a weatherboard fashion (see Figure 6).
- Flashing materials are to be covered (installation of exterior wall surface) within a time frame recommended by the flashing manufacturers.

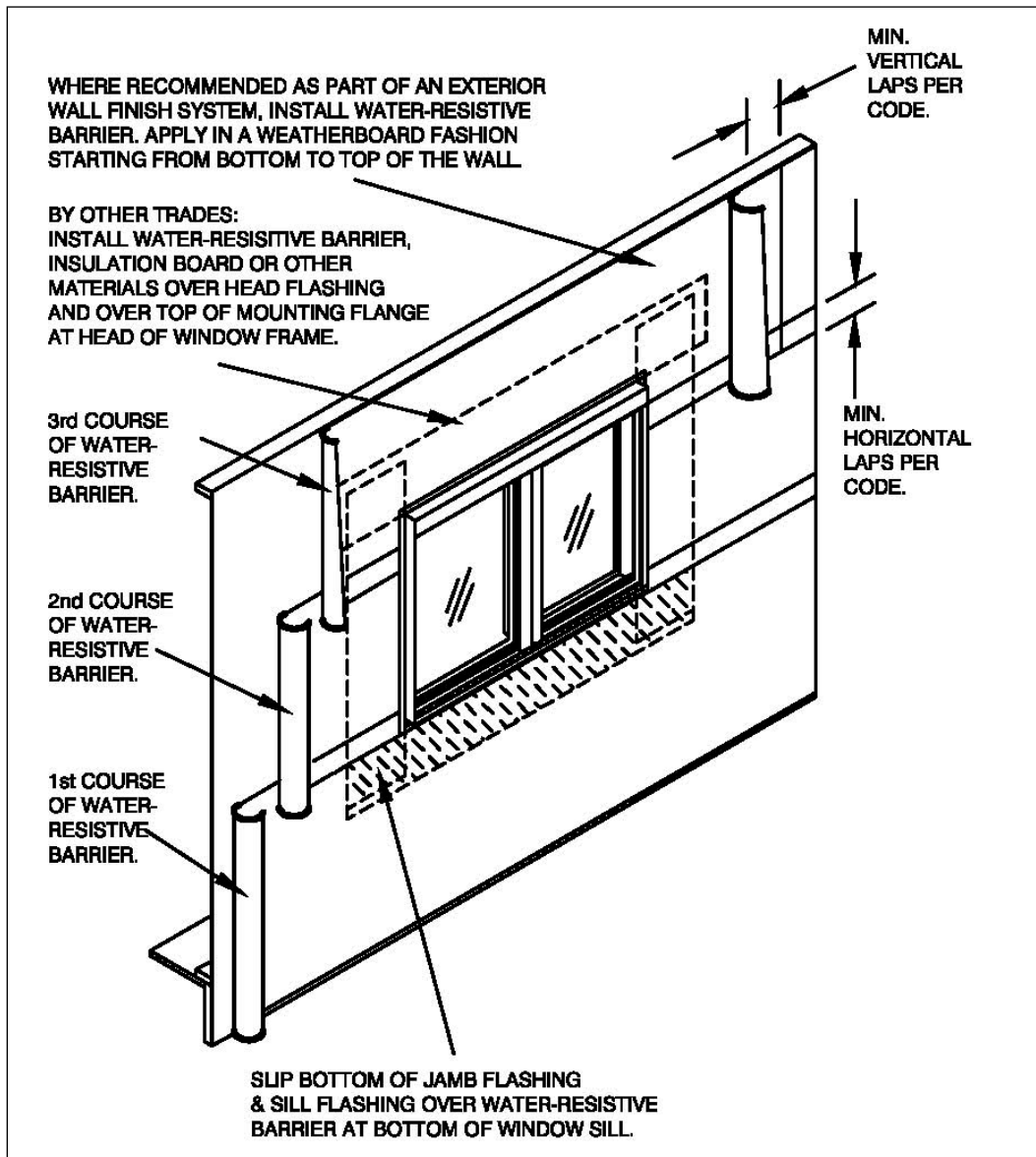


FIGURE 6: Primary Water-Resistive Barrier (WRB) Application by Others

APPENDIX A – MODIFY WATER RESISTIVE BARRIER (WRB)

A1.0 If the WRB has already been installed, some modifications will be necessary. Modify the WRB in the following manner:

1. When the WRB covers the window opening, the WRB needs to be either cut flush with the window rough opening or the modified “I-Cut” can be made in the barrier as shown in Figure A1.
2. Measure for diagonal cuts at top of window corners of WRB (see Figure A2).
 - a. Measure from the former 9 in up and 9 in over, and mark (45° diagonal).
 - b. Cut on the diagonal from marked point to the rough opening corner.
 - c. Measure and cut the other upper corner.
3. Gently raise the top edge of the WRB and tape the corners and center to the barrier surface above. This will allow for later installation of the window and flashing.

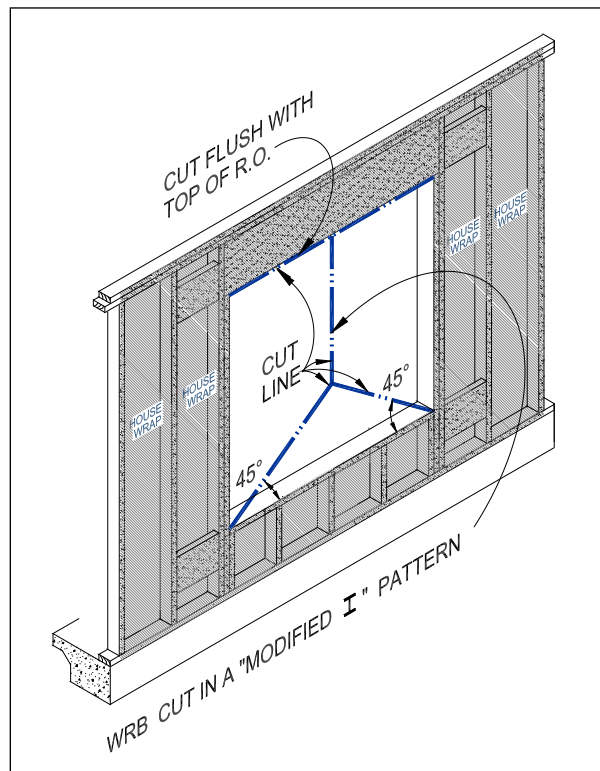


FIGURE A1: Modify Water-Resistive Barrier (WRB)

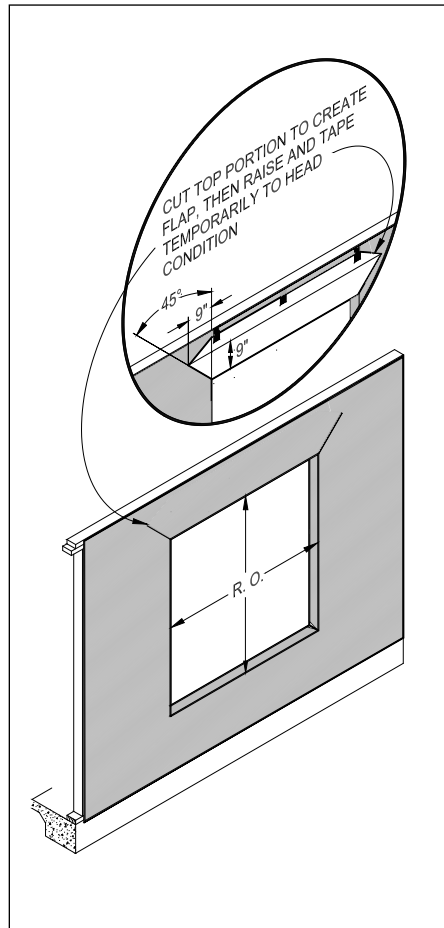


FIGURE A2: Cut Flap at Head and Tape

Changes from AAMA 2400-20 to AAMA 2400-21

- Updated language in Section 6.0
- This document was updated by the Wall Interface Council

Changes from AAMA 2400-02 to AAMA 2400-10

- Various editorial changes were made
- Added new Table 1
- Section new Section 5.7.3.1 Installation of Sill Flashing
- This document was updated by the Mounting Flange Installation Task Group

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”



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