

FMA/WDMA 250-10

FMA/WDMA 250-10 Standard Practice for the Installation of Non-Frontal Flange Windows with Mounting Flanges for Surface Barrier Masonry Construction for Extreme Wind / Water Conditions



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FENESTRATION MANUFACTURERS ASSOCIATION

1625 Summit Lake Drive, Suite 300, Tallahassee, FL 32317

THE WINDOW & DOOR MANUFACTURERS ASSOCIATION

401N. Michigan Avenue, Suite 2200, Chicago, IL 60611

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Foreword: The purpose of this standard practice is to present installation best practices for non-frontal flanged windows, with integral and applied mounting flanges, to mitigate the risk associated with the limitations of surface barrier masonry construction.

This standard practice includes a procedure for the installation of non-frontal flange windows into buildings with a surface barrier (masonry/concrete) wall construction with a height of no more than three stories. Wood frame construction is not included in this document. Detailed instructions for wood construction when used on second and third story construction of a masonry home are covered in FMA/AAMA 100-. Detailed instructions for installation of frontal flange windows in surface barrier masonry construction are addressed in FMA/AAMA 200-.

The techniques demonstrated in this standard practice have been developed specifically to restrict liquid water from entering through the masonry opening and/or around the perimeter of the window frame. The major emphasis is focused on sealing the surrounding area of the window's masonry opening in such a manner as to restrict liquid water from penetrating the wall at the window opening. This standard presumes a drainage plane is not present behind the façade (surface barrier system).

This standard practice provides details for both a "barrier installation", such that there is a full perimeter seal at the exterior interface between the window and the wall cavity (under the flange) and a "drainage installation", such that there is a discontinuous seal at the exterior sill interface to allow drainage from a 'sill pan' flashing system. In general, drainage installations should be utilized for systems that are susceptible to high moisture exposure, moisture sensitive materials, and potential leakage around the interface. It is essential that a robust air / water seal around the interior perimeter of the window / wall cavity interface is achieved in drainage installations. However, there are cases where barrier installations can be utilized successfully and also can be more practical, particularly in such cases where the robust interior air/water seal is difficult to achieve.

Cautionary Statement: Surface barrier construction presents some unique challenges for climates that experience frequent and/or heavy rainfall. It is extremely difficult to obtain and maintain a continuous water barrier over the entire building envelope. In addition, once water breaches the barrier and is absorbed by the construction material, the barrier inhibits the ability for the wall to dry out rapidly. Therefore, a water managed/drainage plane construction is better suited for areas that experience heavy and/or frequent rain. Water that gets past the exterior cladding encounters a secondary water resistant barrier and drains down the cavity where it is flashed to the exterior.

1. Scope

1.1 This standard covers the installation of non-frontal flanged windows in new construction surface barrier masonry wall buildings of no more than three stories in height. It is expected that that all referenced components shall comply with all applicable code requirements in force at the time of the installation.

1.2 To simulate extreme exposure conditions, representative installation methods described in this standard practice have been water tested up to a design pressure of 575 Pascal's (12 psf) water test pressure, using the ASTM E547 water test (ASTM E331 is an acceptable alternative). This does not advocate field or lab testing to those levels as a requirement for this standard practice.

1.3 This practice applies to non-frontal flanged windows which employ an integral or applied mounting flange that is attached and sealed to the window perimeter frame and is designed as an appendage that will cover a previously-installed buck and/or integrate with a pre-formed sill.

1.4 This standard covers the installation process for windows from pre- to post-installation. It does not include fabrication techniques that would be required to join individual windows to each other, either horizontally or vertically. It does not cover any other factory or field fabrication which joins or combines multiple windows. The instructions for mulling windows together and any accessories required must be supplied by the window manufacturer.

1.5 This standard provides minimum requirements for window installation, based on current best practices. Actual conditions in buildings may vary. In some cases the window manufacturer or registered design professional will have to be consulted if the field or building conditions are other than as described in this standard. If this standard conflicts with the manufacturer's instruction, the manufacturer's instruction shall take precedence.

1.6 This standard does not address safety concerns, either from the installation process or conditions present at the building site. It shall be the responsibility of the user of this standard to ensure that all appropriate health and safety practices have been implemented.

1.7 Although an exterior sealant joint is used in this application, the interior seal shall be considered the primary sealant joint which shall create both an air and water seal.

2.0 REFERENCED PUBLICATIONS

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 to referring to the latest edition of that code or standard.

American Architectural Manufacturers Association (AAMA)

- 2.1. AAMA 711-07 Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
- 2.2 AAMA 713-08 Voluntary Test Method to Determine Chemical Compatibility of Sealants and Self-Adhered Flexible Flashings
- 2.3 AAMA 800-08 Voluntary Specifications and Test Methods for Sealants
- 2.4 AAMA 808.3-05 Exterior Perimeter Sealing Compound
- 2.5 AAMA 812-04 Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations

American Society of Testing Materials (ASTM)

- 2.7 ASTM C 794-06 Standard Test Method for Adhesion-in-peel of Elastomeric Joint Sealants
- 2.8 ASTM C 920-08 Specification for Elastomeric Sealant

- 2.9 ASTM C 1281-03(2009) Standard Test Method for Preformed Tape Sealants for Glazing Applications
- 2.10 ASTM E331-00 (2009) reapproved 2009 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- 2.11 ASTM E547-00(2009 reapproved 2009 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Air Pressure Difference

Fenestration Manufacturers Association (FMA)

- 2.12 FMA/AAMA 100-07 Standard Practice for the Installation of Windows with Mounting Flanges for Extreme Wind/Water Conditions
- 2.13 FMA/AAMA 200-09 Standard Practice for the Installation of Windows with Frontal Flanges for Surface Barrier Masonry Construction.

3.0 Definitions

3.1 *Air seal, n*—a continuous seal put into the air gap area around the interior side, exterior side, or both sides of the window perimeter to restrict the infiltration or ex-filtration of air past the window.

3.2 *Aerosol foam sealant, n*—in building construction, a sealant that expands in volume as it is dispensed from a container, using propellant under pressure, to form a rigid or semi-rigid cellular mass.

3.3 *Applied flange, n* - a separate flange that may be added to or removed from the window frame.

3.4 *Back dam, n* - The rear upturned leg of a masonry sill, sill pan or subsill designed for the purpose of containing liquid water. A sealant joint can also be used to form a back dam provided it is part of a continuous air seal.

3.5 *Barrier wall, n*—a wall system that is intended to manage all water at the exterior surface.

3.6 *Buck, n* - A code compliant framework built into a window opening in a concrete or masonry wall to which the window frame is secured.

3.7 *Concrete Masonry Unit (CMU), n* - a pre-cast masonry block used to construct walls.

3.8 *CMU or Masonry Water Resistant Coating, n* - *Moisture* protective, breathable coating that resists liquid water penetration and on masonry surfaces (i.e. CMU block, mortar or poured concrete) and at masonry building interfaces.

3.9 *Compatibility, n* - When materials maintain physical and functional properties while in direct contact or close proximity to each other.

3.10 *End dam a.k.a. Side dam, n* Any means provided to stop the flow of water out of the ends of a

sill, panning system or subsill and into the wall cavity, such as sealant, upstands, plates or gasketing. End dams shall be of a height equal to the height of the back dam or higher.

3.11 *Flashing, n.* – water resistant material that bridges the joint between the window frame and the adjacent construction to prevent water penetration.

3.12 *Frontal flange, n.* refers to a type of window which includes a permanent appendage projecting parallel to the plane of the wall, located at or near the exterior surface of the window for the purpose of installing the window against a backstop, buck, receptor, or other such stepped features that have been incorporated into the rough opening.

3.13 *Integral flange, n.* – a flange that is a continuous part of the window frame.

3.14 *Liquid Applied Water Resistive Coating/ Sealant, n.* – a product applied to a surface in a liquid/fluid state to improve the water resistance of the substrate.

3.15 *Masonry Opening, n.* – that portion of a masonry wall which is left open, providing for the installation of a window.

3.16 *Mounting Flange* a.k.a. *flange, mounting fin, integral fin, n.*—an appendage protruding from the frame of a window, used as either an installation attachment feature or part of the water-resistive barrier interface between the window and the wall, or both.

3.17 *Non-frontal flange, n.* – a flange that is located interior from the most exterior surface (plane) of the window.

3.18 *Pan flashing, a.k.a. sill pan, n.*—a type of flashing used at the base of a rough opening to divert incidental water to the exterior or to the exterior surface of a concealed WRB. Pan flashings shall have a back dam and end dams to form a three-sided pan that has the front open for drainage. They are intended to divert incidental water toward the exterior, including water that may enter through the window unit or around the window (between the rough opening and the window).

Caution: The pan flashing must be integrated with other flashings and the window assembly to divert water that may otherwise penetrate to the sill framing and allow it to freely drain to the exterior. For this reason, sill pans shall not be sloped to the interior. The window, flashings and pan shall be sealed in a manner that reliably inhibits air and moisture flow to the interior.

Pan flashing can be purchased as manufactured assemblies or fabricated from waterproof materials. Pan flashing can be made from self-adhered flashing or from rigid or semi-rigid material, such as metal or a semi-rigid polymer.

3.19 *Pre-cast sill, n.* – A product used at the sill of a window opening designed with a slope for the purpose of draining water away from the window opening to the exterior of the building.

3.20 *Receptor, n.*—a device installed in a rough opening that is designed to receive the window.

3.21 *Sealant (construction), n.* –Any of a variety of compounds used to fill and seal joints or openings in wood, metal, masonry, and other materials. For the purposes of this standard practice, sealant shall have the capability of allowing for joint movement, appropriate adhesion as required for construction applications.

3.22 *Shim, n* – a device, component, or material used to raise, level, plumb, or support a window frame. Lateral shims are placed in the rough opening adjacent to the frame jambs. Setting shims are placed in the rough opening beneath the sill.

3.23 *Surface Barrier Wall Systems, n.*—systems in which the outermost surface of the wall or roof is the sole barrier to intrusion of liquid water.

Note: Barrier systems are designed to be sealed at the exterior surface to keep water out. Barrier systems rely on sealants around building penetrations to prevent moisture intrusion. Most systems make no provision for drainage of incidental moisture that does enter the system. In addition, they generally include an exterior coating that is relatively impermeable to moisture.

4.0 Significance and Use

4.1 This practice recognizes that the effective performance of installed windows is highly dependent upon following proper installation procedures and appropriate workmanship.

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

4.3 This practice recognizes that improper installation of windows may contribute to excessive air infiltration, water penetration, sound transmission, and condensation.

4.4 This practice presumes a working knowledge of applicable federal, state, and local codes and regulations; specifically, but not limited to structural and flashing requirements of applicable codes.

4.5 This standard practice presumes a working knowledge of the tools, equipment, and methods necessary for the installation of specified windows. It further requires familiarity with flashing and sealing, glazing procedures, finishes where applicable, and an understanding of the fundamentals of construction that affect the installation of windows.

4.6 This practice presumes that the windows that have been specified and furnished for the installation comply with all the applicable building codes and regulations, taking into account their location within the structure.

4.7 This standard practice recognizes that the installer must have a working knowledge and an

understanding of the fundamentals of the methods necessary for the installation and application of caulking, sealants, and coatings as required for the installation of windows, including their compatibility with other products.

5.0 Related Issues and Procedures

5.1 Continuity—Continuity shall be maintained between all elements of the surrounding wall and the window.

5.2 Joints and Anchorages—Joints and anchorages shall be designed to accommodate anticipated differential thermal expansion and contraction, as well as the structural requirements within the window/wall assembly.

5.3 Construction Sequence—Effective integration and continuity of the window and other components with the masonry walls is dependent on proper construction sequencing.

5.4 Damage during construction—Damaged, incomplete or improperly constructed masonry openings shall be repaired prior to application of any waterproofing materials and the installation of the window.

5.5 Sealant selection – Prior to using sealant, the general contractor, design professional or builder shall seek input from the sealant manufacturer regarding sealant selection. This includes proper joint design, material (chemical) compatibility, and proper adhesion to the substrates that the sealant will be in contact with.

5.5.1 Chemical compatibility of Sealants—All materials, such as but not limited to coatings, flashings and sealants that come into contact with each other shall exhibit chemical compatibility, per the AAMA 713 specification.

5.5.2 Adhesive compatibility of sealants—Adhesion of sealants to the substrates they will contact shall be verified by the sealant manufacturer peel adhesion peel ASTM C794

5.5.3 Sealant joint design- The design professional, general contractor, or builder shall consult with the sealant manufacture to ensure the sealant joint is designed to accommodate the expected joint movement between the window and the wall openings for the intended purposes.

5.5.4 Sealant performance specifications—Gunnable sealants shall comply with AAMA 808.3 per AAMA 800 section 1.4 or ASTM C920 class 25 Grade NS or greater for proper joint expansion and contraction. If preformed tapes are used, they shall meet ASTM C1281 specification. If low expansion foams are used, they shall meet the AAMA 812 voluntary practice.

5.6 Stucco and Other Cladding - Stucco and other cladding shall not be installed prior to window installation for new construction. .

5.7 Shims: Shims shall be fastened between the window frame and the opening in such a manner to support the window in a plum, level, square, and true position. Setting shims shall be made of high compression strength, waterproof material.

5.8 Compatibility — All materials such as, but not limited to, coatings, flashings and sealants that come into contact with each other shall exhibit chemical compatibility and adhesion for the intended purpose

6.0 Window Installation Procedures

6.1 Pre-Installation Inspection (Responsible trades are detailed in Appendix B)

6.1.1 Verify that the masonry rough opening is the correct size, and meets this standard practice with regard to being square, plumb and true. Remedy any discrepancies. (see photo 1)



Photo 1

6.1.2 Before installation, inspect the masonry opening for missing mortar, cracks in the sill, and any other defect which has produced a void or allows passage of liquid water through the masonry opening. Remedy any discrepancies.

6.2 Pre-Installation Requirements

6.2.1 Masonry Rough Openings

6.2.1.1 Tolerances of masonry openings shall be determined from this standard practice.

6.2.1.2 Identify sill condition method to be used; either pre-cast sill with three-sided buck or poured sill with four-sided buck. Refer to Figures 1-4 for recommended sill designs that are compatible with these window types. Pre-cast sills shall be sealed to masonry openings.

6.2.1.3 After installation of the pre-cast or poured sill, and prior to the installation of the buck, the masonry opening shall be square, plumb, and level. No more than 6 mm (1/4-inch) deviation from specified width, height, and squareness; and 3 mm (1/8-inch) deviation from plumb shall be allowed, unless otherwise specified by the manufacturer's instruction.

6.2.1.4 Treat the masonry opening surfaces with a CMU water resistant coating for the purpose of sealing the masonry window cavity from absorbing liquid water. (see photo 2)



Photo 2

The CMU water resistant coating shall be applied in accordance with the manufacturer's recommendations before the installation of buck/receptor materials. This application may include portions of the exterior masonry surface, to form one contiguous sealed area, but the coating shall not interfere with adhesion of the stucco or other cladding. (see photo 3)



Photo 3

6.3 Installation of Buck, Receptor or Similar Device.

6.3.1 Verify that after the buck is installed, the rough opening will comply with manufacturer's recommended rough opening and clearance dimensions.

6.3.2 Apply two continuous beads of sealant sufficient in size to wet both substrates or appropriate gaskets between the buck material and the masonry opening to resist the passage of liquid water between the buck and the masonry (refer to Figure 2 for bead placement). Additionally, completely seal all of the cut ends of the buck members to restrict the passage of liquid water through the corners. (see photos 4, 5 and 9)



Photo 4



Photo 5

6.3.3 Install buck members which will act as window mounting surfaces at the top and sides (Figure 3 with precast sill) (see photos 6 and 7) or all sides of the masonry opening (Figure 4 with poured sill) (see photo 8). Seal all remaining voids between buck members and masonry. (see photo 9) Use of multiple layer bucks shall not be allowed.



Photo 6



Photo 9



Photo 7



Photo 8

6.3.4 The exterior edge of the buck shall align with the sill material to create a continuous, planar mounting surface for the window flanges.

6.3.5 Anchorage of the buck to the CMU and the number, type and spacing of fasteners required for installation shall be done in accordance with the design pressures and wind-loading requirements of the local building code for applicable wind-load zones and building applications.

6.3.6 Once the bucks/receptors/devices have been attached to the CMU, apply a fillet bead of sealant sufficient in size to wet both substrates into the perimeter joint and into the joinery between the end of the buck and the masonry/sill. Tool the sealant ensuring continuity between the buck and the sill member, with no air or water gaps.

6.3.7 Where wood bucks are used, the exposed exterior edge and the return surface face of the buck shall be coated with a liquid applied waterproof coating or a self-adhering flashing membrane per AAMA 711 to restrict liquid water from penetrating. The coating shall be compatible and allow adhesion with the sealant applied to the back side of the flange later. The interior surface of the wood buck shall be left unsealed to allow drying to the interior as shown in Figures 2, 3, and 4.

6.4 Installation Procedures

6.4.1 Carefully clean and prepare the rough opening and window mounting surfaces. For applied flanges, ensure the flanges are sealed to the window frame, and that the corners are properly sealed.

6.4.2 For barrier installation: apply a continuous bead of sealant of sufficient size to wet both substrates to the exterior edge of the buck or to the back of the mounting flange at the head, jambs, and sill, to provide a

full perimeter seal between the window flange and the buck (see photo 10)



Photo 10

6.4.3 For drainage installation: apply a continuous bead of sealant of sufficient size to wet both substrates to the exterior edge of the buck or to the back of the mounting flange at the head and jambs. Apply a discontinuous bead of sealant to the exterior edge of the buck or to the back of the mounting flange at the sill. The bead of sealant at the sill flange is to have a minimum of two 50 mm (2 in) voids near the ends to permit water that has entered the window sill to exit. **Any finish applied to the sill shall not interfere with the drainage of liquid water (see photo 11)**



Photo 11

6.4.4 Before the sealant skins over, place the window into the masonry opening, seating the flange against the buck. Check that the window is plumb, level, and square and shim as necessary. Install shims in such a manner that will not interfere with a continuous interior air seal as described in paragraph 6.5 (see photo 12).



Photo 12

6.4.5 Following the window manufacturer's instruction and knowledge of the local codes and wind-load requirements, install fasteners per instruction/drawings (see photo 13)



Photo 13

6.4.6 Carefully tool the squeezed-out portion of the sealant to make it flat over the buck.

6.4.7 Apply water proof coating or self-adhered flashing over window flanges, working from sill to head in watershed fashion (see photo 14)



Photo 14

6.5 Interior Air/Water Seal

6.5.1 For Barrier Installation: on the interior, apply backer rod and a continuous perimeter bead of

sealant, an aerosol foam sealant conforming to AAMA 812, or other window manufacturer approved material to form a **continuous interior air seal**.

6.5.2 For Drainage Installation: on the interior, apply backer rod and a continuous perimeter bead of sealant, an aerosol foam sealant conforming to AAMA 812, or other window manufacturer approved material to form a **continuous interior air and water seal**. This completed interior seal and back dam shall not be compromised by the placement of attachment brackets or interior trim. Alteration of manufactured sill pans should be avoided. If sill modification is necessary for structural attachment of mullions and/or anchorage, the integrity of the air and water barrier shall be restored.

Note: To ensure adequate protection against extreme wind driven rain, it is critical that the perimeter interior air and water seal between the window and the sill pan flashing is able to withstand the induced loads. **Special care needs to be applied to the interior corners** (see photo 15)



Photo 15

6.5.3 In cases where shims cause interference with the application of the backer rod, sealant, or foam trim excess shim material to allow for a continuous air/water seal.

6.5.4 Sealant shall be tooled in such a way as to not interfere with the placement of any interior trim on the inside of the window opening.

7.0 Post-Installation Procedures

7.1 Verify that the operable sashes move freely within their frames and that weather stripping or compressible seals make full contact with mating surfaces.

8. Keywords

8.1 *Buck; CMU; Masonry Opening; Sealant; Sill pans; Window; Window installation.*

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*Fenestration Manufacturers Association (FMA)
1625 Summit Lake Drive Suite 300
Tallahassee, Florida 32317
USA
(850) 294-7963 (phone)
(850) 402-0139 (fax)*

Window and Door Manufacturers Association (WDMA)
*401 N Michigan Avenue, Suite 2200
Chicago, IL 60611
USA
(312)321-6802
(312-673-6922 (fax)*

7.2 Verify that operable hardware such as locks, cranks, latches and hinges operate properly.

7.3 After stucco or other cladding is installed on the exterior of the wall, install an exterior perimeter sealing joint between the window and the cladding using backer rod and sealant per paragraph 5.5. (See photos 16 and 17).



Photo 16



Photo 17

7.4 Drainage holes shall be inspected for blockage and freed of any obstructions to allow drainage.

7.5 Locate the window's weep holes (if present) and make sure that no trim, stucco, sills, or any accessories are interfering with drainage to the exterior.

7.6 Verify that the interior and exterior perimeter sealant joints are present and continuous.

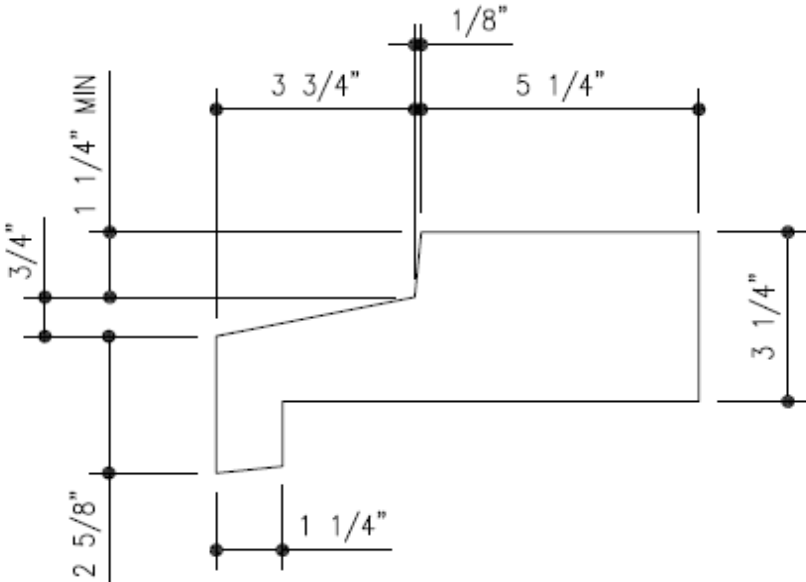
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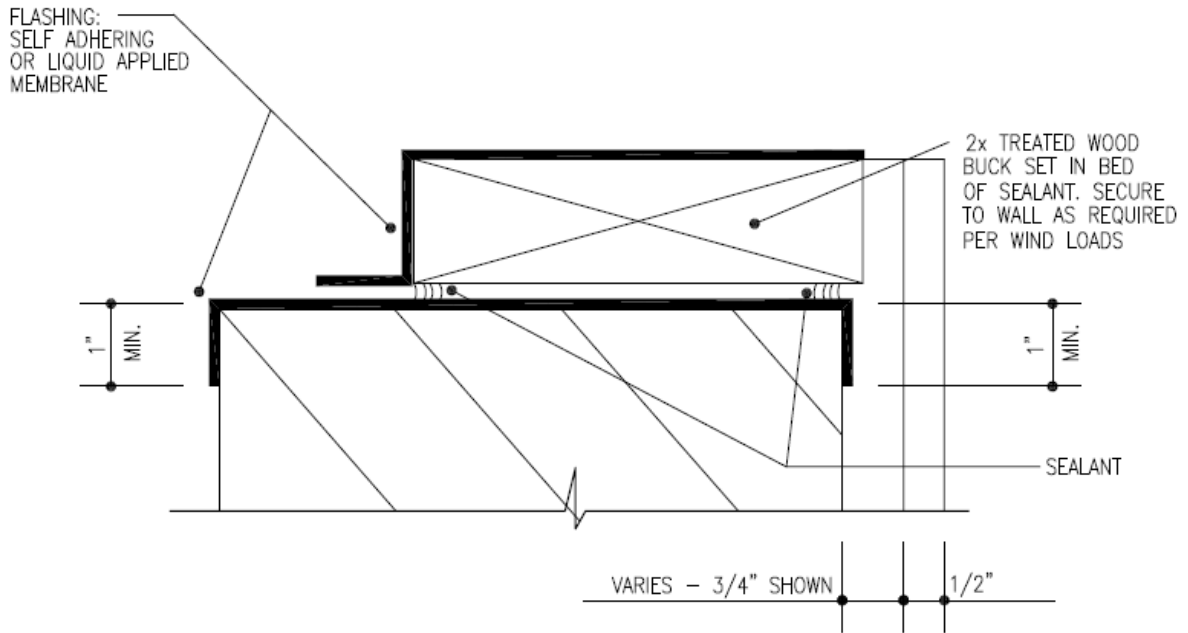


Appendix A - Figures

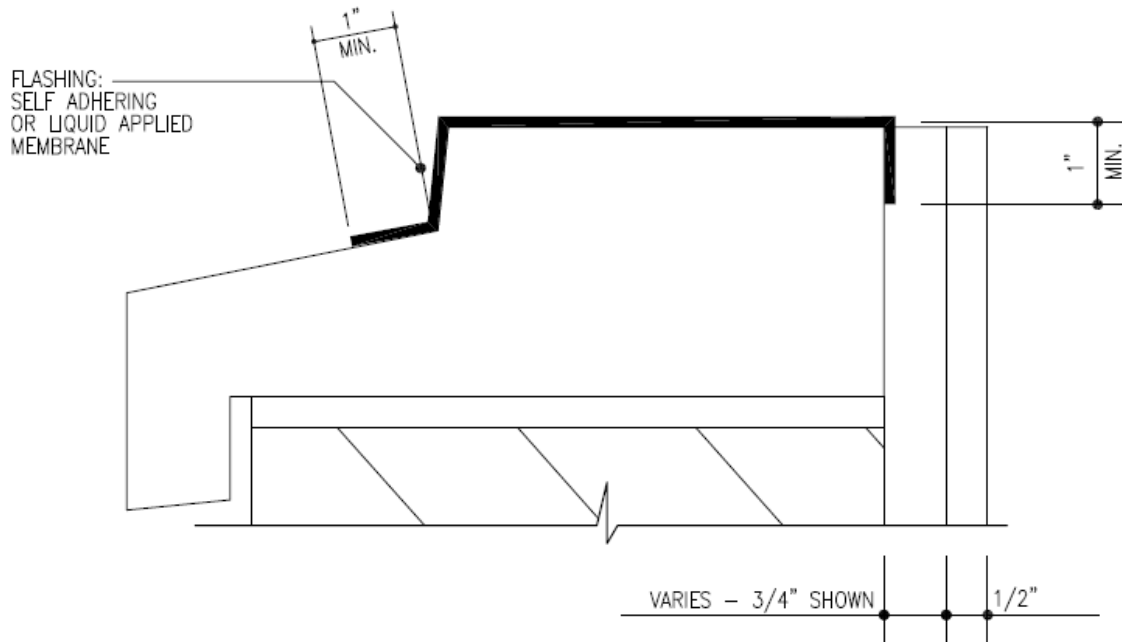


PROJECTING PRECAST SILL

Figure 1

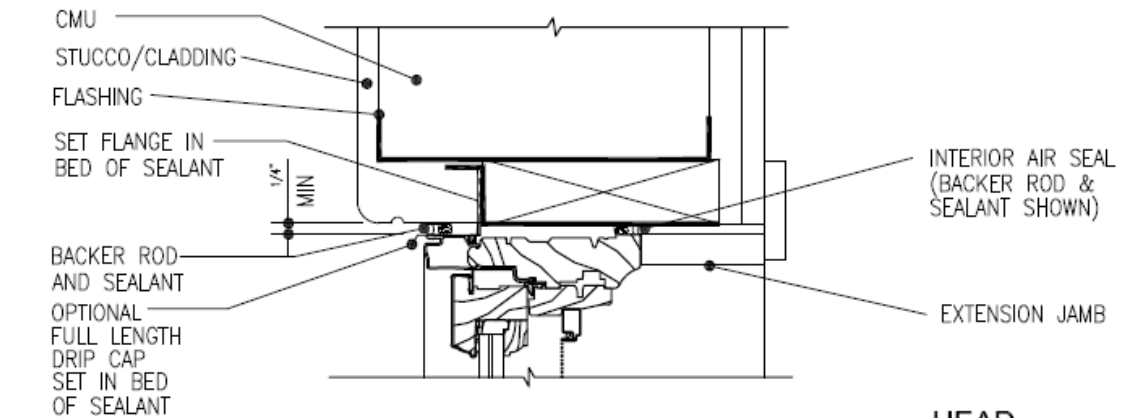


TYPICAL WOOD BUCK INSTALLATION / FLASHING DETAIL

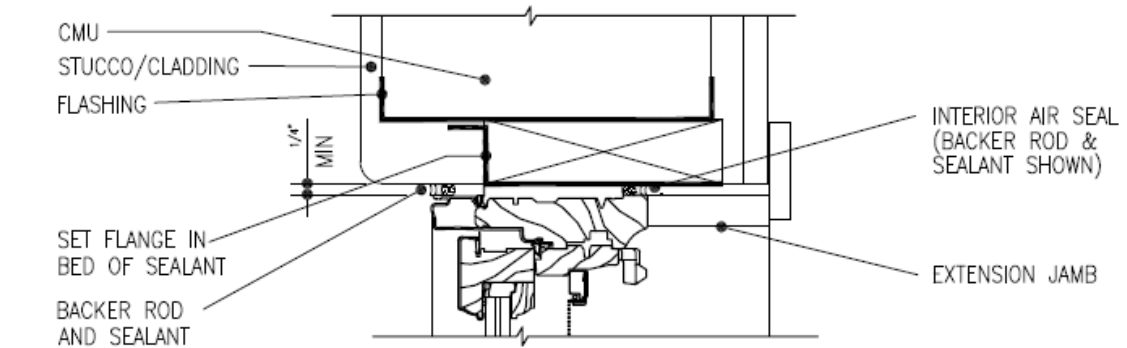


TYPICAL PRECAST SILL FLASHING DETAIL

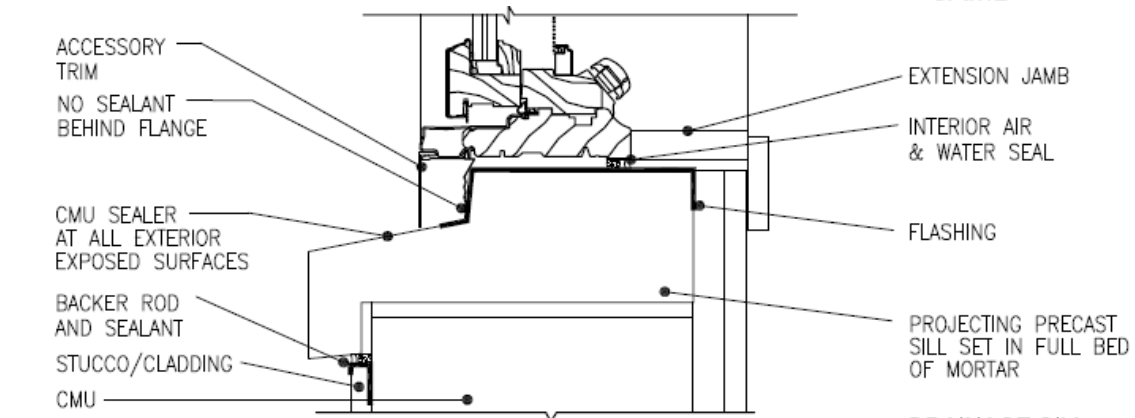
Figure 2



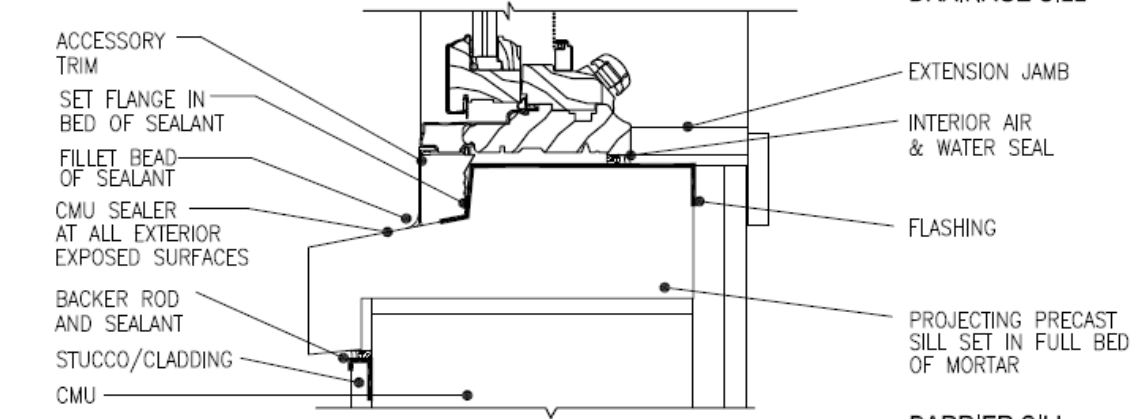
HEAD



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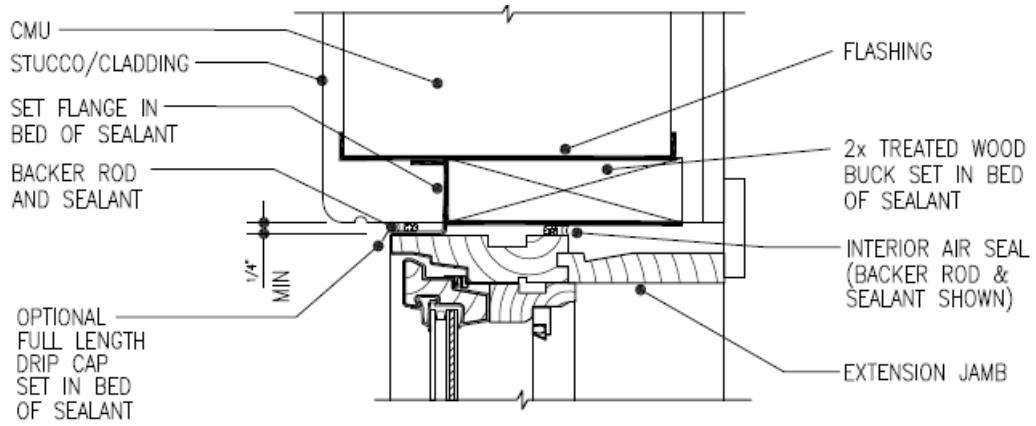
DRAINAGE SILL



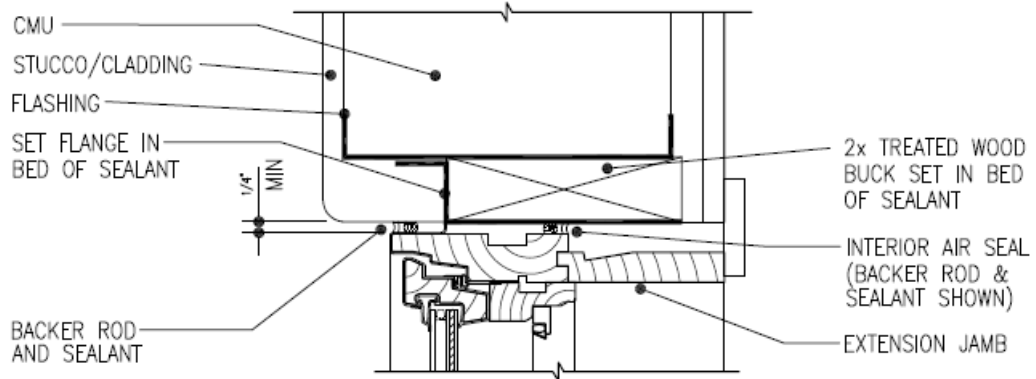
BARRIER SILL

REFER TO FIGURE 2 FOR BLOCKING/FLASHING INFORMATION

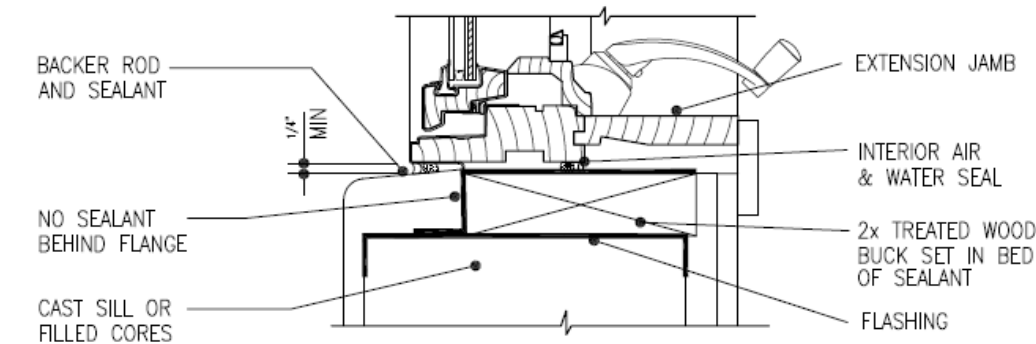
Figure 3



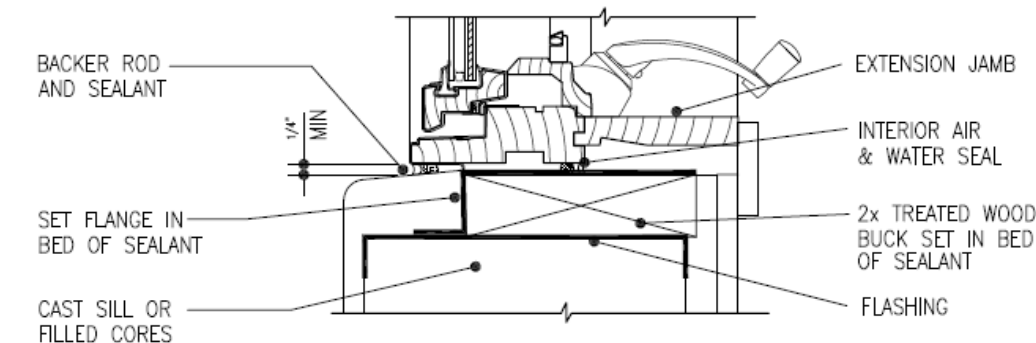
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DRAINAGE SILL



BARRIER SILL

REFER TO FIGURE 2 FOR BLOCKING/FLASHING INFORMATION

Figure 4

Appendix B

Guidelines for Determining Responsibilities of Various Entities

- B.1 This appendix provides users of this standard practice with general guidelines for determining which entities involved in construction projects are typically responsible for various tasks or functions. These guidelines are informative only and are not intended to be mandatory. It is recommended that specific responsibilities for any given project be agreed upon by all involved entities, and be documented in applicable project contracts.

- B.2 General Contractor / Design Professional – The General Contractor / Design Professional are typically responsible for:
 - B.2.1 The necessary coordination of all trades.
 - B.2.2 The proper sequencing of construction activities.
 - B.2.3. Ensuring that all masonry rough openings of the correct size, square, plumb and true, per Section 6.2.1.
 - B.2.4 Remediating any discrepancies identified by the Installation Contractor during the pre-installation inspection described in Section 6.1.
 - B.2.5 Treating the masonry opening with a CMU water resistant coating per Section 6.2.1.4.
 - B.2.6 Installing a water-proof sill per Section 6.2.1.4.
 - B.2.7 Determine and specify appropriate performance requirements of the fenestration units as required by local code per Section 4.6.

- B.3 Installation Contractor – The Installation Contractor is typically responsible for:
 - B.3.1 Conducting the pre-installation inspection of the masonry opening per Section 6.1, and notifying the General Contractor of any discrepancies.
 - B.3.2 Installing the window buck or receptor per Section 6.3.
 - B.3.3 Installing the window per Section 6.4.
 - B.3.4 Verifying the window is properly installed per Section 7.0.

- B.4 Window Manufacturer – The Window Manufacturer is typically responsible for:
 - B.4.1 Providing window products that are designed to comply with the design pressure and wind load requirements specified by the General Contractor / Design Professional for the project.
 - B.4.2 Providing suitable instructions for proper window installation.



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401N. Michigan Avenue, Suite 2200, Chicago, IL 60611
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1625 Summit Lake Drive, Suite 300, Tallahassee, FL 32317
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