

FMA/AAMA 200-12

**Standard Practice for the
Installation of Windows
with Frontal Flanges for
Surface Barrier Masonry
Construction for Extreme
Wind/Water Conditions**

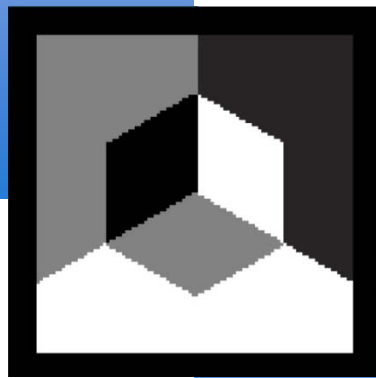




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INTRODUCTION

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

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 practice 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.*

1.0 SCOPE

1.1 This standard practice covers the installation of frontal-flanged windows into buildings with surface barrier wall construction (masonry/concrete) of no more than three stories in height. It is expected 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 and demonstrate the effectiveness of the standard practice, representative installation methods described in this standard practice have been water tested up to and including a water test pressure of 575 Pascal (12 psf) using the ASTM E331 water test (ASTM E547 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 frontal flanged windows which employ an integral or applied 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-cast sill.

1.4 This standard practice 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 shall be supplied by the window manufacturer.

1.5 This standard practice provides minimum requirements for window installation based on current best practices. Actual conditions in buildings may vary. In cases where variations occur the installer shall consult with the window manufacturer or registered design professional. If this standard practice conflicts with the manufacturer's instructions, the manufacturer's instructions shall take precedence.

1.6 This standard practice does not address safety concerns, either from the installation process or those that may be present at the building site. It shall be the responsibility of the user of this standard practice 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.

1.8 This document was developed in an open and consensus process and is maintained by representative members of the American Architectural Manufacturers Association (AAMA) and the Fenestration Manufacturers Association (FMA) as advisory information.

2.0 REFERENCED DOCUMENTS

2.1 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.

2.2 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 812-04(2010), Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations

AAMA AG-12, AAMA Glossary

2.3 ASTM International (ASTM)

ASTM C794-10, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

ASTM C920-11, Standard Specification for Elastomeric Sealant

ASTM C1281-03(2009), Standard Specification for Preformed Tape Sealants for Glazing Applications

ASTM E331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E547-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.

2.4 Fenestration Manufacturers Association (FMA) and AAMA

FMA/AAMA 100-12, Standard Practice for the Installation of Windows with Flanges or Mounting Fins in Wood Frame Construction for Extreme Wind/Water Conditions

3.0 DEFINITIONS

3.1 Please refer to AAMA Glossary (AG-12) for all definitions except for those appearing below (which apply only to this standard practice).

AIR SEAL, *n.* – A seal put into the air gap area around the interior side, exterior side, or both sides of the window perimeter to restrict infiltration or ex-filtration of air past the window.

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.

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.

BARRIER WALL, n. – A wall system that is intended to manage all water at the exterior surface.

BUCK, n. – A code compliant framework built into a window opening in a concrete or masonry wall to which the window frame is secured.

CONCRETE MASONRY UNIT (CMU), n. – A pre-cast masonry block used to construct walls.

COMPATIBILITY, n. – When materials maintain physical and functional properties while in direct contact or close proximity to each other.

END 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.

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

FRONTAL FLANGE a.k.a. 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.

LIQUID APPLIED FLASHING, n. – A material that is fluid at the time of application that provides a water-resistive seal around building openings at or near the interface between the through-wall penetration (i.e., window) and the building envelope and meets the performance requirements of AAMA 714.

MASONRY OPENING, n. – That portion of a masonry wall which is left open, providing for the installation of a window.

PAN FLASHING, a.k.a. SILL PAN, n. – A type of flashing used at the base of a rough opening to divert water to the exterior or to the exterior surface of a concealed WRB. Pan flashings have upturned legs at the rear interior edge (back dam) and right and left sides (end dams), to form a three-sided pan that has the front open for drainage. They are intended to collect and drain water toward the exterior, including water that may enter through the window unit or around the window (between the rough opening and the fenestration).

CAUTION: *The pan flashing shall be integrated with other flashings and the window assembly to capture 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 made from self-adhered flashing or from rigid or semi-rigid material, such as metal or a semi-rigid polymer.

PRE-CAST WINDOW SILL a.k.a. WINDOW SILL, n. – A product used at the sill of a window masonry opening designed with a slope for the purpose of draining water away from the window masonry opening to the exterior of the building.

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 and appropriate adhesion as required for construction applications.

SHIM, n. – A material used to raise, level or plumb 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.

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

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

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

4.4 This standard practice presumes the installer/contractor has a working knowledge of applicable federal, state and local codes and regulations; specifically, but not limited to, structural and flashing requirements based on the applicable codes.

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

4.6 This standard practice presumes that the windows supplied have been specified and furnished for the installation and 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 the 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 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 wall is dependent on proper construction sequencing.

5.4 DAMAGE DURING CONSTRUCTION

Masonry openings which have any cracked, missing/misaligned or damaged masonry, pre-cast sill, mortar joints or missing blocks shall be repaired or replaced 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 voluntary test method.

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 per ASTM C794.

5.5.3 Sealant Joint Design

The design professional, general contractor or builder shall consult with the sealant manufacturer to ensure the sealant joint is designed to accommodate the expected joint movement between window and the wall opening for the intended purpose.

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 the ASTM C1281 standard test method. 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 made of high compression strength plastic or hardwood materials. Shims shall be fastened between the window frame and the opening in such a manner to support the window in a plumb, level, square and true position.

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 meets this standard with regard to being the correct size, square, plumb and true (see Figure 1). Remedy any discrepancies.

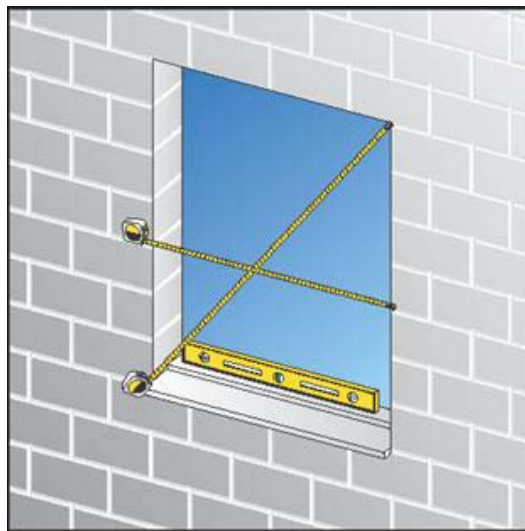


FIGURE 1

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 Size and tolerances of masonry rough openings shall be determined from the window manufacturer's instruction and this standard practice.

6.2.1.2 The masonry opening shall be plumb, level, square and true prior to the installation of the window. No more than 6 mm (1/4 in) deviation from square, height and width and 3 mm (1/8 in) deviation from plumb shall be allowed, unless otherwise specified by the manufacturer's instruction.

6.2.1.3 Verify the correct installation of the pre-cast sill or cast sill in place. Refer to Figure A1 (see Appendix A) for recommended sill type design that is compatible with these window types. Representative head, jamb and sill details are shown in Figure A2 in Appendix A.

6.2.1.4 Treat the masonry opening, including the sill (sub-sill) area, with a liquid applied flashing for the purpose of protecting the masonry rough opening cavity from liquid water intrusion. The seal shall be applied before the installation of the buck/receptor materials. The liquid applied flashing shall be applied in accordance with the manufacturer's recommendations. The liquid applied flashing application shall include the rough opening return, to form one continuous sealed area (see Figures 2 & 3). Using a compatible sealant or liquid applied flashing, ensure the corner joints are properly sealed (see Figure 4). Optionally, application to the interior face around the perimeter of the masonry rough opening provides additional protection. The seal performance shall meet local wind exposure requirements and shall not interfere with adhesion of the exterior façade.

NOTE 2: *in the event that adhesion of the surface applied stucco to the liquid applied flashing is a concern, it is acceptable to coat only the portion of the masonry rough opening that will not be in direct contact with the surface applied stucco exterior façade.*



FIGURE 2



FIGURE 3

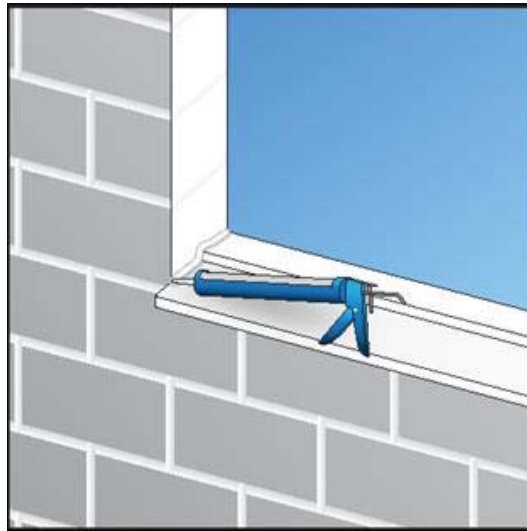


FIGURE 4

6.3 INSTALLATION OF BUCK

6.3.1 Install a window buck which will act as a mounting surface on both sides and the top for the seating of the window into the masonry opening. Use of multiple layer bucks shall not be allowed.

6.3.1.1 The buck shall be installed in such a fashion that there are no edge gaps exceeding 3 mm (1/8 in) between the buck and the masonry sill member.

6.3.1.2 If a sill pan/subsill is used, the buck shall be cut and coped as required to fit snugly on top of the subsill without causing interference with the end dams.

6.3.2 Prior to installation of the buck, apply liquid applied flashing or sealant to all buck surfaces that will be in direct contact with the masonry rough opening (see Figure 5), to prevent the passage of liquid water behind the buck .

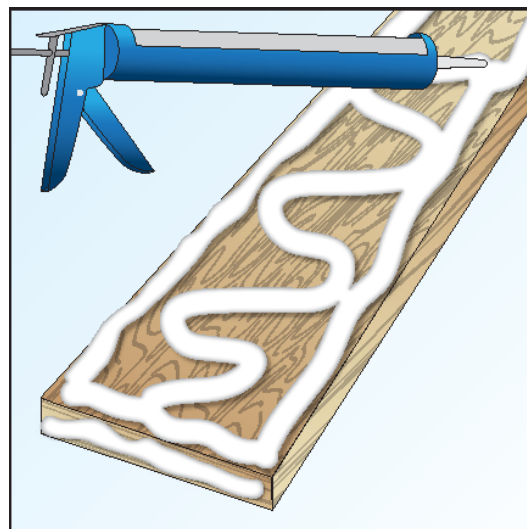


FIGURE 5

6.3.3 The exterior face of the bucks shall align with the sill material to create a continuous, planar mounting surface for the window flanges (see Figure 6).

6.3.3.1 Anchorage of the buck into the masonry rough opening shall be done in accordance with the local wind loading requirements or applicable code.

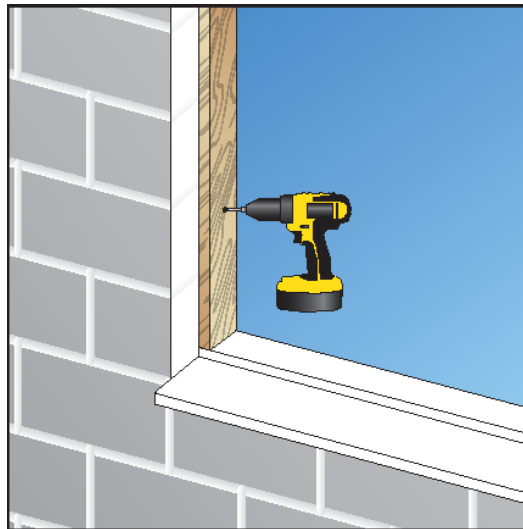


FIGURE 6

6.3.3.2 Once the bucks have been attached to the masonry rough opening. Apply a fillet bead of sealant into the perimeter joint, and into the joinery between the end of the buck and the masonry/sill (see Figures 7 & 8). Tool the sealant, ensuring continuity between the buck and the sill member, with no air or water gaps.



FIGURE 7



FIGURE 8

6.3.3.3 The exposed exterior face of buck and the return surface of the jambs shall be coated with a liquid applied flashing or a self-adhering flashing membrane per AAMA 711 to restrict liquid water from penetrating (see Figures 9 & 10).

***NOTE 3:** in the event that adhesion of the surface applied stucco to the water resistant coating is a concern, it is acceptable to coat only the portion of the masonry rough opening that will not be in direct contact with the surface applied stucco exterior façade.*



FIGURE 9



FIGURE 10

The liquid applied or self-adhering flashing shall be compatible to 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.

6.4 WINDOW INSTALLATION PROCEDURES

6.4.1 Carefully remove any loose construction debris from the buck and sill areas and make sure it is clean and ready for installation of the window.

6.4.2 Inspect and clean the back side (interior surface) of the exterior window flange. Look for any sealant gaps or misaligned welding at the corner joinery. If corner seals are missing in whole or part, contact the window manufacturer for remedy.

6.4.3 After cleaning the window flanges, carefully run a continuous 9 mm (3/8 in) nominal diameter bead of sealant up both jamb sides and across the head of the back surface (interior face) of the window flange. Connect that bead of sealant across any joinery on the window frame at all four corners (see Figure 11). Alternatively sealant can be applied to the exterior edge of the buck (see Figure 12). (Refer to Section 1.4 when alternate procedures are prescribed by the manufacturer.)

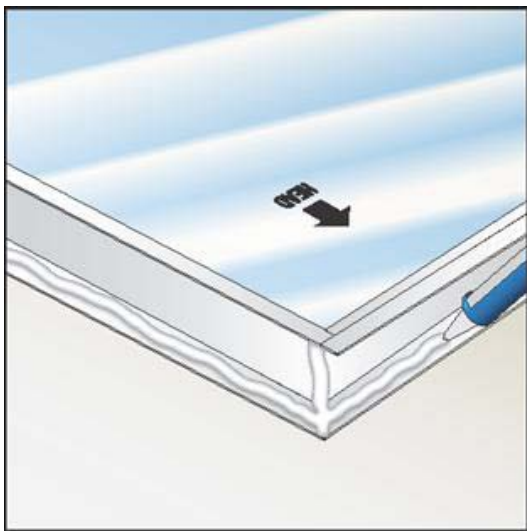


FIGURE 11



FIGURE 12

6.4.4 For drainage installation methods, apply a discontinuous bead of sealant on the interior surface of the flange at the sill (see Figure 13) or to the exterior edge of the buck (see Figure 14).

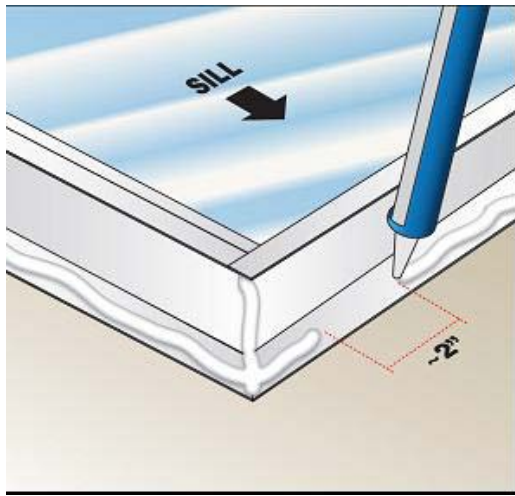


FIGURE 13

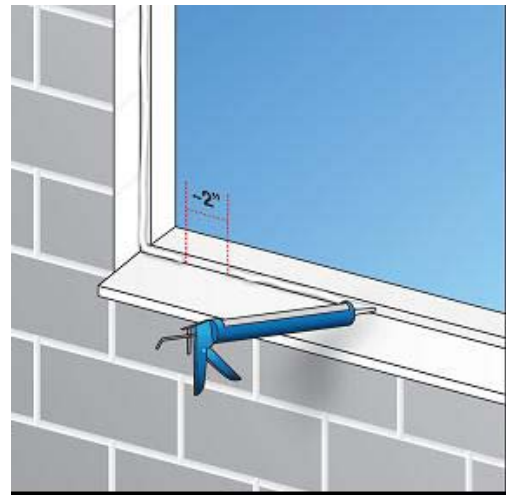


FIGURE 14

The bead of sealant at the sill shall have a minimum of two 50 mm (2 in) voids near the ends, which will allow any liquid water that has entered the window opening to exit easily.

6.4.4.1 Any exterior finish applied to the sill shall not interfere with the drainage of liquid water. The water must be allowed to drain to the exterior surface of the façade.

6.4.4.2 Barrier installation methods shall apply a continuous bead of sealant on all four sides of the interior surface of the flange or exterior edge of the buck.

6.4.5 Before the sealant skins over, place the window into the masonry opening, seating the flange against the buck.

6.4.5.1 Hold the window temporarily in place and check that the window is set plumb, level, square and true and then shim as necessary.

6.4.5.2 Install shims in such a manner that they will not interfere with the application of an air seal which will be applied on the interior side in the steps that follow.

6.4.6 Install fasteners to secure the window in place (see Figure 15) based on the following criteria:

- Manufacturer's instructions
- Adherence to local codes
- Wind-load requirements



FIGURE 15

6.4.6.1 When penetration of the CMU or masonry material is required for structural integrity the installer shall use the manufacturer's specified fasteners.

6.4.7 Recheck the window to ensure that the window is installed plumb, level, square and true to the tolerance specified by the manufacturer (Figure 16).



FIGURE 16

6.4.8 From the exterior, tool the squeezed-out portion of the sealant to make it flat over the wood buck, ensuring that there is no interference with the installation of the cladding or stucco after it has been anchored.

6.4.8.1 In cases where the buck is still exposed on the exterior side after the installation of the window, sealant shall be reapplied (see Figure 17) and then tooled over the wood to ensure full coverage in accordance with Sections 6.3.3.1 and 6.3.3.2.



FIGURE 17

6.4.9 On the interior, apply a backer rod and a continuous interior perimeter bead of sealant, or an aerosol foam sealant without backer rod conforming to AAMA 812 (see Figures 18a and 18b), or other window manufacturer approved material, between the window and the buck to ensure a water resistant interior air seal around the entire perimeter of the window.

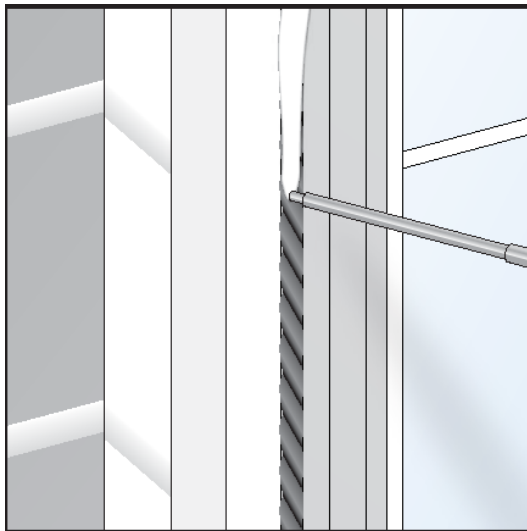


FIGURE 18a

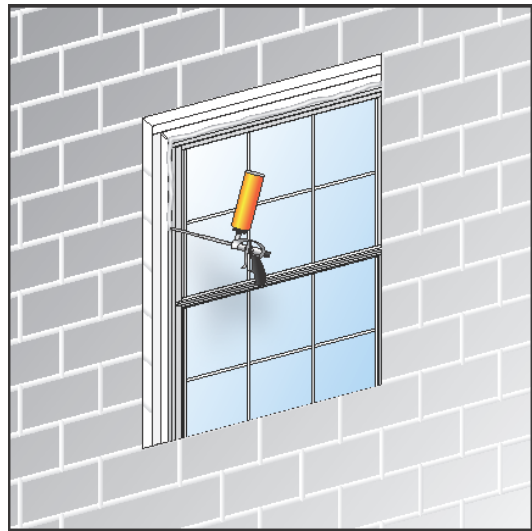


FIGURE 18b

6.4.9.1 In cases where shims cause interference with the application of the backer rod or sealant, trim excess shim material to allow for a continuous air/water seal (see Figure 19).

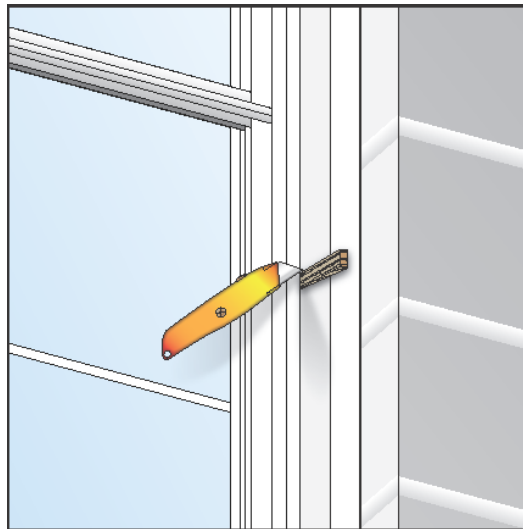


FIGURE 19

6.4.9.2 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.

6.4.9.3 To ensure adequate protection against extreme wind/water conditions, 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.

6.4.10 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 Section 5.5.

7.0 POST-INSTALLATION PROCEDURES

7.1 Verify that the window frame and sash are installed plumb, level, square and true within the manufacturer's specified tolerances

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

7.3 Verify that operable hardware such as locks, cranks, latches and hinges operate smoothly, and that all locking mechanisms engage and operate properly. When included as part of the window package, ensure components, screens, grills, trim or other accessories fit and function properly.

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

7.5 Locate the window's weep holes and make sure that no trim, stucco, sills, or any other appendage is either closing, blocking, or interfering with the weep holes of the window, which provide drainage to the exterior. Verify that the interior and exterior perimeter sealant joints are present and continuous.

8.0 KEYWORDS

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

APPENDIX A: FIGURES AND PHOTOS

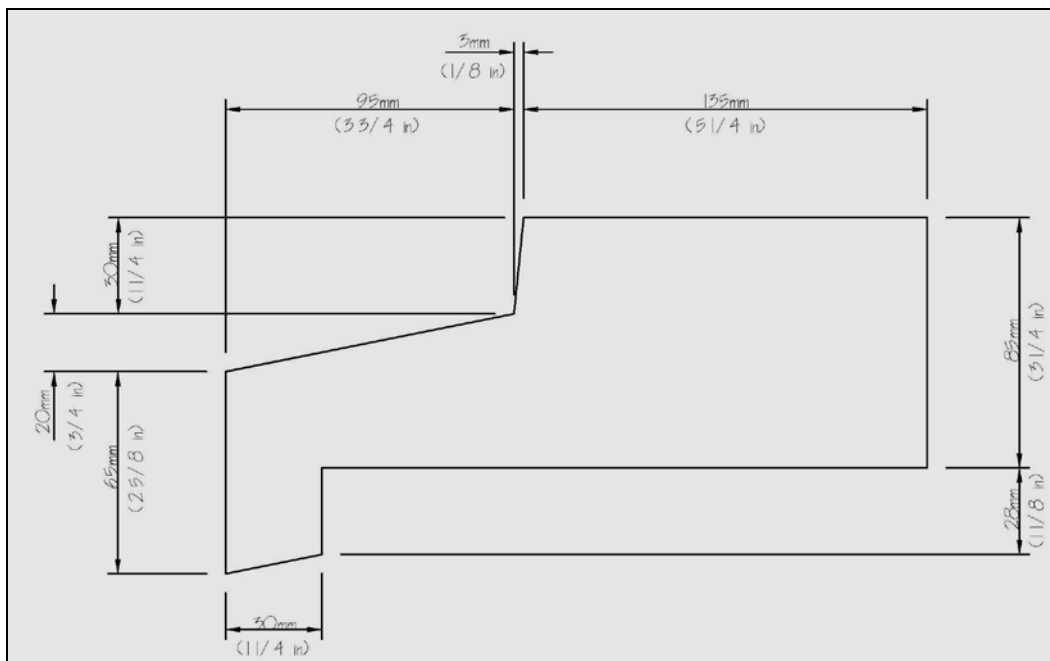


FIGURE A1: Projecting Precast Sill (Typical dimensions)

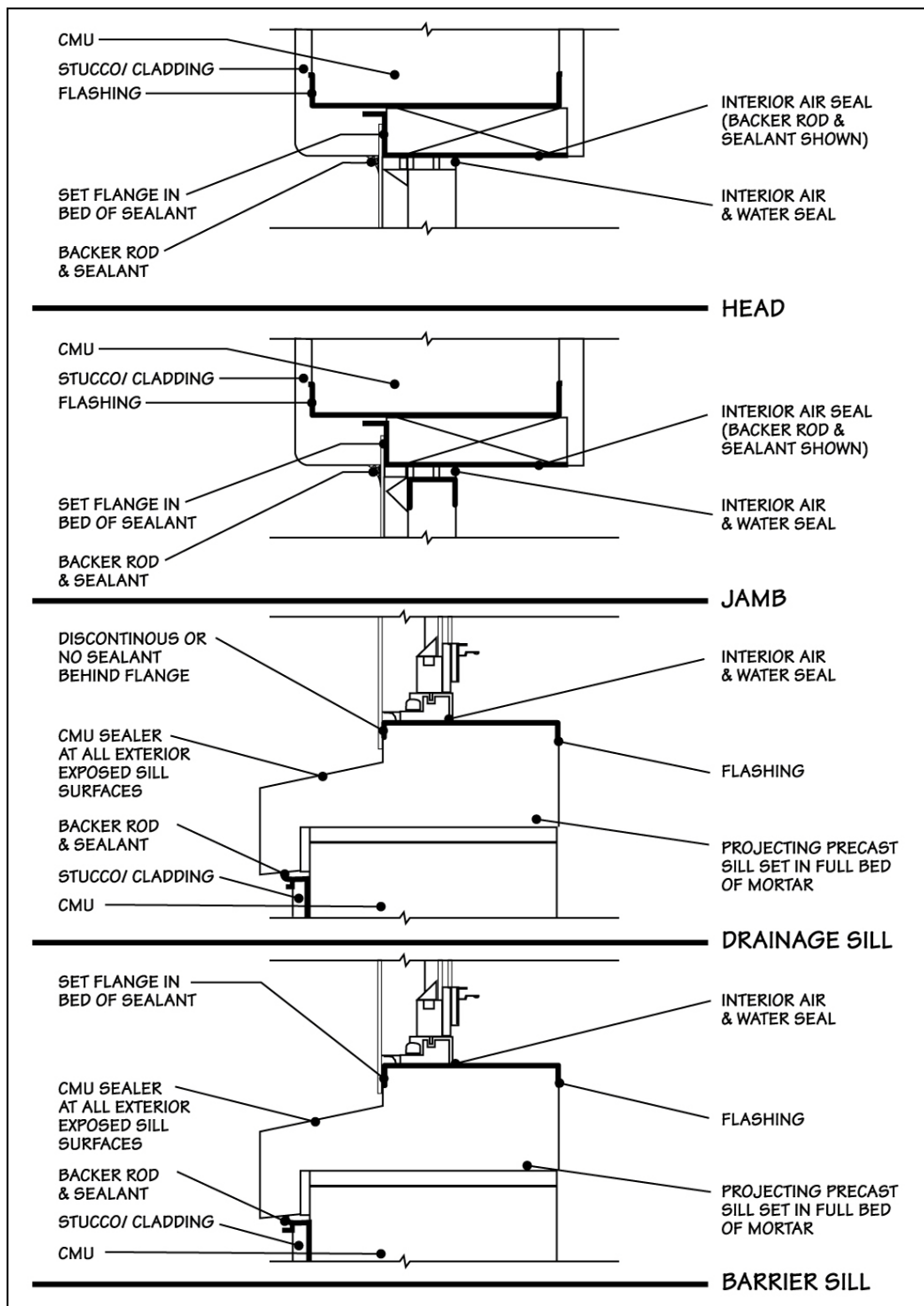


FIGURE A2: Representative Window Installation Details

APPENDIX B: GUIDELINES FOR DETERMINING RESPONSIBILITIES OF VARIOUS ENTITIES

B1.0 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.

B2.0 GENERAL CONTRACTOR/DESIGN PROFESSIONAL

The General Contractor/Design Professional is typically responsible for the following:

B2.1 The necessary coordination of all trades.

B2.2 The proper sequencing of construction activities.

B2.3 Ensuring that all masonry rough openings of the correct size, square, plumb and true, per Section 6.2.1.

B2.4 Remediating any discrepancies identified by the Installation Contractor during the pre-installation inspection described in Section 6.1.

B2.5 Treating the masonry opening with a CMU water resistant coating per Section 6.2.1.4.

B2.6 Installing a water-proof sill per Section 6.2.1.5.

B2.7 Determine and specify appropriate performance requirements of the fenestration units as required by local code per Section 4.6.

B3.0 INSTALLATION CONTRACTOR

The Installation Contractor is typically responsible for the following:

B3.1 Conducting the pre-installation inspection of the masonry opening per Section 6.1 and notifying the General Contractor of any discrepancies.

B3.2 Installing the window buck or receptor per Section 6.3.

B3.3 Installing the window per Section 6.4.

B3.4 Verifying the window is properly installed per Section 7.0.

B4.0 WINDOW MANUFACTURER

The Window Manufacturer is typically responsible for the following:

B4.1 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.

B4.2 Providing suitable instructions for proper window installation.

Changes from FMA/AAMA 200-09 to FMA/AAMA 200-12

- Various editorial changes were made
- All Figures were updated throughout the document for clarification purposes and continuity with FMA/AAMA 100-12
- Section 6.2.1.4 was updated to reference the sill area and an optional application to the interior face around the perimeter of the masonry.
- Added a new Section 6.3.3.1 regarding anchorage of the buck into the masonry rough opening
- Added a new NOTE 3
- Removed old Section 6.4.4.1



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