TIPS AND TRICKS TO A "GREAT" WINDOW INSTALLATION

MANUFACTURER'S RECOMMENDATION OF A HIGH PERFORMANCE WINDOW INSTALLATION

IN ACCORDANCE WITH THE DEPARTMENT OF LABOR AND INDUSTRY'S STATUTE 326.0981, SUBD. 11,

"THIS EDUCATIONAL OFFERING IS RECOGNIZED BY THE MINNESOTA DEPARTMENT OF LABOR AND INDUSTRY AS SATISFYING **1 HOUR** OF CREDIT TOWARD **BUILDING OFFICIALS AND RESIDENTIAL CONTRACTORS** CONTINUING EDUCATION REQUIREMENTS."

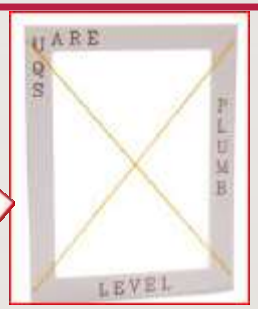
FOR ADDITIONAL CONTINUING EDUCATION APPROVALS, PLEASE SEE YOUR CREDIT TRACKING CARD.

BASIC PRINCIPLES TO A GOOD INSTA;LL

- **The basic concept for dealing with punched openings is straightforward:**
- **• Connect the water control layer of the wall to the water control layer of the window or door.**
- **• Connect the air control layer of the wall to the air control layer of the window or door**
- **• Connect the vapor control layer of the wall to the vapor control layer of the window or door.**
- **• Connect the thermal control layer of the wall to the thermal control layer of the window or door.**
- **• Install the window or door plumb, level and square.**
- **• Don’t let the wind suck or push the window or door out of the wall.**

TOOLS FOR THE WINDOW INSTALLATION TRADE

- Mulling
- Bracketing
- Through Jamb
- Shimming
- Squaring
- Level, Plumb, Square, and True



WINDOW INSTALLATION

- You chose a great Window But!!! Remember the following:
  - The Window is only as good as the Install
  - What are WE going to do about the Install (research) all involved here
  - What do you want to work? WALL or WINDOW (both, with the attention to DETAIL)

IN REFERENCE TO AND RECOMMENDED

- ASTM E2112-07

Manufacturer

Designation: E 2112 – 07

Standard Practice for Installation of Exterior Windows, Doors and Skylights[1]

This standard is issued under the fixed designation E 2112; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This document is intended to provide technical guidance to organizations that are developing training programs for installers of fenestration units in low-rise residential and light commercial structures. The majority of fenestration units selected for installation in these types of structures are certified as meeting specified performance characteristics in standardized laboratory testing. Experience indicates, however, that the performance of fenestration installations is frequently significantly inferior to the performance of the manufactured units in laboratory testing. Installation of fenestration units can significantly influence in-service performance.

The requirements promulgated in this practice have, by consensus, (of individuals with specialized knowledge concerning installation of fenestration units) been identified as necessary to ensure that as-installed performance is roughly equivalent to performance in laboratory testing. The task group responsible for development of this practice recognizes that building owners sometimes, accept as adequate, in-service performance of fenestration installations that are significantly inferior those of the units in laboratory testing. This practice is not intended for use in such circumstances, where owner expectations are modest. The intent of this practice is to provide guidance to those concerned with ensuring that as-installed performance is comparable to the capabilities of the units installed for a solid majority of installations.

A particularly noticeable behavior that indicates deficiencies in installation is rainwater leakage. Rainwater leakage has been the leading reason for dissatisfaction of building owners with performance of fenestration installations. For this reason, this practice places greater emphasis on preventing or limiting rainwater leakage than on any other single performance characteristic.

This practice emphasizes that the water-shedding surfaces of fenestration units must be adequately integrated with adjacent water-shedding surfaces of the building envelope. It does not, however, attempt to promulgate requirements for water-shedding surfaces of building envelopes other than those interfacing with fenestration units. The standard assumes that the basic design of the building's water-shedding system is adequate, that is, that either (*1*) there is a high probability that the outermost building surface will dependably prevent all water entry, or (*2*) the building envelope incorporates an effective concealed barrier that will dependably prevent further intrusion of incidental water that breaches the outermost surface. The practice further assumes that fenestration units can be dependably sealed to, and integrated with, at least one of these surfaces. If the basic design of the building's water-shedding system is inadequate, or does not allow for reliable integration of fenestration units into it, competent installation of the units is unlikely to nullify these deficiencies.

1. Scope

1.1 This practice covers the installation of fenestration products in new and existing construction. For the purpose of this practice, fenestration products shall be limited to windows, sliding patio-type doors, swinging patio type doors, and skylights, as used primarily in residential and light commercial buildings.

1.2 This practice assumes that the installer possesses basic woodworking skills and an understanding of wall and roof construction, sheet metal work, and joint sealant practices.

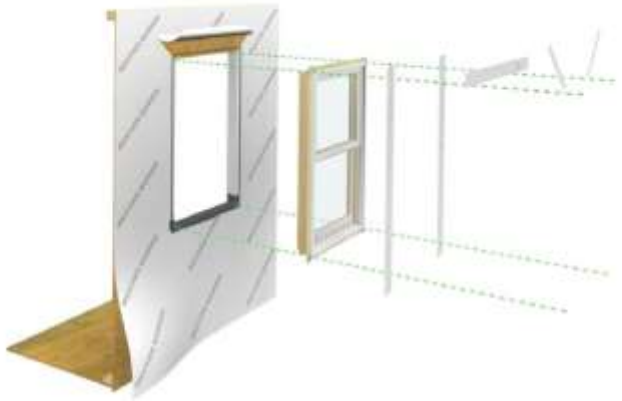
1.3 This practice attempts to instruct and familiarize the installer with the concepts of both Barrier Systems and Membranes/Drainage Systems, in order to ensure the continuity

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.51 on Performance of Windows, Doors, Skylights and Curtain Walls.

Current edition approved Feb. 1, 2007. Published March 2007. Originally approved in 2001. Last previous edition approved in 2006 as E 2112 – 06.

Clad Window Installation

Standard Wood Frame Construction



These instructions are applicable for the following aluminum clad window products:

Clad Ultimate Casement Family	Clad Round Top
Clad Tilt-Turn/Inswing Casement/Hopper	Clad Polygon
Clad Ultimate Double Hung Family	Clad Glider

ABSTRACT: Please read these instructions in their entirety before beginning to install your Marvin window product. These installation instructions demonstrate the installation of a Marvin aluminum clad window in new wood frame construction using an industry approved water management system. For installation using other construction methods, such as remodeling, replacement, and recessed openings refer to "ASTM E2112-01, Standard Practice for Installation of Exterior Windows, Doors and Skylights," for installation suggestions. Information for ASTM E2112 can be found on the ASTM website, www.astm.org.

For product specific issues, service instructions and other field service guides, refer to the Marvin Service Manual, visit our website at www.marvin.com, or contact your Marvin representative.

Regional standard practices, environmental conditions, and codes may vary and supersede the procedures contained within. The responsibility for compliance is yours: the installer, inspector, and owner(s).

The procedures within these instructions are consistent with those used in testing to achieve the advertised DP rating.

TYPE OF CONSTRUCTION

- **New Construction**
- **Full Frame Replacement Window**
- **Insert Window Retrofit**

Type of Barrier

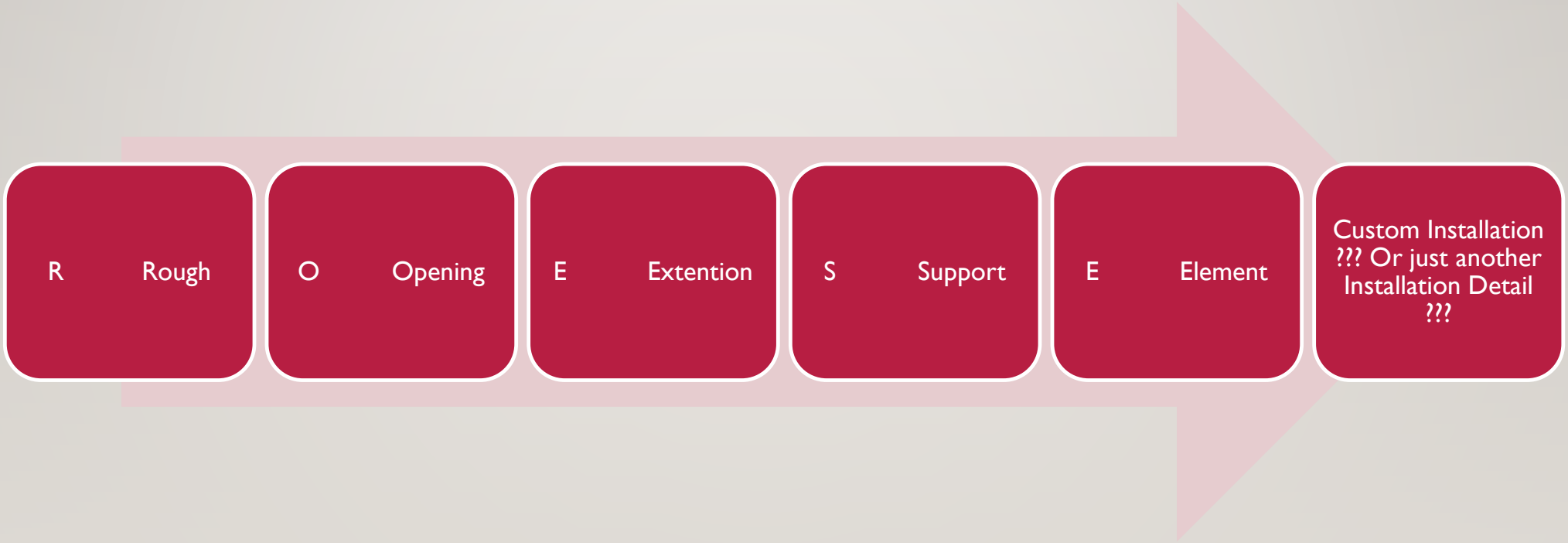
- **Surface Barrier**
- **Membrane Drainage**

HIH PERFORMANCE OPENINGS HOW DO I FIND EFFECTIVE WINDOW INTERFACE???

HIH PERFORMANCE OPENINGS HOW DO I FIND EFFECTIVE WINDOW INTERFACE???

- Build the Wall
- Buck or no Buck Structural Interface
- Window Placement Recessed or protruding exterior wall cladding
- What is my Exterior Drainage Plane?
- What are my expectations in regards to efficiencies and operation

R.O.E.S.E.

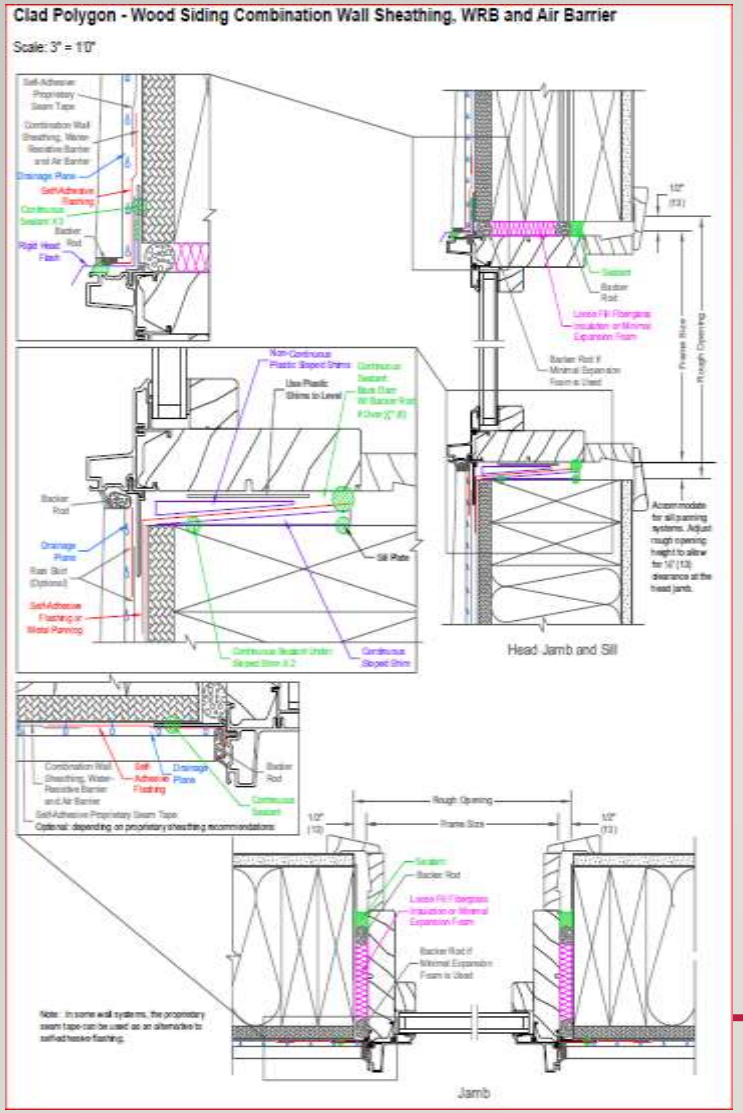

R Rough
O Opening
E Extention
S Support
E Element
Custom Installation ??? Or just another Installation Detail ???

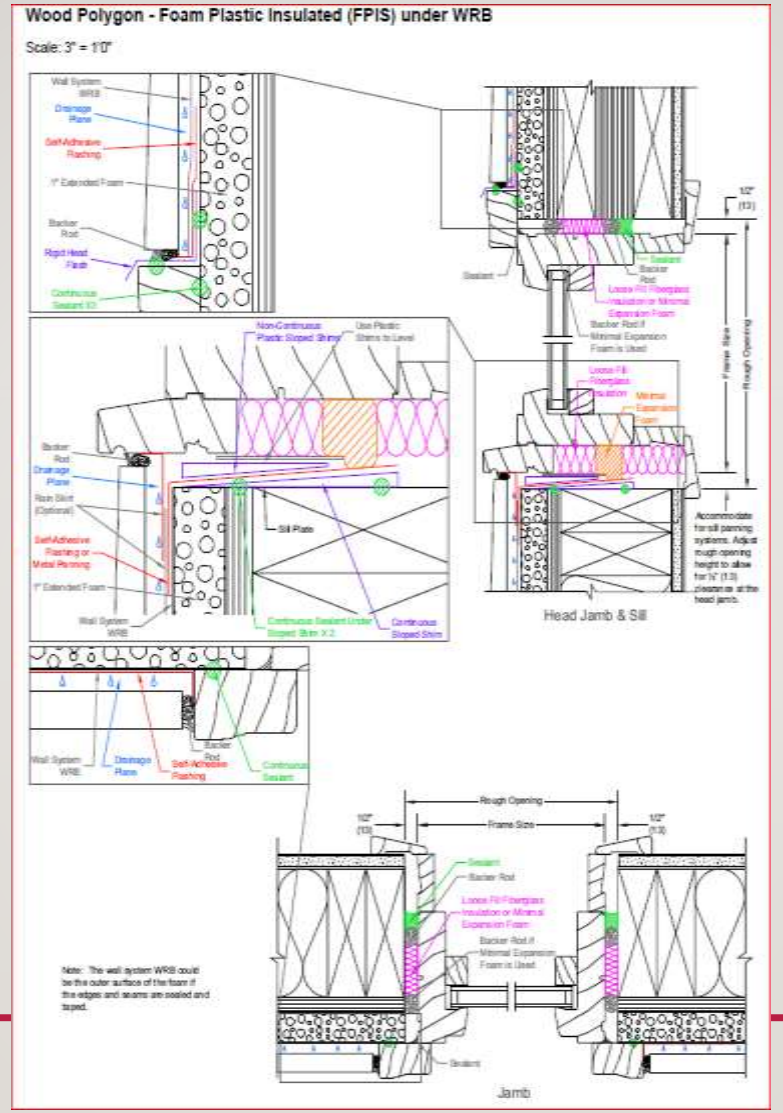
ICF WALLS---------DOUBLE BUCK---------EFFICIENCY'S

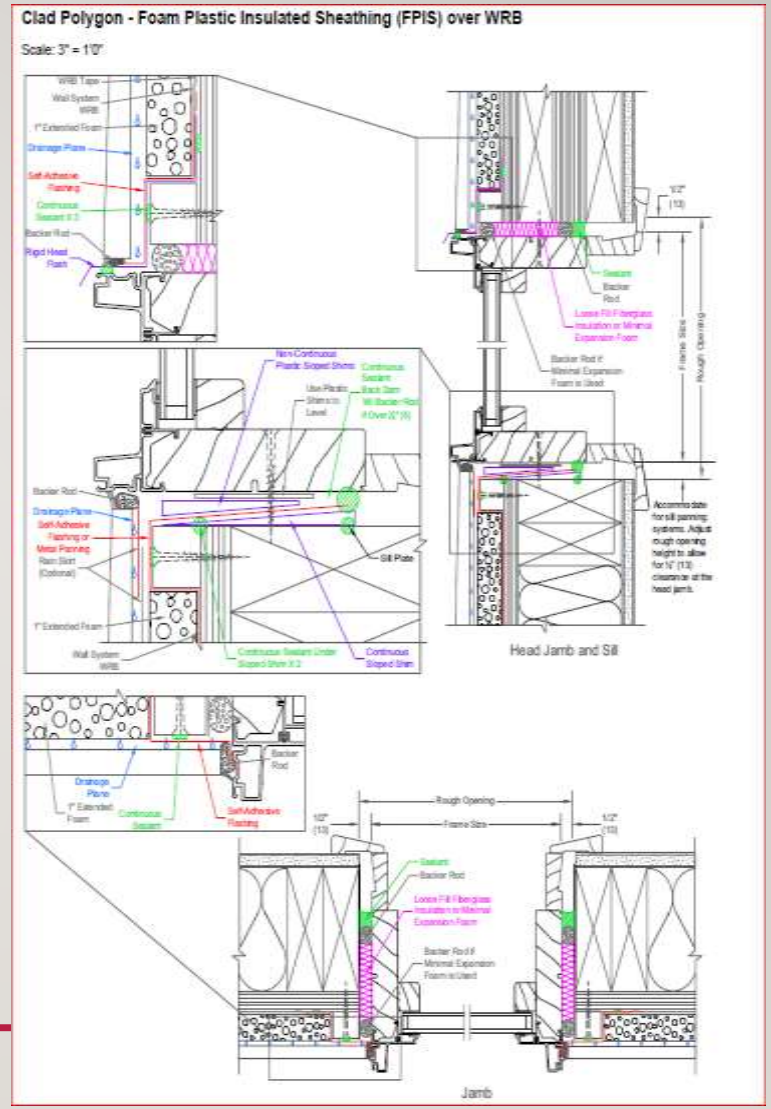
INTERFACING THE WINDOW TO THE CONDITION

WHAT ABOUT THOSE MULLS???

DETAIL TO WALL
INTERFACE AND EFFECT EXTERIOR DRAINAGE PLANE



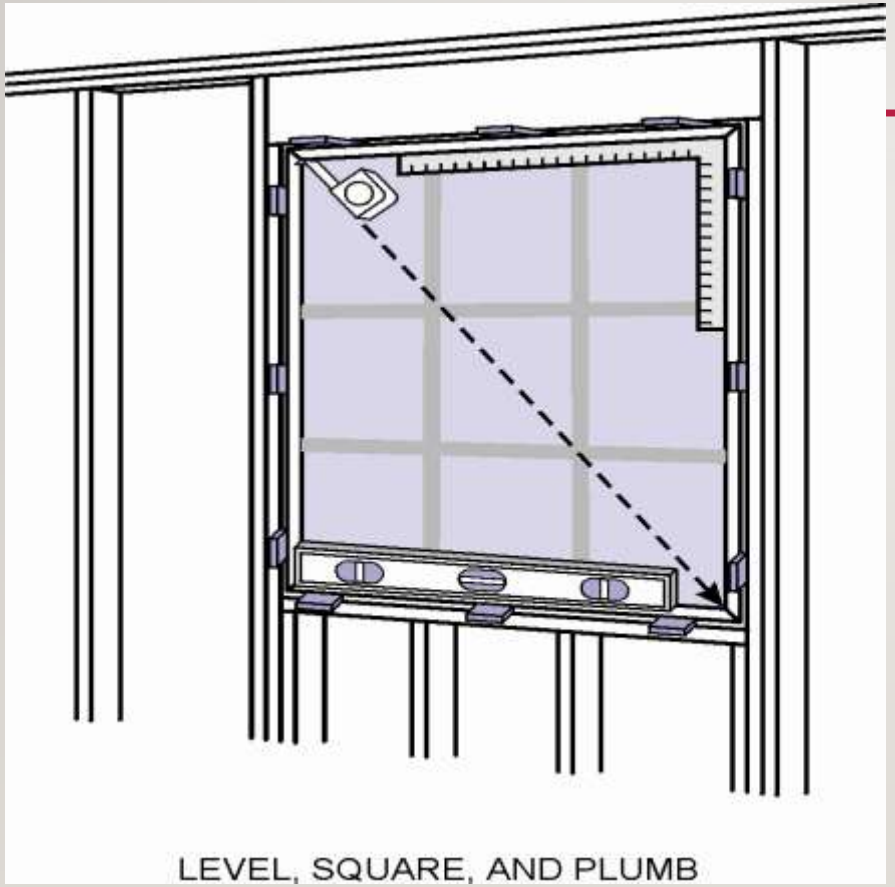




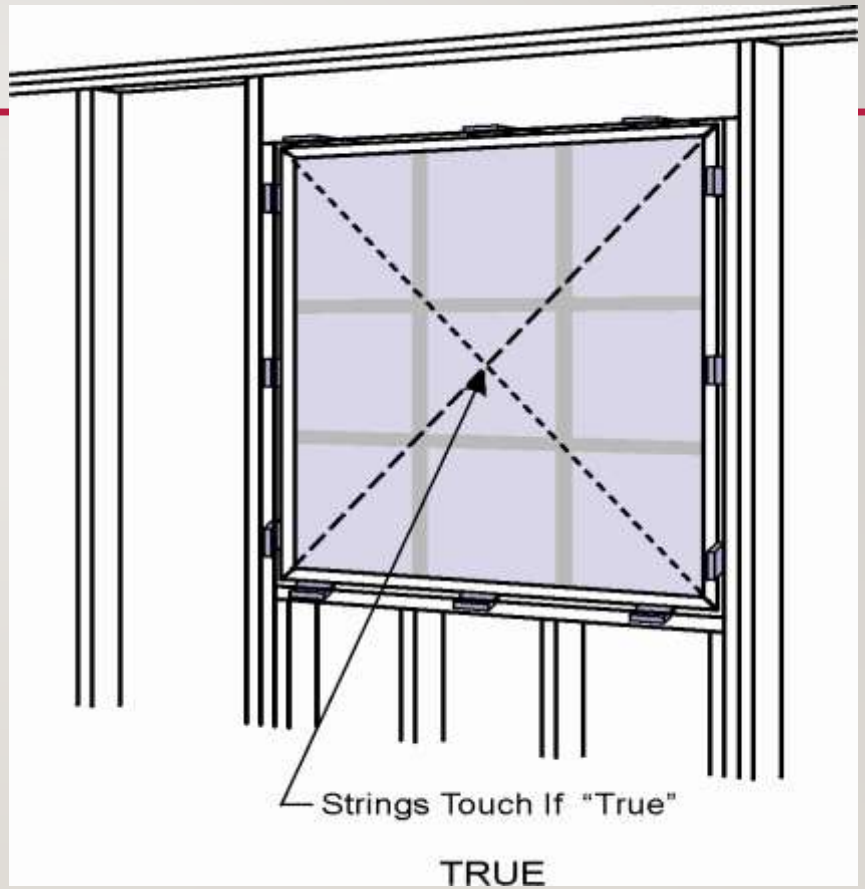
ADM "CONSTRUCTION DETAILS

New Construction - Level, Plumb, Square, and True

Four terms important to performance and operation

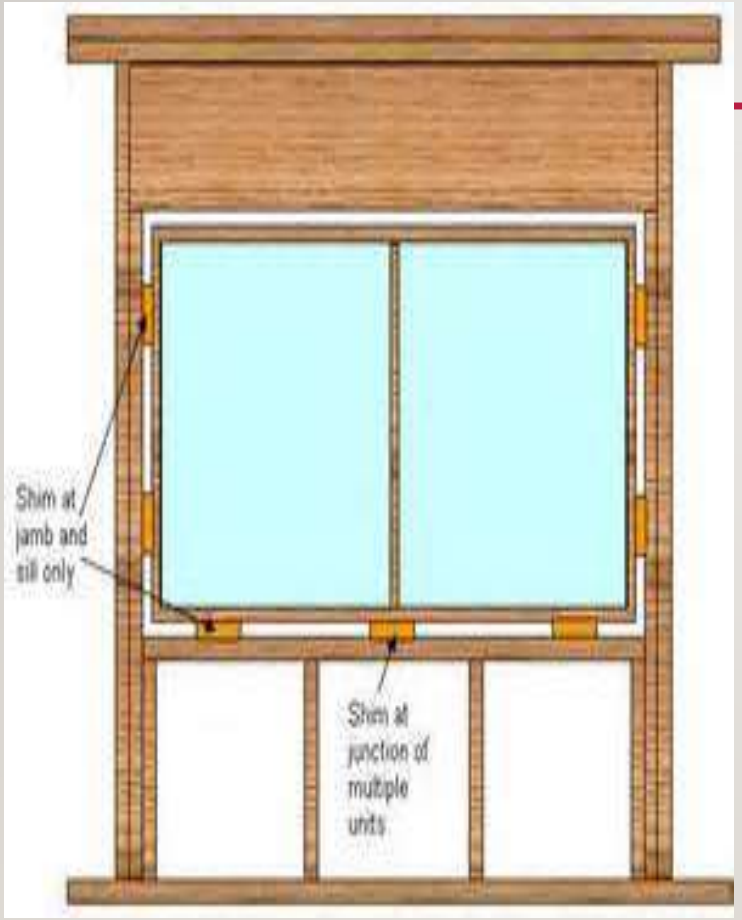


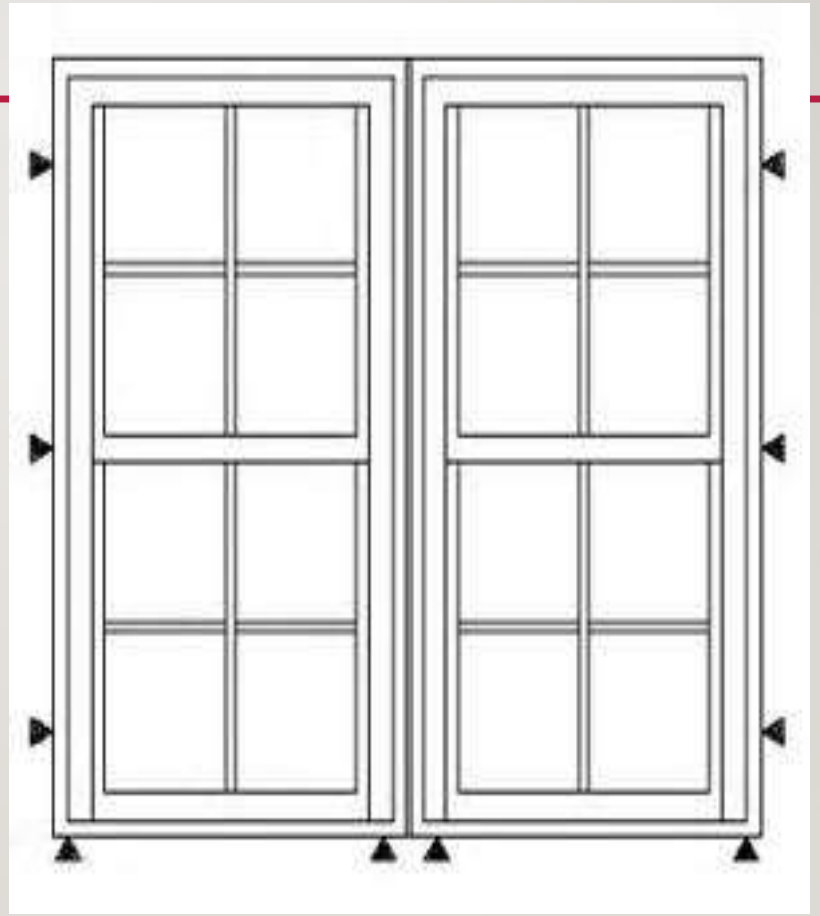
LEVEL, SQUARE, AND PLUMB



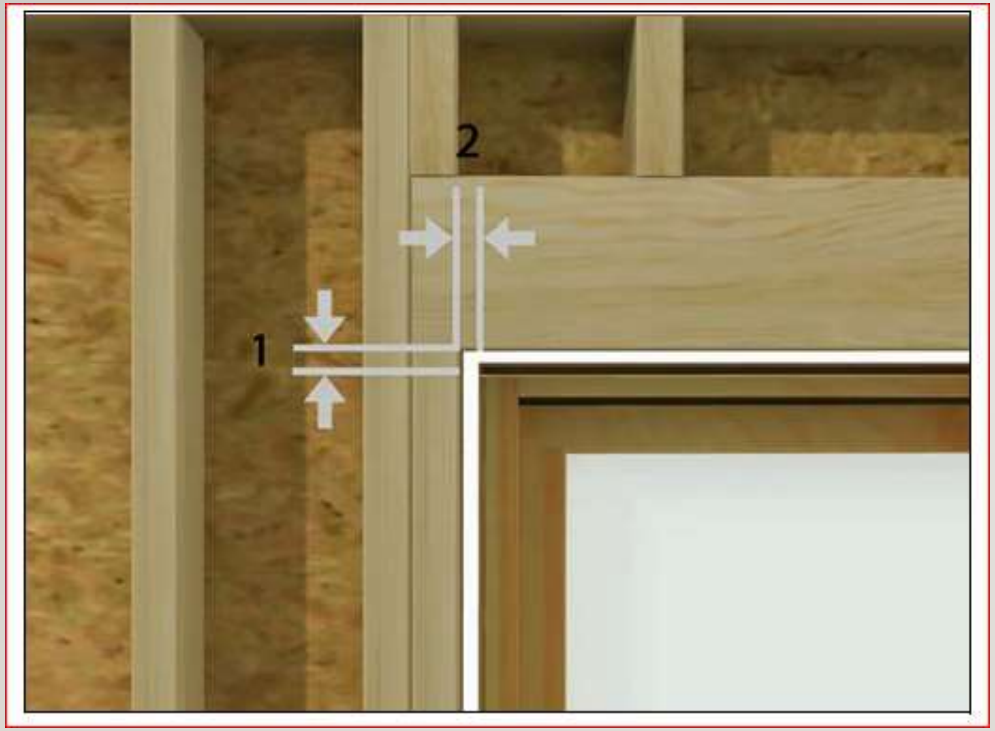
TRUE

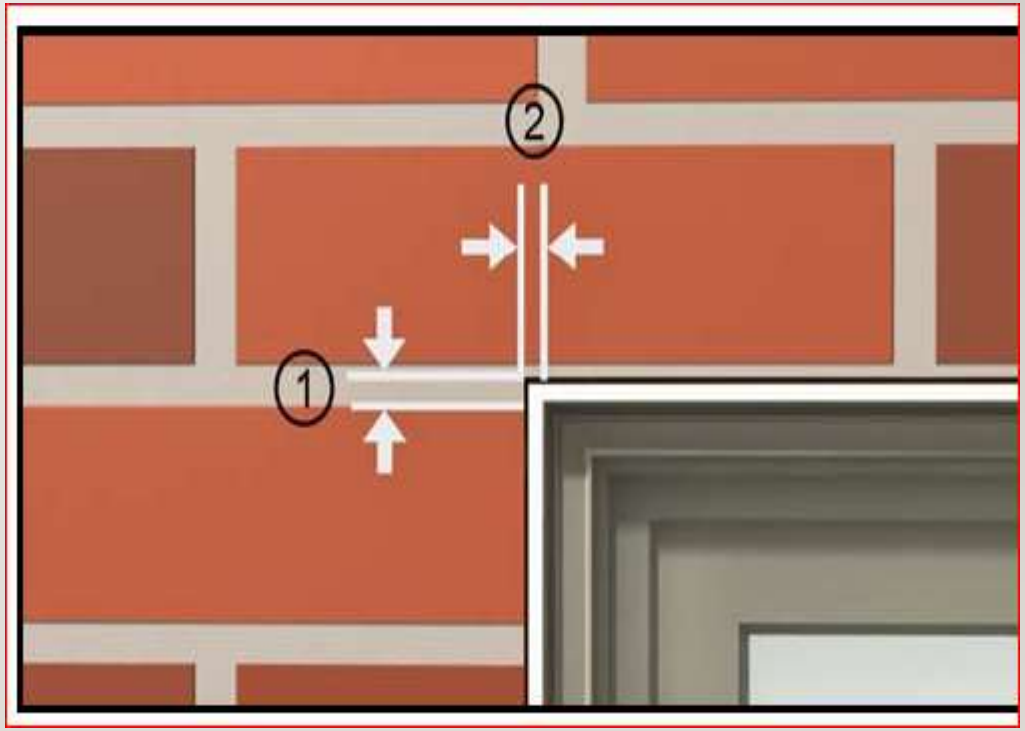
SHIMMING


Shim at jamb and sill only
Shim at junction of multiple units



CLEARANCE PROVISIONS
ROUGH OPENING VS. MASONRY OPENING





CLEARANCE PROVISIONS
ROUGH OPENING VS. MASONRY OPENING

Figure 4 Avoid brick bind, maintain 1/2" gap

BARRIER SYSTEMS

Membrane Drainage Systems

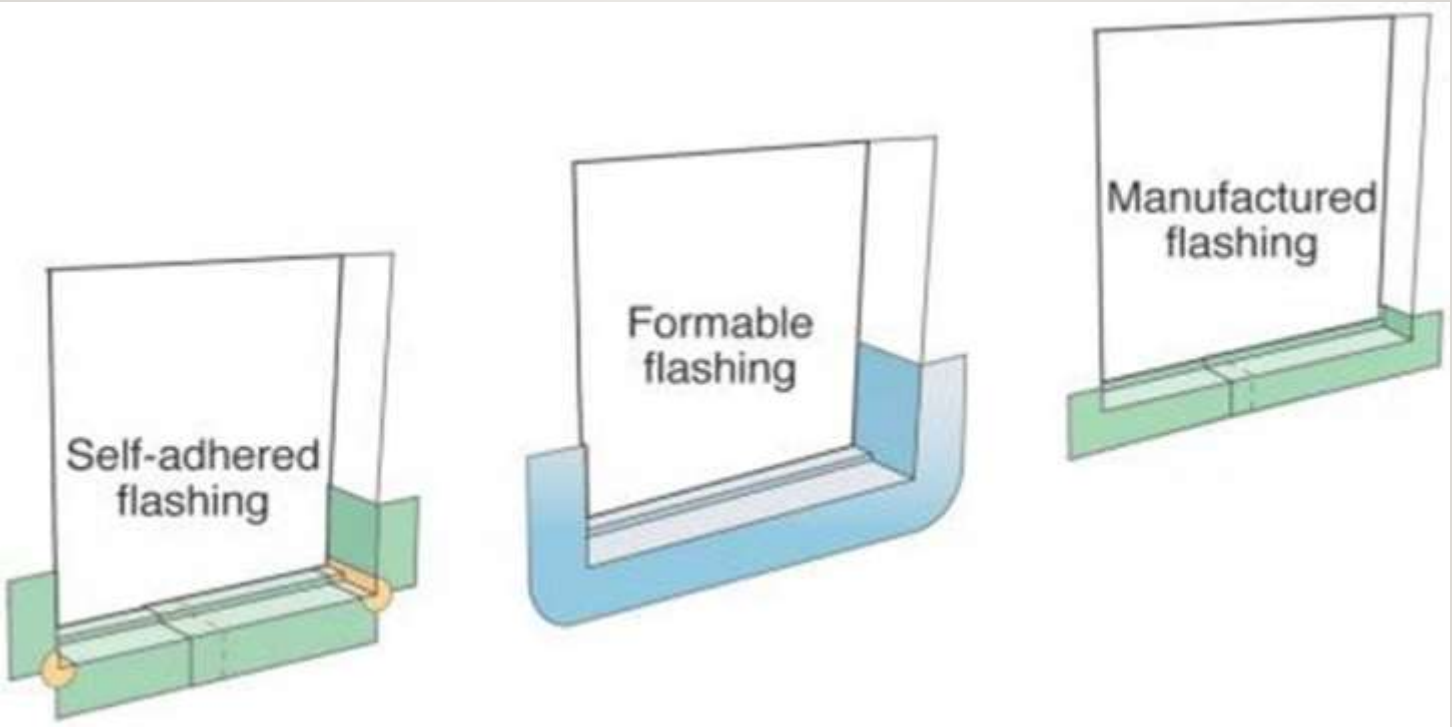
Surface Barrier Systems

Water Management

Where do I want my incidentals to go?

answer: Exterior Drainage Plane

SILL PANS


Self-adhered flashing
Formable flashing
Manufactured flashing

A FLASH IN THE PAN BY ROBERT BATEMAN TYPES OF SILL PAN FLASH

Types of Sill Pan Flashing — Fabrication

(Based on ASTM E2112-07, Table 5)

TYPE	MATERIAL	FABRICATION	DIAGRAM
Type I	Rigid sheet — metal or plastic	One piece	
		Multiple pieces — soldered or welded watertight	
Type II	Rigid sheet — metal or plastic	Multiple pieces — solid preformed corners lapped and sealed or joined to a solid center section with watertight seal	
Type III	Flexible membrane — self-adhering flashing	One-piece, formable membrane	
		Multiple pieces, membrane pieces lapped watertight	
Type IV	Combination — rigid + membrane flashing	Multiple pieces — usually preformed rigid corners joined with lapped self-adhering membrane sheet(s)	
Type V	Liquid — membrane coating	One piece — spray-, brush-, or roller-applied coating applied directly to the substrate. Note: integrate with any separate flashing & WRB	

WHAT ABOUT MY SEALANT

ASTM C920 Sealant Schedule

- Silicone, Latex, Polyurethane, Butyl, Acrylics, Synthetics

Grade NS

- Non-sagging product

Class 25

- 25 % Elongation (the ability to move 15-40%)

Seek proper choices

- Compatibility with other substrates in window interface to the wall (building materials, flashings, sealants, dissimilar materials, fasteners and Etc.)
- **KNOW YOUR S_____ (Substrates)**

SEALANTS AND WHAT TO WATCH FOR:

- **Compatibility -** Watch for:
  - Hardening or softening
  - Tackiness (after normal cure time)
  - Loss of adhesion
  - Discoloration or bleeding
- **Surface Preparation**
  - Sound - free of rotted wood, loose paint, mortar or concrete, etc.
  - Clean - free of dirt, dust, oily substances, and/or old sealant
  - Dry and free of frost

POINTS TO KNOW AND UNDERSTAND ABOUT BUTT JOINTS

Two Sided adhesion

C - Clean

P - Prime

P - Pack

S - Shoot

T – Tool

Note ! Backer Rod controls depth of joint and helps with adhesion and movement

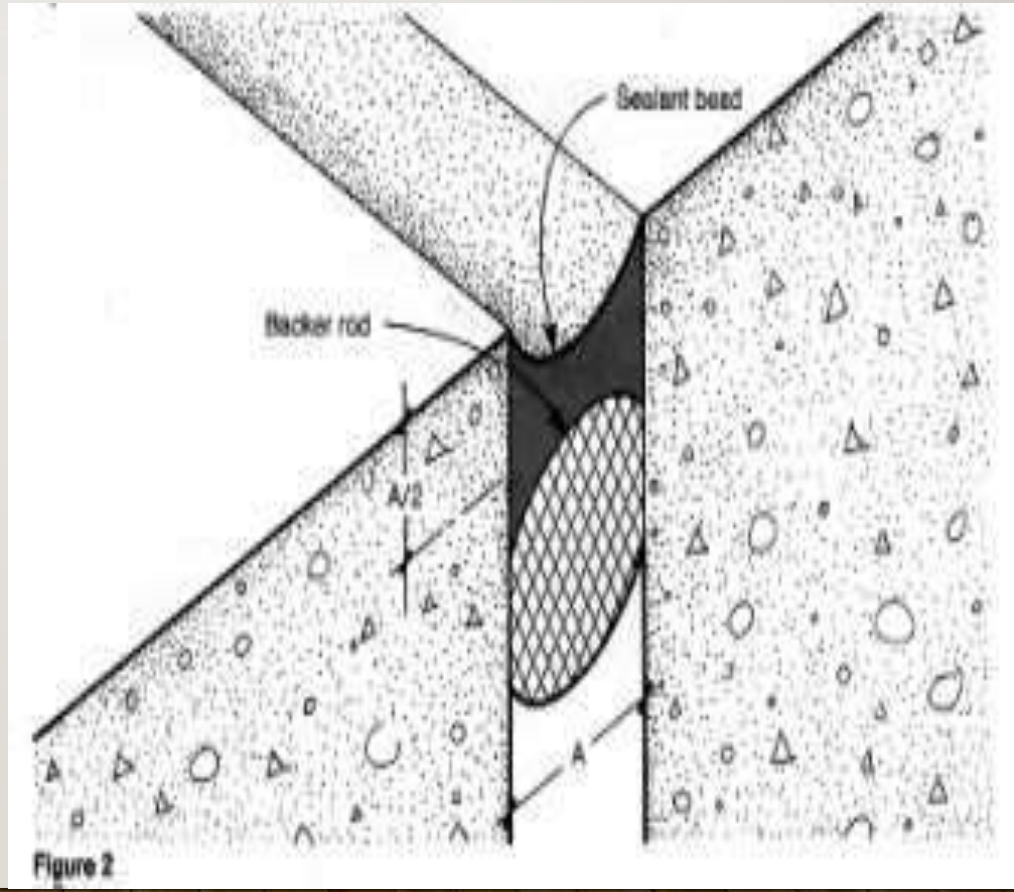
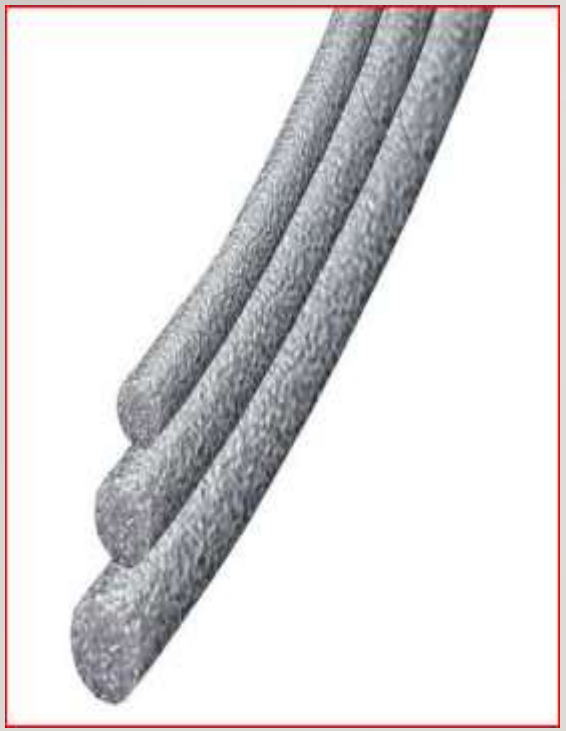
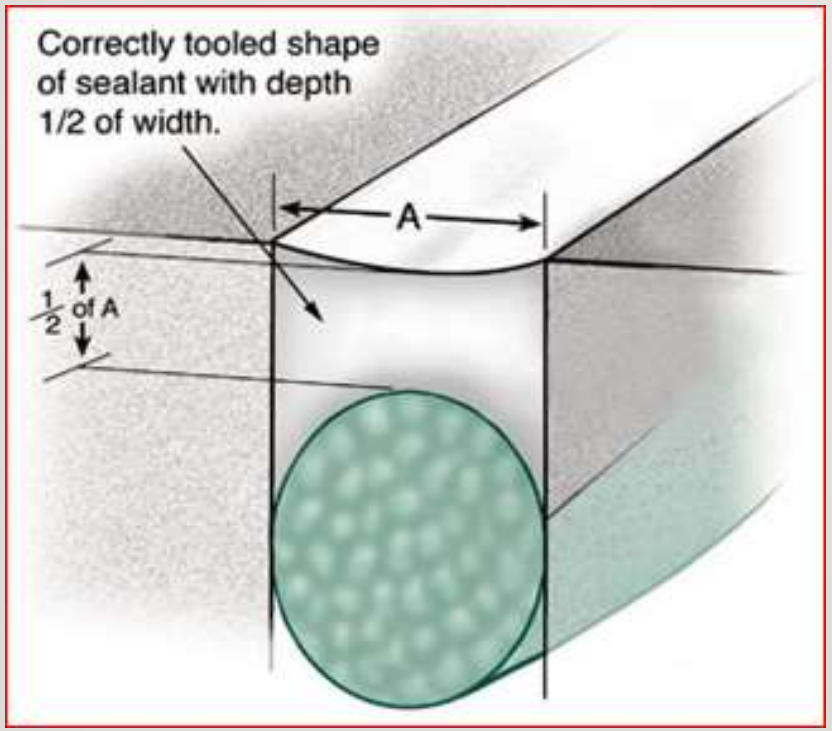
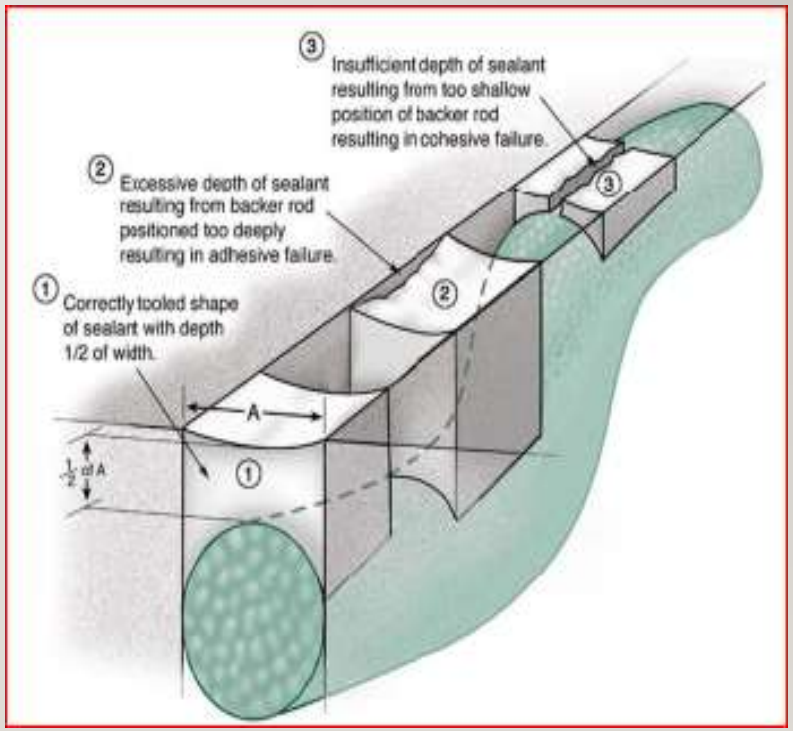


Figure 2

BACKER ROD DETAILS
FAILURE IS THE LACK OF ATTENTION TO DETAIL

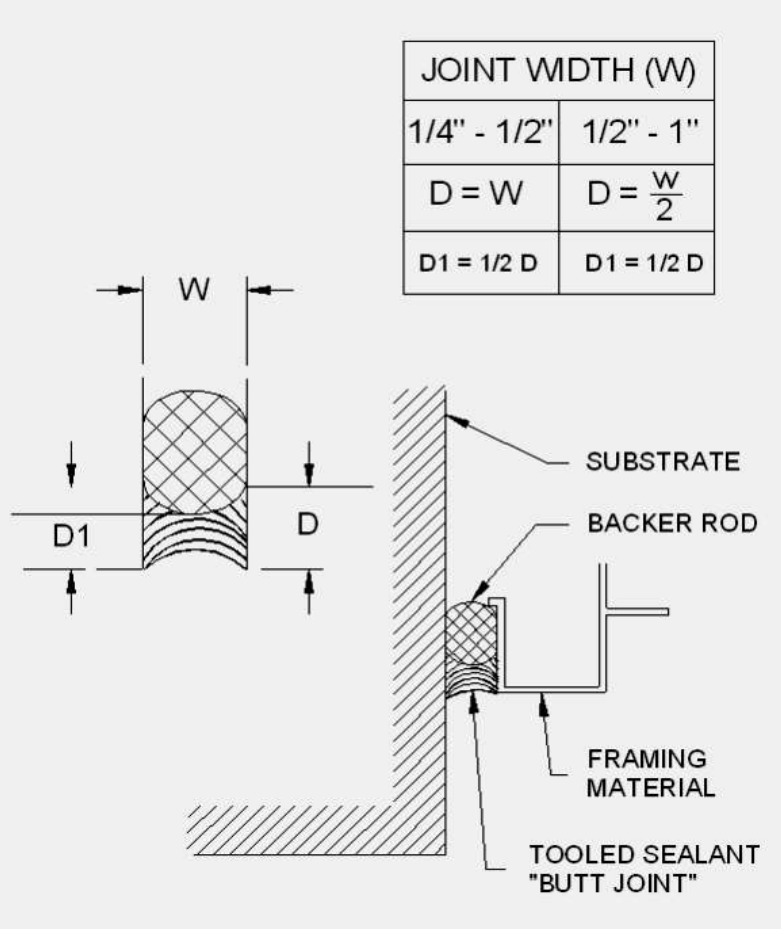






JOINT AND SEALANT DIMENSIONS

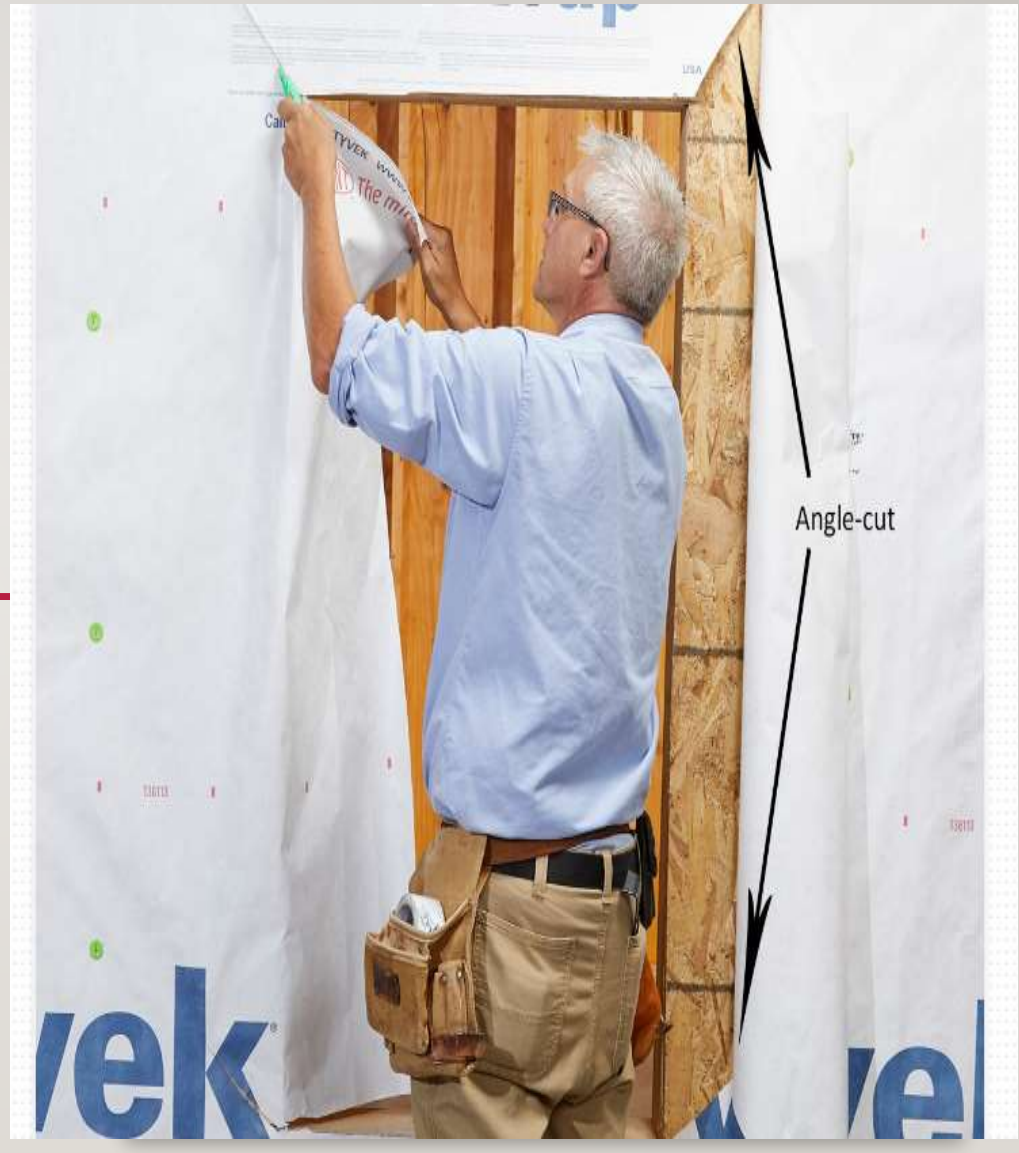
- At least 1/4" sealant bond to each contact surface
- Butt joints of Porous surfaces (concrete, masonry, or brick)– For 1/4" to 1/2" width, the width should equal the depth



ANGLE-CUT THE CORNERS

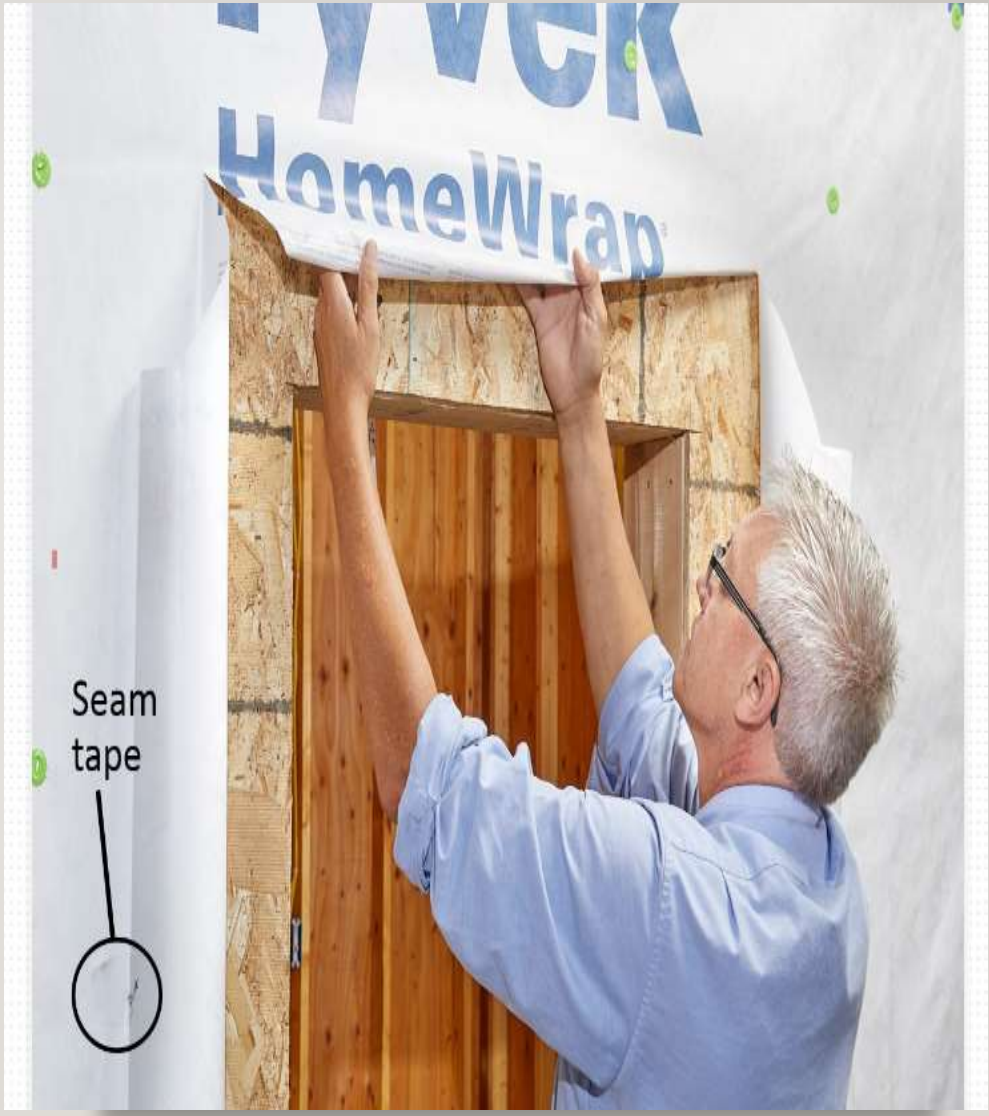
Cut at an angle about 6-in. up and away from all four corners.

Note: The bottom angle cuts are not required by all window manufacturers



FOLD BACK THE FLAPS

Fold back the side-flaps and hold them in place temporarily with seam seal or house wrap tape, not staples. Use a small piece of tape so it doesn't tear the WRB when it's removed. Patch any tears that do occur with seam seal tape. If there are no fasteners in the way, fold the WRB back under itself.

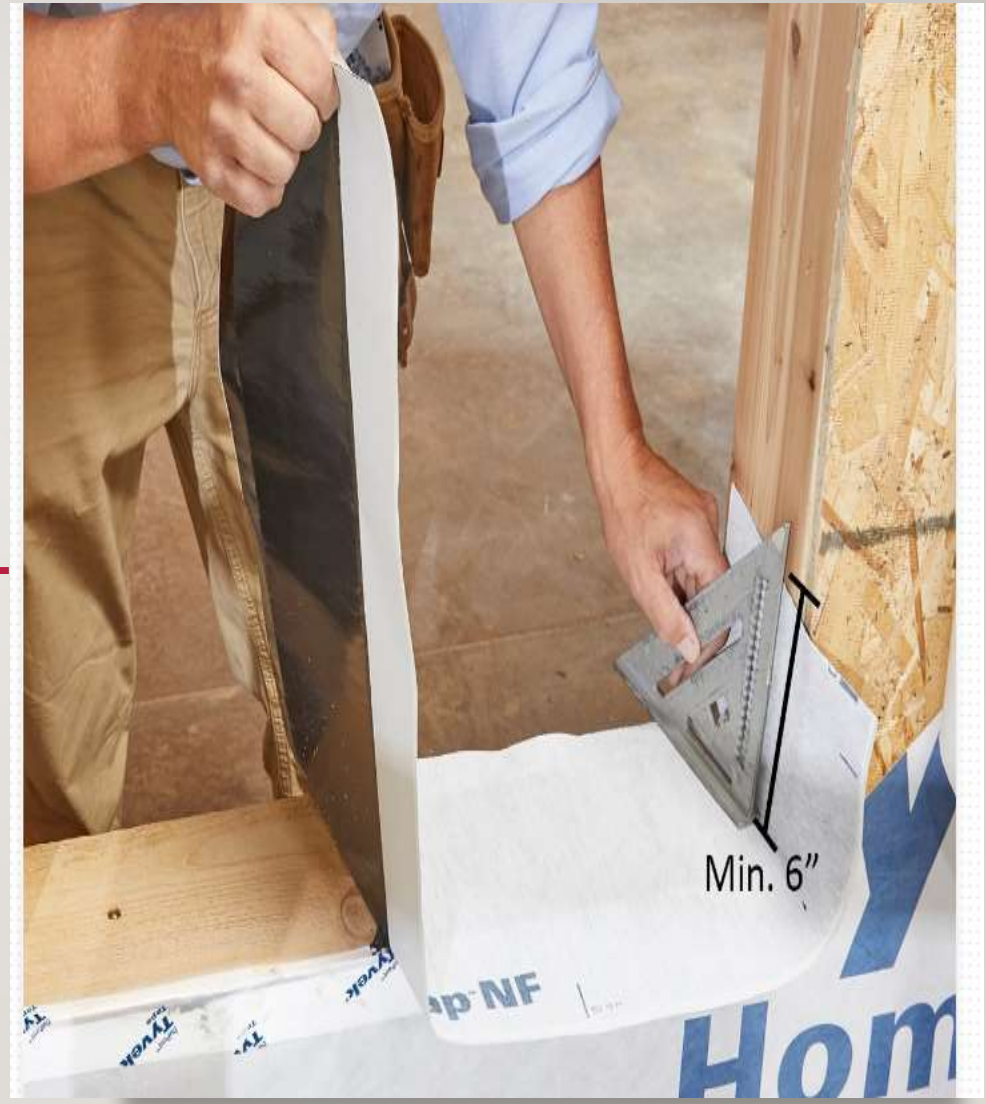


SLOPE THE SILL WITH SIDING

Even with a perfect install, water can still find its way into the opening. It's a good idea to slope the sill in the rough opening to help unwanted water find its way out again. One easy way to achieve a slope is to rip down and install a beveled piece of weather resistant siding. Plan ahead and build the rough openings about 1/2" taller to account for the width of the siding. Shim under the siding if the opening is super out of level, but avoid raising the window higher than other windows nearby. The difference in height will be noticeable and unsightly.

INSTALL THE SILL PAN FLASHING

We're installing Dupont FlexWrap on this window. There are other acceptable products on the market, but FlexWrap has a great track record and is recommended by the folks at Marvin. Tear the 6-in. backing off the flashing tape and lay the tape down over the sill flush with the interior framing. Run the tape a minimum of six inches up the sides of the opening. **PRO TIP**: *Eric pushes the tape tight into the corners with a speed or rafter square*.



INSTALL SHIMS ON THE SILL

Set the lower shims (preferably composite) in place before setting the window. **PRO TIP**: *Eric dabs a little sealant under the shims. That helps keep them in place when setting the window but keeps them loose enough, so they can be moved for minor adjustments later.* Space the shims near the edges, in the center, and for larger windows one no more than 14"inches apart.

FOLD IN SIDES

Wrap the two side WRB flaps inside, around, and on to the inside framing. Staple or tape it in place.

SEAL THE SIDES AND TOP BEFORE SETTING THE WINDOW

Run a 3/8-in. bead of sealant about one-half inch in from the edge of the opening. Leave a 3/4-in. gap on each side of all four corners. Leaving the corners free of caulk ensures the corner gaskets have a clean, smooth surface to adhere to. Don't caulk under the bottom nailing flange. Most exterior grade "Window, Door, and Siding" sealant will work.

LEVEL AND FASTEN THE BOTTOM

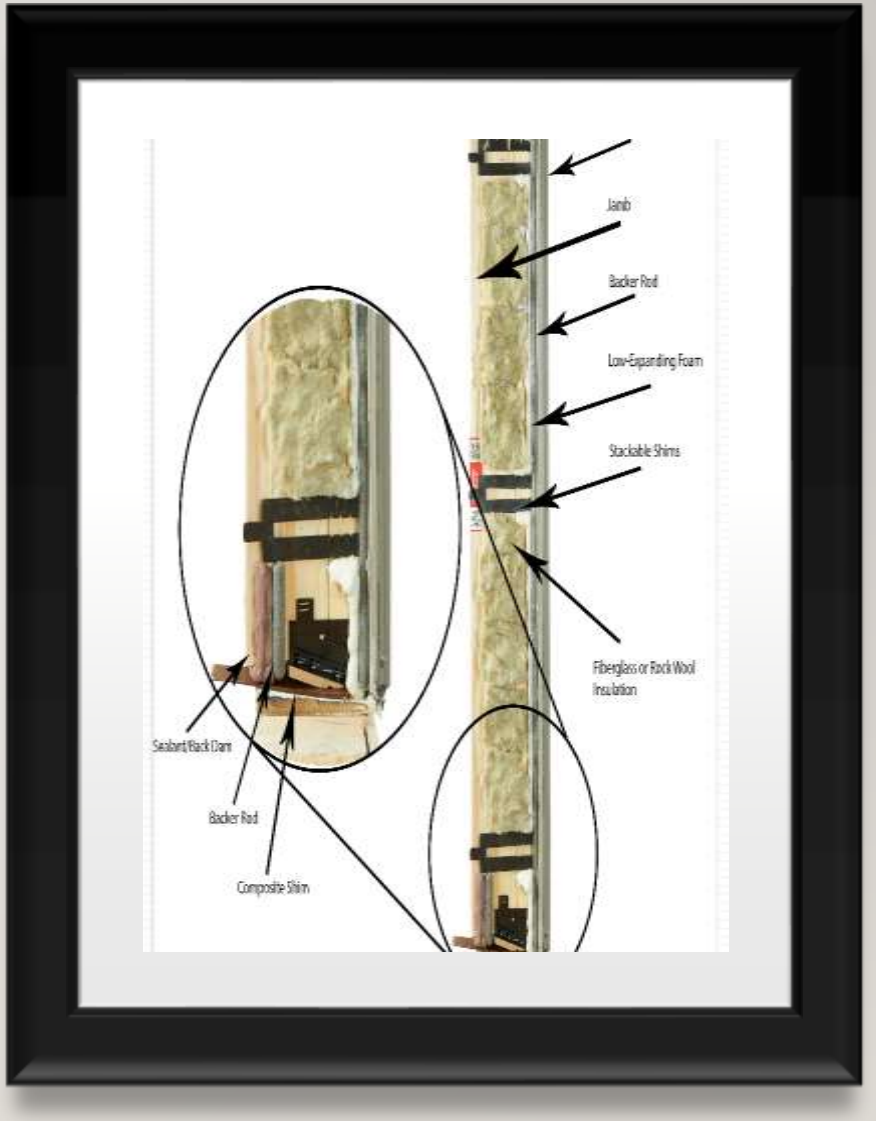
Have your helper on the inside center the window in the opening. Adjust the shims so that the bottom of the window is level and so that each one is in contact with the window. Install two 2-in. exterior grade fasteners on each side near the bottom of the window, and then check the bottom again with a level. **PRO TIP:** *Eric prefers screws to nails because it's easier to readjust the window if something gets out of whack. GRK cabinet screws are his favorite.*

SQUARE AND FASTEN THE TOP

Check that the window is square by measuring diagonally both ways. Adjust the top of the window one way or the other until the measurements are the same. **PRO TIP:** *To ensure an accurate measurement, always hooks the tape under the vinyl drip cap. The drip cap also helps hold his tape measure in place.* Install two fasteners at the top near the corner, and then check for square again. Don't install any more fasteners until the window is shimmed and sealed on the inside.

SEAL UP THE INSIDE

The next several pages will walk you through the process of sealing around the window. Here is what it should look like when you are all done. *Note: Again, this is an approved method for installing Marvin windows. Other manufacturer's methods will vary.*



INSTALL BACKER ROD ON THE SIDES AND TOP

Before installing any more shims, insert a backer rod on both sides and the top, but not the bottom. Push the backer rod tight up against the back of the nailing flange. **PRO TIP**: *Eric uses his speed/rafter square to make several passes pushing in only a couple inches at a time.* The idea behind this backer rod is to eliminate thermal bridging and water infiltration. It prevents the side shims from butting up against the nailing flange, which could channel heat and water.

STRAIGHTEN THE JAMBS

There are three ways to check that the jambs are straight before installing the side shims:

Inspect the reveals (space) between the jambs and the sashes. They should be even.

The distance between the two side jambs should be equal at the top, center, and bottom. This can be checked simply by measuring. **PRO TIP:** *Instead of measuring, Eric uses the top stop as a story pole and compares the gaps between the stop and the jamb at the top, bottom, and center.* Create your own story pole if the window you're installing does not have a top stop, and you have a bunch of them to install.

Open and close both sashes to ensure they operate smoothly.

INSTALL THE SIDE SHIMS

Install shims on the sides of the window in the center, and about 4 inches down from the top and up from the bottom. Some windows have dedicated holes to fasten the jambs to the framing (see next page). Place shims in those locations. Often times, the center of the side jambs will have to be pushed in a bit. **PRO TIP**: *Eric nudges the jambs over with an Air Shim bag to the exact position he wants, and then installs the shims.* Don't shim the top of the window. If the building settles, the window could get compressed, which will likely cause the window to stop working properly and could even result in broken panes of glass.

FOAM THE SIDES AND TOP

Run a bead of low-expanding foam in the gap along side the backer rod. Don't over do it. Just dispense enough foam to create a 1 or 1-1/2-n. bead that bridges the entire gap between the window and the framing. Run the bead out a little ways along each side of the shim. Don't fill the whole space in because even low-expanding foam can expand enough to distort the jambs. **PRO TIP:** Lay out a p*ractice bead on a piece of cardboard, so you can adjust the gun, and gauge how fast to move the tip along inside the gap.*

INSTALL THE BOTTOM BACKER ROD

Starting at one of the lower shims, push in a backer rod around the bottom and up to the other shim. Don't push it all the way in like you did with the other backer rod. Just push in almost to the point where the jamb meets the window unit. (*see "Seal up the inside"*).

CREATE A BACK DAM

Fill the gap from the lower backer rod almost all the way to the inside edge of the framing. Tool in the sealant with your finger or a small chunk of backer rod to ensure that the whole gap gets filled. This back dam will prevent any water that gets past the other lines of defense from getting inside the house. If the window is installed properly there should be nothing stopping the water from escaping back to the great outdoors.

ADD INSULATION

Fill in the rest of the gap on the sides (above the lower shims) and the top with fiberglass or rock wool insulation. Fill the whole gap, but keep it loose and fluffy. Insulation loses its effectiveness the more tightly packed it gets.

ADD CORNER GASKETS

If the window you're installing requires corner gaskets, now's the time to install them.

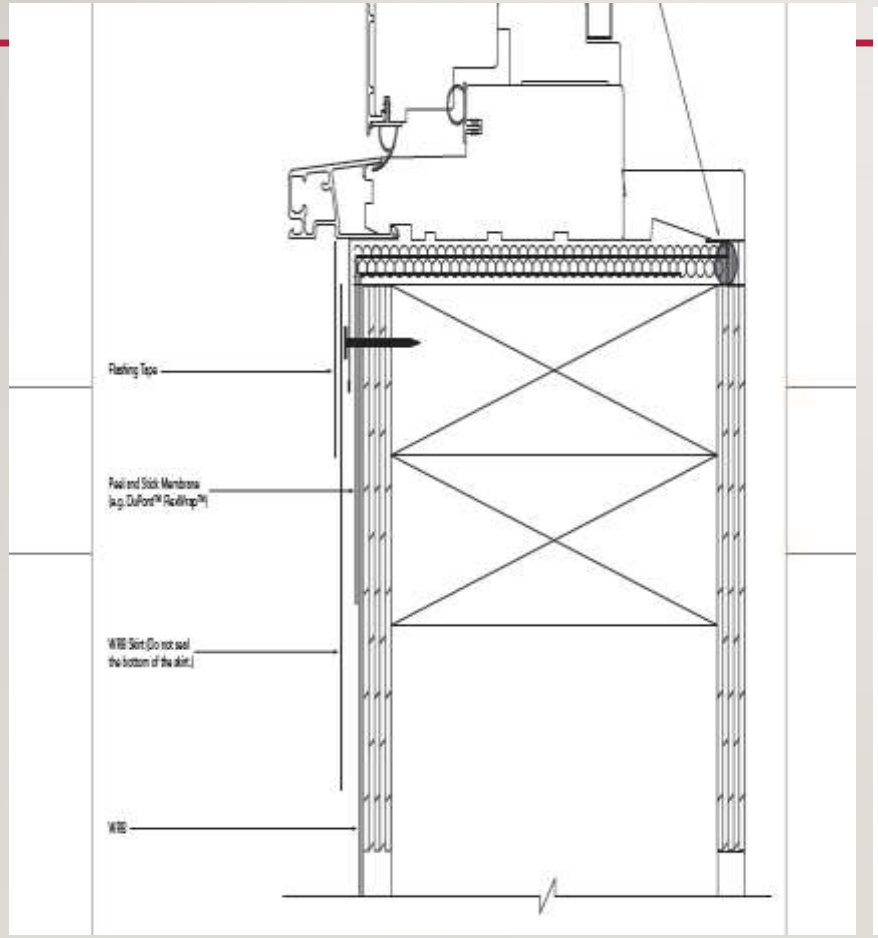
TAPE THE FLANGES

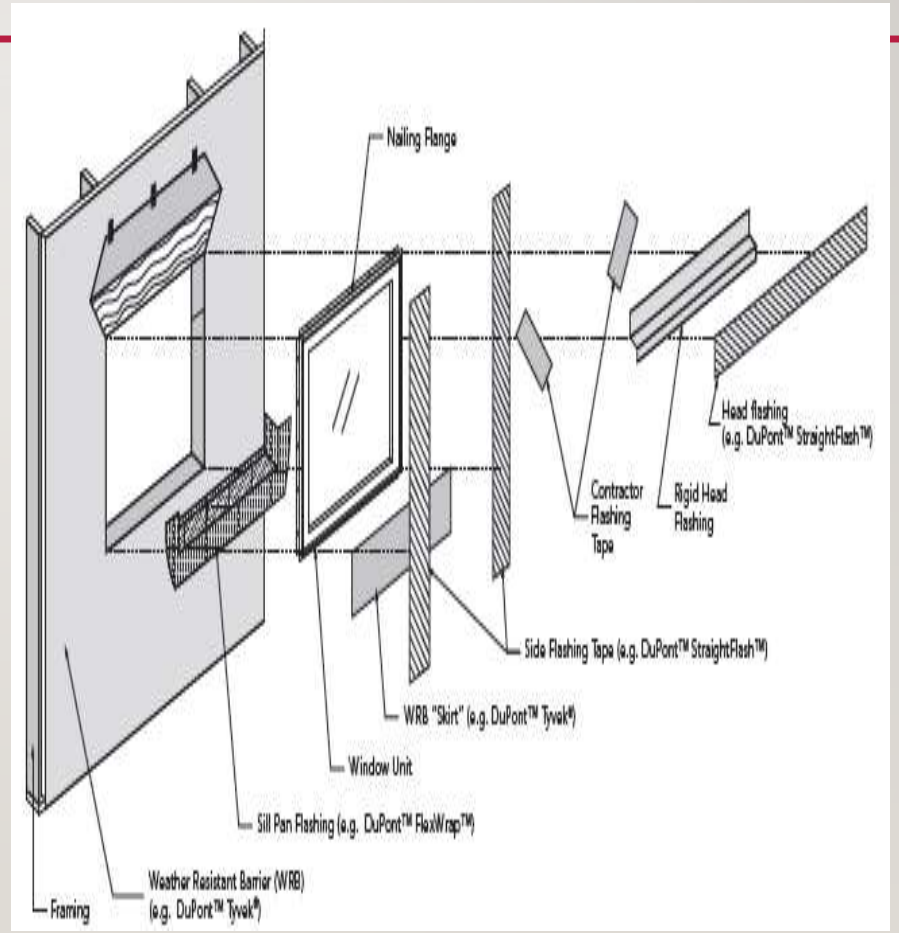
Some windows have a nailing flange that is an integral part of the window (usually vinyl windows), but this window does not. So in order to seal the area where the flange meets the window, the flashing tape needs to be run up onto the side of the window at least 1/4-in. Install the tape on the sides first, about four inches past the bottom of the window and about an inch higher than the upper nailing flange. Run the flashing tape at the top at least six inches past the window on each side.

TAPE THE TOP FLAP

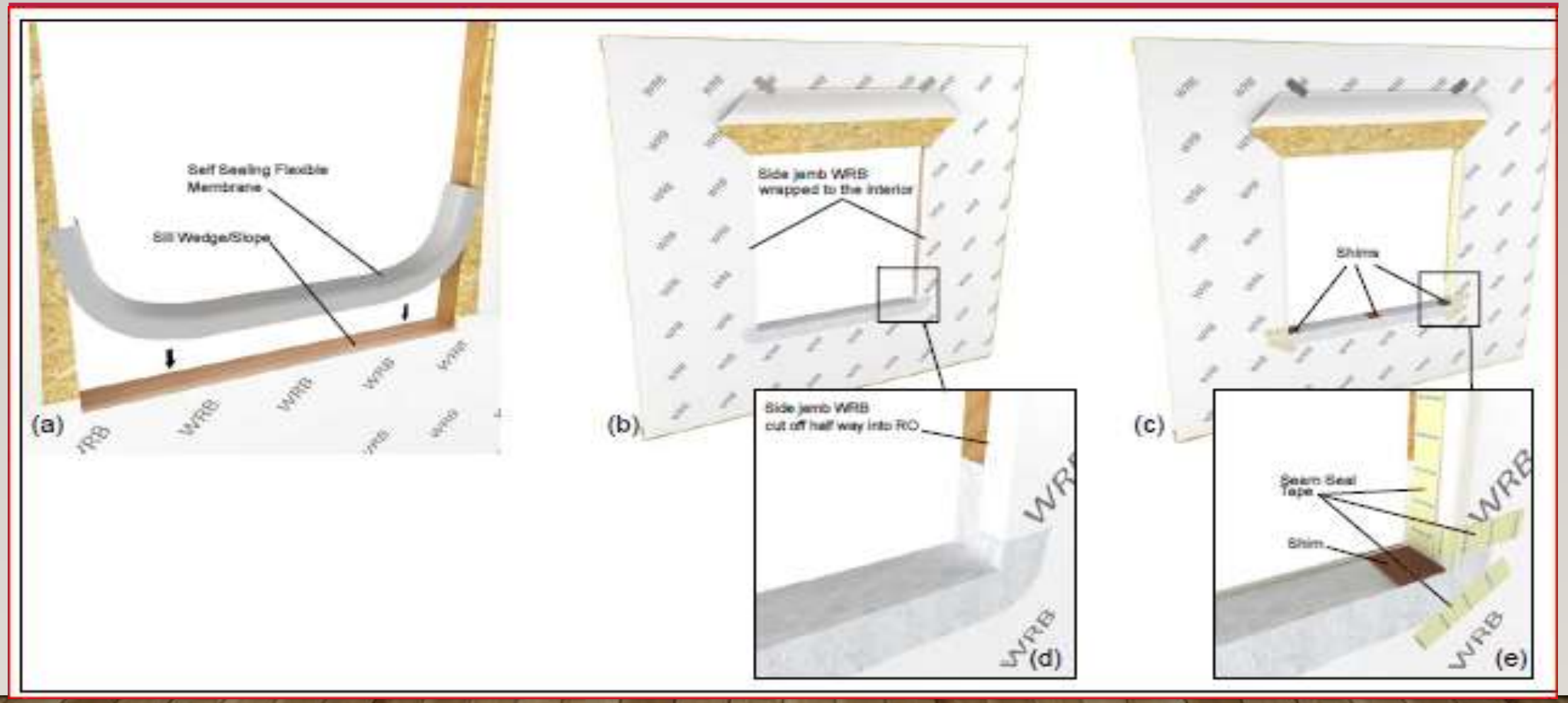
Fold down the top flap of WRB and cover the two angled cuts with seam seal tape. Don't tape the entire bottom of the flap. Instead, just use a few small strips of tape to hold it in place. Yep, you guessed it. The gaps between the tape are there to create an escape route for any water that gets behind the WRB above the window opening.

HIGH PRESSURE SKIRT





TYPE III SIL PAN, AND SHIM DETAILS



SEALANT PLACEMENT

SEALANT ADHESION AND APPLICATION MATRIX

Installation

ADHESION

SEALANT ADHESION GUIDE	SILICONE	POLYURETHANE	LATEX (MEETING ASTM C920)	LATEX	SOLVENT RELEASED	BUTYL TAPE
ALUMINUM ANODIZED	Yes	Yes	Yes	Some	Yes	Yes
ALUMINUM MILL FINISH	Yes	Yes	Yes	Some	Yes	Yes
ASPHALT BUILDING PAPER	Yes	Yes	Yes	Yes	NR	Yes
BRICK	Yes	Yes	Yes	Some	Yes	NR
CONCRETE	Yes	Yes	Yes	Some	Some	No
COPPER	Yes[1]	Yes	Some	Some	Yes	Yes
EIFS	Yes	Yes	Some	NR	NR	NR
FIBERGLASS	Yes	Yes	Some	Some	Some	Yes
GALVANIZED STEEL	Yes[1]	Some	Some	Some	Yes	Yes
GLASS	Yes	Some	Yes	Some	Yes	Yes
HOUSE WRAP	Some	Some	Some	Some	Some	Yes
PAINTED SURFACES [2]	Yes	Yes	Yes	Yes	Yes[3]	Yes
POLYETHYLENE	Some	Yes	No	No	Yes	Yes
POLYSTYRENE FOAM BOARD	Yes	Yes	Yes	Some	NR	Yes
STUCCO	Yes	Yes	Yes	Some	Some	NR
VINYL	Some[1]	Some	Some	Some	Some	Some
WOOD	Yes	Yes	Yes	Yes	Yes	Yes

[1] = Neutral Cure Silicone Only
[2] = Check Paint Individually
[3] = Check for Compatibility
NR = Not Recommended
SOME = Many Are Not Adequate
YES = Majority Are Adequate

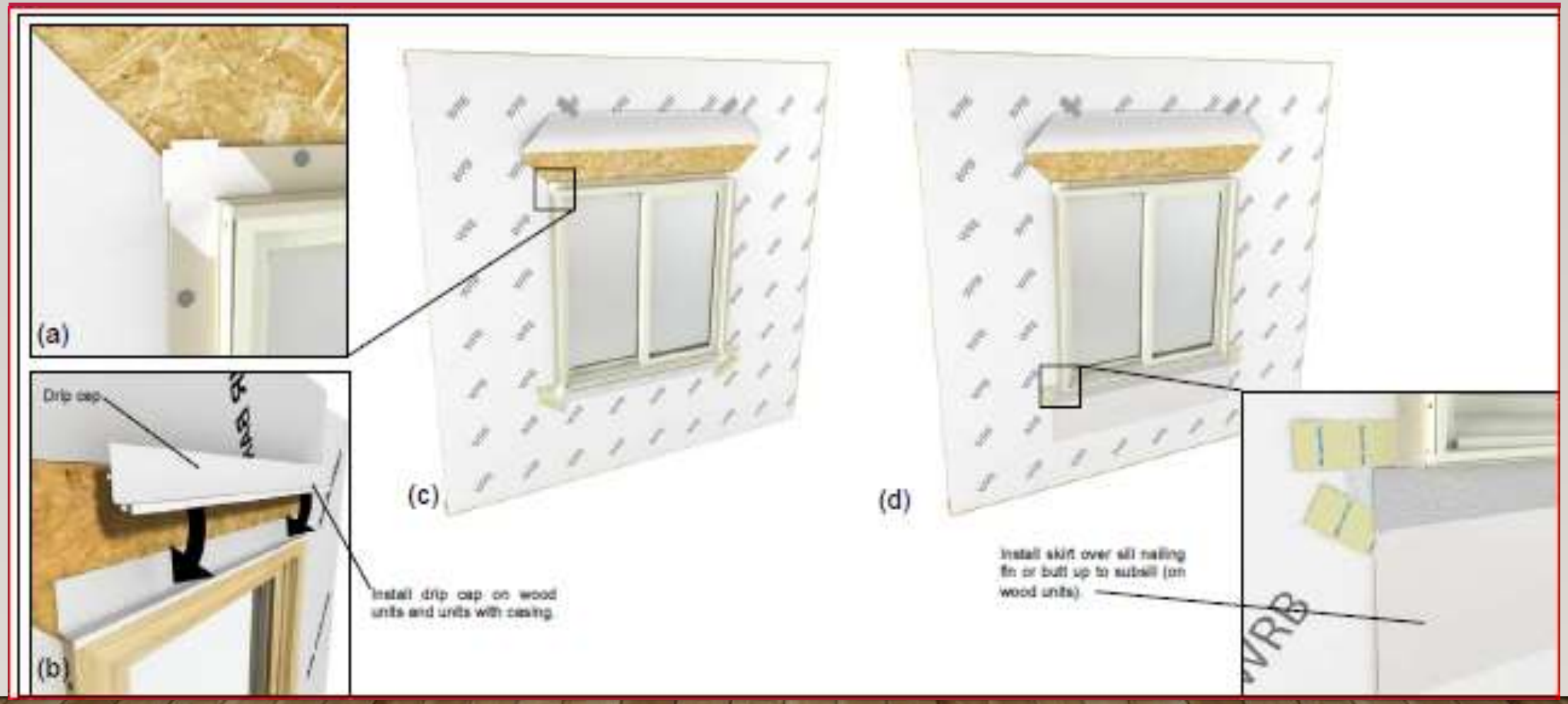
APPLICATION

SEALANT APPLICATION GUIDE	SILICONE	POLYURETHANE	LATEX (MEETING ASTM C920)	LATEX	SOLVENT RELEASED	BUTYL TAPE
BEHIND MOUNTING FLANGE[2]	Yes	Yes	Some	Some	Some	Yes
BOX FRAME TO OPENING	Yes	Yes	Yes	NR	Some	NR
EXTERIOR CASING	Yes	Yes	Yes	Some	Some	NR
EXTERIOR/INTERIOR STOP	Yes	Yes	Yes	Yes	Yes	NR
EXTERIOR PERIMETER[1]	Yes	Yes	Yes	Some	Some	NR
HEADER EXPANDER	Yes	Yes	Yes	Some	Some	NR
INTERIOR TRIM AND STOOL	NR	Yes	Yes	Yes	NR	NR
MULL SEAL	Yes	Yes	Some	NR	NR	NR
PANNING	Yes	Yes	Yes	NR	Some	NR
SILL ANGLE	Yes	Some	Yes	NR	Some	NR
SILL CAPPING	Yes	Some	Yes	NR	Some	NR
SILL EXTENDER	Yes	Yes	Yes	Some	Some	NR
THRESHOLD	Yes	Yes	Some	NR	Some	NR
UNDER DOOR SILL PAN	Yes	Yes	Some	NR	Some	NR
UNDER FLASHING[2]	Yes	Yes	Some	Some	Some	Yes
WALL STOOL	Yes	Yes	Yes	Some	Some	NR

[1] = Match Sealant Movement Capability to Anticipated Joint Movement
[2] = Check Adhesion and Compability to Mating Surfaces
NR = Not Recommended
Some = Many Are Not Adequate
Yes = Majority Are Adequate

FASTENING OF WINDOW TO WALL
2” GALVANIZED ROOFING NAIL OR EQUAL

RHF (RIGID HEAD FLASH) AND HIGH PRESSURE SKIRT DETAIL



MANUFACTURER'S RECOMMENDED INSTALL

HEAD FLASH AND SEALING DETAILS

Figure 22 Apply sealant between window and exterior finish.

CAUTION!

Perimeter sealant must be Grade NS Class 25 per ASTM C920 and compatible with the window product and the finished exterior(s) of the building. Using improper sealant could result in sealant failure casing air and water infiltration.

TECHNICAL DATA IMPORTANT TO INSTALLERS

- The panning must drain water to the exterior of the cladding OR the exterior surface of a concealed weather resistive barrier.

CAUTION!

Be aware that the use of sill pans and other barriers will decrease the rough opening height clearance. Adjust opening dimensions accordingly.

- The panning system used in these instructions is one component in a structure's overall water management system. It should be used in conjunction with an appropriate drainage plane compatible with the exterior cladding.
- Flashing materials must comply with ASTM E2112-01, section 5.13 and be compatible with all materials used in installation including panning systems, air barriers and building papers, sheathing, and the window unit.
- Properly flash and/or seal all windows at the exterior, perimeter.

IMPORTANT

Flashing material must not contain asphalt and must be compatible with flexible PVC (vinyl).

- Sealants used for installation must be Grade NS Class 25 per ASTM C920 and compatible with the

QUESTIONS

Items mentioned & used in today's presentation

- **Utility Knife**
- **Level**
- **Hammer Tacker**
- **Laser Level**
- **Speed Square**
- **Tape Measure**
- **Flashing Tape**
- **Type III Sill Pan Flash**
- **Sealant**
- **Sheathing Tape**
- **Beveled piece of Cedar Siding**
- **Composite and Stackable Shims**
- **Corner Gaskets**
- **High Pressure Skirt**
- **Tyvek House Wrap**
- **High Pressure Skirt**

QUESTIONS

- *Thank you for your time and attention to this Presentation.*

It has been a pleasure to work with you today.

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