WEB BASED
APPLICATION SPECIFIC
INSTALLATION INSTRUCTIONS

Frame-In vs Frame-Out Replacement

Although all possible measures have been taken to insure the accuracy of the material presented,
WIXSYS, and the author are not liable and do not assume any liability in case
of misinterpretation of directions, misapplication, improper installation, or typographical error.

Frame-In or Frame-Out...*Which is best?*

Most callbacks for replacement applications are due to the failure or inability to integrate all 5 barriers of the wall to the new window. Replacement is different from New Construction applications because the opening has to be cleared of all unneeded parts of the old window. The opening needs to be properly prepared to receive the new window. Finally, the existing trim needs to be integrated to the new window.

Two approaches
There are two basic approaches to replacing existing windows with frames of wood, vinyl or a combination of materials.

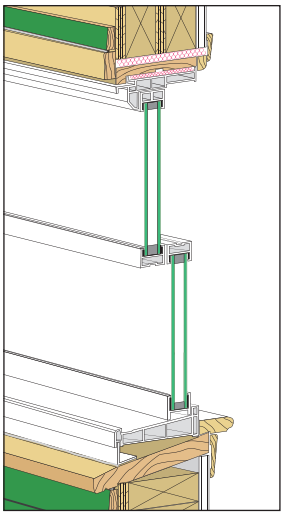
Frame-In. The old window frame is left in the opening with the idea that the interface between the old window and the wall is sufficiently intact to provide an adequate weather barrier and moisture control and/or the old frame is so embedded in the wall, removal would cause unnecessary and extensive damage. Frame-In can be accomplished from inside the house (Inside-Out) or from outside of the house (Outside In) discussed elsewhere in this manual. While each is somewhat unique unto itself, the relative goal is the same: place the new window in the old window frame and sufficiently interface the weather barriers and thermal barriers of the new window to the old window frame.

Frame-Out. The old window is removed down to thee rough opening, requiring a new window and its frame to be integrated with the wall's weather, thermal and air barriers. It approximates a new installation, but has the added burden of the old siding and the interior wall and trim staying in place necessitating more care for the fit and finish. While exterior and interior trim are added later in new construction, with replacement they need to be cut back and then re-assembled up to the window... to preserve or re-establishing the weather seal inside & out.

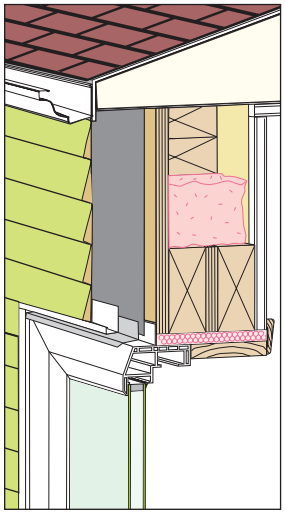
Standard Installation of replacement windows, using pocket installation of box framed windows relies on Frame-in, and a Barrier-only install is often called "Caulk and Walk". That's because the stop against which the box frame is mounted is caulked in an attempt to create an adequate barrier to water, air and moisture penetration of the old window frame cavity. In addition to relying on the old frame to still be an efficient part of the overall wall water management system, it relies on the long lasting ability of caulk/sealant to prevent water and air intrusion. Most caulks/sealants aren't up to the task.

The only secure approach to water management is a Frame Out installation where the new window can be properly integrated into the wall's water management system through flashing, sill pans, and drip caps in addition to the caulk/sealant used.


FRAME-IN



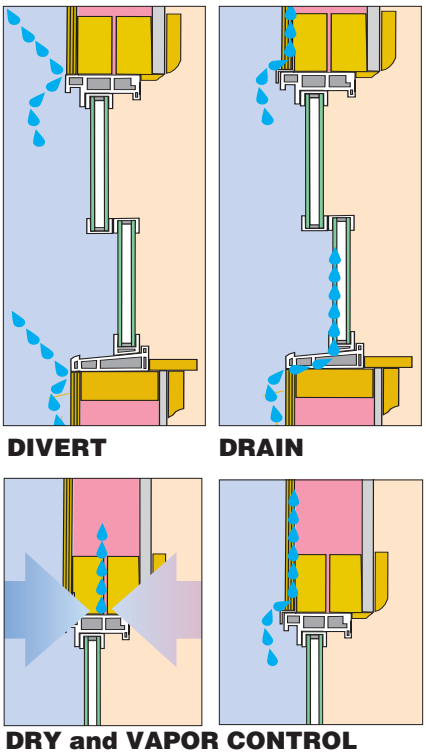

FRAME-OUT



Summary:
Determine which is best: Frame-In or Frame-Out.

Remind the homeowner that Frame-In may make it impossible to properly and completely interface the new window with all the weather barriers in the existing wall

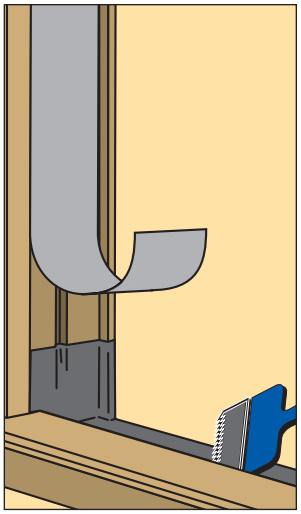
The most complete and weather-tight installation is a Frame-Out, using Divert, Drain , and Dry control techniques and materials to attempt reintegration of the window to the original 5 barriers.



© 2015 AWDI, LLC Do not reproduce without permission

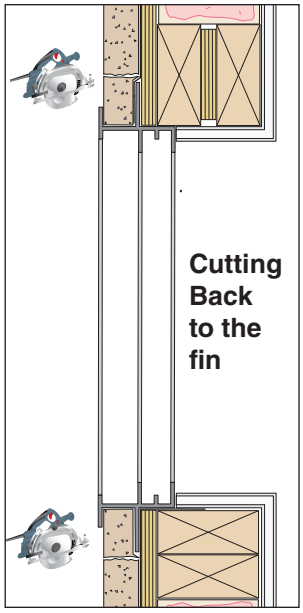
If the decision is to leave the old frame intact, and mount the new window to it or over it, then the preparation of the old frame should include provision for drainage, as previously described.

If the old frame is wood, then application of liquid flashing can be made to the remaining sill, “painting” it along the bottom and up 4” to 6” on each side. Apply the liquid so as to seal all joints of the sill to the interior stool, and to the jambs on each side. This will keep water that may collect under the new window from being absorbed into the old wood frame.

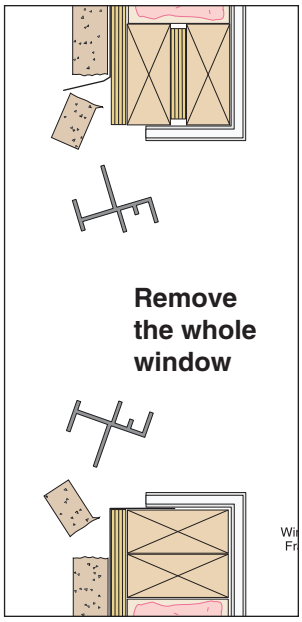


Further, application of adhesive-backed flashing to the jambs and header will provide a diversion path for any water that comes into the cavity. The adhesive-backed flashing should be applied to overlap the liquid-applied sill flashing.

When the new window is mounted, be sure that any sill angles or starter strips allow weeping of any collected water out from under the new window’s sill. If the sill is capped, do not caulk the underside to prevent trapping of water or condensation under the sill capping.



For aluminum windows, where the mounting fin is under the siding (stucco or other siding), you can remove the existing window’s operating sash, and then the stationary glass panel. Cutting the bar between the sash and glazing panels creates an unobstructed opening, leaving the old sill, header and jambs in place.

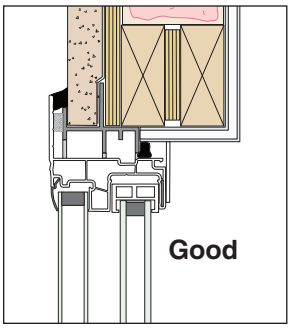


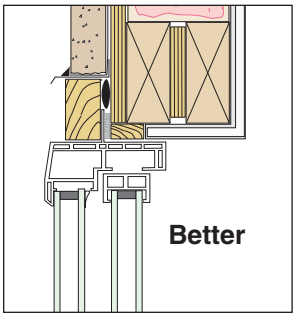
As before, use liquid applied flashing. The sill should be coated, carefully sealing the joints between the sill and the jambs. Apply the liquid up the sides 4” to 6” on each side.

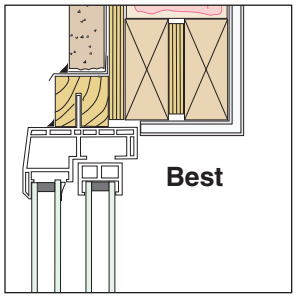
If there are no weep holes in the left-in-place sill track, drill at least two to allow trapped water to drain to the outside.

The installed window should have a flush frontal fin to overlap the siding while the frame of the new window rests on the left-in-place frame of the old window. Installing mounting blocks in the channels of the old sill will help support and level the new window.

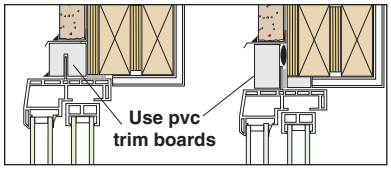
If the total frame is to be removed, start by cutting back the siding to expose the old mounting fin. This will allow the fasteners to be removed from the fin, opening the cavity to re-installation of a finned window. Molding is then re-installed, with appropriate drip cap and flashing, to mate up with the cut-back siding simulating brickmold trim, as shown.



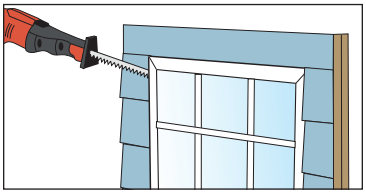


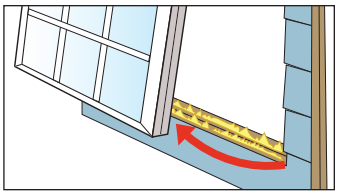


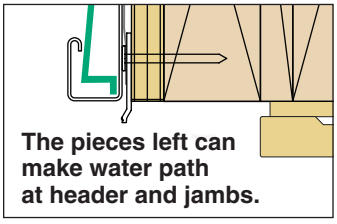
If the new window frame is deeper than the old frame, then the new window needs to be smaller in width and height to “sit” inside the left-in-place wallboard and stool, as shown. An alternative is to kerf a groove in the “brick mold” to fit over the nailing fin which will offset the new window towards the exterior so the interior face of the frame can sit in the same space as the old frame allowing the maximum width and height of the new window, as shown. It is also recommended that a waterproof trim be used.

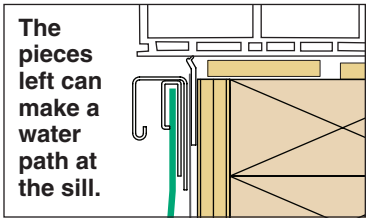


Don’t cut out old window and leave fin.









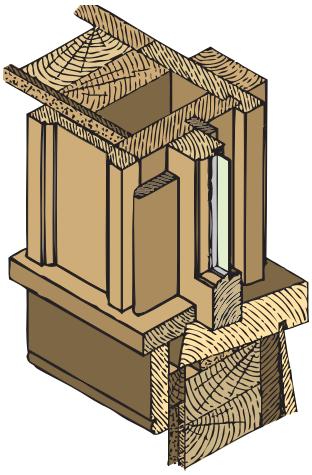
© 2015 AWDI, LLC Do not reproduce without permission

Wood Frame-Out-
Replacement Sequence

Full Frame-Out for Wood Windows

Wood windows present the same opportunity for Full Frame-Out installation. They, however, do not have an old fin but are similarly attached to the house framing such than when removed, they leave a clean opening into which a finned window can be easily re-flashed and installed properly.

There are many benefits to doing a Frame-Out installation beyond the better integration of the new window into the water management system of the wall.



Weight Pockets can require additional 1" width

First, you can realize a greater glass area over traditional blindstop, sash-pocket installation because the new window is filling the total opening, not made smaller by the old frame.

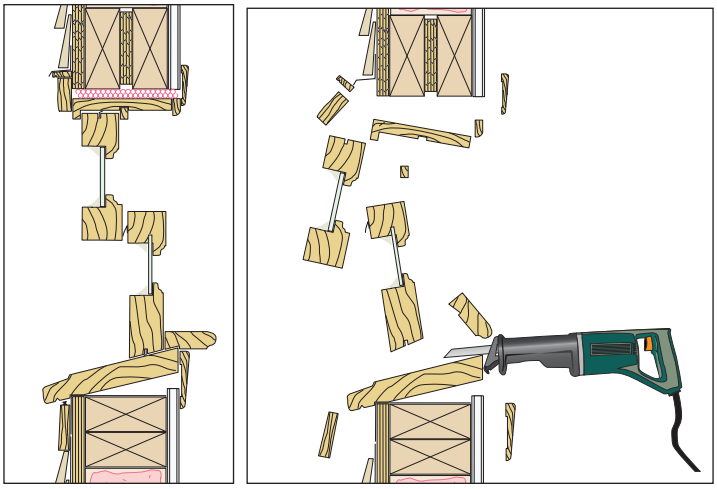
Second, Frame-Out will let you install a bigger window maintaining egress accommodation - important in rooms where the window is the only means of escape in case of emergency or fire.

The Frame-Out method requires that the new window be finned and have jamb extensions (either wood or extruded pvc). It also requires measuring accurately. Measure wood windows with weights and pulleys between the interior of the jambs for the width, and adding 3 inches, and the height taken between the interior face of the header and the sill and adding 3-1/2 inches.

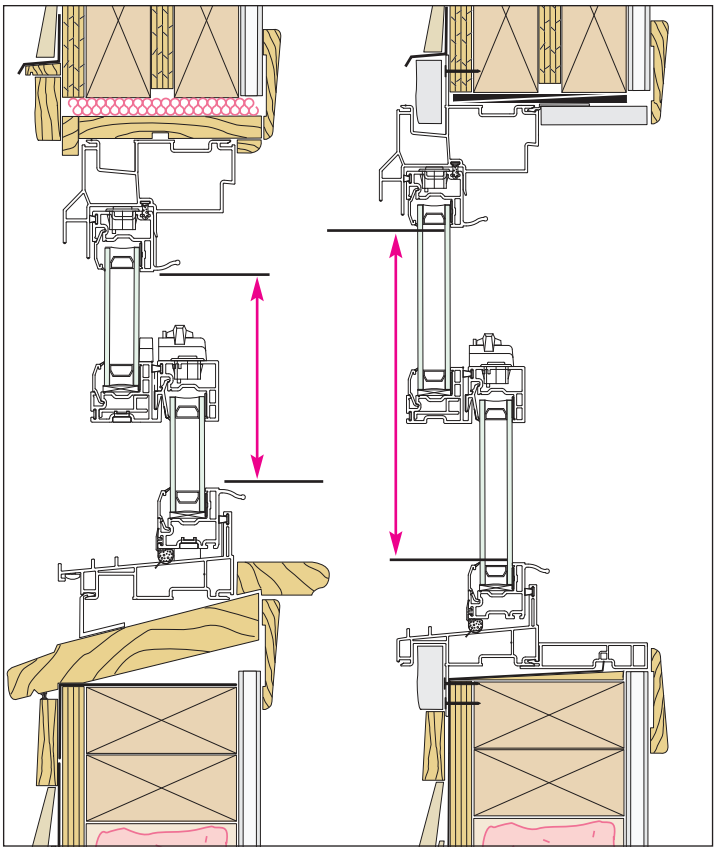
Frame-Out Gives 25% More Glass Area and Egress Area

For wood windows with plastic track and spring balances, add 2 inches to the width and 2-1/2 inches to the height.

This approach will accurately provide a window that will fit and be able to be shimmed and flashed properly.



All pieces of the old window, complete with frame, sill and trim will need to be removed to expose wall framing.



Instead of the pocket Frame-In install, a larger finned new window is mounted to the framing with proper flashing, drip cap and effective sill pan. Cellular pvc trim is applied over the fin. Jamb extensions re-finish the interior. More Glass area, better water management.

© 2015 AWDI, LLC Do not reproduce without permission

Frame Out -
Destructive Tear Out

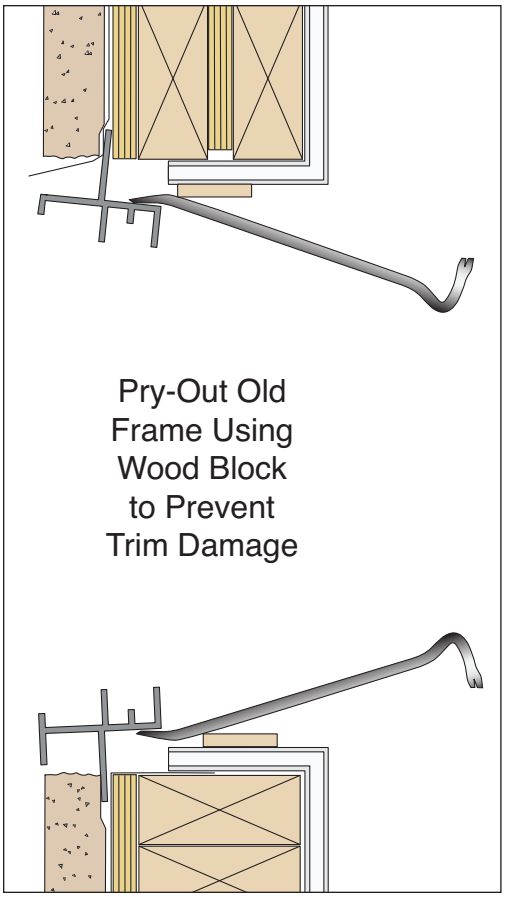
Metal Windows
Metal windows are often buried behind siding that was installed during new construction or a previous remodel of the home. “J” Channel was used to finish the newer siding, and cutting back everything to expose the window’s fin can be an expensive approach. If the decision is for a Frame-Out, then a “destructive” Frame-Out may be the only alternative. This method is best when there is a large overhang or other architectural element on the home to limit the amount of direct rainfall on the new window.

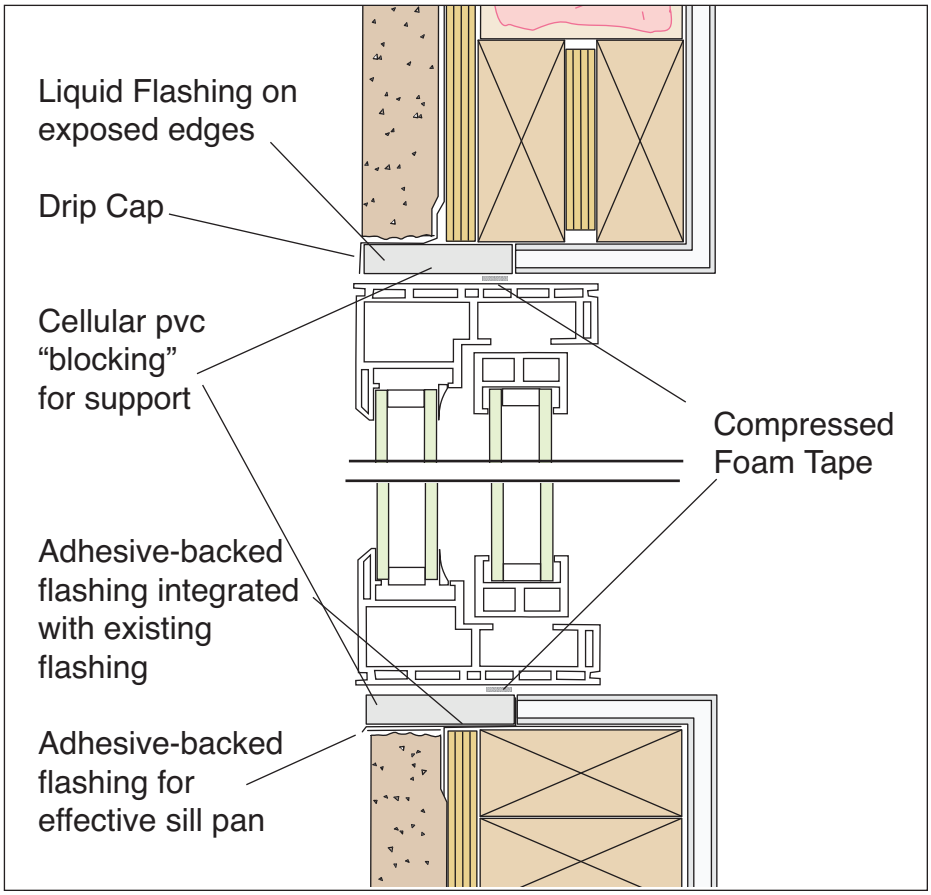
The operable sash and any fixed panels of glass are removed down to the old frame - sill, header and jambs. A pry bar is used to get under the sill, and using a wood block to avoid damage to the interior finish, the sill of the old window is pried up, the header pried down, and the jambs in from the side. This collapses the window into the opening so it can be removed. Prying the old frame, in essence, tears the mounting fin of the old window out of the space between the framing and the siding - destroying the continuity of the old flashing.

It is imperative that some continuity be restored using liquid flashing, or adhesive-backed flashing to repair the opening.

A drip cap and some functional sill pan should be created. “Cover” the 4 sides with cellular pvc of MDF board, which is sealed to the old opening.

The bottom line is to be sure that water is diverted, drained and dried to effect a weather resistant installation.





Whether it’s stucco, panel or lapped siding, prying out of the old frame is basically the same, requiring similar repairs.

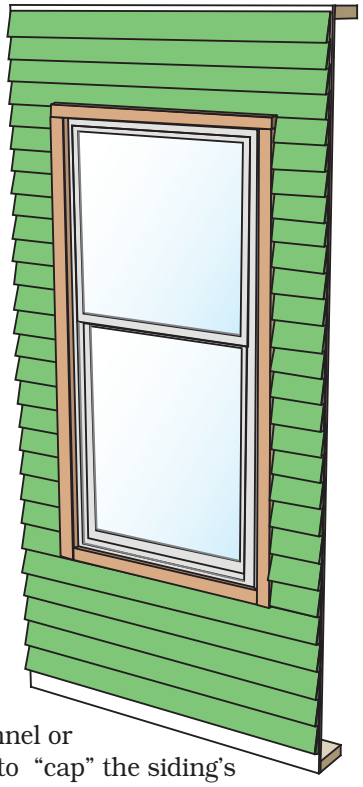
© 2015 AWDI, LLC Do not reproduce without permission

Metal Frame-Out- *Replacement Sequence*

Step 1:
Most original windows with a fin have been trimmed with applied exterior wood trim or casing to cover the mounting fin and abut the siding.

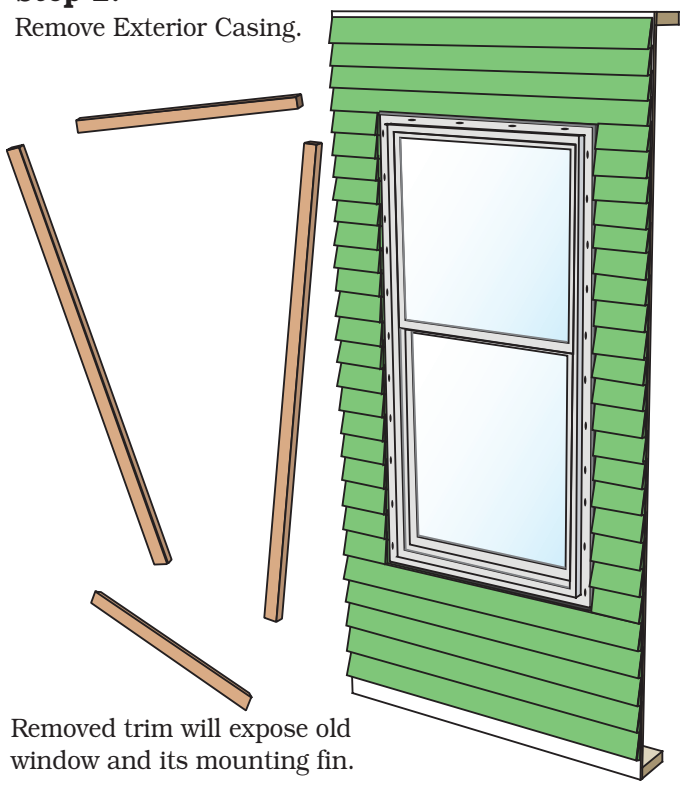
Carefully break any sealed joints between the casing, the siding and the window.

If there is no casing and the siding butts to window frame using a "J" Channel, cut-back the siding with circular saw or Fein Tool to expose the old window's fin, and proceed the same from there.



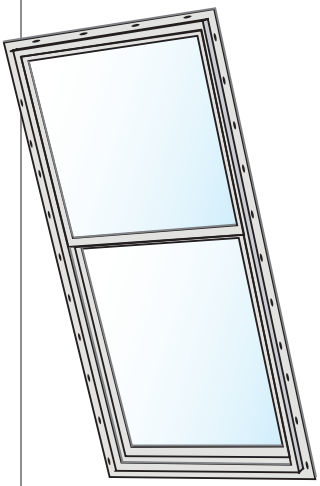
At the finish, use "J" Channel or extended leg "C" Channel to "cap" the siding's cut ends and form a joint with the new casing trim.

Step 2:
Remove Exterior Casing.

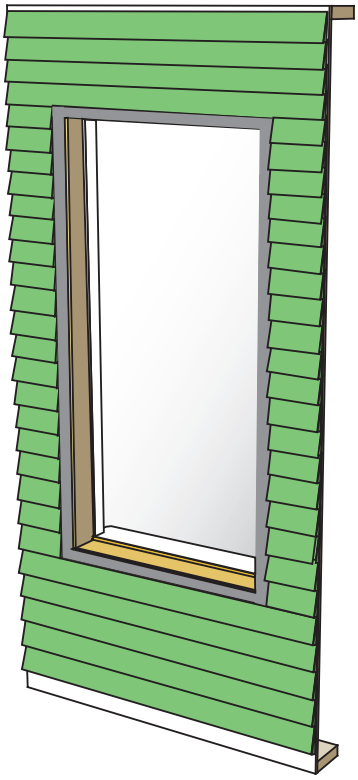


Removed trim will expose old window and its mounting fin.

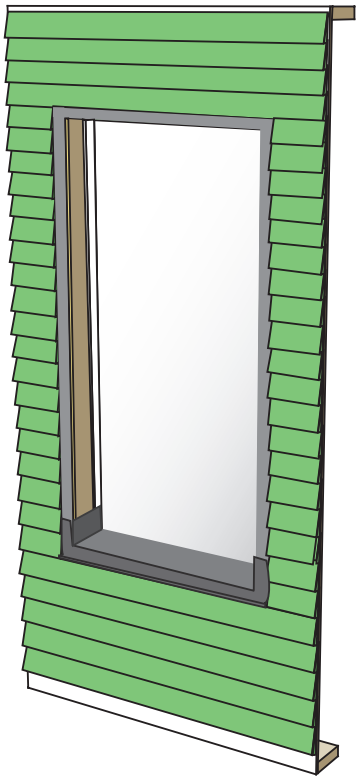
Step 3:
Removed the nails carefully from the old window's fin.



Try to disrupt old flashing as little as possible.



Step 4:
Create Sill Flashing using adhesive-backed flashing, and/or liquid applied flashing to cover the old sill and extend up the jambs about 6 inches.

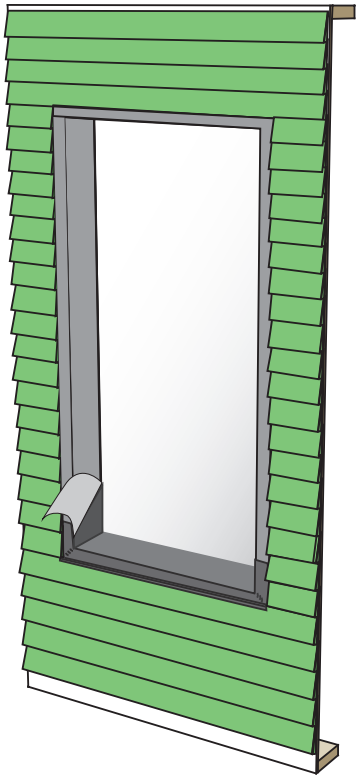


© 2015 AWDI, LLC Do not reproduce without permission

Step 5:

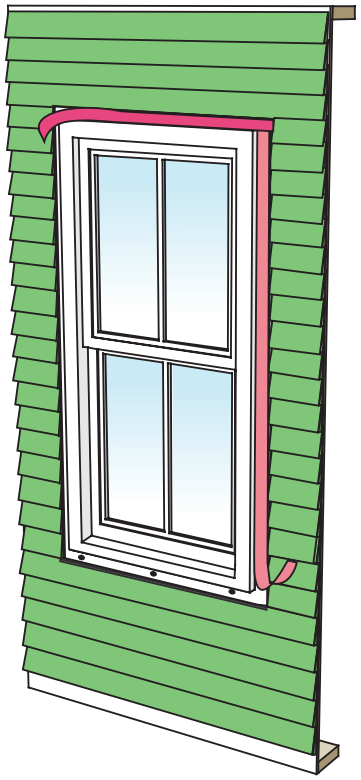
Re-establish jamb and header flashing using adhesive-backed flashing or liquid applied flashing.

Where adhesive-backed flashing is used, overlap the sill flashing with the jamb flashing, and overlap the jamb flashing with the header flashing.

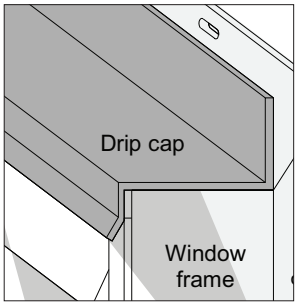


Step 7:

Apply Adhesive-backed flashing over fin and tuck under siding.



Place Drip Cap on top.



Step 6:

Set the new window in place. Carefully shim to leave drainage space at sill and make new window plumb, square and level.

Carefully fasten being careful not to nail the new window too tight.

Use Simplex (or equal) cap nails at header to allow expansion.

Step 7:

Apply new pvc trim casing over flashed fin on header and jambs and then seal.

Trim placed along bottom must allow drainage of any water that may accumulate in sill.

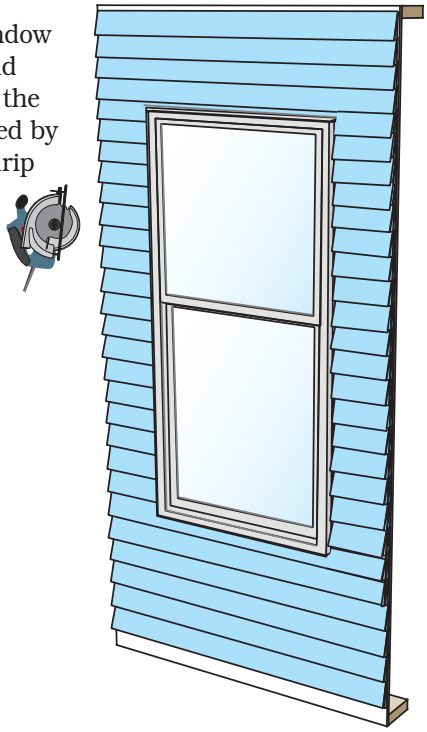
© 2015 AWDI, LLC Do not reproduce without permission

Nailing Fin Frame-Out- *Alternate*

If a Fin-Mounted Window has the fin covered with J-Channel and siding, the siding can be cut back to expose the nailing fin making the old window easy to remove. Once the new window is installed and flashed, exterior trim molding can be applied as shown on previous page.

Step 1:

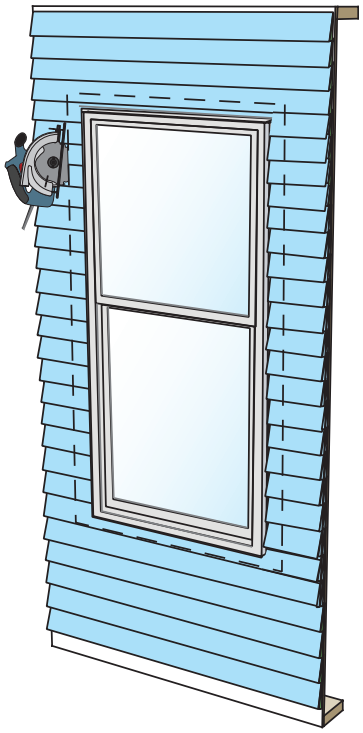
A very common window installation of an old finned window has the mounting fin covered by "J" Channels and drip cap and has the siding butting up to the "J" Channel.



Step 2:

Cut-back the siding with circular saw or Oscillating Tool sufficient width (approximately 1/2" to 2") to expose the old window's mounting fin.

Take care not to cut too deep.



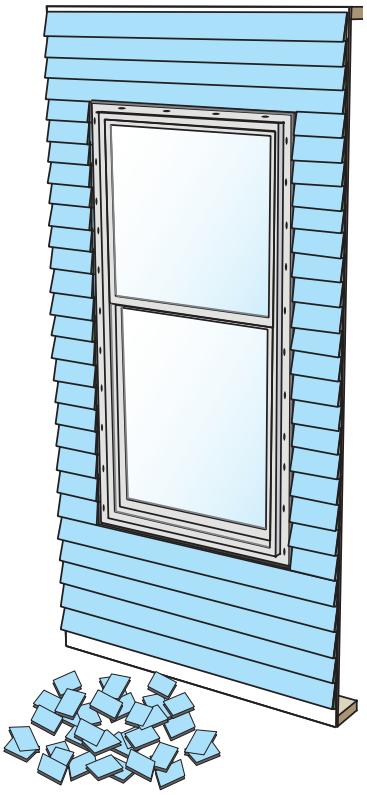
Step 3:

Removed the siding carefully nails carefully from and make adjustments as necessary to expose the complete fin.

Try to disrupt old flashing as little as possible.

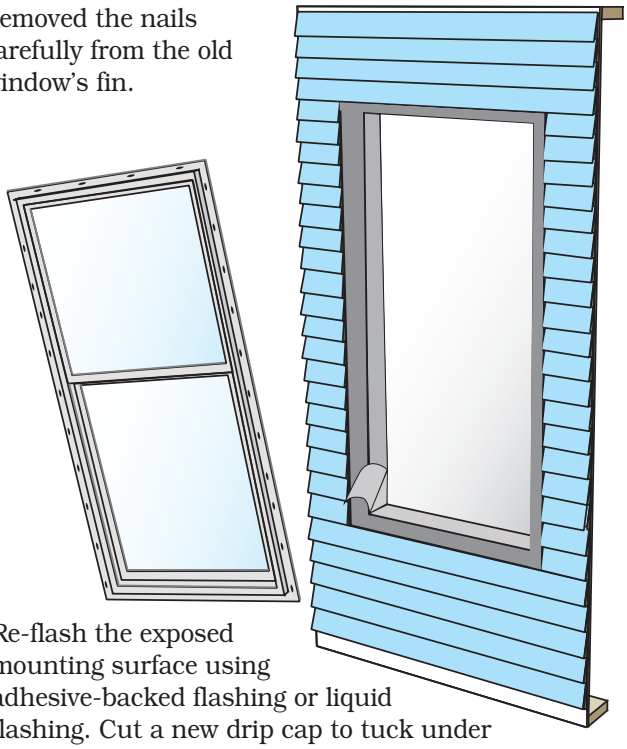
Remove all the siding pieces from around the window as cleanly as possible- trying to preserve any flashing.

The cleaner the cutaway, the easier and better the finished replacement will be.



Step 4:

Removed the nails carefully from the old window's fin.



Re-flash the exposed mounting surface using adhesive-backed flashing or liquid flashing. Cut a new drip cap to tuck under the siding after the new window is installed.

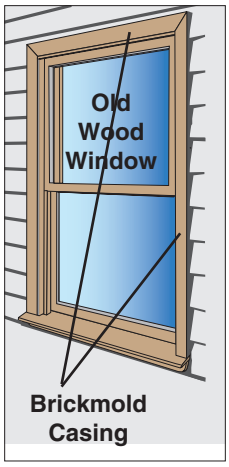
© 2015 AWDI, LLC Do not reproduce without permission

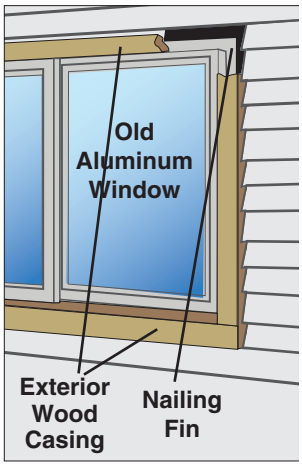
Frame-Out, Kerfed Brickmold Method for Old Wood, Metal or Vinyl Finned Windows

Care always needs to be taken to avoid damaging the weather barrier under the old siding. Prying out old windows can damage the building paper and substrate. These methods allow proper removal of the old window and proper installation and re-establishment of the weather barrier avoiding leaks and potential moisture damage under the siding.

Both old wood windows and old aluminum sliders, often installed in a structure with wood or other lapped siding, or even stucco should be replaced by removing the entire old window down to the rough opening.

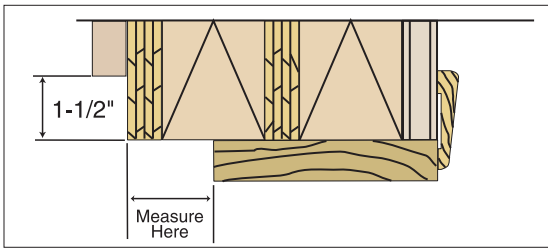
As shown in the figure at right, the old wood window is anchored to the structure by nails through the brick mould casing. The old aluminum window is anchored by nailing through the fin, and then having the fin covered by the siding or wood casing.





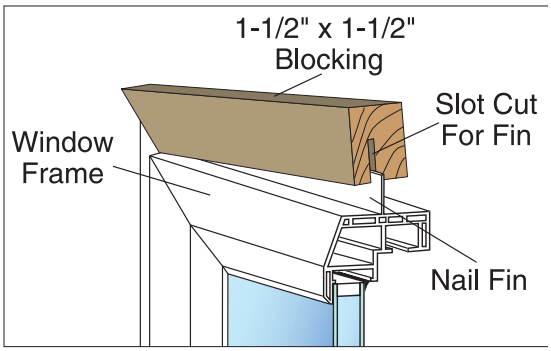
Using a new construction vinyl window (with an integral nailing fin), this alternative method of installation makes use of a wood block (preferably cedar), typically 1-1/2" by 1-1/2" however, any size that makes the job work well is what to choose.. This block is attached to the integral nailing fin around the perimeter of the vinyl window frame. This block, in essence, replaces the brick mould casing of the old wood window, or the nailing fin and wood casing of the old aluminum window.

Care needs to be taken to make sure that the new window with the cedar blocking fills the same opening dimensions of the old window that is removed. If necessary, cut back the siding for a more perfect fit, but if there is sufficient room, accurate measurement prior to ordering the replacement vinyl window may avoid cutting back any siding.



It is also important to make sure that there is a proper drip cap along the header of the vinyl window with the blocking and that the entire perimeter of the new installation is properly caulked to avoid water penetration.

Installations using the rough framing can be done from either the inside or the outside of the home, but the blocking method must be done from the exterior.

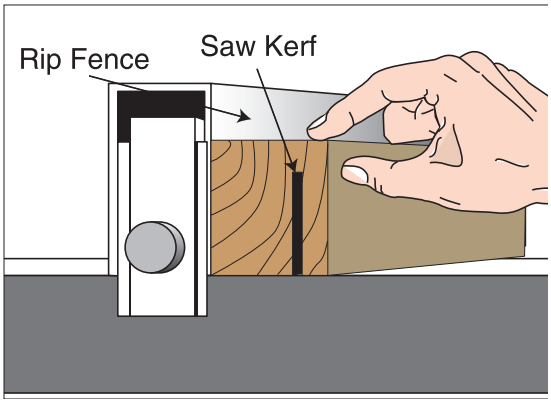


Cut back the siding to install the blocked window.

1. Draw a line on the siding, 1-1/2" from the edge of the rough opening at the head, sill and both jambs. This will be the edge that the blocking will butt up against.

2. Use a circular saw or Window Fitter oscillating tool to cut along the line (to cut through the siding, but not the sheathing or studs below the sheathing) and remove the siding pieces within the cut.

Under some circumstances, the existing window could have been removed. If the existing window is still in place, and there is no casing covering the window nailing fin, removal of 1-1/2" of siding should expose the nailing fin of the old window allowing it to be removed.



3. Measure the depth of the rough opening pocket from the edge of the interior trim (extension jambs or drywall return) to the outside edge of the wall substrate (sheathing or similar) against which the blocking will be seated. The common measurement will be between 3/4" to 1". Whatever the dimension, it is the measurement that will determine the location of the slot to be cut in the blocking.

© 2015 AWDI, LLC Do not reproduce without permission

The measurement from the nailing fin to the exterior edge of the new window frame is typically 1-1/2". If the measurement of the pocket depth (the interior trim to the edge of the substrate) is 3/4", then the interior edge of the slot in the blocking will be cut at 3/4".

4. Measure the width and height of the replacement window. Because you will be cutting 45 degree cuts on each end, add at least 5" to the width and height measurements. Cut a length of the 1-1/2" x 1-1/2" blocking to a length(s) that will allow you to cut the individual blocking for the new window.

5. Cut the slot in the blocking on a table saw. Use a thin kerf blade so that the block fits snugly on the nailing fin of the new window. Set the saw blade for the required measurement away from the rip fence. Then set the saw blade height slightly taller then the depth of the nailing fin (typically 1-1/16" will suffice).

6. Once the slots are cut, cut the blocking to length using a 45 degree miter cut, as shown. Excluding the nailing fin, measure the new window frame to establish the lengths needed for the head, jambs and sill blocking. For each of the blocking pieces, measure from the shorter end of the initial miter to what will be the shorter end of the opposite miter cut. Be careful. Better to be 1/16" longer than necessary, than 1/16" shorter. Also take care that the header and sill pieces, and the two jamb pieces are identical in length.

7. Apply a thin bead of caulk the nailing fin on the exterior side. Place the blocking over the nailing fins of the head, sill and jambs — making sure the interior side of the blocking is facing the interior side of the window on all four sides.

8. Butt the edges of the blocking against the window frame, and bring the mitered ends together. Seal the entire gap between the mitered ends with caulking. Nail the ends of the blocking together (as shown). The window is ready to install.

9. Run a continuous bead of caulking around the perimeter of the rough opening where the blocking will seat against it.

10. The new installation should have a drip cap. If the old drip cap is in place, remove it and replace it with a newly prepared cap that will extend out, over the header blocking. The drip cap can be fashioned using cap stock and a metal brake.

11. Place the window in the opening. Press tightly against the caulk bead to assure a good seal. If measurements were accurate, the interior edge of the new window will butt up against the interior trim (drywall return or jamb extensions). You can use new "J" Channel as long as you are able to fit it under the trimmed siding in proper fashion for proper drainage and in accordance with good flashing techniques.

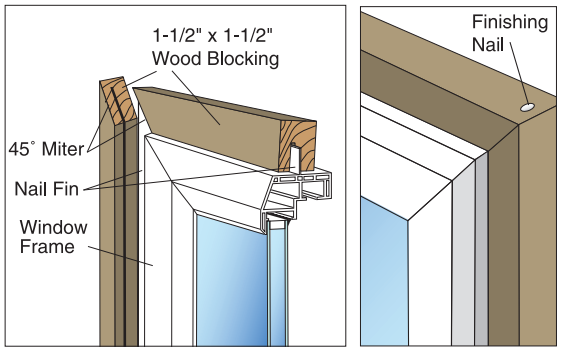
12. Square and plumb the window, and check the sash reveal.

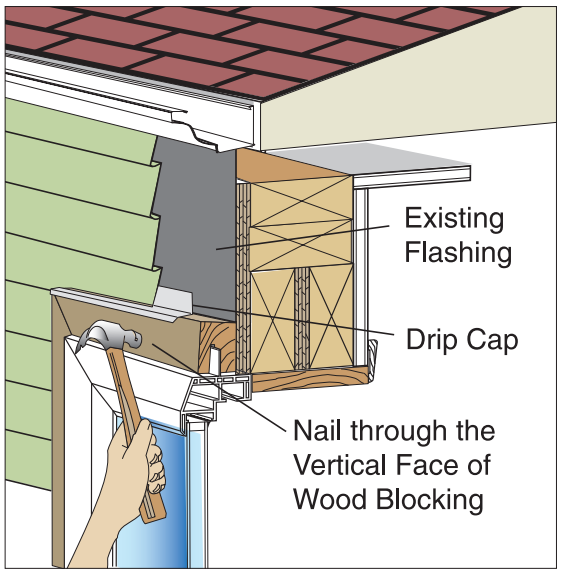
13. Fasten the window to the rough opening through the blocking using #16 stainless steel or corrosion resistant finishing nails. Nails should be placed within 4" from each corner and spaced no greater than 14" apart. Drill pilot holes through blocking, if necessary.

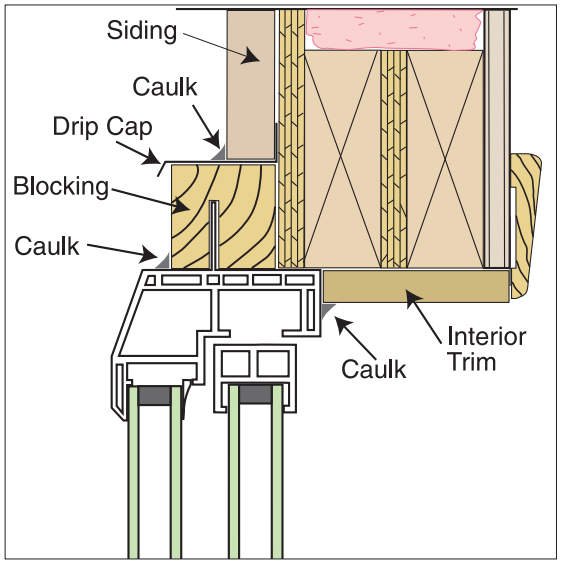
14. Run a continuous bead of caulk around the perimeter of the window, between the blocking and the existing siding, as shown. Also caulk along the joint of the mitered corners.

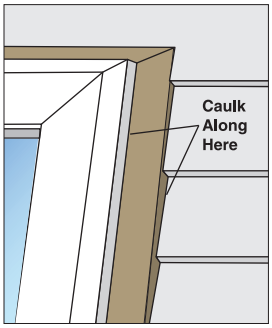
15. Run a continuous bead of caulk around the window where the frame meets the blocking.

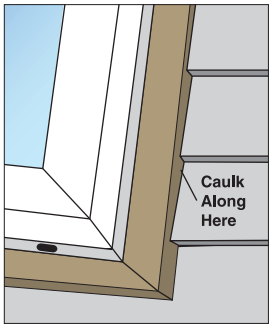
16. Caulk the interior where the new window meets the interior extension jamb or drywall return, and tool the bead smooth. Finish the blocking on the outside to match the existing siding.











© 2015 AWDI, LLC Do not reproduce without permission

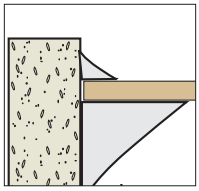
Picking the Proper Sealant

AWDI understands that the application of a sealant is as crucial as the choice of sealant. When a bead of sealant is applied to a joint there are severable factors to consider:

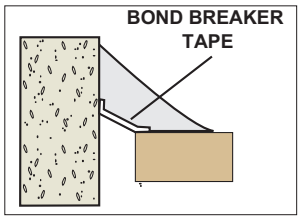
- Adhesion
- Flexibility
- Durability
- Compatibility
- Temp, Weather, Exposure)
- Aesthetics

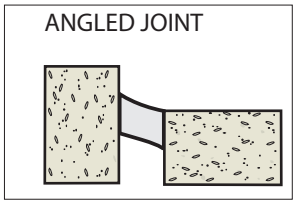
Within these three performance aspects there are countless combinations of applications, substrates and conditions a sealant is exposed to.

Bedding Joints:
For bedding joints, it is especially important that the sealant meet AAMA 800-802, and is of the right consistency and made up of 100% solids so it will not shrink after cure, unlike solvent and latex based sealants that shrink and create gaps after curing.

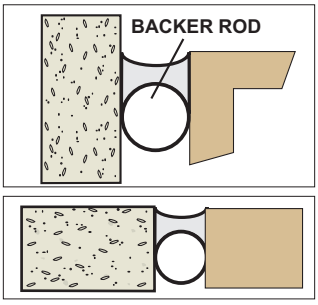


Fillet Joints:
A fillet joint is formed when two surfaces come together to form a right angle. The sealant used to join these two surfaces is triangular in shape. The sealant must adhere to the variety of substrates you're faced with. Without strong adhesion there is a high chance that the sealant will pull away from the substrate allowing for air and water infiltration.





Control Joints:
A control joint is formed when two similar or dissimilar materials meet or when substrates do not form a right angle. This joint will require both a backer rod and sealant for proper application. This joint can be as wide as 5/8 inch and be prone to extreme movement, a highly flexible sealant is necessary for a reliable seal with this application. In order to successfully install a window or door and effect a lasting weathertight seal, AWDI recommends an ASTM C920, Class 50 sealant such as premium DYNAFLEX® from DAP as a good representative to seal the exterior joints of windows and exterior finish materials. The best choice is a sealant that meets AAMA 800-802 to assure proper adhesion to the most common building materials and that is compatible with WRB and flashing tapes; and can be ued in a wide temperature range and wet surfaces.



Desired Properties

- No Shrinkage
- Locks out air and water infiltration to protect integrity of the seal
- Proven Wet Surface Application
- Ability to use the same sealant in warm and cold temperature situations to produce consistent results. 0F – 140F cold and warm weather application
- Strong Adhesion / All Surfaces Will stick to even the most difficult to bond building materials
- 5X stretch, 50% joint movement Long term durability assurance even with expansion and contraction of building materials
- 24 hour fast cure, paintable 1 HR. Fast cure to protect the building structure from outside forces and quick paintability saves time
- Achieves bubbling resistance faster to ensure optimal aesthetics
- 4,600 + Color Matches ensures perfect color match to all primary building materials
- Dirt & Dust Resistance ensures optimal visual appeal long after an installation
- UV Resistance
- Long term durability to compliment the durability of the building structure

© 2014-18 AWDI, LLC Do not reproduce without permission

Spray Foam Insulation

While the term “Spray Foam” is often widely used in construction, there are two different types and each has its advantages and disadvantage.

Spray foam has been shunned by window installers and manufacturers over the years because foams, in the past, have either continued to expand after trim has been applied deforming the more pliable vinyl window frames, or because they have been over used to fill the gaps left when old windows are removed and the underlying rough opening has been exposed.

Make sure the foam you use has been tested in accordance with AAMA 812 and meets standard for low pressure development.

Most standards applying to window installation do not delineate between open cell foam and closed cell foam, the more popular “minimal expansion” foams are most frequently used and they are mostly closed cell. More confusing yet, is when foams are recommended, the compressed foam tape alternatives are called out to be open cell.

When it comes to Spray Foams, it helps to understand the differences.Open-cell spray foam (ocSPF) has a cell structure where the cells are filled with air. The open-cell structure renders soft, flexible foam, with a density of about 0.5-0.8 pounds per cubic foot (pcf).

The R-value per inch of open-cell foam typically ranges from R3.6 to R4.5 per inch. Unlike fiberglass and cellulose, the fine cell structure of ocSPF makes it air-impermeable at certain thicknesses. The air-impermeability of ocSPF qualifies it as an air-barrier material, dramatically reducing air leakage through the building envelope, significantly lowering the building’s heating and cooling costs. However, ocSPF, like fiberglass and cellulose insulations, is moisture-permeable, and may require the installation of a vapor retarder in colder climates.

Closed-cell spray foam (ccSPF) has a closed cell structure which yields rigid hard foam, with a density of 1.8-2.3 pound per cubic foot (pcf), and can provide structural enhancement in certain framed buildings. The smaller cells trap insulating gas from the curing, which has a lower thermal conductivity than still air, and increases the R-value to anywhere from R5.8 to R6.9 per inch.

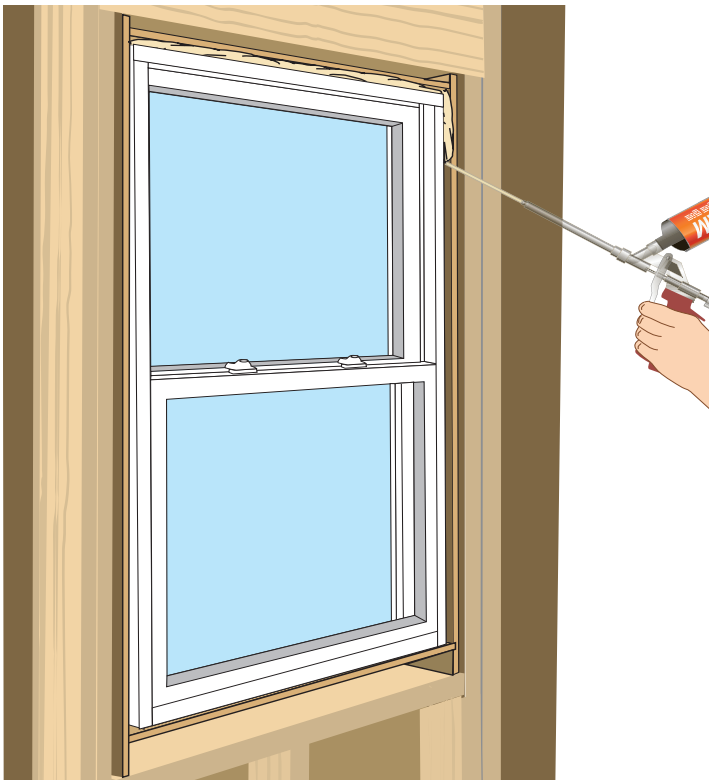
Like ocSPF, ccSPF is also air impermeable at certain thicknesses and can qualify as an air-barrier material. The bigger benefit is that the closed-cell structure of ccSPF also makes it water-resistant, and is the only spray foam that can be used where contact with water is likely.

At a thickness of 1.5 inches, no additional vapor retarder is required for most applications.

Desired Properties

- Make sure the foam used has been tested in accordance with AAMA 812 and meets standard for low pressure development.
- Quick Setting Formulation: can be cut or trimmed in less than 1 hour
- Cold Temperature Application: can be applied in temperatures as low as 14F
- Insulation Value of R5: makes it an efficient method for stopping air and moisture infiltration
- Remains Flexible Once Cured: will not crack or dry out

© 2014-18 AWDI, LLC Do not reproduce without permission



Using Spray Foam

For the best installation, it is necessary for the gap around the window or door to be sealed to block out air, water and vapor penetration. ccSPF can do that well if selected and used properly. Improper use can create water traps, impede drainage and exert excessive pressure to the window frame during expansion.

Remember: Vapor barriers need to applied on the warm side of the opening. Double vapor barriers (one on the warm side and another on the cool side) encourage condensation between and will trap the resulting condensation. Also, window installation cavities (the space between the window frame and the rough opening, or left-in-place old window frame) need to "breathe" to the outside, and allow drainage of collected water to the outside.

Used wisely, ccSPF can be the best solution. AWDI recommends DAP® DRAFTSTOP 812 Window and Door foam. DAP® DRAFTSTOP 812 also achieves a thermal performance of R-5 per inch.

Application

DAP DRAFTSTOP Foam is applied using a Foam Applicator Gun. This foam and gun combination allows for more precise application than the straw grade foam alternative. This gun offers a rear valve used to control the size of bead applied into the openings. The valve also allows the life of the foam to be extended by closing the opening of the barrel for future use.

For even smaller openings, a detachable screw on top is included with the gun to be able to fill gaps as small as ¼" wide.

Important tips:

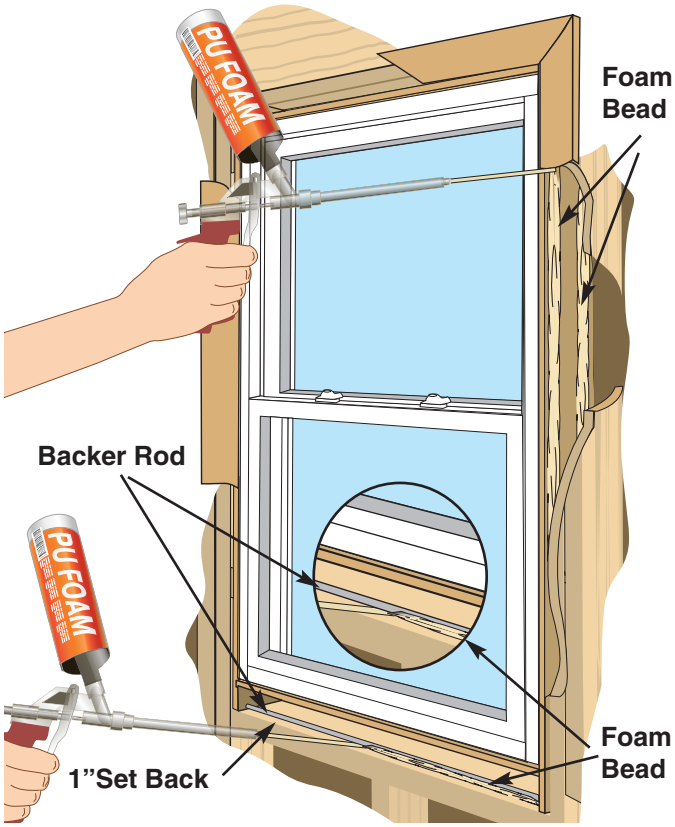
• Similar to the sealant gun, it is critical that you balance the movement of the foam gun or straw barrel and how you dispense the foam so that the foam makes contact with both the rough or existing window frame and replacement window frame.

• If the dispensed foam does not make contact with both the rough frame and the window frame, there won't be an adequate bond to seal out water and air.

• Industry Standards suggest application of 1 inch beads, separated by an equal space. Be careful not to create two vapor barriers - one at the exterior and one at the interior. Make sure there is the ability for the opening to breathe to the cold side for drying and drainage. Use backer rod about one inch in the sill as a stop to make a workable back dam

• When applying foam around the perimeter of the window or door, you must maintain a minimum depth of 1 inch. This depth is required to provide the correct thermal performance, to help improve energy savings, and to protect against condensation problems.

• When applying foam as a back dam to the gap between the window frame and the rough sill, do not allow the foam to extend to the exterior edge of the opening. Maintain a minimum of a 1 inch gap between the foam and the exterior edge of the rough sill. If foam fills this gap at the sill, any water from leakage will not be able to drain to the drainage plane or exterior cladding surface. Place backer rod the length of the sill, 1" from edge and use it as a back dam guide.



© 2014-18 AWDI, LLC Do not reproduce without permission