Window Installation Guidelines

Produced by TimberTek Consulting

Endorsed by:
Johnson County Building Officials Association
May 2007

Johnson County
Window Installation Guidelines

Walls with fenestration units (windows and doors) installed in them are an integral part of the structure's weather-resistive system. This document is designed to show the installer how the water-shedding surfaces of the fenestration units shall be integrated with the adjacent water-shedding surfaces of the building envelope. It is assumed that the basic design of the building's outer most surface will be dependable in stopping most water entry and that the building envelope incorporates an effective concealed water-resistive barrier that will prevent further intrusion of incidental water that breaches the outermost surface. This document will show how the fenestration units are to be sealed to, and integrated with the concealed water-resistive barrier (WRB), otherwise known as the secondary drainage plane. The *2006 International Residential Code*, on which this document is based, requires a water-resistive barrier behind all siding whether the construction is single wall or the more traditional double wall construction.

Most manufacturers of exterior components do not supply instructions that adequately bridge their product to the wall, making it difficult for installers to determine their responsibility when joining components. When available, fenestration product manufacturer's detailed installation instructions shall be used as the fenestration installer's primary guide. In the absence of such manufacturer's instructions, the procedures outlined herein shall be followed. These procedures are based on ASTM E 2112.

Introduction

The shell of the house serves as our first line of defense between those occupying the building and the outside environment. The exterior walls function as a weather barrier and an energy conserving boundary which must be durable enough to last for the life of the structure.

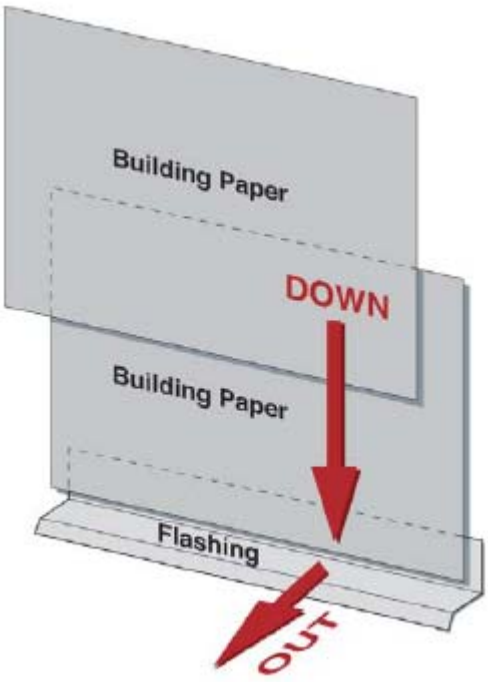
In this hose test, water penetrated this brick veneer in less than one minute

Wood, masonry, brick, stucco, vinyl and other siding materials do not function as barriers to wind driven rain. Sidings are porous and typically have a multitude of joints, laps, and connections making it discontinuous. Air and water are driven through these leakage points by wind, gravity and capillary forces. Since we often use water-sensitive materials for siding and structural elements, leaking water can cause mold and mildew, leading to eventual wood rot, and even corrosion of steel fasteners as well as reduction in insulating R-values. Air leaks also cause increases in energy consumption.

Many builders and carpenters make the mistake of thinking that sidings such as wood, brick, vinyl and stucco are impenetrable barriers against the elements. The fact of the matter is that whether water is propelled by wind, gravity, capillary attraction or some combination of these forces, eventually it finds its way behind, around or through the siding. This is why the code now requires a water-resistive barrier, or secondary drainage plane behind all siding whether the construction is single wall or more traditional double wall construction. The fenestration units must also be incorporated correctly into this portion of the building envelope.

It seems that a majority of builders and framers believe that caulking around windows, between the end-joints of siding and along corner boards constitutes the development of an impenetrable water barrier. Unfortunately, dynamic joints like siding joints move dramatically as a result of changing thermal and moisture conditions. This also occurs where two differential materials meet, such as stucco and wood trim. Even if a joint doesn't move enough to make the caulk itself fail, in time, repetitive movement and prolonged exposure to varying weather conditions will cause failure at the bonded connection. A hairline crack that develops in the caulking is large enough to admit water into the wall system but not large enough to allow drying. In the short term caulking can help block water penetration. However, in the long run it will actually trap moisture behind the siding.

So, if all cladding leaks and caulks all fail, then how can we keep our buildings dry? The water shedding strategies employed by wall systems can be broadly categorized as surface barrier systems and membrane/drainage systems.



Shingle lap of drainage plane materials

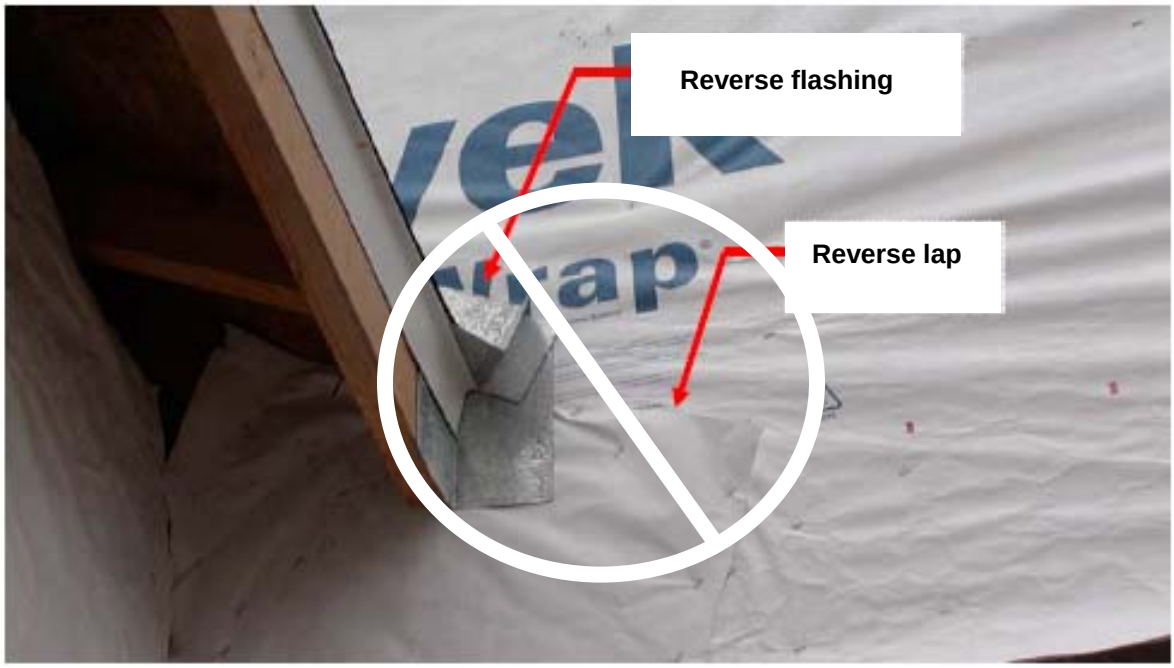
The surface barrier system is one in which the outermost surface of the wall is the primary barrier that protects against water infiltration. A concrete structure, which has had a paint or sealant applied to the exterior surface to protect it is an example of a barrier system. When the window or door unit is installed a sealant which spans from the concrete to the weatherable perimeter of the window or door unit is installed to prevent moisture infiltration.

The majority of wall cladding systems used on light frame buildings incorporate a water-resistive barrier (WRB) behind them, and therefore are membrane/drainage systems. A membrane/drainage system employs a first surface water barrier and a secondary drainage plane. Examples of these types of building envelopes are exterior surfaces made from stucco, lap sidings (such as lumber, plywood and hardboard), interlocking lap sidings (such as vinyl, aluminum, and steel), veneers (such as brick or tile), wood shingles and shakes, and other applied exterior surfaces. In these applications the water-resistant barrier or secondary drainage

plane behind the first surface becomes the barrier to the infiltration of air and water. Building envelopes designed with a cavity between two walls are included in this category.

In membrane/drainage walls, window and door units are integrated with, and sealed to the water-resistant barrier and includes sealing the flashing system. The flashing system shall direct all incidental water to the outer surface of the wall. The design may also allow flashing to route incidental water to the drainage plane only. The membrane/ drainage system requires sealing and integration between the fenestration unit and the concealed WRB. *It specifically does <u>not</u> recognize as acceptable the substitution of a seal between the unit and the outermost surface of the cladding in lieu of sealing and integrating the unit to the concealed WRB.* This is just one reason why windows are not to be installed on top of the siding.

Integration implies permanence, continuity, seamlessness, and being waterproof. Applied flanges may require more elaborate flashing and sealing details to ensure weather protection of the installed unit. When using applied flanges, follow the manufacturers' instructions for sealing the flange to the building frame.



Improper installation of drainage plane materials

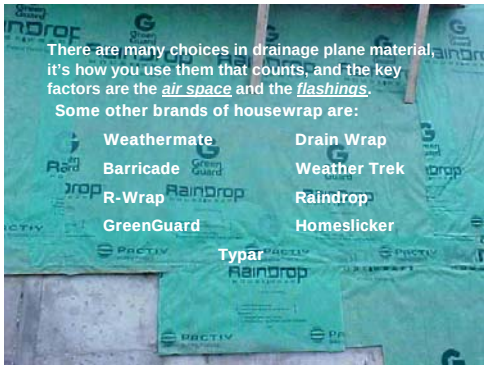
This system described here incorporates a continuous drainage plane with integrated flashings where everything overlaps shingle fashion and directs water down and out. In this system gravity does all the work for us. We can build a water resistive wall system with any kind of siding and with various types of drainage planes and flashing materials.

The key is that the drainage plane must be continuous over the entire building exterior. Then all the windows and doors shall be connected directly to the drainage plane. Every single flashing shall tie into the drainage plane and drain on top of it, not behind it. One reverse lap or unflashed penetration can ruin the whole wall. Another key to an effective drainage plane behind the siding is an air space. Some sidings like vinyl create a natural air space for drainage but some types of cladding need an air space created behind them. Several brands of housewrap have a built-in air space. Some have channels and some are pleated. In either case, they are designed with an air space that allows water that penetrates the exterior cladding to easily drain down and back to the outside.

Continuous drainage plane over entire building

Under the 2006 IRC, even single wall construction shall have a WRB placed directly over the studs behind the siding to protect the wall cavity

After the water resistive barrier is in place, the windows and doors can be installed. Once a window is in place, the installer usually applies a flashing tape over the nailing flanges of the window and considers it to be water-proof. Wrong. First of all, flashing tapes are not designed to stick to some surfaces. They are not designed to stick to wood sheathing, and in single wall construction, they are not designed to stick to siding. Thus, there is no guarantee the windows won't leak at some point. Secondly, most window leakage occurs behind that seal because most windows themselves leak. Without proper sill flashing, water will still get in and drain down to the corners of the window sill where it will come into direct contact with the wood framing and ultimately it will get into the wall cavity causing serious damage to the structure.



Older windows use to have metal pan flashing. Today we have flexible peel-and-stick sill flashings similar to an elastic ice and water shield. When this flexible sill flashing is applied across the bottom of the sill and adhered to the WRB prior to the window installation, the wall is protected in the event the window leaks.

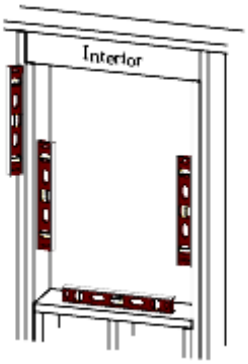
A window placed in a wall should have redundant drainage systems. The window itself should drain, the opening the window sits in should drain, and the wall that the opening is

in should also drain. At every joint, flashing should kick water to the exterior. If you don't provide for effective drainage and instead put your faith in caulks, you are asking for trouble.

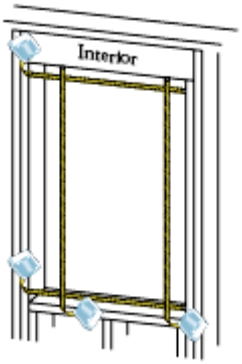
Rain is the primary source of wetting in walls. Our goal is to eliminate rain as a source of wetting. That is why it's important to drain everything and to focus on every element in the drainage system. This includes the drainage plane, the drainage space, the flashings and the weeps. If we pay proper attention to those key details, we will have done most of what is necessary to provide our buildings with dry walls.

Installation of Clad Casement and Awning Windows

Preparing the Rough Opening



Casement and awning windows are available as operating or stationary picture units. The directions below apply to all casement and awning units. Sliding patio doors and French doors will be addressed later in this publication.

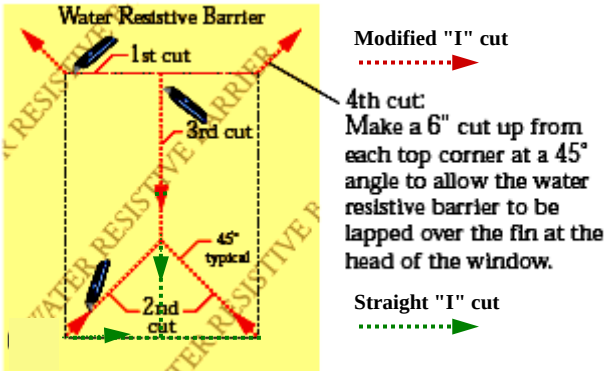


First, verify that the opening is plumb and level. Then measure the rough opening to ensure that it will allow the installation of the window unit in a square, plumb and level condition. Measure all four sides to make sure the rough opening is 1/2-inch larger than the window in both width and height. Be sure the window unit will not be racked by installing it in an out-of-square or out-of-plane opening. Racking of the window or door is not an acceptable practice to get the unit into the opening. Even if racking does not noticeably interfere with the operation of the sash or door it may nevertheless render the unit prone to water intrusion, air leakage, and excessive noise transmission or reduce its ability to withstand design wind loads.

Making the modified "I" cut in housewrap — a straight "I" cut is also acceptable

When using housewrap as the water-resistive barrier, apply the WRB in water shedding fashion, starting at the base of the wall and working towards the top. Install the WRB to the face of the building framing (studs) or sheathing. Next, cut a straight "I" pattern or a modified "I" pattern in the water resistive barrier. Then fold the flaps into the opening and staple to inside wall.

Be sure that flaps are wrapped around corner onto inside face of studs before cutting off excess. At the head of the opening, starting at the top corner of the window, measure from the corner 6 inches up and 6 inches over and mark. Now, carefully cut the housewrap at a 45 degree angle. Raise the top edge of the barrier up and temporarily tape the top corners and center to the exterior WRB surface above. This is done in order to allow for installation of the window and flashing later. Install the horizontal sill flashing material next. Since the sill is flat and level, water that may penetrate the opening will sit on the sill and not drain to the outside as it should.



Fortunately, even water puddled on the sill flashing will dry out faster than if the water is absorbed into the wood sill. In order to block water from moving to the interior, some builders may want to tack a small back dam strip at the inside edge of the opening to prevent water from moving to the interior. A square strip of self adhering foam weather stripping works well for this application and is quick and easy to install.

Bring housewrap back to the inside wall

A better practice is to slope the sill so water will be forced to flow out over the secondary drainage plane. In order to promote this positive drainage, a piece of beveled siding can be tacked to the sill to create a slope to the outside. The flexible sill flashing can then be applied over this slanted surface.

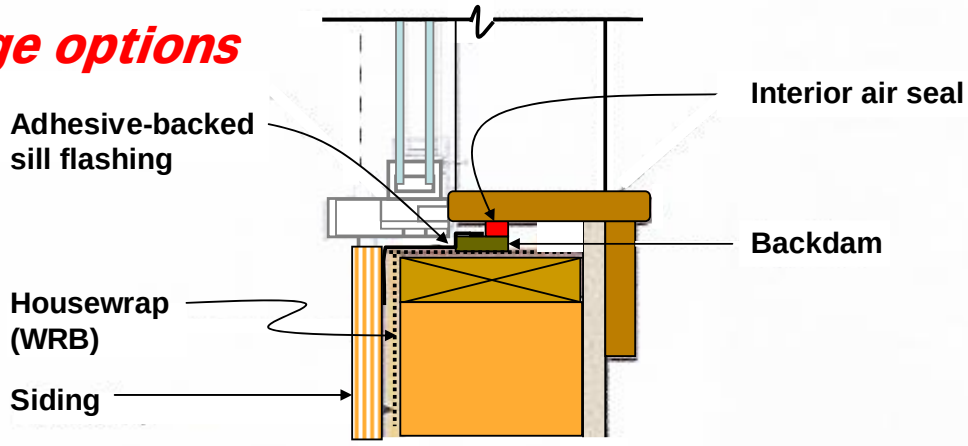
Apply sill flashing across bottom of sill and approximately 8 inches up each side

Before applying the sill flashing, cut a piece of flexible sill flashing tape 16 inches longer than the width of the opening. This tape is typically 7 inches wide for 2x4 walls and 9 inches wide for 2x6 walls. Apply it across the bottom of the opening, over the WRB and approximately 8 inches up each side. It should be installed flush with the inside edge of the framing and the remainder will fold over the WRB on the outside of the opening. The minimum lap on the exterior side is 3-inch. This fully protects the sill, and even the wall cavity, from getting wet in the event water should penetrate the opening.

If a narrower tape is used for this application, put the first piece on so it laps the WRB at least 3-inch on the exterior and then add another piece that overlaps the first strip at least 1-inch. The second piece should now provide enough width to run to the inside edge of the framing and fully cover the sill.

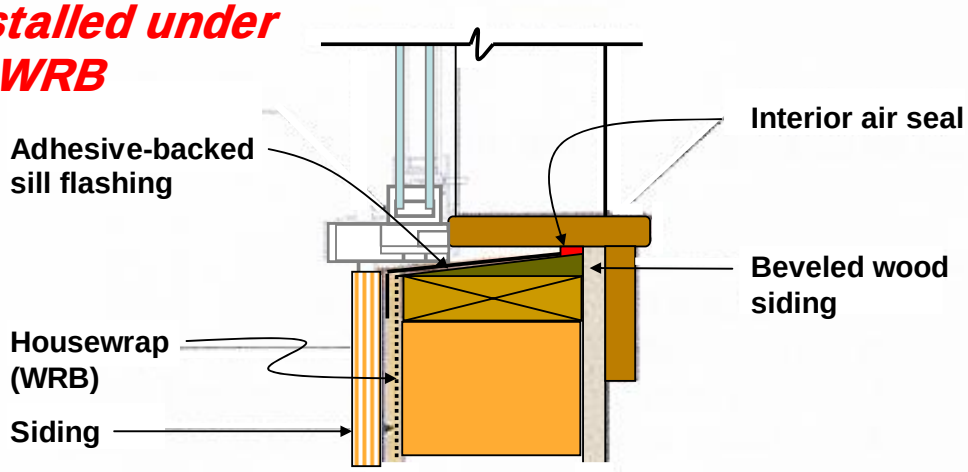
Single Wall Construction

Sill drainage options



A strip of wood nailed at the back of the rough opening sill forms a dam to prevent water from draining into the interior

Windows installed under siding, over WRB



A piece of wood bevel siding nailed over the sill to create positive drainage toward the exterior is even better

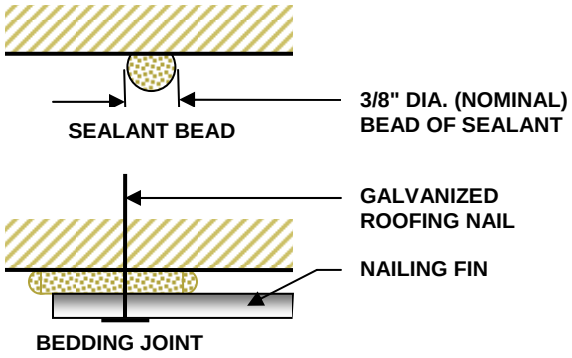
Setting and Fastening the Window

Typically, sill spacers or shims are required on the bottom of the window opening to provide a level surface for the installation of the window. To create a flat, level surface for the window to rest on where beveled siding has been used on the window sill for drainage purposes, take 1-inch wide pieces of the same beveled siding material and

reverse them to create a small level pad on top of the sill flashing membrane and tack them in place. The membrane will seal around nail holes. Place the 1-inch wide shims 1/2-inch from each side of the windows edge and at points where windows are joined in multiple window applications. Improper placement of shims or spacers may result in sagging or bowing of the window unit.

Apply a 3/8" bead of sealant up each side and across the top of the nailing flanges

Before setting the window, check the perimeter mounting flanges to be certain they are 90 degrees to the window frame. If they aren't, the window will not line up correctly on the interior. Some windows require corner seals to be installed at this point. The next step is to apply a continuous 3/8-inch bead of sealant to the back side (interior surface) of the two side and the top nailing fins, in line with the pre-punched holes or slots in the mounting flange, to act as a bedding joint. Do not apply sealant to the bottom flange or it will trap water that is supposed to drain out. Applications where flashing, building paper, water resistant barriers, or nailing fins are "bedded" with a sealant are typically low movement lap type joints where adhesion and compatibility are the primary sealant considerations. Choose sealant accordingly.



Set the bottom of the window on the spacers at the bottom of the opening and tilt the top into position. Center the window between the sides of the opening to allow clearance for shimming and then compress the bedding joint into the WRB. The sealant should bleed out or appear along the edges to ensure an adequate bedding joint. Now, check the unit for level and plumb. The racking tolerance for window units shall not exceed 1/8-inch out of level or plumb for dimensions up to 4 feet, or more than 3/16-inch for dimensions greater than 4 feet. Check the interior reveal and window operation and then finish attaching the widow unit into the opening.

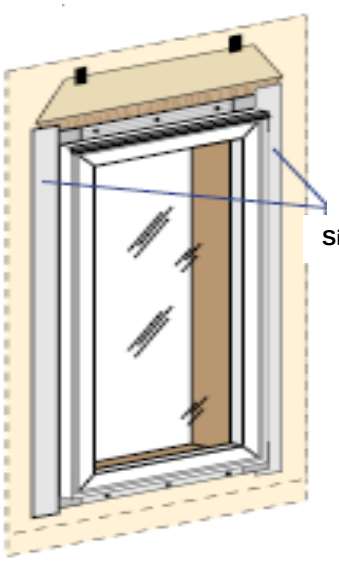
Set the bottom of the window on shims and tilt into place

Consult with the window manufacturer's fastening specifications to ensure units are installed properly to meet or exceed performance ratings. Fasteners shall be installed to secure the unit under service conditions (weight, wind load, temperature variations, etc.). To provide adequate protection against corrosion, use only hot-dipped galvanized or similar corrosion-resistant fasteners that are compatible with the materials being joined. Fastener length shall be sufficient to penetrate the substrate to a depth designed to meet the manufacturer's recommendations. Typically, 1-3/4-inch or 2-inch galvanized roofing nails are required in every pre-punched hole in the nailing fin to connect the unit to the substrate, which in single wall construction is the studs.

Fasten in place with galvanized roofing nails

The installation of fasteners shall not cause excessive distortion of any frame or sash member, nor in any way impede the operation of the unit. However, when fastening windows to the building structure through an integral nailing flange, the frequency of said fasteners shall be as required to prevent excessive buckling (± 1/16-inch) of the flange and ensure continuous and positive compression on perimeter caulking between flange and structure. The integral nailing flange at the head of the window shall be fastened in such a manner as to insure that the window head will not bow downward if the header over the window deflects. This can be accomplished by vertically elongated installation holes in the integral nailing flange at the window head or special flange clips that allow movement of the flange in a vertical direction. When using elongated holes, do not drive fasteners tight, in order to allow freedom of vertical or horizontal movement.

Integrating the Window to the Water Resistive Barrier



Side jamb flashing

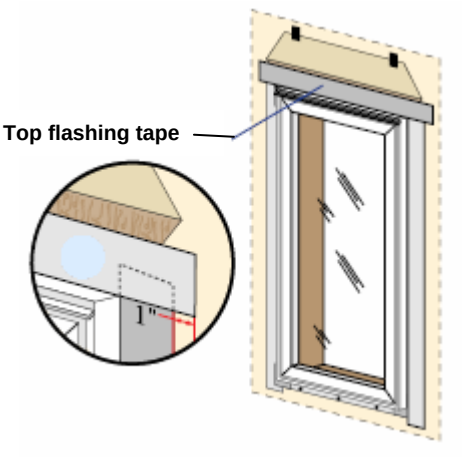
All component manufacturers' installation instructions shall be reviewed and adhered to. If the component manufacturers' instructions or details do not describe the integration of the fenestration product to the water-resistive barrier, the component manufacturers should be contacted for installation details. Many window manufacturers state that the design and installation of flashing and sealing systems are the responsibility of the architect, contractor or installer. If installation instructions cannot be obtained from the window manufacturer, the details set forth in this guide should be used.

The ASTM standard requires flexible flashing to be a minimum of 9 inches wide when being caulked in place. The use of self-adhesive type flashings is acceptable. They are

approximately 4 inches wide and seal themselves to the weather resistant barrier and to the mounting flange creating a water tight joint. They are not designed to adhere to wood sheathing or sidings. The flashing tape must properly adhere in order to be acceptable for use. Flashing should be non-reflective and lapped in a water shedding weather board or shingle fashion.

Side jamb flashing tape installed shingle style

Cut two pieces of flashing tape the height of the window rough opening plus 2 times the flashing width minus 1-inch. Apply one piece to each side over the nailing flange and onto the water resistive barrier. The tape should extend above the top of the window 1-inch less than the width of the flashing tape and overlap the sill flashing tape on the bottom of the window. Be sure the tape is pressed down firmly and adheres properly to the nailing fin and the WRB.

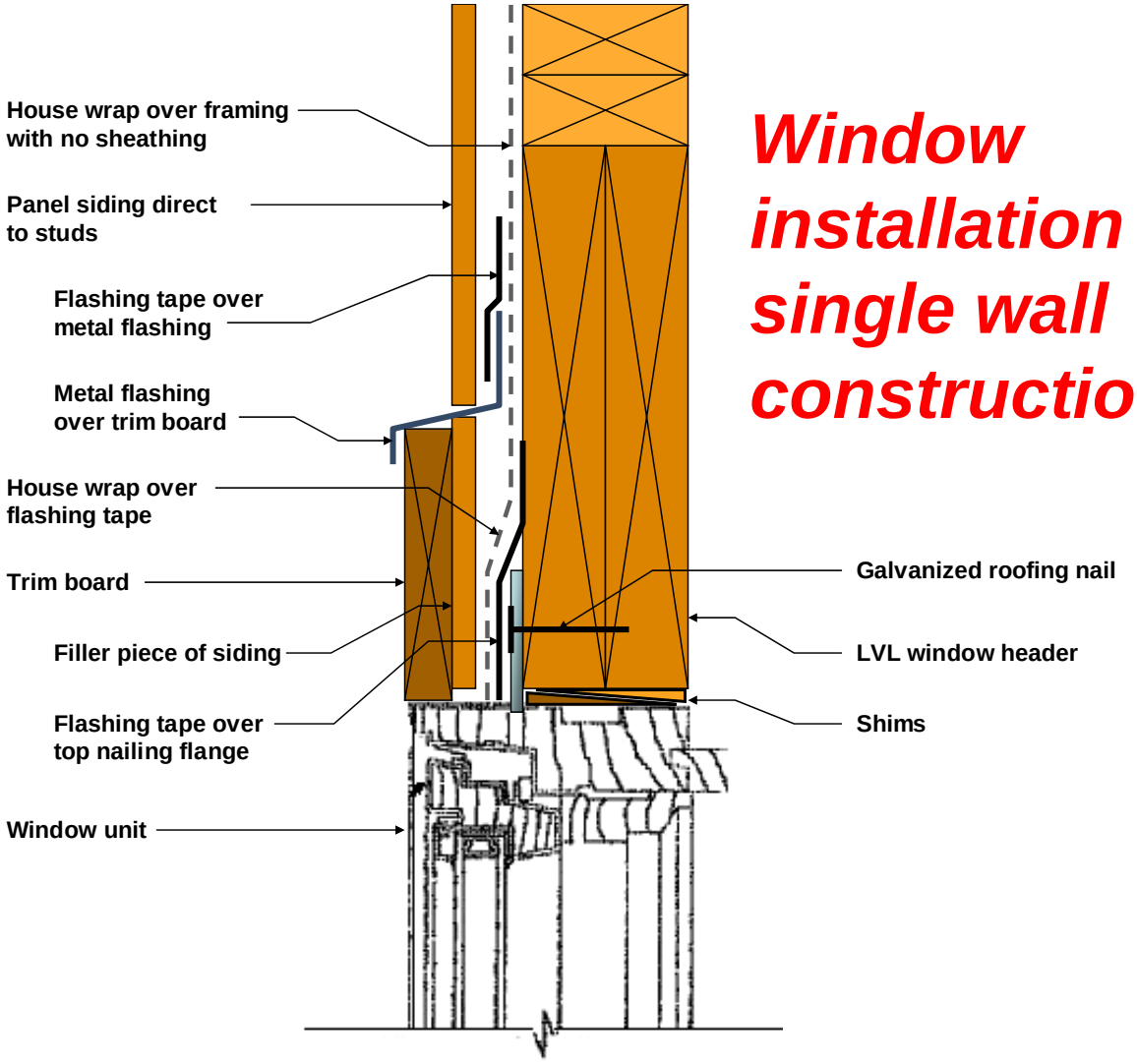


Cut a piece of flashing tape long enough to go across the top of the window and extend at least 1-inch past the side flashing tape on both sides. Unless the window unit's head trim has a top surface that slopes toward the exterior and has a pronounced drip edge, a drip cap, which has these characteristics and extends outward beyond the head trim's outermost surface, shall be installed over the window unit's head trim. Apply the flashing tape over the top nailing fin and drip cap, if applied, and again press firmly into place. Now, fold down the top flap of the WRB and cut pieces of flashing tape at least 1-inch longer than the diagonal cuts in the WRB. Apply the tape covering the entire diagonal cut in the WRB at both upper corners of the window.

Once installed, local wind and weather conditions as well as exposure to other trades can have a detrimental effect on the permanent attachment of the flashing. The building contractor must inspect and maintain the flashing, ensuring that it is secure and in proper working condition prior to being covered up by other materials.

Flashing tape across top of window with housewrap folded down over it

Window installation in single wall construction

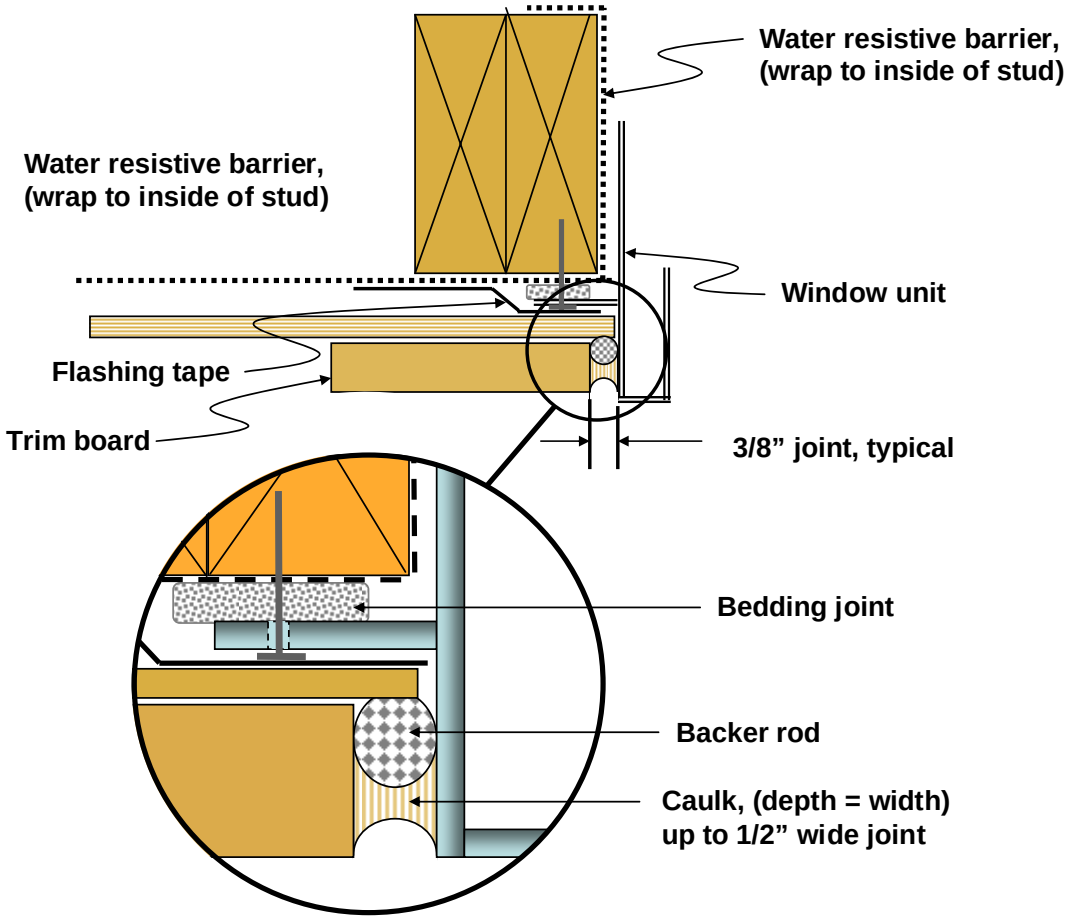


Sealing the bottom of the window is not allowed under these guidelines. This is only done in barrier systems and light frame buildings are not considered a barrier system. Light frame construction is considered a membrane/drainage system. This requires that water be allowed to drain out at the bottom of the window opening. Sill flashing protects the wood sill and allows any water that may enter the wall cavity to drain to the outside, unlike flashing tape placed over the bottom nailing fin. Some window manufacturers specify this barrier system be used with their windows. It is up to the local jurisdiction whether to allow this practice or not. It is not allowed in this guideline since we know water will get into the wall cavity and will become trapped if the bottom is sealed.

Sealing the Window to the Exterior Siding

When applying siding, brick veneer or other exterior finish material, leave adequate space between the window frame and the siding material for sealant. In selecting the type of sealant to use, the installer shall consider; 1) any anticipated joint movement and the sealants' movement capability; 2) sealants ability to adhere to all joint surfaces such as frame members, flashing, siding and other wall components; 3) the sealants compatibility with coatings, adhesives and other surfaces; 4) the need for primers; 5) and surface preparation such as cleaning.

WINDOW INSTALLATION IN SINGLE WALL CONSTRUCTION



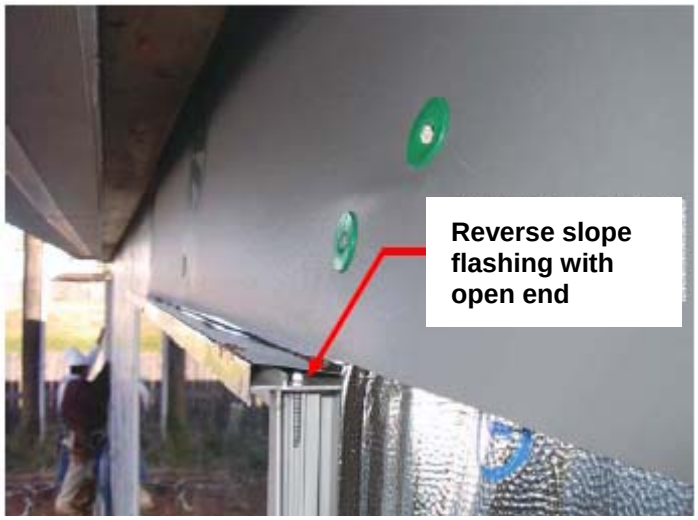
Elastomeric sealants are required where joint movement is anticipated such as around windows. Most sealant joints require a sealant backing material to assure proper joint shape and sealant dimensions and to prevent "three-sided adhesion." Joints should be a minimum of 1/4-inch wide. Joints are typically recommended to be at least 3/8-inch

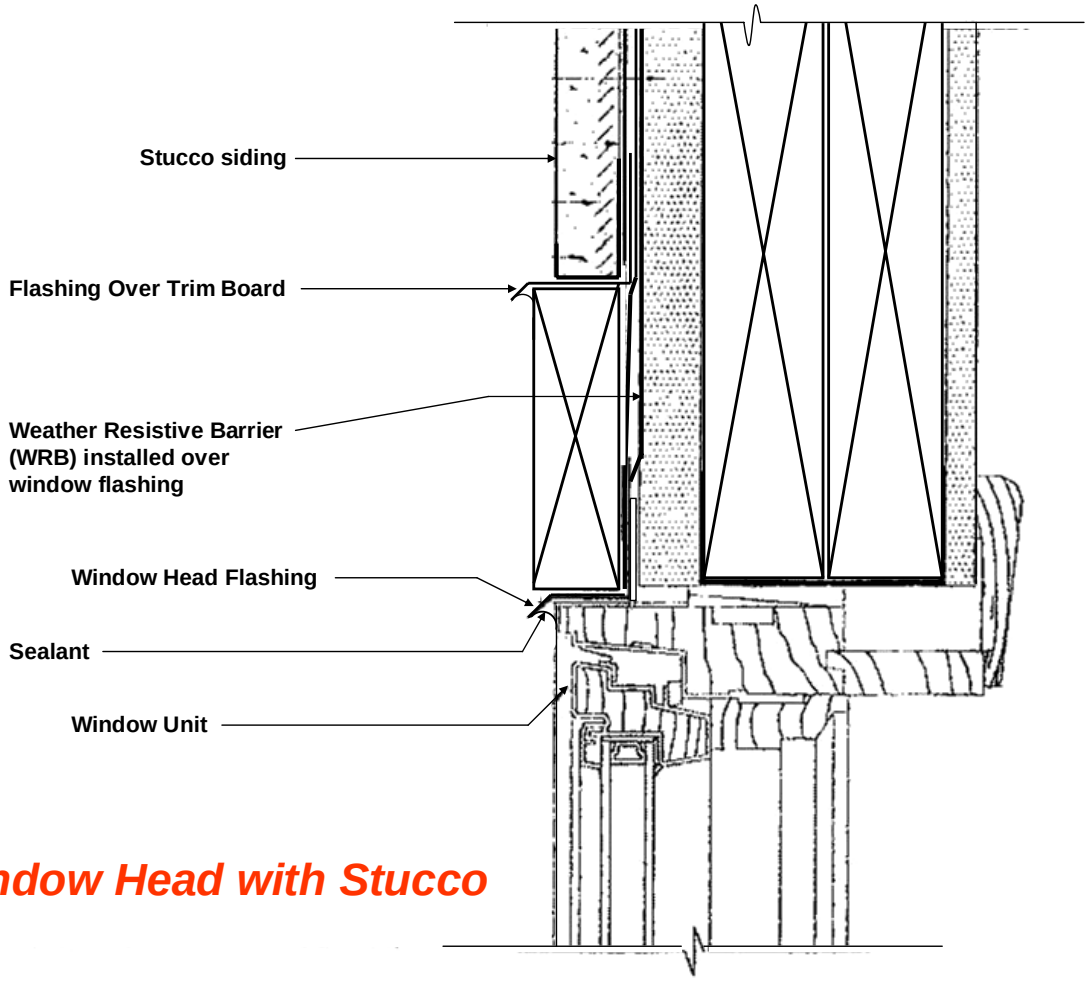
wide. In general, sealant backing should be installed in butt joints so that the depth of the sealant is no more than the joint width for joints up to 1/2-inch wide. For joints over 1/2-inch up to 1-inch wide, the depth should be half the width. Sealant depth should not be less than 1/4-inch nor more than 1/2-inch. Backer rod is usually cylindrical and compressible. The diameter is larger than the joint and the rod is compressed when inserted into the joint. Compression of the backer rod provides the proper configuration for the sealant. The backer rod also prevents three-sided adhesion, which can cause cohesive failure. When finished, the sealant should be the shape of an hourglass. This shape creates a more flexible sealant line capable of expanding and contracting. In the absence of sealant specifications, the installer should contact the manufacturer of the window unit or the sealant manufacturer for recommendations.

Flashing (drip cap) should be bent down over the end of the trim boards to prevent water infiltration under the flashing

When trim is installed around windows, proper sealing between the window and the wood trim is required as well as the proper flashing over the trim above the window. The code requires corrosion-resistant flashings be installed continuously above all projecting wood trim, including smart trim, regardless of the type of exterior cladding material being applied. For this application, a drip cap shall be placed over the trim board that extends outward beyond the trims outermost surface or it may be bent down over the end of the trim board so water cannot flow back under the drip cap. Flashing tape is then applied over the vertical leg of the drip cap to seal it to the water-resistive barrier. The exterior cladding can then be installed over the flashing.

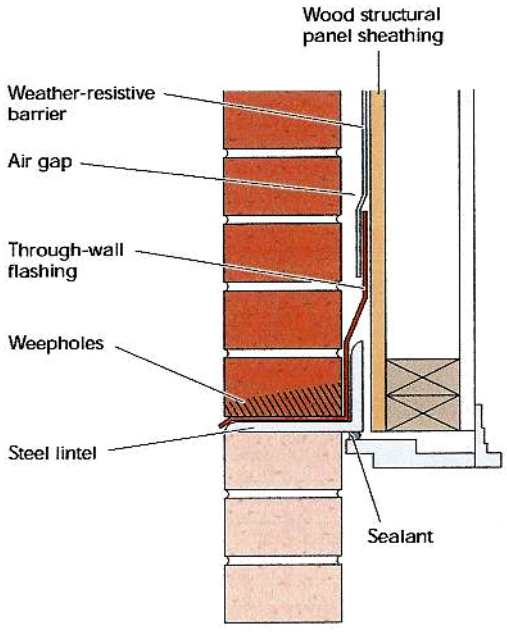
Direct contact between incompatible materials shall be avoided. Aluminum flashings shall be protected from incompatible materials such as mortar, concrete, other masonry products, or pressure-treated wood framing. When aluminum, copper or galvanized metal is specified for head flashing, it shall be no less than 26 gage in thickness. Do not use sealants that contain solvents. Sealants that contain solvents can have an affect on the bonding and performance of self-adhesive type flashing materials.





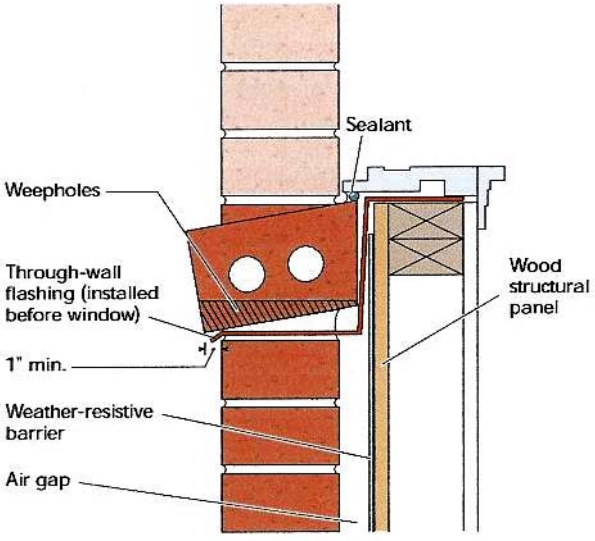
Window Head with Stucco

Below — Cross section of window showing integration of water-resistive barrier in a brick veneer wall



Window head detail

Window sill detail



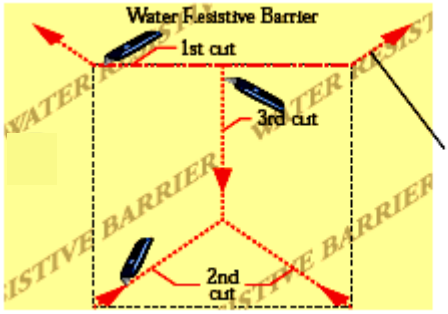
Installation of Clad Sliding Patio Doors and French Doors

Rough Opening Preparation

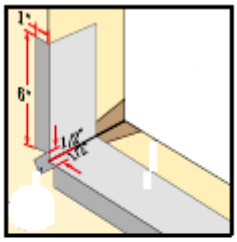
Sliding patio doors and French doors are installed in much the same manner. The following installation guidelines are appropriate for both types of doors.

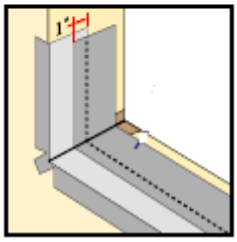
First, verify that the opening is plumb and level. Then measure the rough opening to ensure that it will allow the installation of the door unit in a square, plumb and level condition. Measure the opening width at the top, bottom and center of the opening. Measure the height at the far left side, the far right side and in the center of the opening. Make sure the rough opening is 1/2-inch larger than the sliding door in both width and height. For French doors the rough opening height should be 1/2-inch larger and the width should be 3/4-inch wider. Be sure the door unit will not be racked by installing it in an out-of-square or out-of-plane opening. Racking of the door is not an acceptable practice to get the unit into the opening. Even if racking does not noticeably interfere with the operation of the door it may nevertheless render the unit prone to water intrusion, air leakage, and excessive noise transmission or reduce its ability to withstand design wind loads.

When using housewrap as the water-resistive barrier, apply the WRB in water shedding fashion, starting at the base of the wall and working towards the top. Install the WRB to the face of the building framing (studs) in single wall construction, or over the sheathing in double wall construction. Next, cut a straight "I" cut or a modified "I" pattern in the water resistive barrier. Then fold the side and bottom flaps into the opening and staple to inside wall and floor. Be sure that flaps are wrapped around corner onto inside face of studs before cutting off excess. At the head of the opening, starting at the top corner of the window, measure from the corner 6 inches up and 6 inches over and mark. Now, carefully cut the housewrap at a 45 degree angle. Raise the top edge of the barrier up and temporarily tape the top corners and center to the exterior WRB surface above. This is done in order to allow for installation of the door and flashing later.



Before applying the sill flashing, cut a piece of flexible sill flashing tape 16 inches longer than the width of the opening. This tape is typically 7 inches wide for 2x4 walls and 9 inches wide for 2x6 walls. Apply it across the bottom of the opening and approximately 8 inches up each side. It should be installed flush with the inside edge of the framing and the remainder will fold over the WRB on the outside of the opening. The minimum lap on the exterior side is 3-inch. This fully protects the floor under the door from getting wet in the event water should penetrate the opening.



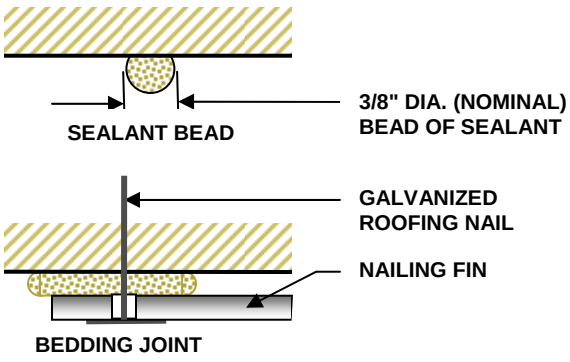


If a narrower tape is used for this application, put the first piece on so it laps the WRB at least 3-inch on the exterior and then add another piece that overlaps the first strip at least 1-inch. The second piece should now provide enough width to run to the inside edge of the framing and fully cover the sill.

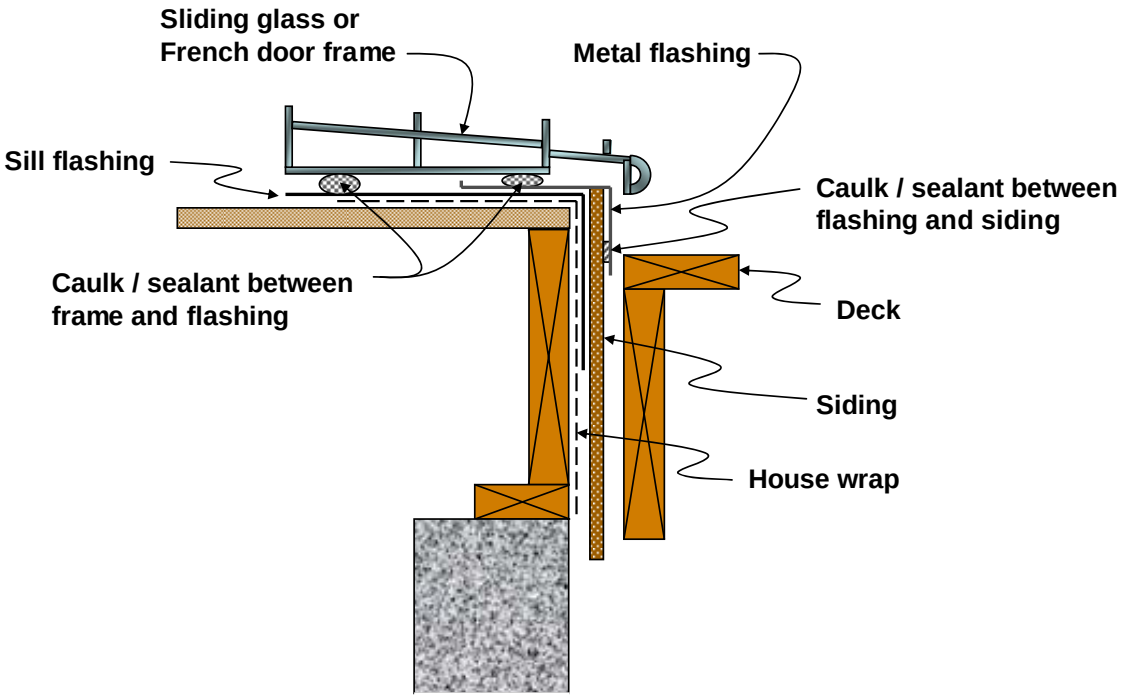
Setting and Fastening the Door

Before setting the door, check the perimeter mounting flanges to be certain they are 90 degrees to the door frame. If they aren't, the door will not line up correctly on the interior. If the door uses a clip installation system, install clips according to manufacturer's instructions. Note that it is more common to require closer clip spacing for a hinged door than for a sliding door. If the door uses a fin installation system, the next step is to apply a continuous 3/8-inch bead of sealant to the back side (interior surface) of the two side and the top nailing fins, in line with the pre-punched holes or slots in the mounting flange, to act as a bedding joint. Some doors require corner seals to be installed at this point. Then apply two continuous 3/8-inch beads of sealant across the full length of the framed opening (or along the bottom of the door frame) at points that will make contact with the door sill. Deposit a sufficient amount of sealant at the corners so the bottom door frame corners are embedded in sealant when the door is installed.

Set the bottom of the door in the bottom of the opening and tilt the top into position. Center the door between the sides of the opening to allow clearance for shimming and then compress the bead of sealant into the WRB. The sealant should bleed out or appear along the edges to ensure an adequate bedding joint. Now, check that the sill is level and both jambs are plumb. The door should also be checked for squareness by measuring the diagonals. Diagonal



SILL FLASHING AT SLIDING GLASS OR FRENCH DOOR



measurements should be equal or within 1/8-inch of each other. For French doors, open the hinged panel and re-close. Before the panel is completely closed check for even contact between it and the weather-stripping on the lock jamb and head. If the door panel does not meet the weather-stripping uniformly, the wall may be out of plumb and will need to be realigned. Correct this situation before proceeding. Check the interior reveal and then finish attaching the door frame to the wall.

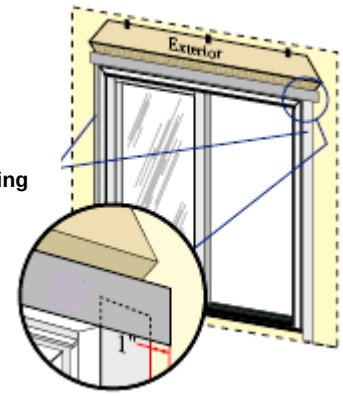
Consult with the door manufacturer's fastening specifications to ensure units are installed properly to meet or exceed performance ratings. Fasteners shall be installed to secure the unit under service conditions (weight, wind load, temperature variations, etc.). To provide adequate protection against corrosion, use only hot-dipped galvanized or similar corrosion resistant fasteners that are compatible with the materials being joined. Fastener length shall be sufficient to penetrate the substrate to a depth designed to meet the manufacturer's recommendations. Typically, 1-3/4-inch or 2-inch galvanized roofing nails are required in every pre-punched hole in the nailing fin to connect the unit to the substrate.

The installation of fasteners shall not cause excessive distortion of any frame or sash member, nor in any way impede the operation of the unit. However, when fastening doors to the building structure through an integral nailing flange, the frequency of said fasteners shall be as required to prevent excessive buckling (± 1/16-inch) of the flange and ensure continuous and positive compression on perimeter caulking between flange and structure. The integral nailing flange at the head of the door shall be fastened in such a manner as to insure that the door head will not bow downwards if the header over the door deflects. This can be accomplished by vertically elongated installation holes in the

integral nailing flange at the door head or special flange clips that allow movement of the flange in a vertical direction. When using elongated holes, do not drive fasteners tight, in order to allow freedom of vertical or horizontal movement.

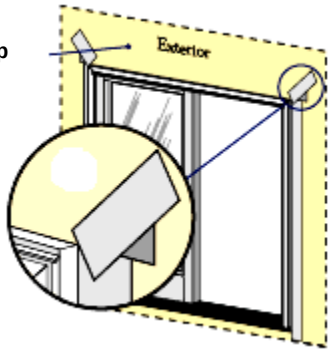
Integrating the Door to the Water Resistive Barrier

All component manufacturers' installation instructions shall be reviewed and adhered to. If the component manufacturers' instructions or details do not describe the integration of the fenestration product to the building envelope, the component manufacturers should be contacted for installation details. Many window and door manufacturers state that the design and installation of flashing and sealing systems are the responsibility of the architect, contractor or installer. If installation instructions cannot be obtained from the door manufacturer, the details set forth in this guide should be used.



The ASTM standard requires flexible flashing tape be a minimum of 9 inches wide. These self-adhesive type flashings seal themselves to the weather resistant barrier and to the mounting flange creating a water tight joint. The flashing tape must properly adhere in order to be acceptable for use. Flashing should be non-reflective and lapped in a water shedding weather board or shingle fashion.

Cut two pieces of flashing tape the height of the window rough opening plus 2 times the flashing width minus 1-inch. Apply one piece to each side over the nailing flange and onto the water resistive barrier. The tape should extend above the top of the door 1-inch less than the width of the flashing tape and overlap the sill flashing tape on the bottom of the door. Be sure the tape is pressed down firmly and adheres properly to the nailing fin and the WRB.



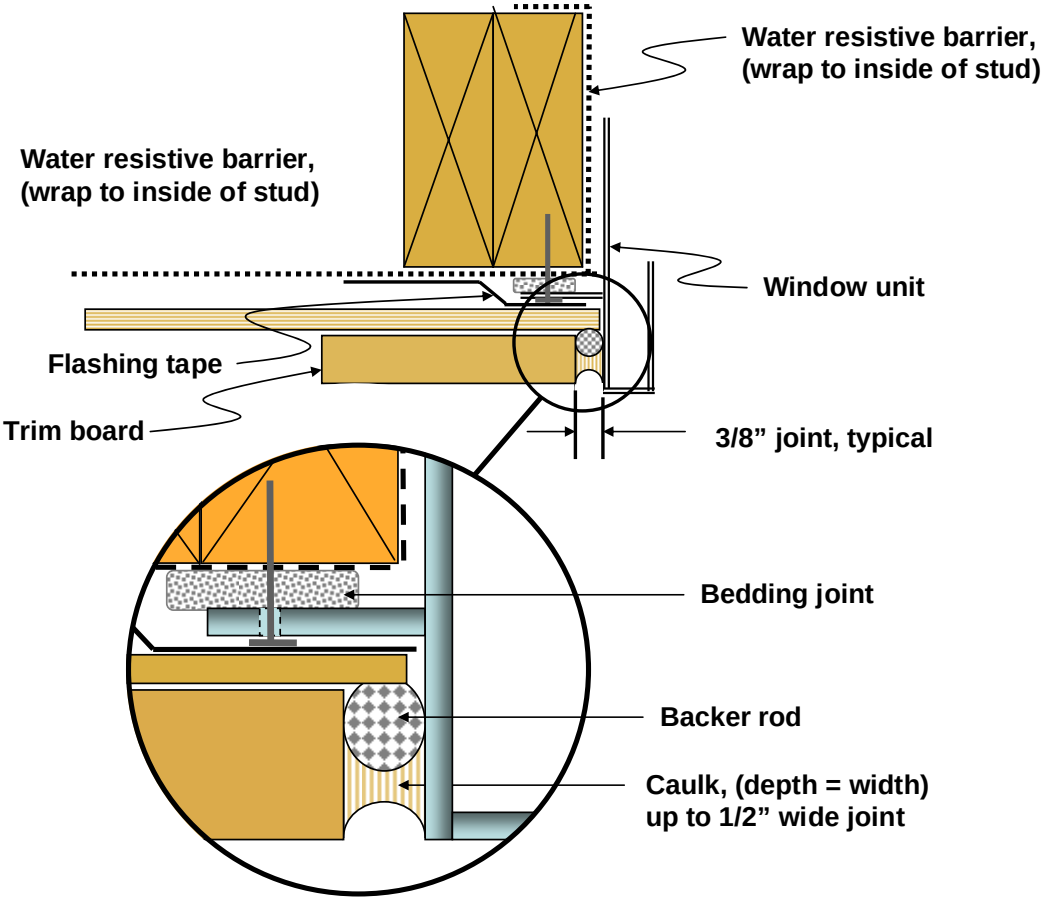
Cut a piece of flashing tape long enough to go across the top of the door and extend at least 1-inch past the side flashing tape on both sides. Unless the door unit's head trim has a top surface that slopes toward the exterior and has a pronounced drip edge, a drip cap, which has these characteristics and extends outward beyond the head trim's outermost surface, shall be installed over the door unit's head trim. Apply the tape over the top nailing fin and drip cap, if applied, and again press firmly into place. Now, fold down the top flap of the WRB and cut pieces of flashing tape at least 1-inch longer than the diagonal cuts in the WRB. Apply the tape covering the entire diagonal cut in the WRB at both upper corners of the door.

Once installed, local wind and weather conditions as well as exposure to other trades can have a detrimental effect on the permanent attachment of the flashing. The building contractor must inspect and maintain the flashing, ensuring that it is secure and in proper working condition prior to being covered up by other materials.

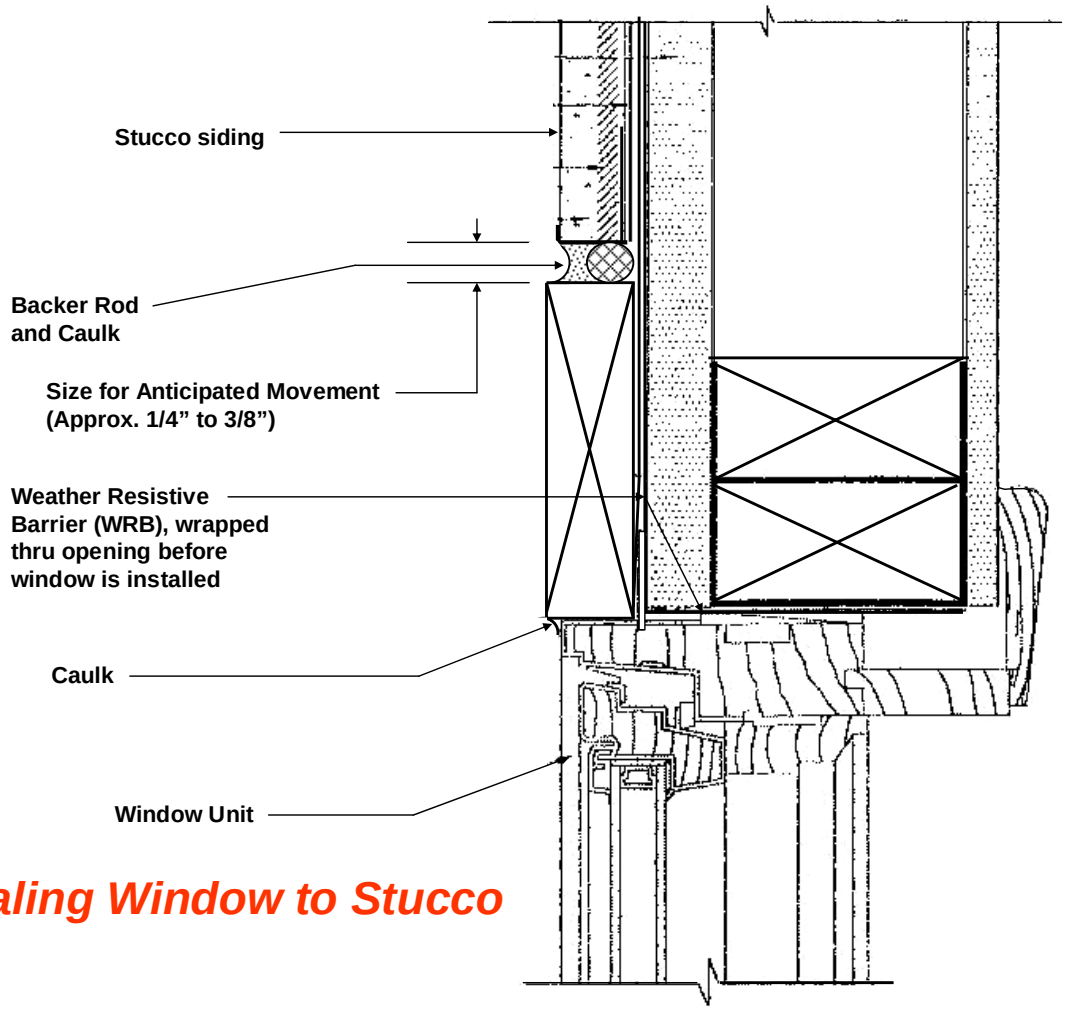
Sealing the Door to the Exterior Siding

When applying siding, brick veneer or other exterior finish material, leave adequate space between the door frame and the siding material for sealant. In selecting the type of sealant to use, the installer shall consider; 1) any anticipated joint movement and the sealants' movement capability; 2) sealants ability to adhere to all joint surfaces such as frame members, flashing, siding and other wall components; 3) the sealants compatibility with coatings, adhesives and other surfaces; 4) the need for primers; 5) and surface preparation such as cleaning.

DOOR INSTALLATION IN SINGLE WALL CONSTRUCTION



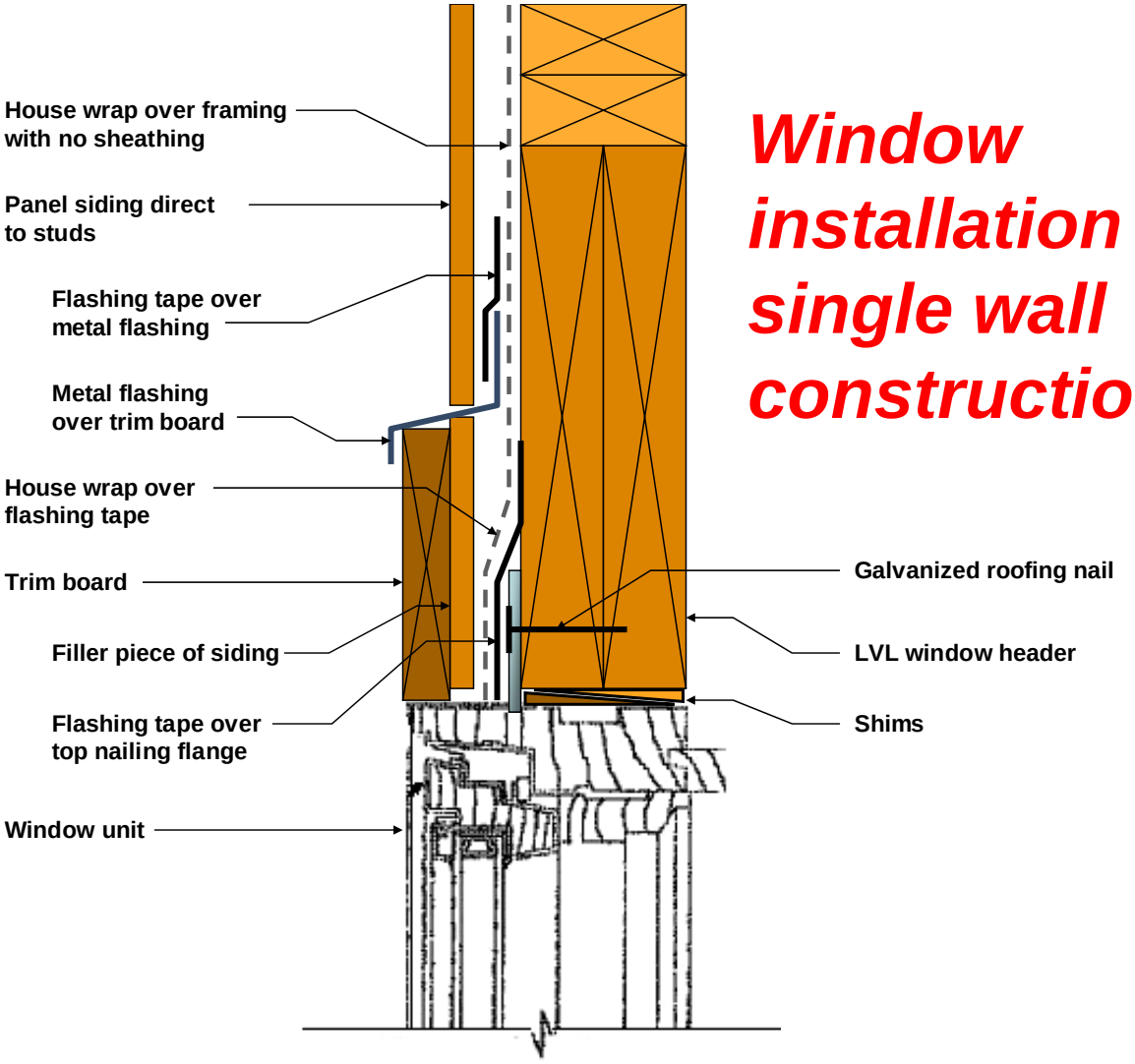
Elastomeric sealants are required where joint movement is anticipated such as around doors. Most sealant joints require a sealant backing material to assure proper joint shape and sealant dimensions and to prevent "three-sided adhesion." Joints should be a minimum of 1/4-inch wide. Joints are typically recommended to be at least 3/8-inch wide. In general, sealant backing should be installed in butt joints so that the depth of the sealant is no more than half the joint width. Sealant depth should not be less than 1/4-inch nor more than 1/2-inch. Backer rod is usually cylindrical and compressible. The diameter is larger than the joint and the rod is compressed when inserted into the joint. Compression of the backer rod provides the proper configuration for the sealant. The backer rod also prevents three-sided adhesion, which can cause cohesive failure. When finished, the sealant should be the shape of an hourglass. This shape creates a more flexible sealant line capable of expanding and contracting. In the absence of sealant specifications, the installer should contact the manufacturer of the door unit or the sealant manufacturer for recommendations.



Sealing Window to Stucco

When trim is installed around doors, proper sealing between the door and the wood trim is required as well as the proper flashing over the trim above the door. The code requires corrosion-resistant flashings be installed continuously above all projecting wood trim, including smart trim, regardless of the type of exterior cladding material being applied.

Window installation in single wall construction



For this application, a drip cap shall be placed over the trim board that extends outward beyond the trims outermost surface or it may be bent down over the end of the trim board so water cannot flow back under the drip cap. Flashing tape is then applied over the vertical leg of the drip cap to seal it to the water-resistive barrier. The exterior cladding can then be installed over the flashing.

Flashing (drip cap) should be bent down over the end of the trim boards to prevent water infiltration under the flashing

Direct contact between incompatible materials shall be avoided. Aluminum flashings shall be protected from incompatible materials such as mortar, concrete, other masonry products, or pressure-treated wood framing. When aluminum, copper or galvanized metal is specified for head flashing, it shall be no less than 26 gage in thickness. Do not use sealants that contain solvents. Sealants that contain solvents can have an affect on the bonding and performance of self-adhesive type flashing materials.

Once the door is in place, install the hardware and for hinged doors drive deadbolt strike plate and hinge screws into the studs as required. When installing these screws, take care not to pull the frame out of square, plumb or level.

Do not expose unfinished wood to high moisture conditions, excessive heat or humidity. Finish wood surfaces immediately after installation. Unfinished wood surfaces will discolor, deteriorate or bow and split. Do not stain or paint weatherstripping, silicone beads, vinyl, glass or hardware. Refer to finishing manufacturer's instructions for priming, painting, staining and varnishing guidelines.

This publication was produced by TimberTek Consulting for the Johnson County Building Officials Association and is published by the Johnson County Contractor Licensing Program.