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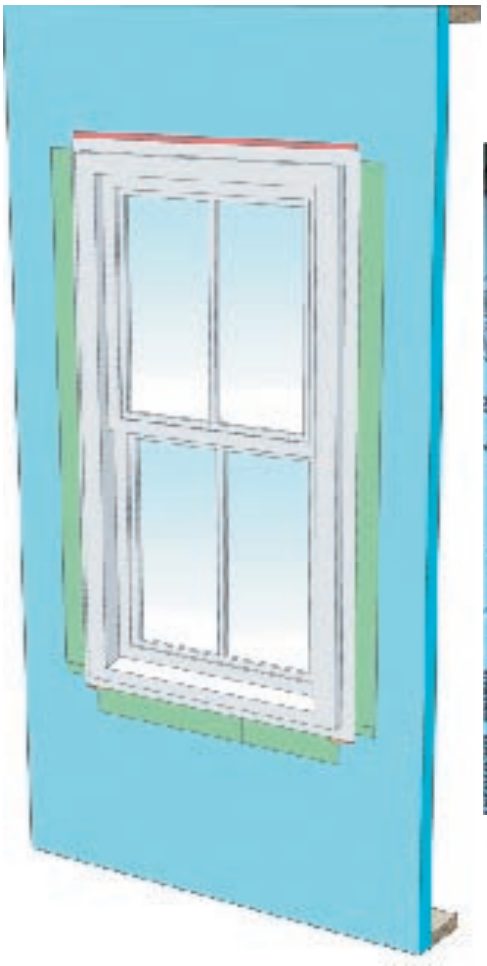
Installing Windows with Foam Sheathing on a Wood-Frame Wall



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Building Technologies Program

Installing Windows with Foam Sheathing on a Wood-Frame Wall

January 1, 2004, to December 31, 2004

Building Science Corporation
Westford, Massachusetts

NREL Technical Monitor: Robert Hendron
Prepared under Subcontract No. KAAX-3-32443-05

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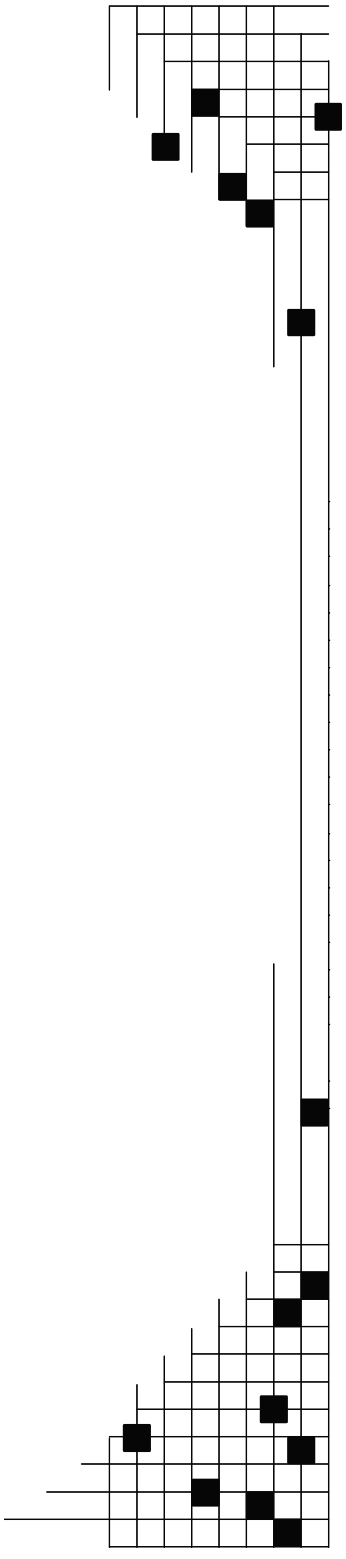

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Installing Windows With Foam Sheathing on a Wood-Frame Wall

Introduction

Residential housing design continues to move toward the development of high-performance sustainable building systems. To be sustainable, a building must not only be efficient and durable but also economically viable. For these reasons, new methods of enclosure design have been examined that provide high thermal performance and long-term durability and also reduce material use (including waste), simplify or integrate systems and details, and potentially reduce overall initial costs of construction.

One new idea relating to enclosure design is to use exterior foam insulating sheathing as the primary sheathing and drainage plane for the wall assembly. However, as with any building enclosure system, proper details for the management of water, vapor, and energy transfer is critical.

Window systems need to be installed in such a way as to be consistent with principles of building science. Window installations also require an understanding of how to maintain the continuity of the drainage plane of the wall.

Background

As the desire to provide more thermally efficient enclosure assemblies increased, so did the problems with moisture accumulation within building enclosure assemblies. Often the problems occurred as a result of new materials being introduced into the designs for specific purposes, without adequate understanding of all of their properties and the potential impacts on the assembly as a whole. Many enclosure failures occurred because of the lack of appreciation that products and materials have other properties than the ones that they are initially designed for.

Though these lessons were hard learned, we can now use this knowledge for our benefit. Through examining and understanding materials based on all of their properties (not just what they were initially created for), we can potentially eliminate redundancies in enclosure design, making the systems simpler and more cost effective.

In cold climates the use of exterior rigid insulation sheathing boards has been a method of increasing thermal performance of the enclosure, as well as a means of reducing the condensation potential within exterior wall assemblies. This concept, while not new, has become more accepted in recent years and is being used in residential construction. While this method has proven to be effective, it was introduced as an addition to standard residential construction for a specific purpose. The base wall assembly generally remained unchanged, with other materials used for air sealing and water management.

The opportunity that presented itself was the integration of the exterior rigid insulation board into the enclosure assembly to act not only as insulation but also as the primary sheathing and drainage plane for the wall assembly. This system, combined with advanced framing concepts,

can provide cost savings from the reduction of building materials used (fewer studs, the elimination of plywood or OSB sheathing, and housewraps), and the reduction of construction waste (incorporating standard construction product dimensions in the design of the building to minimize cutting). While the use of exterior insulation was initially used in cold climates, the benefits of the integrated system from increased thermal performance and reduced costs make it potentially viable in other climates zones as well.

As with any enclosure system, proper detailing for the management of water, vapor, and energy transfer is critical. The most important of these for durability of enclosure assemblies is water management.

Window Installation Details

In most wall assemblies, the connection details around windows have been the source of the most problems with water penetration into the building. The following are a set of details that describe how to install a window into a wall with insulating sheathing as an integrated drainage plane.

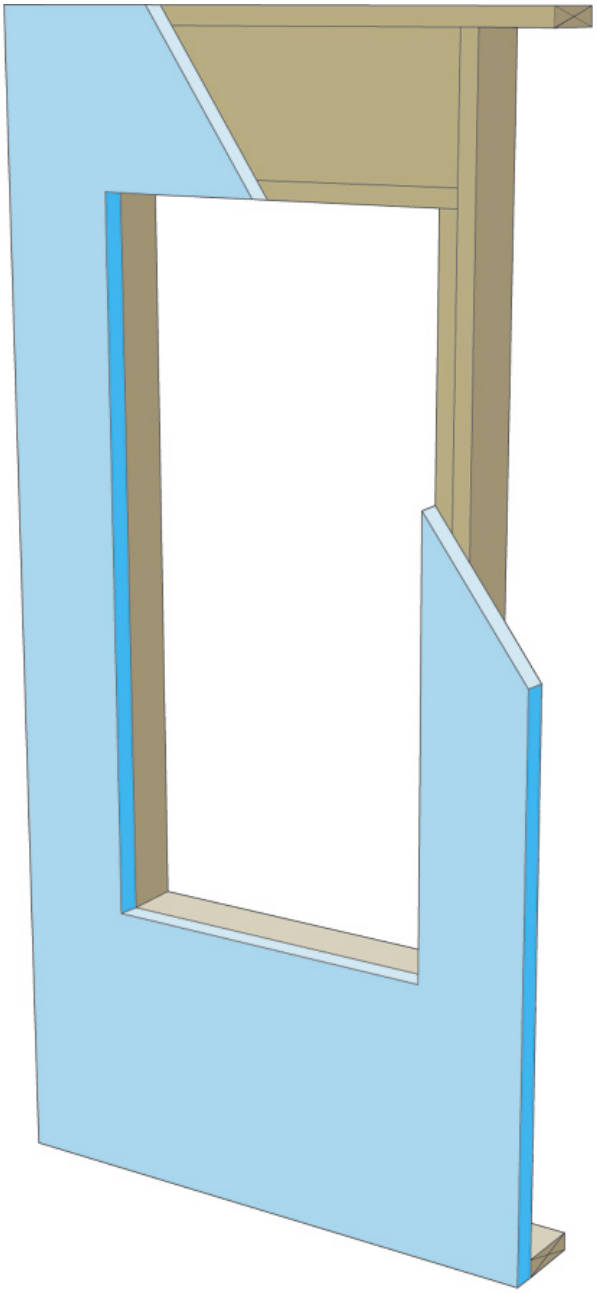
Installing Window with Foam Sheathing on a Wood-Frame Wall

Step 1

Insulating sheathing on wood-frame wall

For the foam sheathing to be an effective air barrier and provide the drainage plane, the joints between the boards must be sealed.

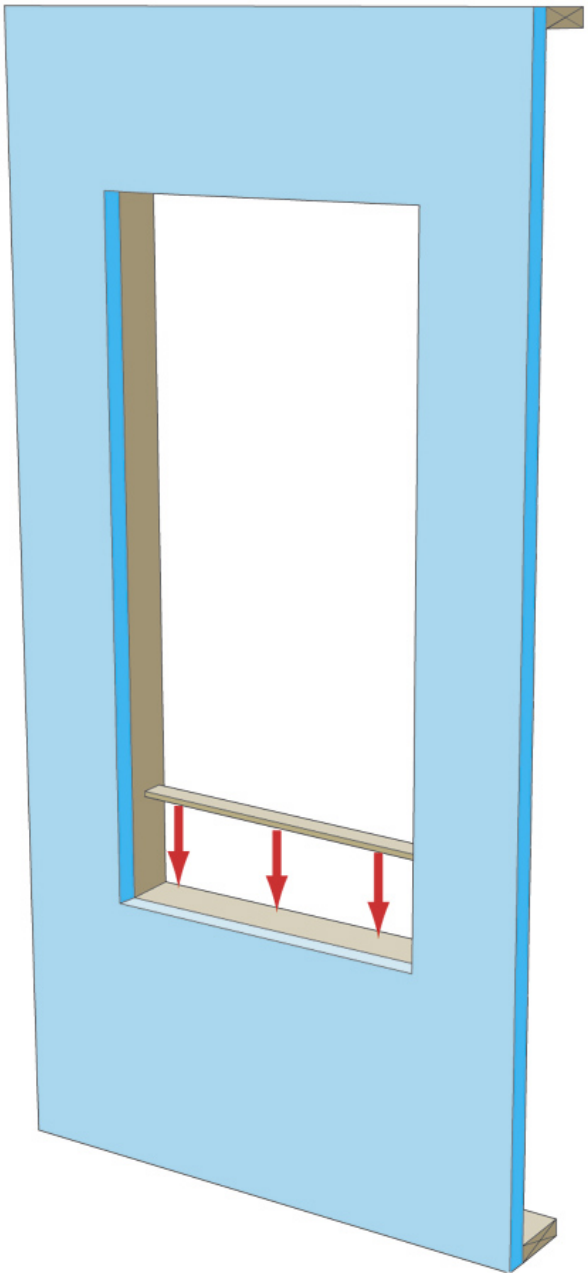
Even with all the joints sealed, it is still not recommended to have a vertical joint in the sheathing occur over a window head. The layout of the sheathing board over the wall area should be done with this in mind.



Step 2

Install backdam

A backdam should be installed to direct any water that may leak through or around the window back toward the exterior.



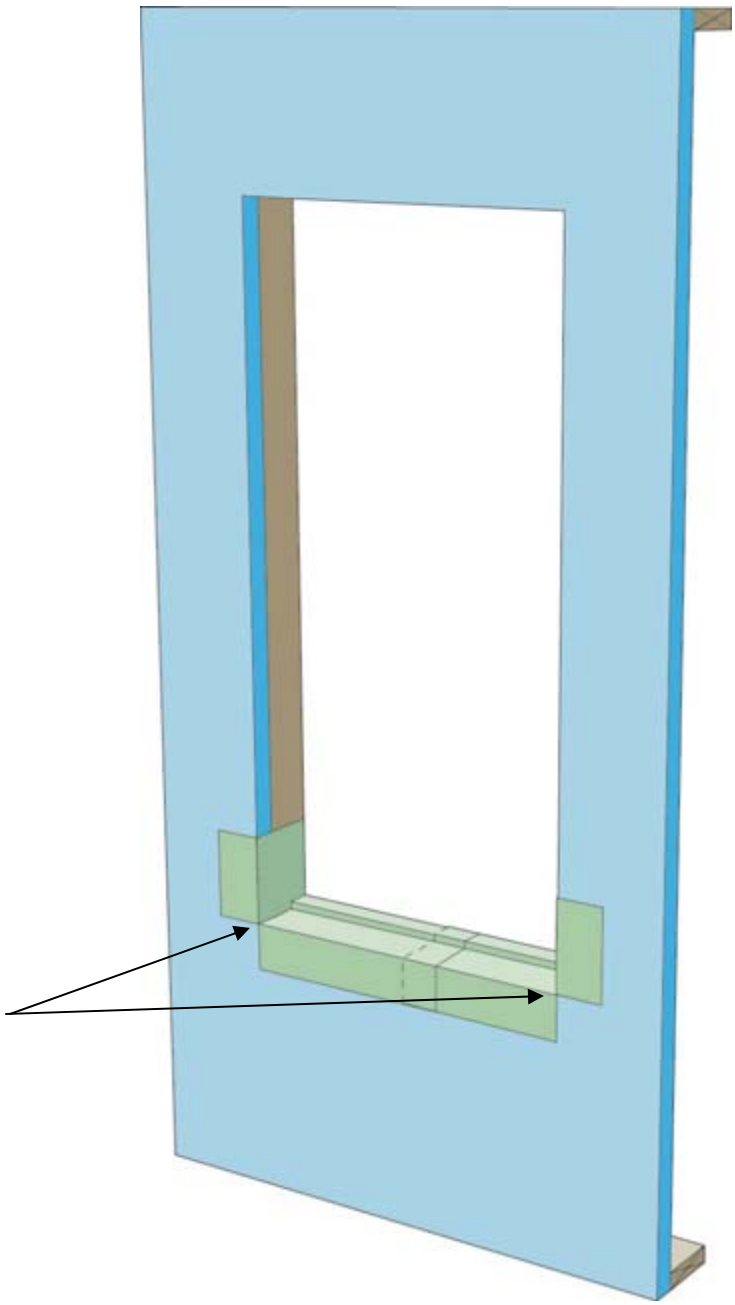
Step 3

Apply first piece of adhesive-backed sill flashing; apply second piece of adhesive-backed sill flashing

To protect the rough opening from moisture and to maintain the continuity of the air seal between the wood framing and the sheathing, an adhesive-backed sill flashing should be installed.

Because the exterior face of the foam insulation is also the drainage plane, the sill flashings must extend out to the exterior face of the sheathing.

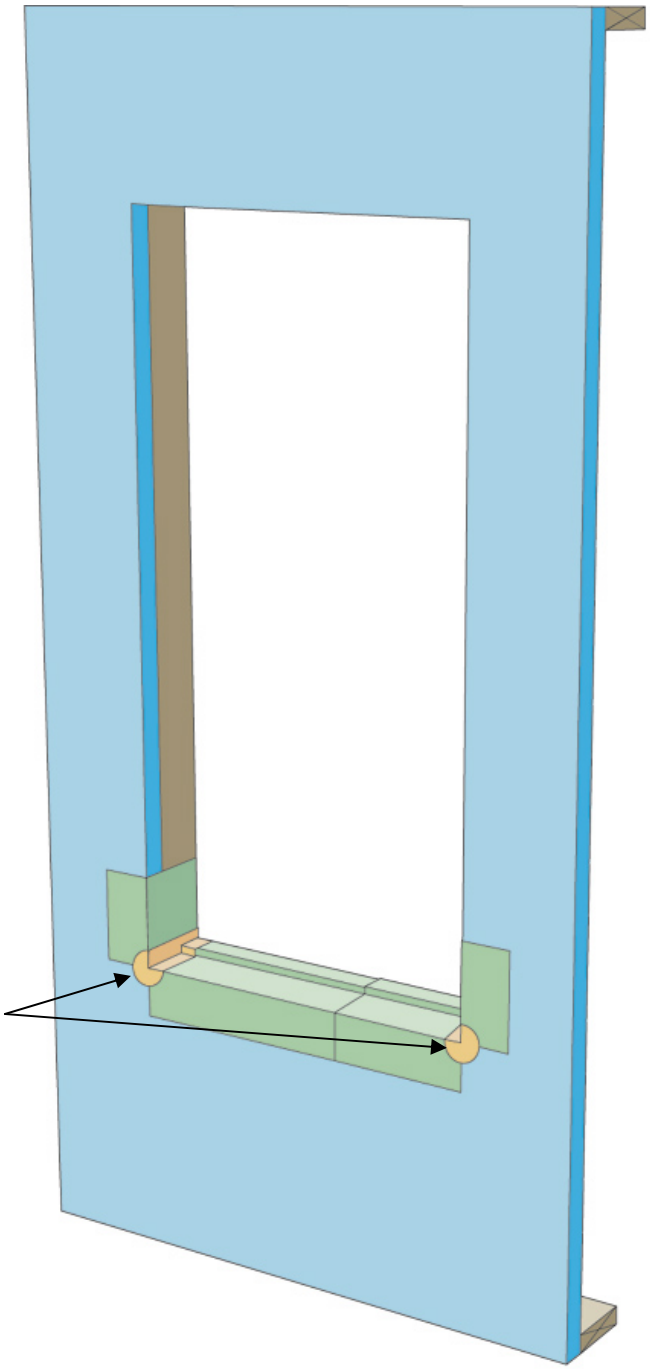
The cutting and folding of the adhesive-backed flashing results in “holes” at the exterior corners of the rough opening. These holes need to be covered to prevent moisture infiltration.



Step 4

Install corner flashing patches at sill

The “holes” at the exterior corners of the cut and folded flashing (from the previous step) need to be sealed with corner flashing patches.

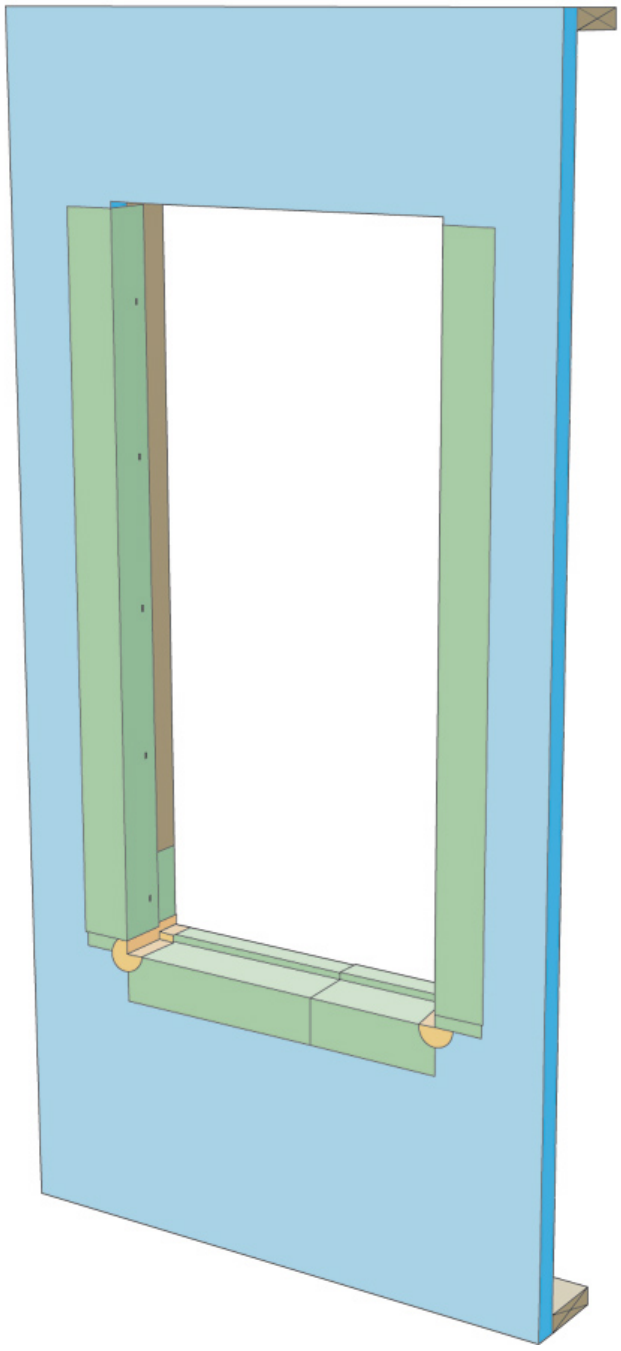


The yellow material in this illustration shows where the corner flashing patches should be applied in order to cover the holes at the folds in the underlying flashing.

Step 5

Install adhesive-backed jamb flashing; jamb flashing adhered to foam and stapled to frame

The adhesive-backed jamb flashing is installed next so that the joints are shingle-lapped to prevent a reverse flashing situation.

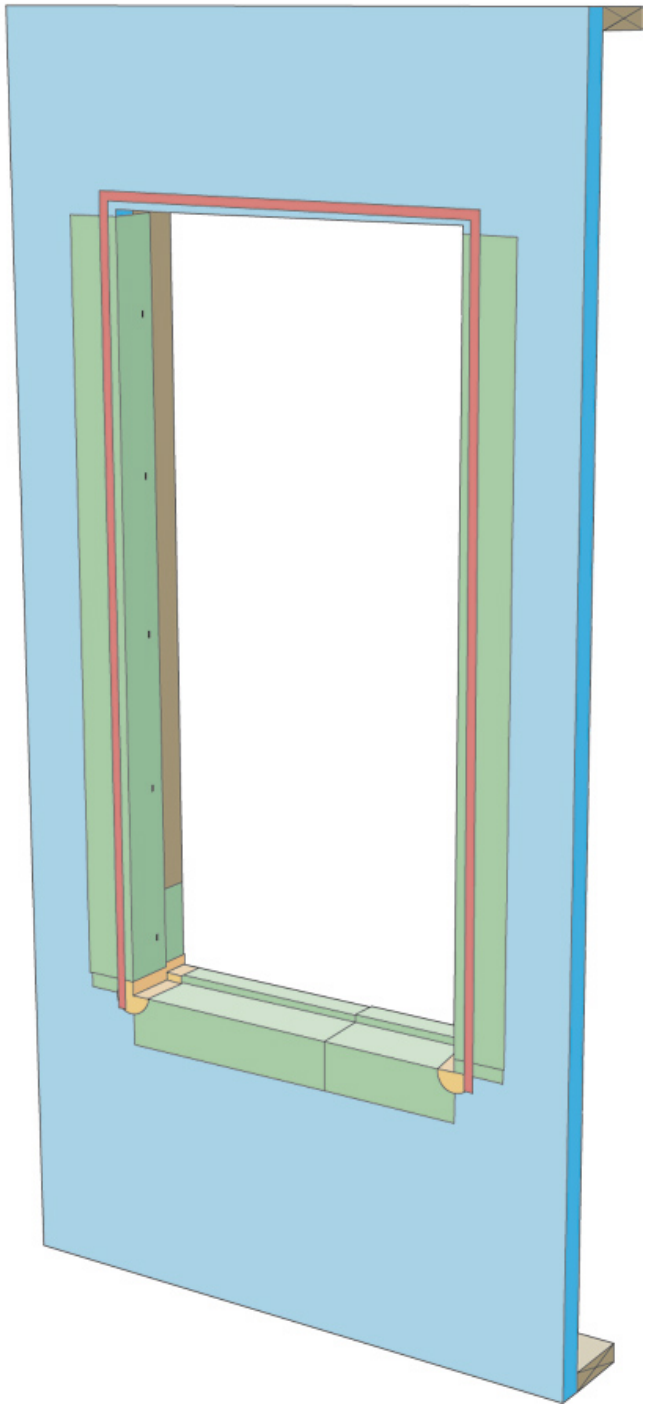


Step 6

Apply sealant at jambs and head; alternatively, sealant can be placed on the backside of the nailing flange (back-caulked); sealants, housewraps, and flashings must be chemically compatible

Sealant is installed behind the nailing flange at the head and jambs to provide a seal behind the nailing flanges of the window.

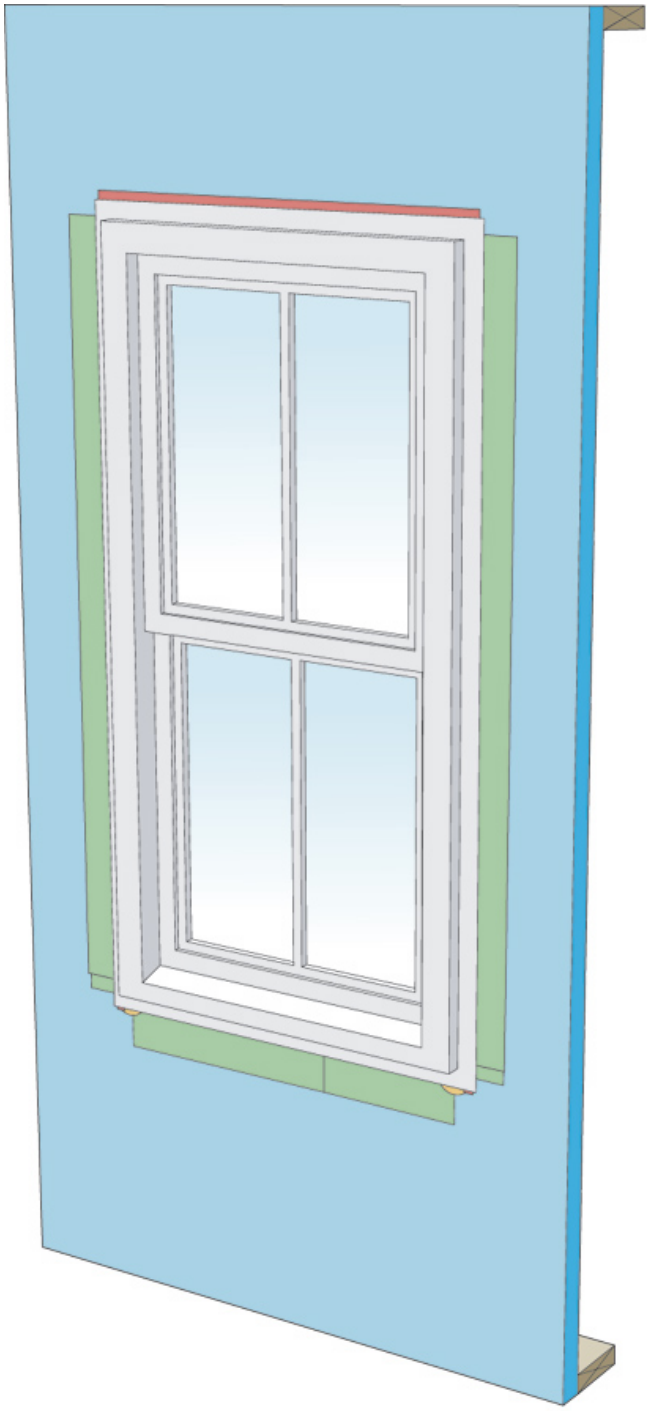
The sill is left open to allow the cavity below the window to drain to the exterior.



Step 7

Install window plumb, level, and square per manufacturer's instructions

The window should be installed as per the manufacturer's instructions. Setting blocks and shims should be installed between the wood rough opening and the window frame (the window should no bear on the foam sheathing). The window must be anchored to the wood rough opening.

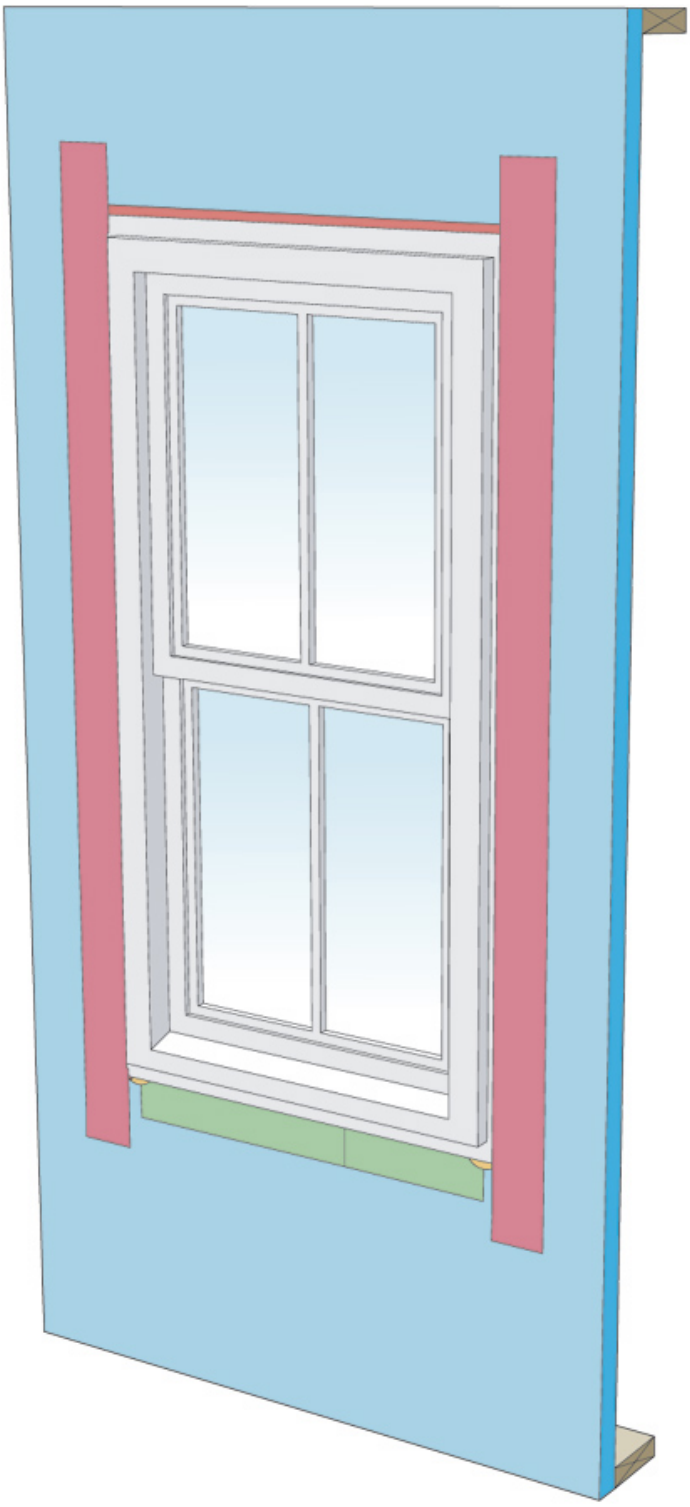


Step 8

Install jamb flashing

Flashing should be installed over the nailing flanges of the jambs to seal the jambs against water penetration from the exterior.

The sill is not sealed allowing for drainage of the rough opening, back to the exterior.

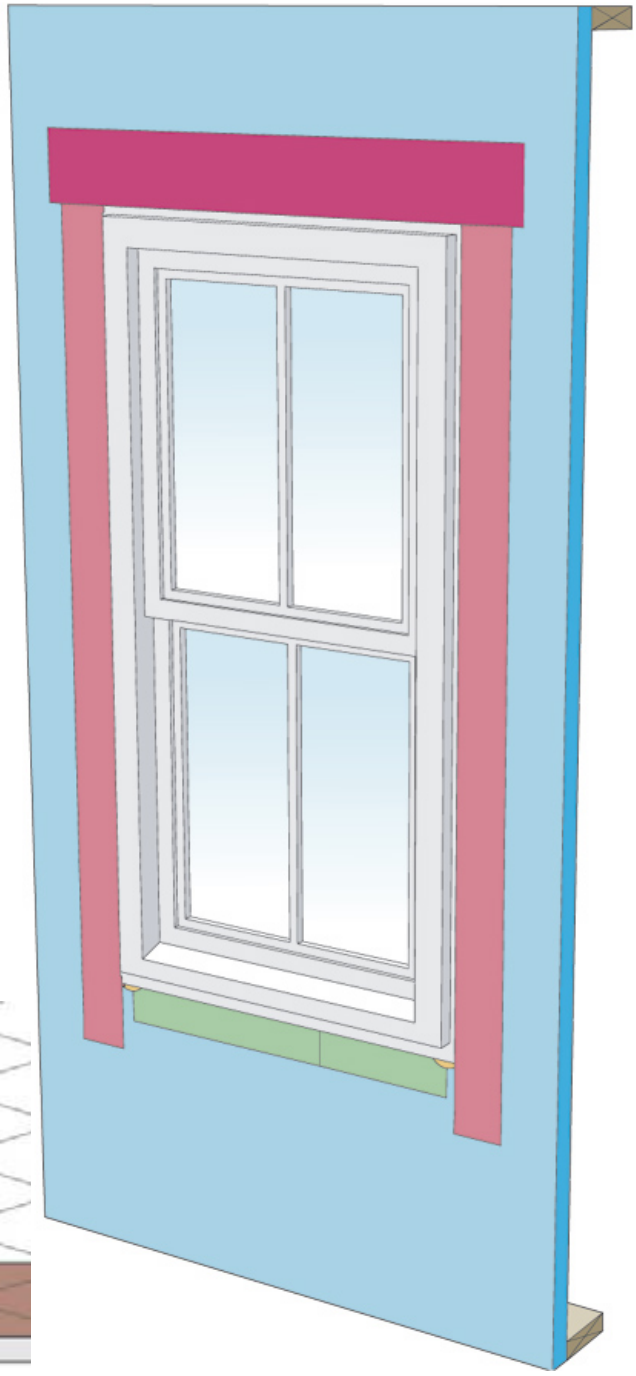


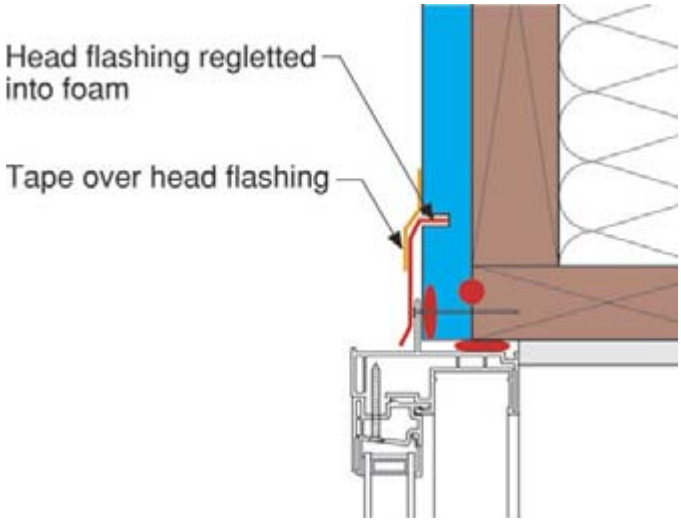
Step 9

Install drip cap (if applicable); install head flashing

Installation of a drip cap (if applicable) and head flashing is very important as the nailing flange at the window head can act as a reverse flashing directing water into the interior.

One method for extra protection is to create a reglet for the drip cap in the face of the sheathing above the window head.



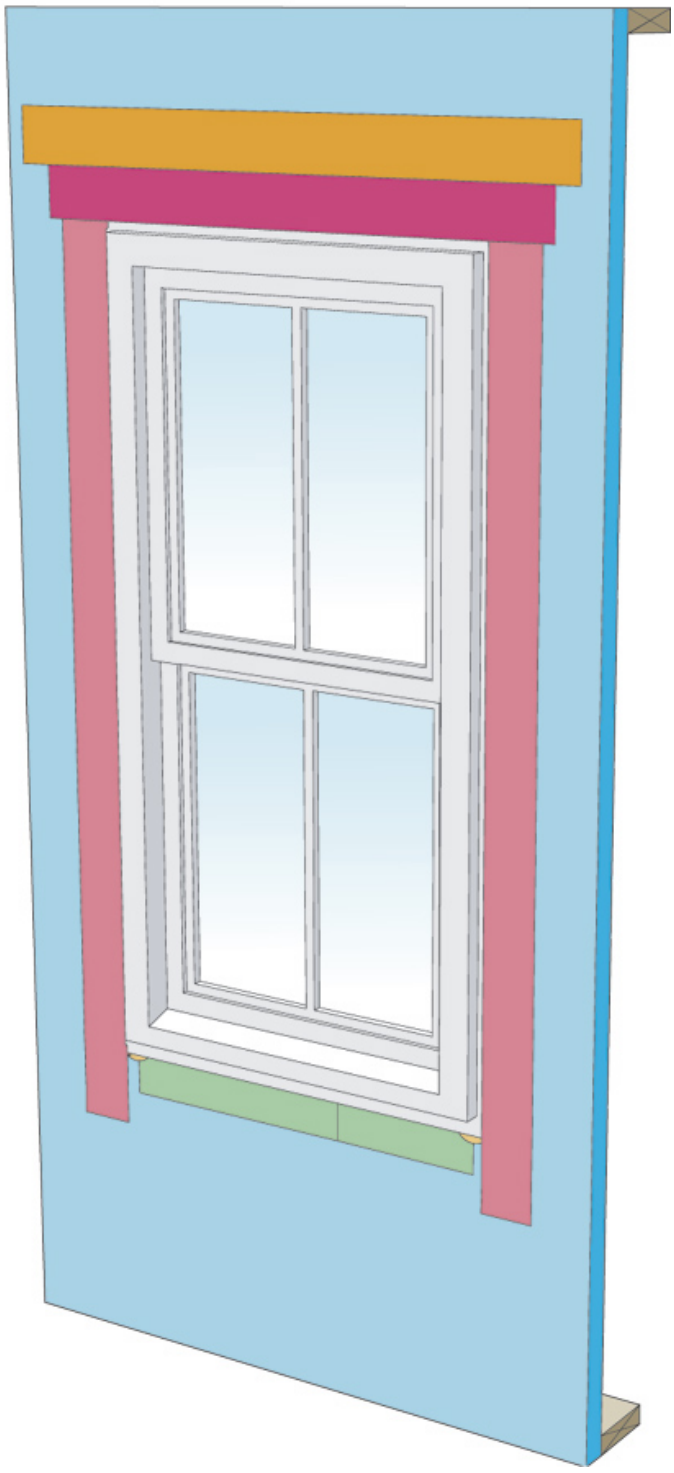


Step 10

Tape head flashing; air seal window around entire perimeter on the interior with sealant or non-expanding foam

Interior sealant or non-expanding foam should be installed around the entire perimeter of the window to complete the air seal between the wall system and the window frame.

Care must be taken to ensure that the foam does block the drainage from the sill rough opening to the exterior.



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