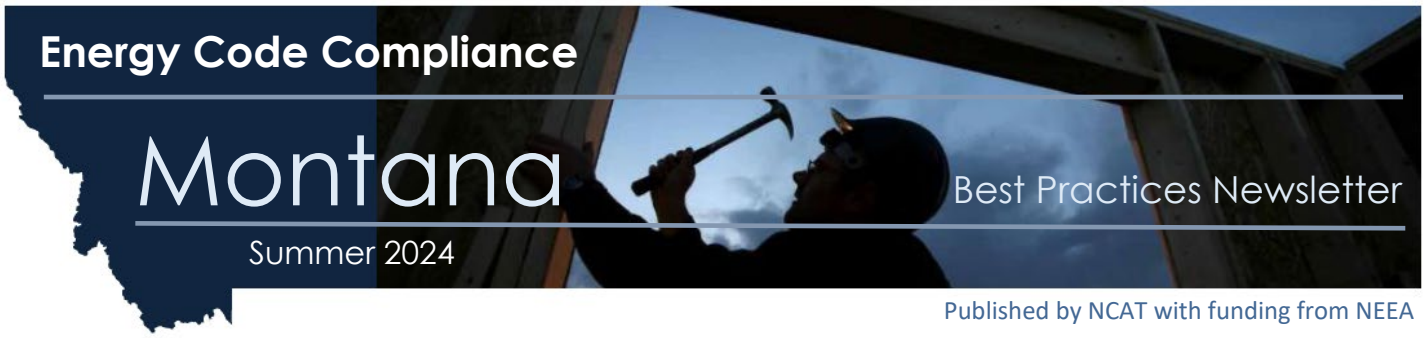

Energy Code Compliance

Montana Best Practices Newsletter

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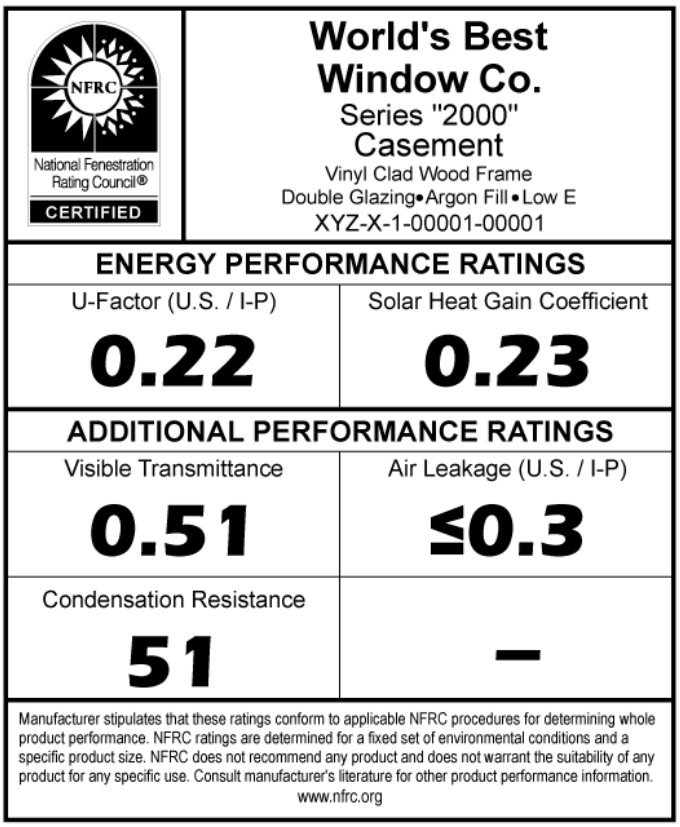
WINDOWS AND DOORS

In theory, the most energy-efficient home would be one built without doors or windows. However, since nobody wants to live in what would essentially be an extra-large cooler, the energy code requires that windows and doors, referred to as *fenestration*, used in residential construction be energy-efficient. The more doors and windows included in a home, the greater the likelihood of air leakage and loss of insulating qualities the home will have. However, these losses can be mitigated by using quality doors and windows and installing them properly. The insulation qualities of the best fenestration products money can buy can easily be undone by improper installation.



Graphic: nfrc.org

Designers consider many factors when choosing fenestration for new construction. Are they fixed panes, sliders, double hung, casement? The 2021 IECC (energy code) does not care about the type of or style of fenestration but instead requires a minimum certified performance level. Table 402.1.3 of the 2021 IECC requires fenestration in zone 6, which includes all of Montana, to be rated at a U-Factor of .30. Ratings are determined by the National Fenestration Rating Council (NFRC) and provided on a label affixed to the window by the manufacturer. These labels should be left on the windows until a final inspection by the local code official. Products lacking such a labeled U-Factor will be assigned a default U-Factor from Table R303.1.3(1) or Table R303.1.3(2) of the IECC.

You'll notice that there are several measurements included on an NFRC label, and each one will help designers determine the best value for their client.

NFRC (nfc.org) describes these measurements as follows:

U-Factor measures how well a product can keep heat from escaping from the inside of a room. The lower the number, the better a product is at keeping heat in. Range: 0.20–1.20

Solar Heat Gain Coefficient measures how well a product can resist unwanted heat gain, which is especially important during summer cooling season. The lower the number, the less you'll spend on cooling. Range: 0–1

Visible Transmittance measures how well a product is designed to effectively light your home with daylight, potentially saving you money on artificial lighting. The higher the number, the more natural light is let in. Range: 0–1

Air Leakage measures how much air will enter a room through a product. The lower the number, the fewer drafts you will experience. Range: ≤ 0.3

INSTALLATION

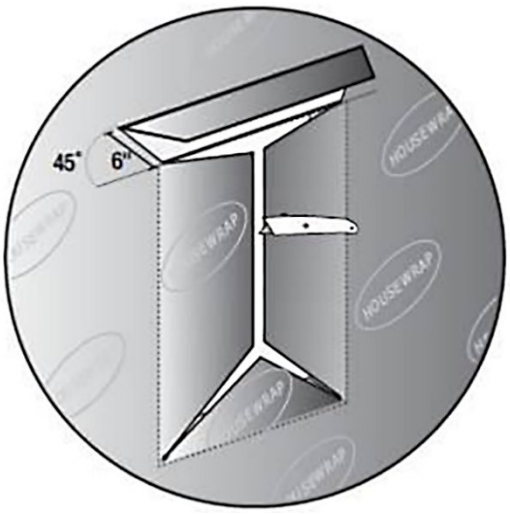
Once the homeowner and designer have chosen the windows for a new home, it is particularly important that the builder properly installs the window. Most window manufacturers will have instructions for proper installation, but the following instructions are considered best practices for preparing a window opening. An improperly installed window or door can not only lead to unnecessary loss of energy, but also can allow water, air, and water vapor to enter the wall assembly, leading to damage to the structure in the form of rot and mold.

Step-by-step flashing

When preparing an opening for flashing, make sure that when the house wrap is installed, the window and door openings are not cut out, but have a continuous sheet of house wrap over the opening.

Step 1:

Once the opening has been identified, the installer should cut a modified I shape in the opening to allow the housewrap to be folded across the window's framing members. Fold the side and bottom flaps into the window opening and secure. Above the window opening, cut a head flap. Fold it up to expose the sheathing and loosely tape it in place out of the way. This head flap will later be installed over the window's flange in such a way as to divert any water that gets past the cladding to be diverted out and away from the window opening.



Graphic: Build America Solution Center, Energy.gov

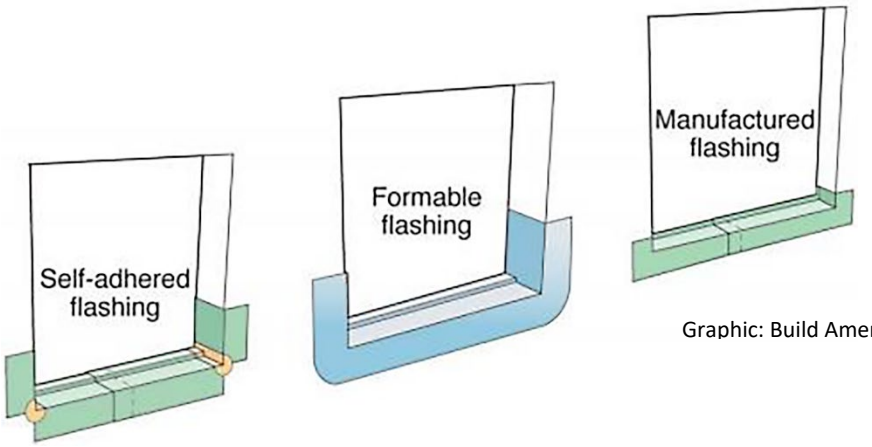
Step 2:

For pan or sill flashing, use formable flashing, a stretchable self-adhered membrane that bends at corners so that one continuous piece can be used to cover the bottom and sides of the sill.

First, install a back dam consisting of a strip of wood or beveled siding nailed along the back (inside) edge of the rough opening (over the flap of housewrap).

Cover this with the membrane. Begin pressing in the middle of the sill and work toward the sides, removing adhesive covering strips as you go. Make sure to press the membrane tightly into the corners to avoid tears later when the window is installed.

Other options for pan flashing include self-adhered non-elastic membrane, which must be cut and patched at corners; two-piece rigid manufactured pan flashing, which comes with a built-in back dam that must be protected from breakage during window installation or asphalt-based liquid flashing, which is applied with a paintbrush or roller.



Graphic: Build America Solution Center, Energy.gov

Step 3:

Caulk the outside edges of the head and side jambs and install the window but do not caulk across the sill.

Install the window plumb, level, and square following manufacturer's specifications.

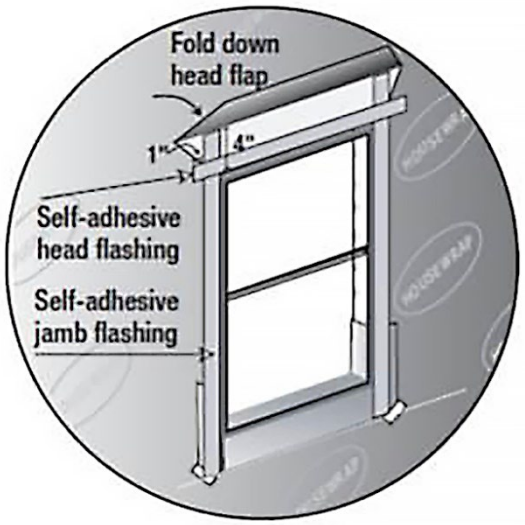
Caulk top and sides of window.

Step 4:

Install jamb and head flashing. Install a self-adhesive jamb flashing extending 4 inches above the top of the head flange and even with the bottom of the sill flashing.

Install self-adhesive head flashing extending 1 inch beyond the jamb flashing.

Unfold the house wrap and lay over the head flashing. Tape bottom edge of house wrap across the top window flange and tape down corner seams of house wrap.



Graphic: Build America Solution Center, Energy.gov

Step 5:

On the interior side of the window, seal the gap between the window and the rough opening with backer rod, and for added measure, cover thebacker rod with a flexible caulk.

Step 6:

Install trim that has been painted or primed on all sides. Above top trim, install cap flashing that extends past trim. Cover top edge of cap flashing with adhesive membrane strip. Cover the top edge of the membrane with sheathing tape and install cladding.

Doors

Door installers should follow the same procedure as for windows, except that a pan flashing integrated with the house wrap is installed. ASTM E2112-07 recognizes several flashing materials and methods, including single-piece sill pans formed from rigid sheet metal, multi-piece sill pans formed from rigid sheet metal or plastic, flexible membrane, or combinations of rigid corners connected by flexible membrane. The manufacturer's installation instructions should be followed for each of these alternatives.

CONCLUSION

The details of a proper fenestration installation can determine whether a house will be comfortable for its occupants, or drafty and uncomfortable. Additionally, air leakage through poorly constructed and/or poorly installed doors and windows can determine whether a builder will pass the required Montana blower door test. A few extra minutes to do it right will yield long-term gains for both clients and builders in increased comfort and energy savings, as well as fewer callbacks.

RESOURCES

Montana Department of Environmental Quality, Residential Code and Energy Efficiency, deq.mt.gov/energy/Programs/code

National Fenestration Rating Council, nfrc.org

Build America Solutions Center, basc.pnnl.gov