BASIS OF DESIGN

WINDOWS

GENERAL INFORMATION:

- Selecting the right windows can save energy and affect resident comfort.
- Window installation will have an impact on building durability (water control) as well as energy use and resident comfort.
- There are three main components of windows that affect performance: the glazing, the frame, and the spacer (material or system that separates the glass panes).
    - **Window frames** are available in a wide range of materials. Common materials for windows include wood, vinyl, aluminum, and fiberglass.
    - **Glazing** choices affect how much light the window will transmit and how much of the sun's heat they allow into interior spaces, and how well they prevent the flow of heat.
    - The **spacer** is the component that separates two panes of glass from one another and holds them at a fixed separation. Older double-pane glazing units typically have metal spacer that are highly conductive. This can increase the risk of condensation on the glass near the window frame. Newer high performance windows have thermal spaces that help maintain resistance to heat flow at the perimeter of the glazing unit.
- Window rating are based on three primary classifications:
    - **U-factor**, the amount of heat that a material conducts (lower is better).
    - **Solar Heat Gain Coefficient (SHGC)**, a measure of how much of the sun's heat energy is transmitted through the glass.
    - **Visual Transmittance (VT)**, is the percentage of visible light transmitted through the glass.
- Two other voluntary criteria (not required to be included on NFRC labels) are also important to window performance:
    - Air leakage
    - Condensation resistance

Considerations for historic buildings:

- Historic buildings may have restrictions on the type (operation) of window, the frame material, and certain panning details.
- For projects using historic tax credits, all window details will have to be reviewed by local governing authorities.

BASIS OF DESIGN

REQUIREMENTS

SAFETY REQUIREMENTS:

- POAH and POAH Communities Window Limiter Policy: Windows should be limited to opening 4" maximum.

  CLICK HERE FOR THE WINDOW LIMITER POLICY

  https://static1.squarespace.com/static/57add27ac534a5d1b9a205a7/t/58dd5adfa5790a2b20301b21/1490901728393/Window+Limiting+Device+Policy+and+Implementation+11-12-2014.pdf

REQUIRED DETAILS:

- For each unique window type or wall assembly provide details for the head, sill and jamb conditions.
- The details must clearly demonstrate the water control for the window opening (flashing and drainage).
- The details must also clearly demonstrate how the air barrier of surrounding assemblies will be transferred to the window.

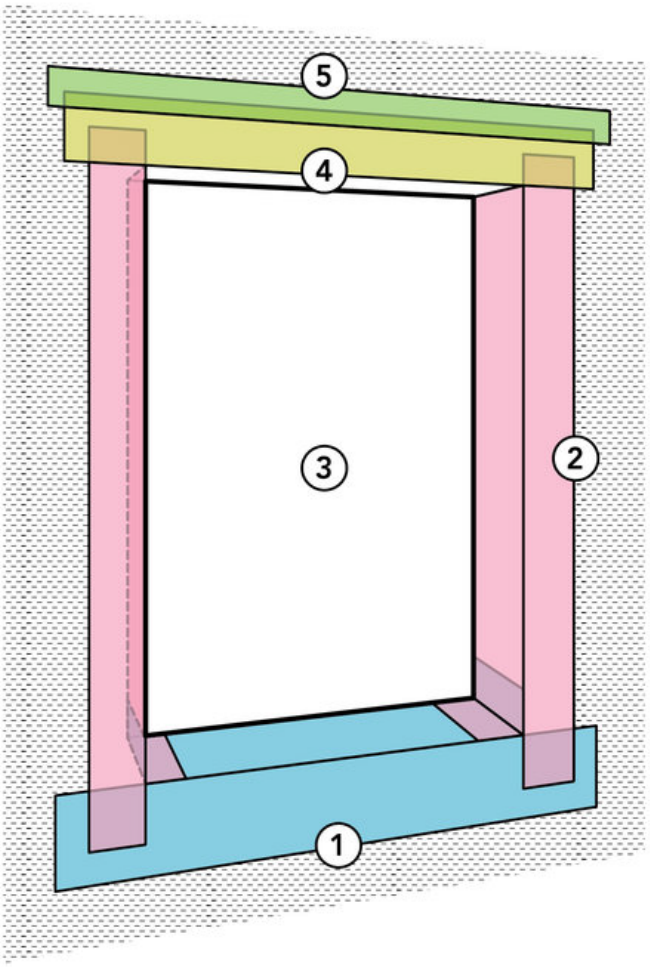
INSTALLATION REQUIREMENTS:

- Window openings shall be fully flashed with flashing at the sill and jambs of the window opening.
- The window opening shall have provision to drain any incidental water on the flashing in the window opening. The sill flashing shall drain over the drainage plane of the wall or over the wall cladding.
- The window shall be fully air sealed to the window opening at the entire **interior** perimeter of the window frame.
- For mulled window units, the junction of windows shall include:
  - Provision for drainage from the joint
  - Continuous air barrier across the interior side of the joint

BASIS OF DESIGN

WINDOW FLASHING DIAGRAM

INSTALL FLASHING FROM BOTTOM UP



STEP 5
FLASHING TERMINATION
Terminate the top edge of flashing with sheathing tape (typical for all bituminous or butyl self-adhered flashing membranes)

STEP 4
HEAD FLASHING
Head flashing laps over jamb flashing and over window head flange

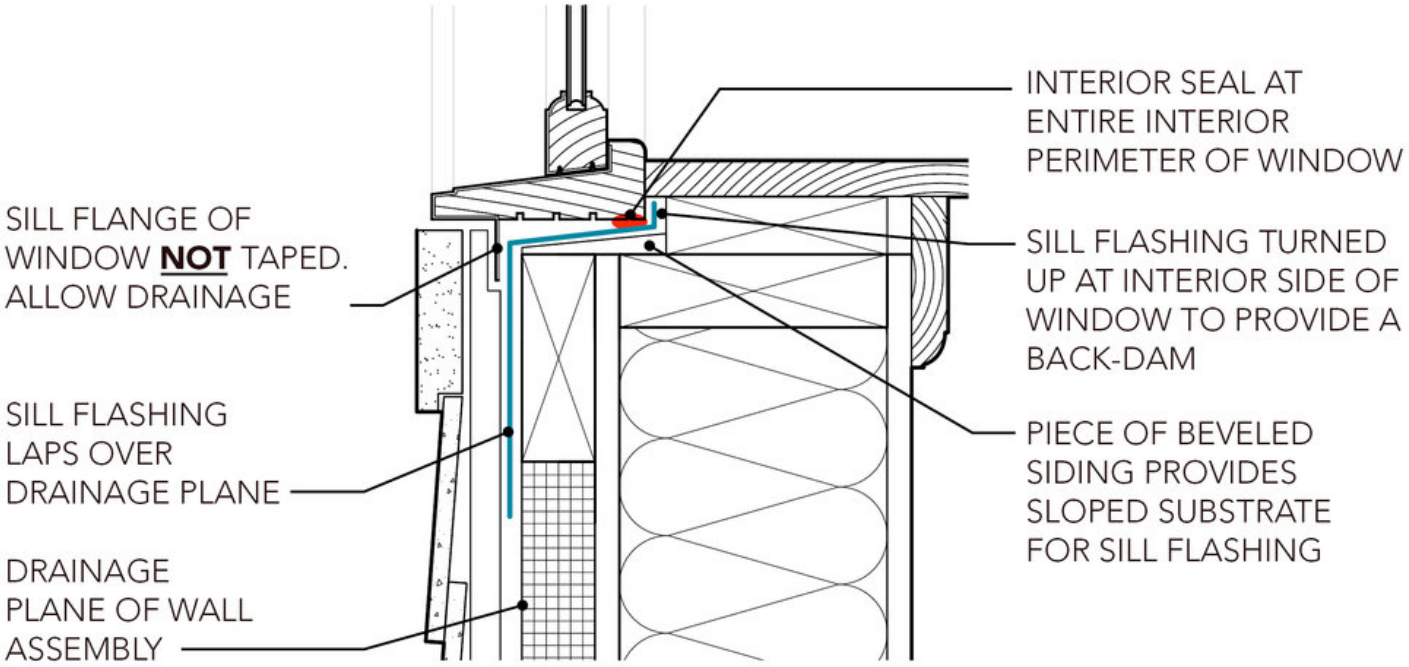
STEP 3
WINDOW UNIT
Install window unit in opening

STEP 2
JAMB FLASHING
Jamb flashing laps over sill flashing

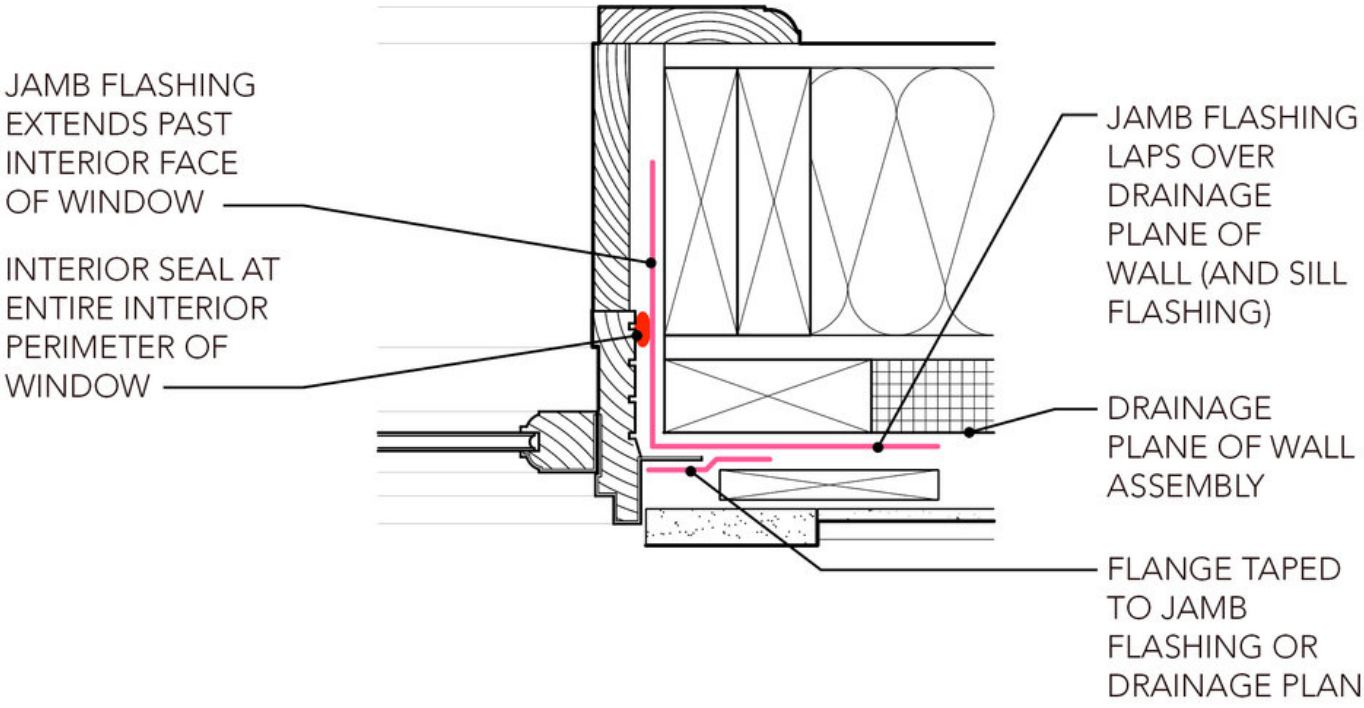
STEP 1
SILL FLASHING
Sill flashing turns up at jambs

BASIS OF DESIGN

WINDOW FLASHING AT SILL



WINDOW FLASHING AT JAMB



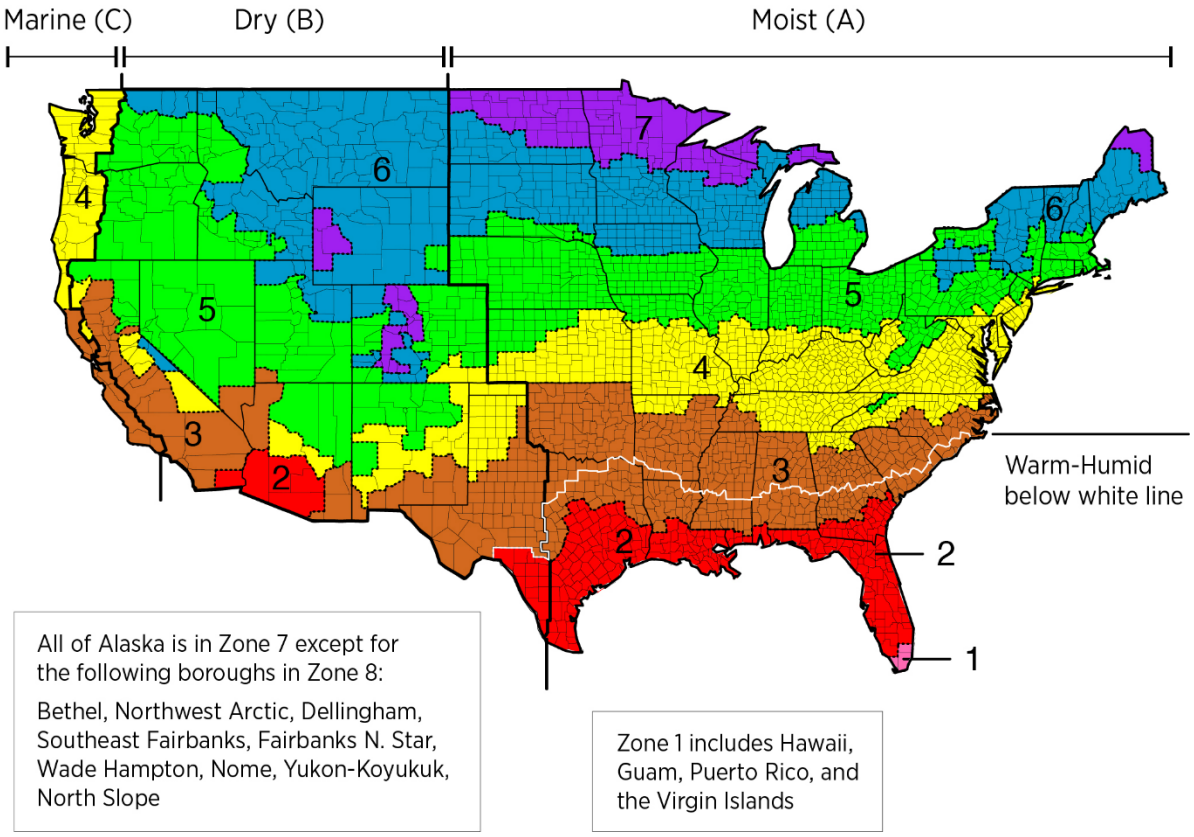
BASIS OF DESIGN

PERFORMANCE REQUIREMENTS:

- Windows must comply with **local energy code**.
  - To verify if specific window energy properties comply with the local code requirements, look for the **NFRC label**.
  - The National Fenestration Rating Council (NFRC) label is needed for verification of energy code compliance. The NFRC label displays whole-window energy properties and appears on all fenestration products which are part of the ENERGY STAR program (www.nfrc.org).
- Windows must be **ENERGY STAR** certified. Often energy star certified windows meet or exceed energy code requirements.
- Proper window installation is necessary for optimal performance, to avoid air and water leakage. Always follow manufacturers' installation guidelines and use trained professionals for window and skylight installation.

BASIS OF DESIGN

- Window performance is based on location and climate. See below for climate zone requirements. To find your climate zone, use the following link: https://basc.pnnl.gov/images/iecc-climate-zone-map

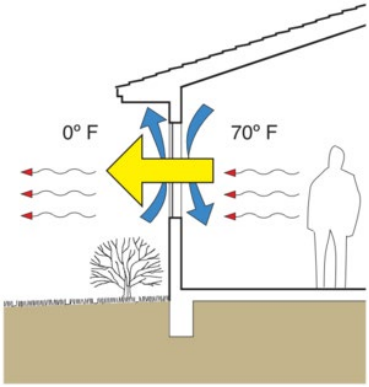


- Windows must meet the following U-Factor and Solar Heat Gain Coefficient (SHGC) requirements.

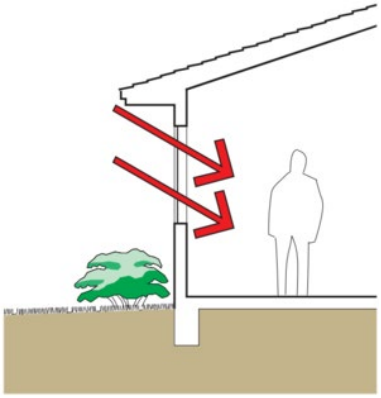
Climate Zone	Fenestration U-Factor	Maximum SHGC
1	0.50	0.25
2	0.40	0.25
3	0.30	0.25
4	0.29	0.40
5	0.23	0.40
6	0.21	0.40
7	0.17	Any

BASIS OF DESIGN

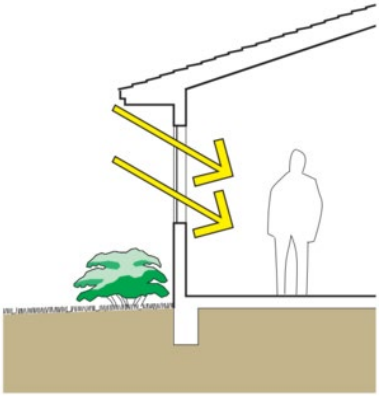
TERMS & VOCABULARY:



U-Factor
The rate of heat loss is indicated in terms of the U-factor (U-value). This rate of non-solar heat loss or gain through a whole window assembly is measured in Btu/hr-sf-°F. The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value.

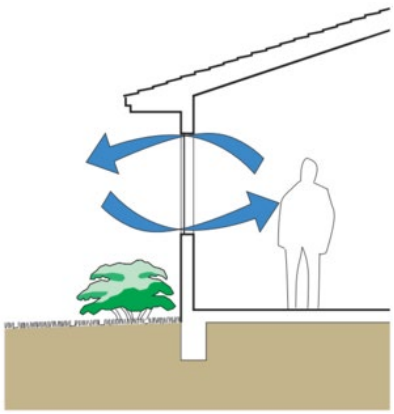


Solar Heat Gain Coefficient (SHGC)
The SHGC is the fraction of incident solar radiation admitted through a window. SHGC is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits. Whether a higher or lower SHGC is desirable depends on the climate, orientation, shading conditions, and other factors.



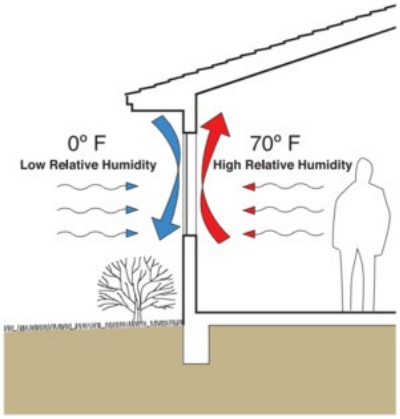
Visible Transmittance (VT)
The VT is an optical property that indicates the amount of visible light transmitted. VT is a whole window rating and includes the impact of the frame which does not transmit any visible light. While VT theoretically varies between 0 and 1, most values are between 0.3 and 0.7. The higher the VT, the more light is transmitted.

BASIS OF DESIGN



Air Leakage (AL)

AL is expressed in cubic feet of air passing through a square foot of window area (cfm/sf). The lower the AL, the less air will pass through cracks in the assembly. AL is very important, but not as important as U-factor and SHGC.



Condensation Resistance (CR)

CR measures how well a window resists the formation of condensation on the inside surface. CR is expressed as a number between 1 and 100. The higher the number, the better a product is able to resist condensation. CR is meant to compare products and their potential for condensation formation. CR is an optional rating on the NFRC label.

Further Resources:

- Efficient Windows Collaborative
  - http://www.efficientwindows.org/
- The National Fenestration Research Council
  - http://www.nfrc.org/