

# BPA Residential

## WEATHERIZATION

### Specifications & Best Practices Guide



This document is the replacement windows and patio doors section of BPA's contractors' guide. It provides step-by-step instructions, discusses best practices, and includes Weatherization Program requirements that are highlighted in bold text.

Numbered lists are used to describe a step-by-step procedure. Lists beginning with letters show different options a contractor may choose.

The complete BPA guide is a comprehensive overview of basic weatherization for a home. If you have comments or questions, please email [ResEEprogram@bpa.gov](mailto:ResEEprogram@bpa.gov).

## 12 PRIME WINDOW, SLIDING GLASS DOOR, AND FRENCH DOOR REPLACEMENTS

Old, leaky windows are a common comfort issue with occupants, and windows can be a durability concern with the home. Single-pane windows and aluminum-framed windows don't offer much resistance to heat loss in the winter and can cause discomfort for occupants. Windows without low-e glazing allow solar energy to overheat the house in summer.

Windows are often in disrepair due to years of operation and exposure to the elements. In some cases, windows create drafts because they don't close completely. In extreme cases, windows allow rainwater to drain into the wall and compromise the structure.

Check with your local serving utility for U-factor requirements for replacement windows.

### 12.1 General Window Requirements

**Comply with these bolded general requirements on all window and patio door replacements.**

Additional recommended best practice steps are included as well. **Window requirements also apply to patio doors unless otherwise stated.**

1. **Replacement windows must be certified and labeled for U-factor in accordance with the simulation, testing, and certification procedures of the National Fenestration Rating Council Incorporated (NFRC).**
2. Installers should always confirm that adhesives being used are designed and rated for exterior use and will work with both existing and new flashing and water-resistive barriers.
3. **Caulk and prime all exterior wood, including frame, sash, trim, stops and sills on all sides and ends.**

4. Support the bottom rail of a patio door within 1/2 inch of exterior edge of the frame. Any wood that touches the ground or concrete must be pressure-treated.
5. Incorporate the replacement window and window opening into the home’s water-resistive barrier using proper flashing techniques for each specific window type.
6. Hardware and fasteners must be aluminum, stainless steel or another noncorrosive material.
7. Seal the structural frame to the window, and seal surrounding gaps and cracks.
  - a. **Frame:** Install caulk or low-expansion foam between window frame and rough opening. Install backer rod or non-expanding foam and caulk where gaps are greater than 3/8 inch.
  - b. **Exposed framing components:** Caulk at exposed wood-to-wood framing cracks; remove sash weights, if applicable, and seal and insulate weight channels.
8. Cover gaps of over 3/8 inch between the exterior siding and the window with solid trim material. Fill all exterior or interior voids over 3/8 inch in width or depth with window manufacturer-approved materials, such as non-expanding foam, backer rod, or similar product prior to caulking, if caulking will be applied.
9. Verify that windows operate smoothly and safely.

## 12.2 Window Installation Requirements

▶ [Go to Project Checklist](#)

**Comply with these bolded requirements when replacing windows.** Additional recommended best practice steps are included as well.



**Window-frame types:** It’s important to order the right frame type for the method of window installation you plan to use.

### **Water-Resistive Barrier (WRB):**

Designers and builders assume that some rainwater penetrates the siding. The WRB is the building’s last defense against water, which deteriorates building materials over time. House wrap and asphalt felt are the most common WRBs. Window replacements that expose the homes WRB must incorporate the WRB in the window installation. Install a sill pan below the window and flashing on the side fins. Use flashing to connect the window opening to the WRB so water that penetrates the siding, trim, or window exits the building by way of the WRB.

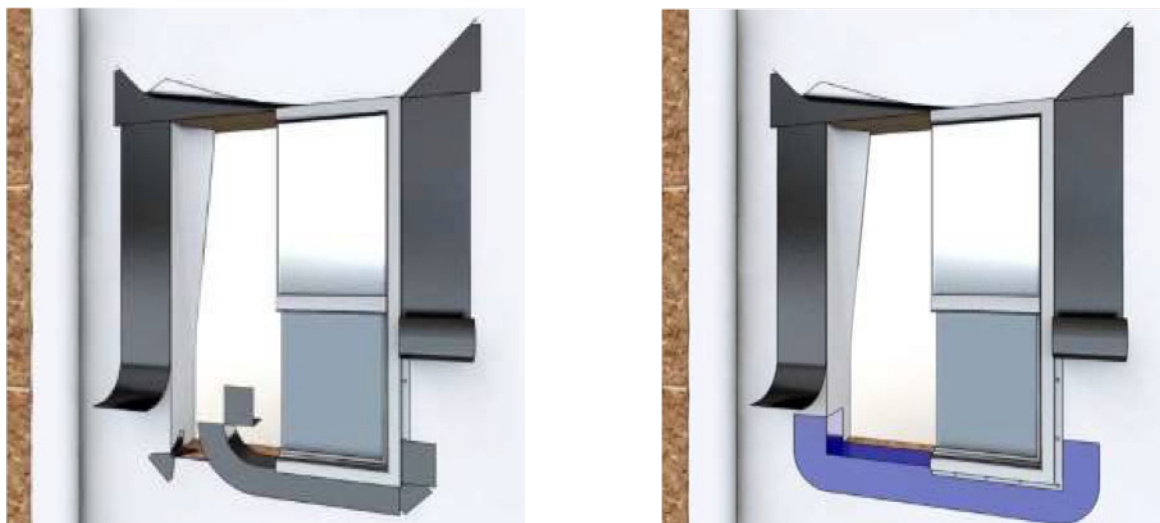
### 12.2.1 Replacing Nailing-Fin Windows

Windows with nailing fins can be installed in the rough opening after the existing window frame and exterior trim are removed. Nailing fins allow the window to be integrated into the water-resistive barrier, protecting the home from water damage. Fasten the nailing fins directly to the house’s sheathing or framing, but support the window’s weight on the sill with or without shims before fastening the window to the building.

Windows are exposed to wind and rain. Install replacement windows so water that penetrates the siding or trim drains to the outside. With proper flashing, the fins and flashing create a drainage system that directs water to the outside rather than relying exclusively on caulked siding to prevent rain water from penetrating the building.

Comply with these requirements to install a nailing-fin window securely in the rough opening.

1. At the sill, insert the flashing underneath the existing siding and on top of existing building paper. The bottom nailing fin of the window will cover this flashing.
2. Install the window by sliding the top fin under the building paper. Side and bottom fins should rest on top of the building paper. Use flat shims to provide a level surface and support under the vertical structural members of the new window frame. Don't allow the fins to support the window's weight.
3. Use fasteners with heads wide enough in diameter to span the holes or slots in the window fin. Avoid over-driving the fasteners or otherwise deforming the window fin.
4. Flash the window around its perimeter with 15-pound felt, house wrap or a peel-and-stick membrane.
  - a. First, flash the side fins of the window, overlapping the sill flashing;
  - b. Then, flash the top fin of the window, overlapping the side flashing.
5. Windows that are exposed to wind-driven rain or without overhangs above them should have a rigid head flashing to prevent rainwater from draining onto the window.
  - a. If the tops of the windows are already protected by an overhanging metal head flashing, tuck the new flashing behind this head flashing.
  - b. If the tops of exposed windows aren't protected by head flashing, insert new metal head flashing behind the existing siding and building paper at the top of the window and over the head trim piece. The head flashing should extend beyond the sides of the window enough to divert water away from vertical joints bordering the window.
  - c. Tuck the head flashing up behind the exterior siding at least 1 inch. Metal head flashing must have downward bending lip of at least 1/4 inch on the front and ends.
6. Thoroughly caulk all filler and trim pieces surrounding the replacement window.



**Flashing nail-fin windows:** Place the window on and over the sill flashing. The side and top flashing cover the fastening fin. The two methods shown here are using a flexible membrane (right) and using a bowtie-shaped flashing to underlay the corners when using a standard membrane.

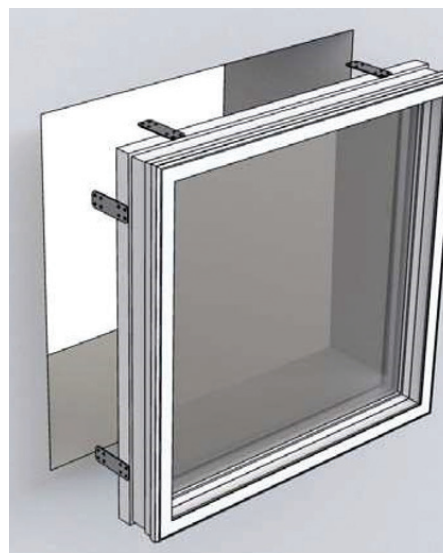
## 12.2.2 Block-Frame or Finless Windows

Install block-frame (finless) windows when the existing window frame can't be removed or into a masonry window opening. Block-frame windows rely on caulk to create a weatherproof seal around the perimeter. Take care when installing caulk so that it is durable and effective for as long as possible.

**Comply with the following bolded requirements when installing block-frame or finless windows.**

Additional recommended best practice steps are included as well.

1. Block-frame or finless windows may require a sufficiently wide gap between the existing window frame or masonry opening to allow for the following.
  - a. Leveling the window.
  - b. Insulating the gap with foam.
  - c. Allowing for slightly out of square opening.
2. **If window-weight cavities are accessible, remove the weights, fill the cavities with insulation, and seal the cavities.**
3. **Support block-frame or finless windows under their main vertical supports with shims that level the window.**
  - a. **Use flat shims if the sill surface is flat.**
  - b. **Use tapered shims or a sill angle if the sill surface is sloping.**
4. **Windows without fins must be secured to the rough opening within 4 inches of each side corner and a minimum 12 inches on center along the remainder of the sides of the frame with one of these fastening methods.**
  - a. **Screws fastened through the window frame. Use screws that are designed for fastening block- frame windows.**
  - b. **Jamb clips or plates that are fastened first to the window and then to the opening in separate steps.**
5. **Protect the existing sill with a metal or plastic sill pan or rigid sill flashing if necessary for drainage and to protect the existing sill that protrudes from the exterior wall. Or, install a new sill as part of the window replacement.**
6. **Fill any gaps over 3/8 inch that are between the exterior siding and the block-frame window. Install backer rod in all exterior or interior voids over 3/8 inch in depth or width before caulking.**
7. If possible, flash block-frame windows between the opening and the replacement-window frame and extend the flashing out far enough to slip under or into the siding.
  - a. Tuck the flashing up behind the exterior siding at least 1 inch.
  - b. Sill and head flashing should have a downward bending lip of at least 1/4 inch on the front that sheds water away from the building.
8. **Caulk around the perimeter of the window to the existing frame to prevent water intrusion.**



**Block frame window installation:** Block-frame windows don't have a fin. Installers use plates or screws to fasten the window to its opening.

### 12.2.3 Flush-Fin Window Replacement

Flush-fin windows work well for any window opening with a flat finished surface surrounding the window opening.

**Replace windows in stucco walls using windows with flush fins, also called stucco fins, which have no nail holes. Flush-fin windows are replacement windows that fasten to the window opening and mount directly over the flat siding surrounding the window opening. This flush-fin window-replacement technique is similar to block-frame window installation.**

1. **If window-weight cavities are present and accessible, remove the weights, fill the cavities with insulation, and seal the cavities.**
2. **Support the replacement window on the existing sill with one of the following materials.**
  - a. **A flat or tapered continuous wood support.**
  - b. **Flat shims under the window's main vertical supports.**
  - c. **Tapered shims under the window's main vertical supports if the sill is sloping.**
3. **Apply a sealant that remains flexible to the back of the flush fin of the replacement window in order to seal it to the surface of the exterior wall. Leave a gap in the caulking at the bottom fin for 1 inch on each side of the window's weep holes to allow water to drain.**
4. **Windows must be secured to the rough opening within 4 inches of each side corner and a minimum 12 inches on center along the remainder of the frame with one of these fastening methods.**
  - a. **Screws fastened through the window frame. Use screws that are designed for fastening block-frame windows.**
  - b. **Jamb clips or plates that are fastened first to the window and then to the opening in separate steps**

## 12.3 Safety Glass and Emergency Egress

**All windows must meet the following safety glazing and egress requirements. Use safety glazing in locations where the risk of breakage is high. Egress windows are windows with an opening sash large enough for people to use as a fire escape.**

**Safety glazing requirements apply to replacement windows, replacement patio doors, multi-glazing inserts and storm windows. Each pane of glass requiring safety glazing must bear the manufacturer's permanent safety glazing label. This label of identification is etched or ceramic-fired on the glazing and clearly visible in one of the corners of the pane.**

### 12.3.1 Hazardous Locations Requiring Safety Glazing

**Comply with state and local code for required safety-glazing locations.**

Common locations for safety glazing include the following.

1. Glazing in entry doors.
2. Glazing in patio doors and French doors.
3. Glazing in a fixed or operable panel that meets all of the following conditions:

- a. The exposed area of an individual pane is greater than 9 square feet.
  - b. The bottom edge is less than 18 inches above the floor.
  - c. The top edge is greater than 36 inches above the floor.
  - d. One or more walking surfaces are within 36 inches horizontally of the glazing.
4. Glazing in a fixed or operable panel adjacent to a door where the nearest vertical edge of the window is within a 24-inch arc of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface.
5. Glazing in hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers, if the bottom edge of the glazing is less than 60 inches above the drain inlet.

### 12.3.2 Emergency Egress Openings

**Where an existing window meets code-required egress requirements, the replacement window must also meet those egress requirements.**

Generally, when windows in bedrooms are replaced, egress windows should be recommended.