

## **Appendix E**

### **Windows Retrofit Description and Photos**

## Appendix E - Windows Retrofit Description and Photos

Prior to beginning heating season experiments, the factory installed windows were retrofit with highly insulating windows in the experimental home and double-pane clear windows typical of existing homes in the region in the baseline home. In addition to characterizing the energy use and thermal comfort impacts of the improved window performance, this research also documented the impact of proper installation practices.

The baseline windows were installed by local trades with no special instruction. For this installation, the existing factory windows were removed and silicone caulk was applied on the outside of the rough opening. The retrofit baseline windows were installed by squaring the window in the opening, screwing the window in place, and foaming/caulking the interior seam as necessary. This installation was meant to typify normal construction practices.

The experimental windows were installed in accordance with manufacturer's instructions and with the assistance of Jeld-Wen field installers. In the experimental window installation, the existing windows were removed and a butyl adhesive was sprayed on the bottom sill of the rough opening to prepare the surface for the moisture barrier material. Figure E.1 shows a picture of the butyl adhesive used in this installation.



**Figure E.1.** Butyl Adhesive Spray and Prepared Rough Opening in Experimental Home

On the butyl adhesive, a felt and foam peel-and-stick membrane was applied which covered the lip of the rough opening (to sit under the window) and wrapped around to the front of the house on the siding. A foam strip on top of the felt should line up with the inside seam of the window. The foam acts as a moisture barrier, preventing water from entering the home under the window, while the felt wicks any water out of the sill and to the exterior drainage plane. The felt would have been installed on house wrap, but the Lab Homes do not have house wrap installed so it was installed directly on the siding. Figure E.2 shows installation of the peel-and-stick felt membrane.

The felt membrane was installed with a heat gun and roller to provide a water-tight seal to the drainage plane, as depicted in Figure E.3.



**Figure E.2.** Felt and Foam Peel-and-Stick Membrane Applied to Experimental Home Rough Opening Sill Plate to Manage Water Intrusion



**Figure E.3.** Installation of Sill Plate Moisture Barrier

The sill plate moisture barrier was caulked at the seams to ensure a water-tight installation.

On the two patio doors, a graded sill pan was used.

New windows were installed in the prepared rough opening. Windows were squared, shimmed when necessary, and screwed to the exterior.

Limited caulk, spray foam, and cylindrical foam rod was used to seal window in place.

Reinstalled strip on inside and outside.



**Figure E.4.** Peel-and-Stick Membrane Applied with Heat Gun, Roller, and Caulker at Seams for Air-Tight Installation



**Figure E.5.** Installation of Foam Rod (left) to Seal Window and Squaring of Window in Opening (right)