



Building America Case Study Whole-House Solutions for New Homes

Exterior Rigid Foam Insulation at the Edge of a Slab Foundation

Fresno, California

PROJECT INFORMATION

Construction: New Home

Type: Single-family, affordable

Builder:

Wathen-Castanos Hybrid Homes, Inc.,
www.wchomes.com

Size: 1,789 ft²

Price Range: Starting at \$205,000

Date completed: 2011

Climate Zone: Hot-dry

PERFORMANCE DATA

Using BEopt version 1.3 modeling on the house plan and specifications noted for this Fresno, California, unoccupied test house, the research team determined that the house will achieve energy savings of 35.5% with respect to the *Building America House Simulation Protocols**.

*Hendron, R. and Engebrecht, C. NREL/TP-550-49426. "Building America House Simulation Protocols." Golden, CO: National Renewable Energy Laboratory, 2010.

Exterior rigid foam insulation at the edge of the slab foundation was a unique feature for this low-load, unoccupied test house in a hot-dry climate and may be more appropriate for climates with higher heating loads. U.S. Department of Energy Building America research team IBACOS worked with National Housing Quality Award winner Wathen-Castanos Hybrid Homes, Inc., to assess the performance of this feature in a single-family detached ranch house with three bedrooms and two full bathrooms constructed on a slab-on-grade foundation in Fresno, California.

One challenge during installation of the system was the attachment of the butyl flashing to the open framing. To solve this constructability issue, the team added a nailer to the base of the wall to properly attach and lap the flashing. In this strategy, R-7.5, 1.5-in.-thick extruded polystyrene (XPS) was installed on the exterior of the slab for a modeled savings of 4,500 Btu/h on the heating load.



The slab edge of the test house prior to installation of the XPS rigid foam insulation, showing the nailer that supports the foam.

Key Energy Efficiency Measures

HVAC

- 20.5 seasonal energy efficiency ratio and 13 heating seasonal pump factor Infinity Variable Speed Heat Pump with Greenspeed Intelligence; above- and below-door transfer grilles
- R-8 ductwork and air handlers located entirely in conditioned space
- Balanced ventilation system consisting of an energy recovery ventilator
- Kitchen and bath fans vented to outside

ENVELOPE

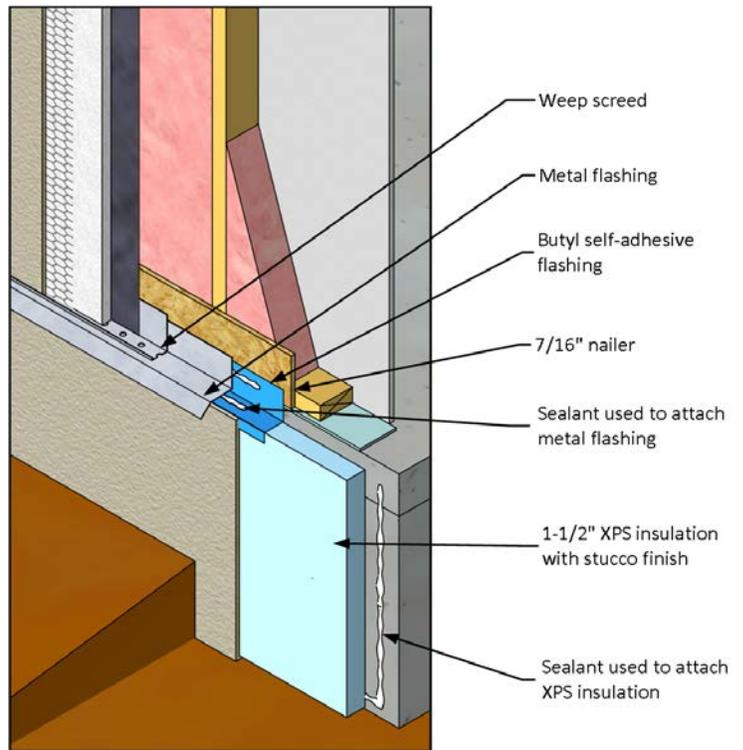
- Slab-on-grade edge insulated with R-7.5 1.5-in.-thick XPS insulation
- R-60 ceiling, 13-in. raised heel trusses
- R-23 insulation in 2x6 cavity, R-7.5 exterior foam sheathing
- Double-pane, low-e, vinyl windows, U = 0.16 and solar heat gain coefficient = 0.19
- Tightly sealed house, 1.0 ACH50

LIGHTING, APPLIANCES, AND WATER HEATING

- 100% fluorescent lighting; hardwired
- ENERGY STAR® ceiling fans
- ENERGY STAR refrigerator, clothes washer, and dishwasher; gas, conventional cooking range
- Gas, tankless water heater

For more information, see the Building America report, *Commissioning of the Fresno, California, Retrofit Unoccupied House*, at www.buildingamerica.gov

Image credit: All images were created by the IBACOS team.



Construction detail showing key parts of the slab edge insulation flashing.

Lessons Learned

The following lessons were learned from this portion of the project:

- This method of applying rigid XPS foam insulation to the exterior slab edge of a foundation can be done efficiently and effectively.
- The additional cost and installation effort involved in using this method are neither excessive nor prohibitive.
- This practice is better suited for climates with higher heating loads where losses through the slab edge would be higher.
- Trades in warm climates are unfamiliar with this method, so additional education of the trades regarding this installation practice is warranted to encourage the trades' acceptance of the method.

"We worked out the flashing detail on this particular item, and it actually finished really well. I am not so sure we get the "bang for the buck" on this item in our (hot-dry) climate zone."

- Freddie Logue, Construction Manager
Wathen-Castanos Hybrid Homes, Inc.