Building America Case Study

Raised Ceiling Interior Duct System

New Smyrna, Florida

PROJECT INFORMATION

Project Name: S.E. Volusia County Habitat for Humanity Zero Energy Ready Home

Location: New Smyrna, FL

Partners:

S. E. Volusia CO Habitat for Humanity

Building America Partnership for Improved Residential Construction, *ba-pirc.org*

Building Component: HVAC

Application: New and/or retrofit; Single and/or multifamily

Year Tested: 2013

Applicable Climate Zone(s): all

PERFORMANCE DATA

(of the measure alone, not whole house)

Cost of energy-efficiency measure (including labor): $1890 or $1.51/ft^2

Projected energy savings: 6.5% overall compared to Building America 2010 Benchmark

Projected energy cost savings: $165/year compared to Building America 2010 Benchmark

Builder S.E. Volusia County Habitat for Humanity (SEVHFH) was interested in constructing a home to the new U.S. Department of Energy (DOE) Zero Energy Ready Home standards. SEVHFH partners with DOE team Building America Partnership for Improved Residential Construction on Habitat for Humanity homes and routinely builds to ENERGY STAR V3.1. The only modification to the design needed to comply with the Zero Energy Ready Home criteria was the interior duct requirement. Unwilling to incur the added costs of a foam roof deck or wall heights that exceed 8 ft to accommodate a fur-down chase, SEVHFH opted to build a fur-up or raised ceiling chase.

Fur-up chases require attention to different details than a "standard" build. Typically, the home's roof trusses need to be redesigned, and duct size in lateral run-outs is constrained to the width of the trusses, usually 21 in. (2 ft on center).The order in which trades are required changes, and the trades can affect the success or failure of a chase-based interior duct system. Also, air sealing and insulating the resulting chase where it rises above the attic floor can pose significant challenges.

In this project, SEVHFH's heating, ventilation, and air conditioning contractor sized the chase using ACCA Manual D, and the truss manufacturer used those results to redesign the roof trusses to accommodate the chase. SEVHFH used Habitat for Humanity International's Gifts-in-Kind program to procure 2-in.-thick, 2 × 8 sheets of Styrofoam blueboard; double layers of blueboard glued together with construction adhesive and taped joints resulted in a well-sealed, R-20 chase. Next, the attic side of the chase was further wrapped with R-11 batts after installation for a final R-value of 31. The chase liner's individual pieces of blueboard were laid up to alternate the seams and joints to increase air sealing. Rigid ductwork was used as it fills the rectangular area of the chase better than flex duct, reducing the chase size. The main trunk of the duct work was built on the floor, raised into place, and supported in the chase.

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Description

Main duct is lifted into place.

Lateral duct with chase running between trusses. Duct size is limited.

Completed chase ready for insulation wrap and drywall. Note sealed bottom using ½-in blueboard.

For more information, see the Building America report, *Achieving Challenge Home in Affordable Housing in the Hot-Humid Climate,* at: *buildingamerica.gov*

Image credit: All images were created by the BA-PIRC team.

Ready to install the second layer of blueboard. Note the staggered joints and adhesive used to seal seams and attach layers together.

Lateral run-outs were then installed in the chase over partition walls. After supply boots were formed and sheet metal rims installed to allow the installation of registers, the bottom of the chase was sealed with a sheet of ½-in. blueboard to ensure that no air leaked from the chase to the attic and that moisture would not reach the drywall under the chase.

Lessons Learned

- Regular team meetings are very important to ensure coordination and quality work from all subcontractors.
- The job-site supervisor must be vigilant to ensure the system is implemented properly.
- There are additional costs for framing and drywall. A more expensive duct system (ductboard versus flex-duct) may be required because of space limitations.
- Payback is impacted by other efficiency improvements, depending on the expense of the method employed. Therefore, cost benefits are seldom the sole motivation for implementation.

Looking Ahead

This construction technique must comply with many codes about smoke and flame spread of materials and use of building cavities as ducts. Future refinements to the technique could use the chase as a passive return system without additional material.

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Energy Efficiency & Renewable Energy

For more information, visit:
buildingamerica.gov

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