Building America
Efficient Solutions for Existing Homes

Case Study:
Build San Antonio Green

San Antonio, Texas

PROJECT INFORMATION

Construction: Deep energy retrofit

Type: Single-family, affordable, total interior rehab of foreclosed single-story home

Partners: Build San Antonio Green, CPS Energy, T & J Builder, City of San Antonio

Size: 1,047 ft^2

Cost: about $50,000

Date Completed: May 2011

Climate Zone: Hot-humid, IECC 2A

PERFORMANCE DATA

HERS Index: pre-retrofit 161; post-retrofit 93

Projected annual energy cost savings: $545

Projected annual energy reduction: Site=33%, Source=46%

Total cost of energy-efficiency measures: $9,620

Rate of return: 5.66%

Billing data: Not available

Building America researchers provided technical assistance to Build San Antonio Green (BSAG, www.buildsagreen.org) for three of their deep energy and green retrofits. BSAG is a well established non-profit organization in the community that has certified more than 710 new homes as well as 15 retrofits through its Green Retrofit Program to date.

Technical assistance provided by the Pacific Northwest National Laboratory (PNNL) team included retrofitting strategy assessments, performance testing, quality assurance, and metering. The PNNL team included Calcs-Plus, which led the field work, and the Florida Solar Energy Center, which led the metering effort.

This San Antonio home is one of three deep energy renovations of occupied affordable homes certified in 2011. The homes were selected through the City of San Antonio's Owner-Occupied Housing Rehabilitation Program. Built in 1949, this slab-on-grade, three-bedroom, one-bath, 942-square-foot home had only a basic level of cooling and heating provided by three window air conditioners, one of which was a heat pump. The renovation increased the floor area to 1,047 square feet. The thermal envelope consisted of a shallow, uninsulated, single-assembly roof and frame walls with minimal insulation estimated to be R-4. Extensive retrofitting work was required to bring the home up to modern standards including removal of all drywall and installation of a new 6:12 pitch roof.

(Photo above) Before and after photos of the 1949 retrofit.

(Photo left) Unfaced batt insulation was properly installed in wall cavities without gaps or compression

Photo sources: BSAG and Calcs Plus

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KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- SEER 14, 2-ton air conditioner combined with an 80% AFUE gas furnace in vented attic
- Mastic-sealed, R-6 flex ducts. Transfer grills in all bedrooms. Leakage to outside = 46 cfm@25 Pa
- Positive-pressure whole-house ventilation system (run-time only) with electric damper that prevents entry of outside air when compressor shuts off
- Kitchen and baths vented to outside
- Carbon Monoxide detector

Envelope:

- Radiant barrier roof decking over R-30 ceiling insulation
- 2x4 walls with R-13 insulation
- Double-pane, low-e, metal windows. U = 0.54, SHGC = 0.30
- House ACH50 = 7.5 (pre-retrofit was 22.3).

Lighting, Appliances, and Water Heating:

- 100% CFL
- Standard older appliance
- Energy feedback display
- 0.62 EF gas water heater in exterior closet

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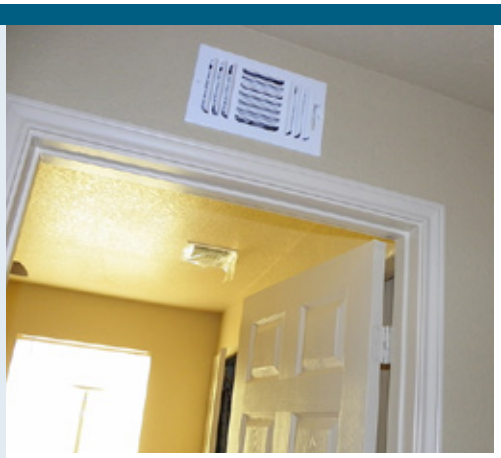

Transfer grilles (left photo) were installed to ensure good return air flow even when the bedroom doors are closed. The outside air intake is through a filter-backed grille (right) that removes dust and pollen from the ventilation air which is circulated by the new central HVAC' system's air handler fan. *(Photo sources: BSAG and Calcs-Plus)*

Lessons Learned

- To ensure combustion safety, the gas furnace was installed in the attic and the gas water heater was installed in an exterior closet.
- A tight duct system, the transfer grilles, and the outside air ventilation system proved to be implementation challenges even with an HVAC contractor willing to learn. As a result, multiple site visits, onsite duct testing, and training were required to achieve the project goals.
- The availability of the pre-retrofit utility bills permitted the team to calibrate the analysis model, which was then used to estimate the post-retrofit savings. To better understand actual energy use and occupant lifestyle, all three project homes are being metered.

"Participating in the Building America Deep Energy Retrofit study has had a great effect on Build San Antonio Green. After all the retrofit work was done, we walked away with knowledge of new techniques and features that we have incorporated into our program. The BSAG Green Retrofit Program now incorporates measures that will further the energy efficiency and comfort of these homes. The study was a great benefit not only to BSAG, but to our homeowners as well."

Lina Luque, Certification Manager, Build San Antonio Green

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