



## Building America Efficient Solutions for Existing Homes

# Case Study: Lake Sumter Habitat for Humanity

Eustis, Florida

### PROJECT INFORMATION

Construction: Retrofit

Type: Single-family, historic home

Builder:

Lake Sumter Habitat for Humanity  
<http://www.habitatls.org/>

Size: 1,040 ft<sup>2</sup>

Date completed: August 2011  
(originally built in 1981)

Climate Zone: Hot-Humid

### PERFORMANCE DATA

HERS index:

Home as found = 132; case study  
after retrofit = 78

Projected annual energy cost  
savings: \$725

Total cost of energy-efficiency  
measures: \$ 5,310

Incremental annual mortgage:  
\$428

Payback period: 7 years

Billing data: Available in FY12

### Project Description

Improved energy efficiency was a critical goal to make this 1981 home more affordable for a family in need. Lake Sumter Habitat for Humanity purchased and renovated the unoccupied 1,040 ft<sup>2</sup> slab-on-grade, single family ranch home in Eustis, Florida to demonstrate that low-income housing can be affordably renovated to achieve big savings. With the help of Building America researchers from Pacific Northwest National Laboratory and the Florida Solar Energy Center, energy-efficient measures were implemented that reduced annual energy bills by an estimated 42%.

The Building America team recommended R-38 attic insulation, ENERGY STAR windows, a heat pump with a seasonal energy efficiency ratio (SEER) of 13 (this metric applies to the cooling efficiency – the heating season performance factor (HSPF) was 7.7), an ENERGY STAR refrigerator, compact florescent lamps (CFLs) in light fixtures, and dramatically reduced duct leakage (86% improvement). These measures were estimated to reduce energy bills by \$725 annually, for a simple payback period of 7 years. The total package of



recommendations is anticipated to save energy equivalent to 4,170 kWh for a \$725 annual reduction in energy bills. To verify savings calculations for this home, the Building America team will monitor the energy consumption.

Habitat for Humanity replaced this SEER 9 air conditioner and gas furnace with a standard heat pump, providing an anticipated reduction in energy use of and saving an estimated \$277 in annual energy costs. The closet housing the equipment was reconfigured and a new ducted return plenum was constructed.

## KEY ENERGY-EFFICIENCY MEASURES

### HVAC:

- SEER 13, HPSF 7.7 heat pump (little heating load in south Florida)
- Pre-retrofit duct leakage = 0.32 cfm flow to out (Qn out)  
Post-retrofit duct leakage = 0.046 cfm (Qn out)

### Envelope:

- R-38 blown ceiling insulation in attic
- Lightly colored asphalt shingles. Solar absorption = 0.08
- Energy Star double-pane, low-e, vinyl windows. U = 0.51, SHGC = 0.25

### Lighting, Appliances, and Water Heating:

- 100% CFL
- ENERGY STAR® refrigerator

For more Information, please visit:

[www.buildings.energy.gov](http://www.buildings.energy.gov)



**Right:** Additional insulation was blown into the attic and air leakage in the ductwork was sealed to reduce air infiltration. **Left:** A combination of foam sealant and insulation was used to seal the penetration in the return plenum (right), which previously led to an open wall cavity, providing pathways to the attic and outside.

## Lessons Learned

- Although replacing windows saved only \$69 on utility bills annually, replacements were necessary since many of the existing windows were broken or did not lock.
- It was possible to achieve an estimated 30% improvement in energy efficiency for a 30-year-old home with moderate changes to the HVAC equipment, ceiling insulation, lighting, and appliances with an estimated cost of \$4,027.
- Close attention to air sealing details is important for efficient operation of all systems. In this home, an interior wall cavity which formed the front of the air handler closet was not sealed and attic air was being pulled through this pathway, increasing duct leakage. This opening was later sealed with spray foam, to achieve an overall duct leakage of 0.046 flow to out.
- Due to low heating and cooling loads in this house, it was not cost effective to install a higher-efficiency heat pump; a standard-efficiency unit was selected with an expected payback period of 9 years.

“The cost of going from R-30 to R-38 ceiling insulation was 8¢ per square foot, pretty much a no-brainer. If we can bring down monthly payments for utilities, that home becomes that much more affordable to the homeowner.”

– Sean Del Castillo, Construction Project Manager, Habitat for Humanity of Lake Sumter.

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