## Building America Efficient Solutions for New Homes

# Case Study: Habitat for Humanity Palm Beach County

West Palm Beach, Florida

## PROJECT INFORMATION

**Construction:** New Home

**Type:** Single-family, affordable

**Partners:** Habitat for Humanity of Palm Beach County, FL www.habitatpbc.org

**Size:** 950 to 1,340 ft$^2$

**Cost:** about $90,000

**Date Completed:** 2011

**Climate Zone:** Hot-humid, IECC 2A

## PERFORMANCE DATA

**HERS Index:** 57-58

**Projected annual energy cost savings:** $434

**Added first cost of energy-efficiency measures:** $1,500

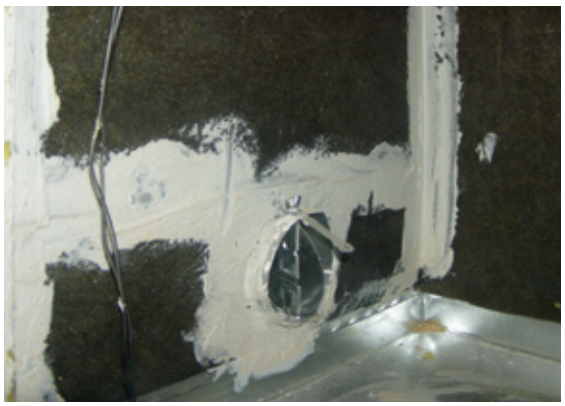
**Annual mortgage increase:** $75

**Annual net cash flow to homeowner:** $359

**Billing data:** Not available

In 2011, Building America assisted Habitat for Humanity of Palm Beach County (HabitatPBC) in completing three high-performance prototype houses that achieved HERS index scores of less than 60, which is about 30% better than typical HabitatPBC construction, at a payback of less than 4 years. The HabitatPBC is planning to implement these strategies in future homes they build. This has the potential for significant and affordable energy savings as HabitatPBC has built more than 111 affordable houses and served an additional 125 families worldwide through their affiliation with HFH International (today serving >20 families a year).

Building America (through the Florida Solar Energy Center, a member of the Pacific Northwest National Laboratory team) achieved the energy savings at a cost of $1500 per house with a projected utility bill savings of $434 per year. All three houses involved were also certified to ENERGY STAR® for New Homes, Version 2.0 or 2.5.



Typically air handlers are located in garages in Florida. *(Left)* In these homes the air handler was located in a closet inside the home to improve air quality and energy efficiency. *(Right)* A fresh air intake is ducted to the return air plenum to bring in fresh outside air that is filtered and tempered by the central air handler before being circulated throughout the home. (Photo Source: Florida Solar Energy Center)

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## KEY ENERGY-EFFICIENCY MEASURES

### HVAC:

- SEER 14 AC with strip heat (little heating load in south Florida)
- Well-sealed R-6 flex ducts in vented attic. Air-handler in interior closet. Return air jump ducts in all bedrooms. Duct leakage to outside = 26 cfm @ 25 Pa
- Positive pressure whole-house ventilation system (run-time only)
- Kitchen and bath fans vented to outside

### Envelope:

- Light-colored shingle roof
- R-38 blown ceiling insulation in vented attic
- R-13 grade-1 batt insulation in 2x4 frame wall
- Double-pane, low-e, vinyl windows. U = 0.34, SHGC = 0.26
- Tightly sealed house, ACH50 = 2.5

### Lighting, Appliances, and Water Heating:

- 100% CFL
- ENERGY STAR® ceiling fans
- ENERGY STAR® refrigerator
- Heat pump water heater

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Compared to electric water heaters, heat pump water heaters can save 50% or more in energy use. To function properly they need to be located in a garage or other large room; however, HabitatPBC homes are built without garages. The solution here was to build a small unconditioned room (left) that is connected to the hot attic (right) to provide adequate free air for the proper operation of the heat pump water heater. *(Photo Source: Florida Solar Energy Center)*

## Lessons Learned

- Increases in roof reflectance and attic insulation achieved greater energy efficiency gains than added wall insulation.
- Because cooling and heating loads are small in small, well-built Florida houses, dramatic increases in air conditioning equipment efficiency were not warranted.
- HabitatPBC was able to achieve the HERS indexes (57, 57, and 58) for the three homes using off-the-shelf components and building materials.
- Air sealing around the window and door frames and air sealing the top plate to the wallboard with a foam gasket significantly improved the overall air tightness of the home.
- As HabitatPBC homes are not normally built with a garage, a small external closet was built to house the heat pump water heater (HPWH) and the space was connected to the attic, which provides warm air that results in better performance of the HPWH.

"(Participation in the program) has been a positive experience for our affiliate, not only for the homeowners, but also for our staff in making them aware of the large energy impact that small changes can make. The small upfront investment is minimal compared to the huge long-term payoff we receive."

*Don Kula, Construction Manager*
*Habitat for Humanity of Palm Beach County, Florida*

U.S. DEPARTMENT OF ENERGY
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For more information, visit:
www.buildingamerica.gov

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The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.