Building America Case Study
Whole-House Solutions for Existing Homes

Applying Best Practices to Florida Local Government Retrofit Programs

Central Florida

HOUSING TYPE

Construction: Retrofit

Type: Single-family detached; distressed, foreclosed housing

Partners:
Brevard County Housing and Human Services Department, City of Ft Myers, City of Melbourne, City of Palm Bay Housing and Neighborhood Development Services, Sarasota Office of Housing and Community Development, Volusia County Community Assistance

Size: 792 ft^2–2,408 ft^2 (avg 1,365)

Location: Central Florida

Climate Zone: Hot-humid

PERFORMANCE DATA

(Phase 1, Deep Retrofit Averages)

HERS Index Scores: Pre-retrofit =129; Post-retrofit = 83

HERS Index Improvement: 41% (unrelated to pre/post HERS Index averages)

Projected annual energy cost savings: $612 (31%)

Estimated cost premium for efficiency package: $3,854

Estimated annual mortgage increase: $169

Estimated annual cash flow: $169

Billing data: Not available

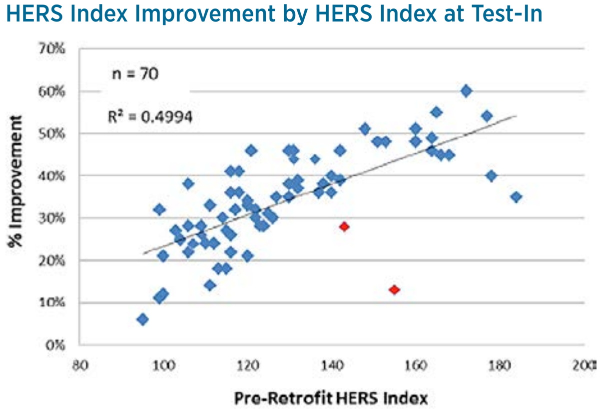
Building America U.S. Department of Energy

During 2009, 2010, and 2011, researchers of the U.S. Department of Energy's research team Building America Partnership for Improved Residential Construction (BA-PIRC) provided analysis and recommendations to eight affordable housing entities conducting comprehensive renovations in 70 distressed, foreclosed homes in central Florida. Partners achieved a mutually agreed upon goal of 30% improvement in HERS Index score in 46 of the renovations. In this two-phased project, best practices for deep energy retrofits were identified and implemented across communities.

During Phase 1, the study found that replacement components that are moderately more efficient can be combined with additional efficiency enhancements to cost effectively achieve projected annual energy savings of 15%-30% and higher in typical existing homes in this area.

At the end of Phase 1, researchers identified the most prevalent energy efficiency strategies in the deep retrofits and compiled a set of best practices appropriate to the current labor pool and market conditions in central Florida. They apply variably to homes depending on existing conditions, simplifying decision making for retrofit program managers and staff. Improvement levels correlated more closely with whole-house efficiency levels (see graph), which reflect home improvements and replacements, than vintage of homes.

HERS Index Improvement by HERS Index at Test-In



Phase 1 HERS Index improvement averaged 34%. Improvement correlated with pre-retrofit HERS Index better than any other characteristic including age. The 30% improvement goal was met in 46 homes.

City of Melbourne Package of Improvements

DESCRIPTION

- Runtime mechanical ventilation
- 15 SEER; 8.5 HSPF, 2.5 ton ENERGY STAR heat pump
- Interior air handler closets, sealed central return plenums, passive return air pathways, duct sealing average 4 cfm per 100 ft^2 of conditioned space (Qn,out = 0.04)
- ENERGY STAR refrigerator
- Fluorescent lighting (combination of fixture and bulb replacement)

ENVELOPE:

- R-38 ceiling insulation
- ENERGY STAR double pane, low-E vinyl frame windows (U = 0.23; SHGC = 0.20)
- Whole house air tightness: ACH50 = 7

For more information, see the Building America report, *Applying Best Practices to Florida Local Government Retrofit Programs,* at *www.buildingamerica.gov*

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

Pre-retrofit: Typical unsealed return plenum (left). Post-retrofit: Return plenum edges and seams are sealed, preventing return air from non-interior spaces, saves energy, and improves indoor air quality (right).

In Phase 2, the best practices guidelines were refined based on feedback from the City of Melbourne and the City of Ft. Myers, which incorporated the best practices into master specifications for community-scale renovation programs. The Melbourne program included ten homes in 2012. Typical specifications drawn from the best practices (see sidebar) result in 25% projected annual energy cost savings compared to minimum efficiency retrofit options when applied to an average distressed home (HERS Index ~130).

Lessons Learned

Final reports for Phases 1 and 2 include lessons in program development, market gaps and barriers, and technical implementation. Following are example lessons.

- The best practices provide recommendations for varying energy-related conditions. Deep retrofits are most likely when slightly higher performance specifications are selected for replacements at time of wear-out and combined with low-to-moderate cost non-replacement efficiency enhancements such as ceiling insulation.
- Duct systems were sometimes leakier after renovation. Testing will provide verification that specifications are met. Providing a list of likely leakage points can save time and extra site visits. For challenging details, such as eliminating building cavities "ducts," provide detailed guidance.
- Develop clear, standardized boiler plate language for each master specification to improve implementation consistency of bid documents and communicate expectations to contractors, subcontractors, and other program stakeholders.
- Program developers and contractors often have conflicting understanding of code requirements. Rather than referencing code sections, include the relevant specifications in the bid documents. Codes have different requirements for existing homes than in new construction.
- Involve staff, code officials, and key contractors in program development to identify and resolve road blocks before they occur in the field.
- Prototype key program elements that require changes in typical construction procedures before requiring them to gain first-hand experience and develop examples of successful implementation.
- Include quality assurance protocols that address performance metrics (e.g. whole house air tightness) that fall outside of customary contractor responsibilities.

U.S. DEPARTMENT OF ENERGY

Energy Efficiency & Renewable Energy

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www.buildingamerica.gov

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