

University of Central Florida
Energy Efficient Building Technologies and Zero Energy Homes

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Description: The project consists of two elements: 1) the construction of two flexible research homes at FSEC to conduct research on advanced building energy efficiency technologies under controlled conditions; and 2) a staged, field retrofit study in a small number of unoccupied homes to measure and document the effectiveness of a series of retrofit measures that can be deployed using current technology. The project will also conduct an annual meeting where other FESC participants, other university members and utility, industry, the U.S. Department of Energy, and other stake holders will be briefed on plans and progress. Inputs from meeting participants will be sought.

Budget: \$1,224,000

Universities: UCF/FSEC

Progress Summary

A. Staged Retrofit Study of Unoccupied Homes

Technical assistance was provided for government and non-profit residential retrofits. FSEC technical support was largely funded through Building America, and local retrofits were funded by block grants. Key findings:

- 100 Homes Analyzed
 - 73 Retrofits completed
 - 15 Retrofits in progress
 - 12 Lost from study after initial analysis
- Mostly: single family detached, concrete masonry or frame, single story, built 1954 - 2006, 754 – 2408 sq. ft, split-system forced air mechanical systems are the norm.
- Poor HERS results were largely related to duct leakage.
- Ducts were leakier at post-retrofit in 17.5% of the cases.
- Average annual projected whole house energy savings was 25% or \$493/year at \$0.13/kWh.
- Lack of return air ducts in the bedrooms causing depressurized central rooms was common and provided an opportunity to discuss remedies with contractors.
- 42 homes achieved 30% or more improvement in HERS Index.

B. Flexible Residential Test Structures

Construction of the flexible residential test structures was completed in December 2010. A preliminary measurement of temperature during passive load conditions indicates that the buildings track each other well. A number of DOE staff toured the facility when they visited the Florida Solar Energy Center in January, after FSEC had been awarded a four-year research contract in which the facility will play a significant role. In early 2011, the instrumentation was ordered, and as of September most of the thermocouples were installed. Each building was tightened so that known amount and locations of leakage could be placed in one structure while the other serves as a control. Heat and moisture generation equipment has been installed along with a control system to schedule internal gains.

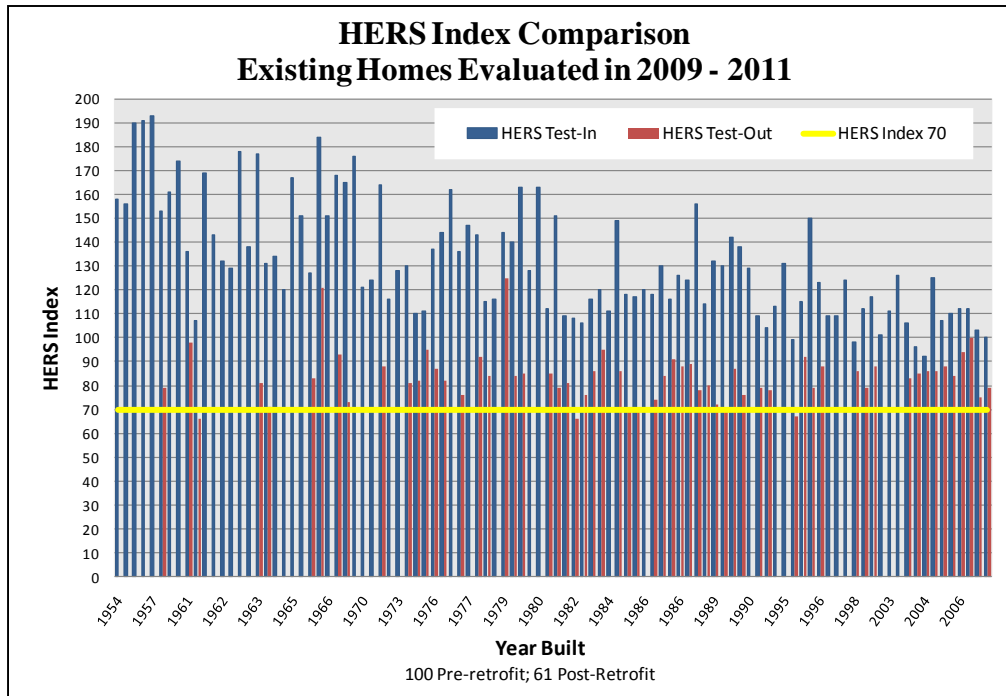
2011 Annual Report

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- Frequency of including heat pump water heater in retrofits increased towards latter part of study.

A



comparison of before and after HERS Index of homes in study is shown in Figures 1 and 2.

Figure 1: HERS Index (the lower the better) for Before and After Retrofits by Year of Construction

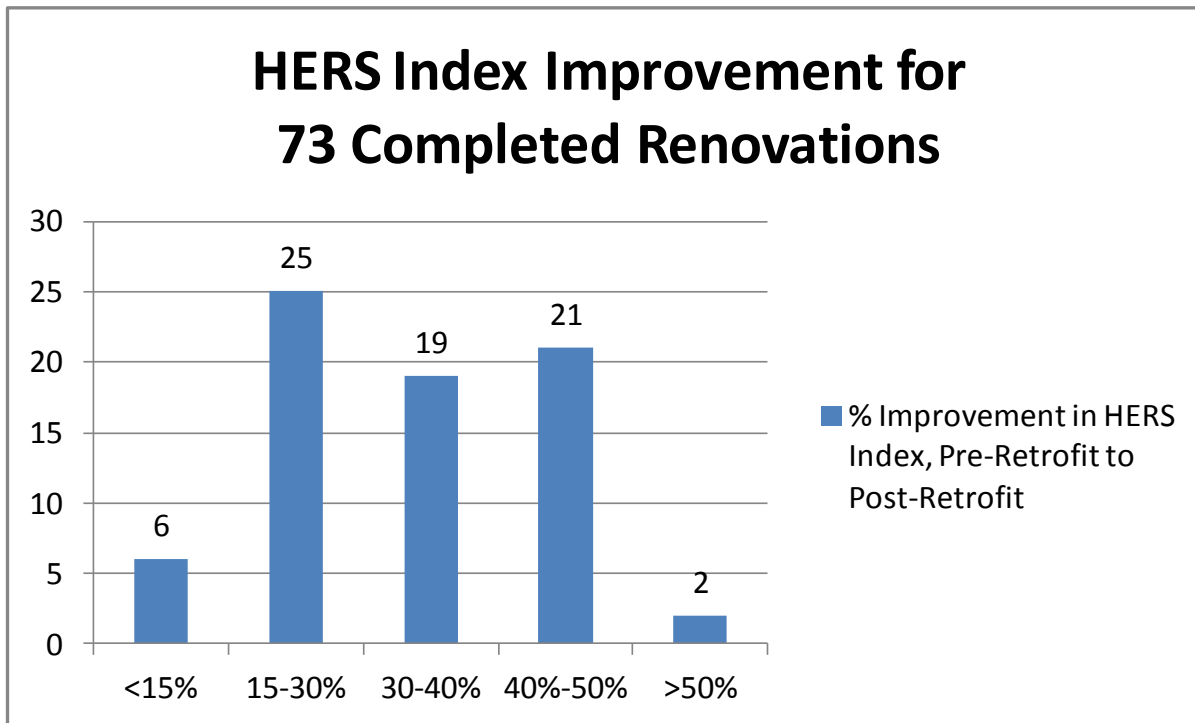


Figure 2: HERS Index Improvement for 73 Complete Renovations

B. Flexible residential test structures:

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Senior Engineer, John Sherwin, installs wall surface thermocouple.



Project Specialist, David Hoak calibrates schedule controller to use with latent load generator.