



## BUILDING AMERICA TOP INNOVATIONS HALL OF FAME PROFILE

### INNOVATIONS CATEGORY:

2. House-as-a-System Solutions
- 2.1 New Homes with Whole-House Packages

# High-Performance Affordable Housing with Habitat for Humanity

Building America teamed with the Troup-Chambers Habitat for Humanity and 1,000 volunteers to build 19 ENERGY STAR® homes in one a week during the 2003 Jimmy Carter Work Project in LaGrange, Georgia.

Habitat for Humanity is now the sixth largest builder in the United States. The non-profit organization recommends that all of its affiliates build to ENERGY STAR standards. Thanks to substantial guidance from Building America on projects across the country, many of Habitat's 1,500 U.S. affiliates have built homes that meet the criteria. Several have even surpassed ENERGY STAR. Some projects have reported annual utility savings as high as \$1,800 per household.



### **BUILDING AMERICA TOP INNOVATIONS**

**Recognizing Top Innovations in Building Science** - The U.S. Department of Energy's Building America program was started in 1995 to provide research and development to the residential new construction and remodeling industry. As a national center for world-class research, Building America funds integrated research in market-ready technology solutions through collaborative partnerships between building and remodeling industry leaders, nationally recognized building scientists, and the national laboratories. Building America Top Innovation Awards recognize those projects that have had a profound or transforming impact on the new and retrofit housing industries on the road to high-performance homes.

*High-performance homes provide compelling benefits for all homeowners, but no sector is better served than affordable housing. These are the homeowners that most need the reduced costs of ownership, maintenance, and health associated with these homes. Building America research projects have paved the way for affordable housing providers such as Habitat for Humanity to effectively address this need.*

Habitat for Humanity (Habitat) has a clear goal: Enable low-income people to become owners of affordable, durable homes. Building America shares this goal, so a partnership was natural. Since the first days of the Building America program, the U.S. Department of Energy and its research partners have provided technical assistance to Habitat. Researchers have helped local Habitat affiliates make informed choices about energy efficiency, indoor air quality, and moisture management.

Habitat Metro Denver and researchers from the National Renewable Energy Laboratory worked together to create a series of climate-appropriate Energy Demonstration Homes. Experimenting with a variety of techniques and technologies, they designed a house that would use only 40% of the energy of a typical code-built home. The affiliate used the experience gained from this process to choose which features could be replicated easily and affordably in their future homes. Today, every house built by Habitat Metro Denver is tight, well insulated, and energy efficient.

In Westford, Massachusetts, architects and engineers at Building Science Corporation, a Building America research partner, designed a prototype high-performance home for cold climates calculated to save the homeowner approximately \$1,200 per year in energy bills. The partnership didn't end with the design. Building Science Corporation held Saturday workshops with Habitat staff and volunteers to review the goals of the project. When building got underway, the researchers verified that construction went according to plan.

The partnership between Building America and Habitat for Humanity expanded in the wake of Hurricane Katrina in 2005. Habitat affiliates across the country planned "blitz builds" and wanted to ensure the hundreds of new homes would be durable in the Gulf Coast environment.

To meet affiliates' many requests for guidance, Building America worked with Habitat International to create a set of building standards. *U.S. Construction Standards: Gulf Coast* was issued in 2006. The guide provided a whole-house approach to building durability, health, and energy efficiency. "With good building science, all these go hand in hand," said Janet McIlvaine of the Florida Solar Energy Center, who served as Building America's liaison to Habitat.

The standards weren't complicated, said McIlvaine. They included good air-sealing and insulation, high-efficiency windows, heating and cooling equipment, and techniques to ensure good ventilation and moisture management. The standards state that every home should be tested for leaks in the ducts and building envelope, since air leaks allow energy loss, growth of mold and mildew, and entry points for insects.

The U.S. Department of Energy has since produced more guides for Habitat affiliates, including the *U.S. Sustainable Construction Standards* in 2009 and the *High Performance Home Building Guide for Habitat for Humanity Affiliates* in 2010. The guides help affiliates build durable, energy-efficient homes that low-income people can afford to keep.

In the 2009 guide, Habitat set basic requirements for sustainable construction practices. It called on all affiliates to build homes that meet, at a minimum, the U.S. Environmental Protection Agency's standards for ENERGY STAR® and healthy indoor air quality. It also set minimum durability standards that address local geographic, climatic, and disaster issues.

Some people argue that energy-efficient construction is not affordable enough for affordable housing. "The biggest misconception with green building is that it's too expensive or too hard to maintain," said Dennis Neal, director of construction for the Greater Chattanooga Habitat affiliate. "We've found neither of those to be true." Neal's view is echoed throughout the Habitat network and can be verified with simple calculations. If, for example, energy-saving measures add \$2,000 to a mortgage at 7% interest, it will cost the family about \$13 a month. Families typically save much more than that on their energy bills.

"We monitored our first house for five years and compared it to a similar house that was built without the energy-efficiency changes," said Claire Twomey, executive director of Lakeland Habitat in Florida. Utility savings averaged \$150 per month. "People talk about payback periods with energy-efficiency measures," Twomey said. "But our homes essentially have instant payback."

## Key Lessons Learned

- Building America field projects prove that Habitat affiliates in any part of the country working with limited budgets and volunteer labor can achieve the standards set in the 2009 Habitat U.S. Sustainable Construction Standards.
- Projects with Metro Denver, DC Habitat, Greater Los Angeles, Iowa City, and others show that even net-zero energy construction is possible within the Habitat construction model.



Habitat affiliates across the country held "blitz builds" to construct homes for Gulf Coast residents in the wake of Hurricane Katrina. Building America provided crucial guidance so that homes would be climate-appropriate, durable, and energy efficient.

"It's not fair to our families if their energy bill is higher than their mortgage."

**Bruce Carpenter**, Construction Manager,  
Metro Denver Habitat

## REFERENCES

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