Habitat for Humanity: LaGrange, Georgia, 2003 Jimmy Carter Work Project

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"The attention to detail far exceeds the standard practice."
Walter Hendrix, Executive Director of Troup Chambers Habitat for Humanity

Could 1,000 volunteers using donated materials build 22 homes in just 7 days, and could they build them all to ENERGY STAR® standards? That's just what the Troup-Chambers Habitat for Humanity of LaGrange, Georgia, did between June 6 and 13, 2003, and every home qualified for ENERGY STAR.

These are the first ENERGY STAR homes Troup-Chambers Habitat has built and the experience was so positive that Walter Hendrix, Executive Director of Troup-Chambers Habitat for Humanity, said "We are incorporating ENERGY STAR in every house we build from here on out."

Troup-Chambers Habitat plans to build 38 homes this year and 30 to 40 per year over the next 20 years as part of Habitat for Humanity International's 21st Century Challenge, an initiative to eliminate substandard housing in the 21st Century. The homes range in size from 850 to 1,252 square feet, with two to five bedrooms and one to two bathrooms. Homes range in cost from $45,000 to $57,000 and are sold through a special no-interest mortgage program to low-income families who invest "sweat equity" in the construction of their own and other Habitat homes. Habitat affiliates across the country built 5,400 houses last year, putting Habitat for Humanity International at number 16 on Builder's list of top 100 U.S. builders.

Hendrix, who took over as president of the Troup-Chambers Habitat affiliate in 2002 after 34 years as a private home builder, said he felt that building to ENERGY STAR standards produced a better house without a large increase in construction costs over their standard construction:

"We found no significant increase in materials costs or in subcontract labor costs. It was really more in techniques, heavy caulking, ways to keep unfiltered outside air from coming in. Quite honestly when I had my own construction firm, I had concerns about making the house too airtight. The Building America team members educated us on the right way to seal a house to keep humid air out and to add mechanical ventilation for fresh air exchange. We did a lot more caulking. We used sill seal below the bottom plate, which no one was doing in LaGrange. The Building America consultants showed our volunteers how to wrap the houses, apply the insulation and foam caulk, and wrap duct joints with mastick... The attention to detail far exceeds the standard practice."

While Troup-Chambers Habitat hires subcontractors to install the electrical, plumbing, HVAC, and flooring, Hendrix estimates that their labor force is 60% volunteer, including some who have never done construction before. Therefore, construction techniques have to be simple enough for even novices to follow.

"The Building America team members from Building America's Industrialized Housing Partnership were extremely dedicated. They brought a lot of experience and intelligence to the program," said Hendrix. "They did insulation installation classes with all the house

Habitat for Humanity: The 16th Largest Builder in the United States

The U.S. has 1,651 active affiliates who have built 5,400 houses in 2002 and 44,617 houses total since Habitat's founding in 1976. Habitat for Humanity International is ranked number 16 in the Builder Top 100.

Through volunteer labor and donations of money and materials, Habitat builds and rehabilitates simple, decent houses with the help of the homeowner (partner) families. Habitat houses are sold to partner families at no profit, financed with affordable, no-interest loans. The homeowners' monthly mortgage payments are used to build still more Habitat houses. Habitat has built more than 150,000 houses around the world, providing more than 750,000 people in more than 3,000 communities with safe, decent, affordable shelter. HFHI was founded in 1976 by Millard Fuller and his wife Linda.

leaders and met on several occasions with HVAC contractors to go through equipment, installation, and duct sealing tech-niques. They were always there to give us advice on material purchases and decisions."

The importance of air sealing is stressed to the volunteers. A continuous wall air barrier is installed, consisting of the following:

- Sill seal between the slab and exterior wall bottom plate
- Rigid insulation sheathing (over OSB) sealed at all seams and edges
- Tar paper window flashing installed shingle fashion to the sides and bottom of the rough opening then sealed to the rigid insulation and the rough opening with caulk
- Caulk between the window frame and tar paper flashing (applied to each back side of the nail-ing flange just before each window is set).

Habitat receives free rigid insulation from Dow and, for this project, used 1/2-in. thick 4-ft x 8-ft sheets attached with collared nails. A contin-uous ceiling air barrier is formed by the dry-wall and the top plates of all the walls.

Holes for wiring and plumbing through the rigid insulation, top plates of exterior and interior walls, and the ceiling drywall all represent breeches of the house air barrier and are sealed with either caulk or expanding foam.

Common sites for this type of sealing include bathroom and kitchen plumbing and fans, the main electrical panel, outside electrical outlets and water faucets, electrical and plumbing runs through top plates, and dryer vents. Holes too large for foam sealant are first covered or filled in with appropriate materials such as drywall, OSB, or rigid insulation, then the joint can be sealed.

The rigid insulation serves as both the primary air barrier and the drainage plane in this wall assembly so sealing the seams and edges is critical. Tape designed for exterior air/moisture barrier applications is used because other tapes will fail over time, leaving gaps for both air and moisture intrusion.

The space between the window frame and the rough opening is insulated with strips of sill seal or wall insulation (folded length-wise, kraft face to interior, for easy placement). Where possible, this insulation is caulked to both the window frame and rough opening to back up the air seal on the exterior at the nailing flange. This is complementary to the seal at the window flange, which forms an important element of the drainage plane. Expanding foam is NOT used because it could cause deformation of the window frame. Habitat wanted to teach sealing methods that can be universally applied for volunteers' future work.

Builder Profile

Habitat for Humanity

Where:
LaGrange, Georgia

Founded:
1987

Employees:
2 part-time employees
subcontractors and volunteers

Development:
Jimmy Carter
Work Project 2003

Size:
22 homes

Square footage:
850–1252 ft^2
2–5 bedrooms
1–2 bathrooms

Price range:
$45,000 to $57,000

Key Features:
- R-13 batt wall insulation with 1/2-in. rigid insulation
- Double-pane, low-e windows; U = 0.39, SHGC = 0.57
- Programmable thermostat
- Heat pump
- Interior air handler closet in two- and four-bedroom homes
- Right-sized mechanical system
- R-30 in attic
- Insulated steel doors

Typical wall construction is 2x4, 16-in. on-center with R-13 fiberglass batt insulation, OSB, and 1/2-in. Dow Styrofoam blue board rigid insulation. All of the houses also have vinyl siding. The typical HVAC system in an average Habitat house is strip heating and air conditioning. In the ENERGY STAR Habitat houses, heat pumps with efficiency ratings of 10 SEER and 6.8 HSPF were installed. Programmable thermostats were also installed to provide more accurate control and performance.

HERS Rating

Each home was tested by a team of Building America Industrialized Housing Partnership researchers, Southface Energy Institute staff, and Habitat for Humanity International staff and volunteers. The average HERS rating exceeded 86.

Innovations

The two-bedroom homes include a sealed, interior air-handler closet. In the air-handler closets, the space below the platform was made air tight to provide a continuous path from the return air grill to the opening in the air-handling unit. The gap between the ceiling drywall and the supply duct was filled. Caulk was applied at the edges of the bottom edge of the drywall, the bottom plate, and the platform edges.

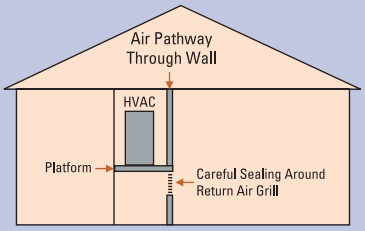
The LaGrange community was designed as a green-space community with shared green-space available to residents and residential traffic directed behind the homes for parking.

Comfort, Durability, and Health

The attention paid to air sealing the house reduces infiltration and drafts, saves energy, and improves durability by reducing the movement of humid air through the walls. The air paths that are sealed are also the "bug paths." Because cockroach dander is among the top 10 allergy and asthma triggers in the United States, these air-sealing efforts are good for occupant health as well. Programmable thermostats

"We will build 38 homes this year and intend to build 30 to 40 per year from here on out. Our goal is to make everyone of our new homes ENERGY STAR."

Walter Hendrix, Executive Director of Troup Chambers Habitat for Humanity



Careful sealing of the air-handler closet, including framing in the return air grill, sealed leaks through open wall cavities that could pull hot and humid air from the attic.

COST COMPARISON TO CONVENTIONAL MEASURES

Less ← Conventional → More	
Heat Pump	
	+$400 ADDED COST
High-Performance Windows	
	+$90 to $135 ADDED COST
Air-Tight Return Plenum	
• *2- to 4-bedroom only*	+$20 ADDED COST
Air Sealing	
• *Caulk and sill seal*	+$30 ADDED COST
Insulation Tape	
• *For use with rigid insulation from Dow*	+$34 ADDED COST
Housewrap	
-$100 SAVINGS	• *Not needed with rigid insulation*
Right-Sized Heat Pump	
-$250 SAVINGS	• *1/2-ton reduction*
TOTAL COST DIFFERENCE	**+$224-$269 ADDED COST**

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allow more accurate control and performance. Double-pane, low-e windows reflect infrared radiation, reduce energy consumption, and prevent carpets and furniture from fading.

The Bottom Line

When asked about costs, Hendrix said, "We found no significant increase in materials costs or in subcontract labor costs. It's mainly the attention to detail, it far exceeds the standard practice. Will it cost more? On a typical 3-bedroom house you might realize $1,000 in extra cost. The return on that is probably 2 to 3 years to the homeowner."

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Building America Program
George S. James • New Construction • 202-586-9472 • fax: 202-586-8134 • e-mail: George.James@ee.doe.gov
Terry Logee • Existing Homes • 202-586-1689 • fax: 202-586-4617 • e-mail: terry.logee@ee.doe.gov
Lew Pratsch • Integrated Onsite Power • 202-586-1512 • fax: 202-586-8185 • e-mail: Lew.Pratsch@hq.doe.gov
Building America Program • Office of Building Technologies, EE-2J • U.S. Department of Energy • 1000 Independence Avenue, S.W. • Washington, D.C. 20585-0121 • **www.buildingamerica.gov**

Building Industry Research Alliance (BIRA)
Robert Hammon • ConSol • 7407 Tam O'Shanter Drive #200 • Stockton, CA 95210-3370 • 209-473-5000 • fax: 209-474-0817 • e-mail: Rob@consol.ws • **www.bira.ws**

Building Science Consortium (BSC)
Betsy Pettit • Building Science Consortium (BSC) • 70 Main Street • Westford, MA 01886 • 978-589-5100 • fax: 978-589-5103 • e-mail: Betsy@buildingscience.com • **www.buildingscience.com**

Consortium for Advanced Residential Buildings (CARB)
Steven Winter • Steven Winter Associates, Inc. • 50 Washington Street • Norwalk, CT 06854 • 203-857-0200 • fax: 203-852-0741 • e-mail: swinter@swinter.com • **www.carb-swa.com**

Davis Energy Group
David Springer • Davis Energy Group • 123 C Street • Davis, CA 95616 • 530-753-1100 • fax: 530-753-4125 • e-mail: springer@davisenergy.com • deg@davisenergy.com • **www.davisenergy.com/index.html**

IBACOS Consortium
Brad Oberg • IBACOS Consortium • 2214 Liberty Avenue • Pittsburgh, PA 15222 • 412-765-3664 • fax: 412-765-3738 • e-mail: boberg@ibacos.com • **www.ibacos.com**

Industrialized Housing Partnership (IHP)
Subrato Chandra • Florida Solar Energy Center • 1679 Clearlake Road • Cocoa, FL 32922 • 321-638-1412 • fax: 321-638-1439 • e-mail: subrato@fsec.ucf.edu • **www.baihp.org**

National Association of Home Builders (NAHB) Research Center
Tom Kenney • National Association of Home Builders (NAHB) Research Center • 400 Prince George's Boulevard • Upper Marlboro, MD 20774 • 301-430-6246 • fax: 301-430-6180 • toll-free: 800-638-8556 • **www.nahbrc.org/**

National Renewable Energy Laboratory
Ren Anderson • 1617 Cole Boulevard, MS-2722 • Golden, CO 80401 • 303-384-7433 • fax: 303-384-7540 • e-mail: ren_anderson@nrel.gov • **www.nrel.gov**

Tim Merrigan • 1617 Cole Boulevard, MS-2722 • Golden, CO 80401 • 303-384-7349 • fax: 303-384-7540 • e-mail: tim_merrigan@nrel.gov • **www.nrel.gov**

Oak Ridge National Laboratory
Pat M. Love • P.O. Box 2008 • One Bethel Valley Road • Oak Ridge, TN 37831 • 865-574-4346 • fax: 865-574-9331 • e-mail: lovepm@ornl.gov • **www.ornl.gov**

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