

**DOE CHALLENGE HOME
CASE STUDY****Ithaca
Neighborhood
Housing Services**

Ithaca, NY

**BUILDER PROFILE****Ithaca Neighborhood Housing Services**

Ithaca, NY

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www.ithacanhhs.org**FEATURED HOME/DEVELOPMENT:****Project Data:**

- Name: Holly Creek Lane
- Location: Ithaca, NY
- Layout: Town houses 2 or 3 bedroom, 1.5 baths
- Conditioned Space: 1,160 ft²
- Completion: May 2013
- Climate Zone: 6A

Performance Data:

- HERS Index without solar PV: 50
- HERS Index with solar PV: NA
- Projected annual utility costs: \$1,547
- Projected annual energy cost savings: (compared to a home built to the 2006 IECC): without solar \$583
- Projected annual energy savings (compared to a home built to the 2006 IECC): without solar 260 therms, 393 kWh

Eleven fortunate homebuyers in an Ithaca, New York, neighborhood are getting brand new townhomes that are not only affordable, they are also among the most energy efficient in the state. All 11 of the two-story, 2- and 3-bedroom townhouses at Holly Creek were built to the requirements of the U.S. Department of Energy's Challenge Home program. This means every home meets ENERGY STAR Version 3, complies with the U.S. Environmental Protection Agency's Indoor airPLUS criteria, has EPA WaterSense-qualifying fixtures, and sports a host of additional features to make them energy efficient, durable, and comfortable. The builder, Ithaca Neighborhood Housing Services (INHS), recently broke ground on 11 more townhomes on the adjacent property that are targeted to meet DOE Challenge Home and the U.S. Green Building Council's LEED for Homes Gold standard.

This high level of efficiency and performance aligns with the mission of the builder, INHS, a non-profit, community development corporation that is committed to revitalizing Ithaca's neighborhoods by helping people of modest incomes obtain affordable housing on a long-term basis. INHS was begun in 1977 as a partnership between neighborhoods, the local government, and the business community to reverse the decline of downtown Ithaca by renovating rather than tearing down old, deteriorating homes. The organization has grown to become a renovator, builder, and leaser of new and existing apartments, town homes, and single-family homes for low- to moderate-income residents in Ithaca. They have built or renovated more than 500 units and made low-interest loans available to homeowners for the renovation of hundreds more.

For newer residents driving around Ithaca today, it's hard to imagine the urban decay that marred much of downtown Ithaca in the 1970s, but long-time residents remember the transformation. One house at a time was the INHS's approach. "Our goal was to inspire others in the neighborhood to improve their homes and, in so



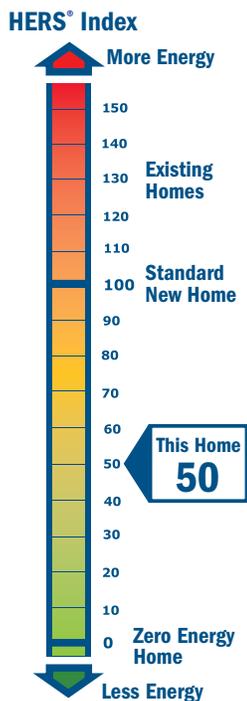
DOE Challenge Home builders are in the top 1% of builders in the country meeting the extraordinary levels of excellence and quality specified by the U.S. Department of Energy. Every DOE Challenge Home starts with ENERGY STAR for Homes Version 3 for an energy-efficient home built on a solid foundation of building science research. Then, even more advanced technologies are designed in for a home that goes above and beyond current code to give you the superior quality construction, HVAC, appliances, indoor air quality, safety, durability, comfort, and solar-ready components along with ultra-low or no utility bills. This provides homeowners with a quality home that will last for generations to come.

Blown cellulose provides an R-52 blanket above the ceiling and is dense packed in the walls to provide R-20 worth of insulation. Triple-pane windows with low-emissivity coatings help retain heat during the winter.



CHALLENGE HOME CERTIFIED:

- 1 BASELINE**
certified ENERGY STAR for Homes Version 3.0
- 2 ENVELOPE**
meets or exceeds 2012 IECC levels
- 3 DUCT SYSTEM**
located with the home's thermal boundary
- 4 WATER EFFICIENCY**
meets or exceeds the EPA WaterSense Section 3.3 specs
- 5 LIGHTING AND APPLIANCES**
ENERGY STAR qualified
- 6 INDOOR AIR QUALITY**
meets or exceeds the EPA Indoor airPLUS Verification Checklist
- 7 RENEWABLE READY**
meets EPA Renewable Energy-Ready Home.



doing, to create a positive and self-perpetuating cycle of neighborhood pride to bring renewed vitality to downtown Ithaca,” said Paul Mazzarella, INHS executive director. Now Ithaca is often named in national “best places to live” lists.

As INHS transitioned to new-home construction, making those homes as energy efficient and durable as possible became a focus to help make the homes affordable to live in as well as to purchase. The Holly Creek homes have sold at starting prices of \$104,000, well below the county’s median home price of \$183,000. And just as important, according to Scott Reynolds, director of real estate development for INHS, residents can expect monthly gas bills of about \$50 per month.

INHS began seeking LEED for Homes certifications on their homes about 7 years ago, according to home energy rating system (HERS) rater Karla Donnelly of Steven Winter Associates. INHS has obtained the LEED for Homes gold level on many projects and platinum level on some projects, which include new single- and multi-family homes, according to Donnelly.

With construction of the Holly Creek homes, INHS is also dedicated to meeting the DOE Challenge Home criteria. The town homes at Holly Creek are constructed with simple designs and compact floor plans, coming in at under 1,200 ft² for each two-story home. The development itself has a compact footprint: 11 town home units in three buildings (two quads and one triplex). The development is situated on a generous lot with native landscaping, limited turf, and sidewalks promoting pedestrian activity to nearby community resources and public parkland. The side-by-side homes have traditional lines with columned front entries. Private, fenced rear patios provide occupants with individual space while shared front lawns encourage participation in the larger community. A neighboring development sits above Holly Creek on the sloped site so extensive vegetation and retaining walls were installed to mitigate storm water run-off. Holly Creek Phase 2, currently under construction, will add 11 more affordable town homes on an adjacent lot.

The homes are built on monolithic slab foundations using a shallow frost-protected foundation construction method that saves on construction time and cost while providing code-approved protection against frost. In cold climates, footings are traditionally dug as much as 4 feet below grade to place the footing below the frost line. Using the shallow frost-protected foundation method, these footings were poured only 18 inches below grade. The foundation walls are insulated on the exterior with R-15 of XPS insulation. The above-grade portion is covered with



A shallow, frost-protected foundation saves excavation time and costs while insulating the homes' concrete slab foundations.

The slab sits on 4 inches of crushed rock and a passive radon mitigation system is installed under the slab with a vent stack exiting through the roof.

a skim coat of stucco for protection. At the bottom of the foundation wall (18 inches below grade), a second piece of R-15 XPS rigid foam insulation is installed horizontally extending out 24 inches from the base of the wall and down at a slight angle. This horizontal insulation is installed around the entire perimeter of the home to protect the foundation from frost by retaining heat in the ground below. With this technique, insulation is not needed below the slab. Studies by the National Association of Home Builders Research Center found that construction, excavation, labor, and materials costs for shallow frost-protected foundations were 15% to 17% lower than costs for construction of a traditional foundation for the same size home.

The town homes at Holly Creek have vented attics. The attic floor is thoroughly air sealed and then covered with 14 inches (R-52) of blown cellulose insulation. The units are divided by common walls that are well air sealed. The common wall between each unit consists of a 2x6 top and bottom plate with staggered 2x4 studs. The wall cavity contains R-13 unfaced rock wool insulation for sound proofing. Two layers of drywall are glued onto each side of this wall with a special sound-dampening sealant to provide a sound-proof, airtight seal and fire break to the framing. Acoustic sealants are used to air seal the top and bottom

plates. Steven Winter Associates conducted guarded blower door tests to determine air leakage at the common walls and found it to be a very low 30 cfm at 50 Pascals.



A wall-hung condensing boiler with an efficiency rating of 92.5 AFUE provides hot water for domestic use and for radiant floor heating.

The non-shared walls of the home use 2x6 24-inch on-center framed wall panels that are produced off site. This panelized wall construction can produce straighter, drier walls with faster assembly time and less framing waste. The wall panels employ advanced framing techniques such as insulated, right-sized headers above windows and doors, 2-stud corners, ladder blocking at interior wall intersections, avoidance of unnecessary studs around doors and windows, and alignment of framing members on a 2-foot grid. These techniques reduce the amount of lumber

HOME CERTIFICATIONS

DOE Challenge Home

LEED – Gold

EPA WaterSense

ENERGY STAR Version 3

EPA Indoor airPLUS



Every DOE Challenge Home combines building science specified by ENERGY STAR for Homes and advanced technologies and practices from DOE's Building America research program.

used and provide more space in the wall cavities for insulation. This efficient framing method reduced wood framing waste to less than 3% on the project. The walls are dense packed with R-20 of blown cellulose insulation. The exterior sheathing is OSB that is covered with house wrap. For durability, the clapboard siding is a rot-resistant fiber cement product.

The triple-pane, vinyl-framed windows have an insulating argon gas fill between the panes and low-emissivity coatings on the glass to reduce heat loss in winter and heat gain in summer. The windows have a thermal resistance (U value) of 0.25 and a solar heat gain coefficient of 0.22. Care was taken at installation to properly integrate the windows with the house wrap and flexible membrane flashing around the windows.

As a veteran ENERGY STAR and LEED for Homes builder, Reynolds has an appreciation for the efforts of HERS raters like Donnelly, who provide the testing, inspections, and third-party verification of performance required for Challenge Home and other program certifications. Plans and specifications were reviewed prior to construction and sustainable strategies were adopted then revisited at regular project team meetings. Insulation was visually inspected and the homes were tested for whole house air leakage with a blower door test. Results varied by house, ranging from 1.82 to 2.9 air changes per hour at 50 Pascals pressure, but all were below the 3 ACH 50 maximum required for the DOE Challenge Home program.

A wall-hung condensing boiler with an efficiency rating of 92.5 AFUE provided hot water for domestic use and for space heating via radiant floor loops in the slab on the first floor and under the flooring in the second floor. No air conditioning was installed. Ventilation is provided by ENERGY STAR bath fans, which operate continuously at low speed but have a higher speed available for after showering.

The Ithaca Neighborhood Housing Services marketed the homes with open houses, on-site signage, and information on their website including a video (http://www.youtube.com/watch?v=fp66yz8vKdM&feature=player_detailpage).

To help homeowners continue to maximize their energy-savings potential, the agency asks each owner (many of whom are first-time buyers) to participate in a one-hour home owner training workshop. At the workshop, they receive a homeowners' manual prepared by INHS, along with information about maintenance, the workings of building systems like the heating and ventilation systems, the thermostats, sustainable landscaping, green cleaning practices, and local recycling options.

“Occupants notice how quiet the homes are and appreciate the indoor air quality, but the low operating costs are the biggest benefit from an affordability standpoint,” said Donnelly.

KEY FEATURES

- **Path:** performance
- **Walls:** 2x6 24-inch on-center walls, advanced framed, R-20 of dense pack cellulose, fiber cement siding
- **Roof:** R-52 (14 inches) of blown cellulose covers the attic floor
- **Foundation:** slab on grade, shallow frost-protected foundation; R-15 at perimeter, R-15 horizontal
- **Windows:** triple-pane, argon-filled, low-e coated, vinyl-framed, U=0.25, SHGC=0.22
- **Air Sealing:** 1.82 ACH 50
- **Ventilation:** ENERGY STAR bath fan, continuous with boost
- **HVAC:** 92.5 AFUE wall-hung condensing boiler for in-slab and below-floor radiant heat; no AC
- **Hot Water:** 92.5 AFUE wall-hung condensing boiler with on-demand delivery
- **Lighting:** 100% CFL (95% screw based CFL, 5% pin CFL)
- **Appliances:** ENERGY STAR-rated dishwasher and refrigerator
- **EPA WaterSense:** all plumbing fixtures
- **Other:** bamboo floors; no- and low-VOC cabinetry and finishes; within half-mile of public transportation; construction debris recycling