

United Way of Long Island Housing Development Corporation

Patchogue, NY



BUILDER PROFILE

United Way of Long Island, Deer Park, NY
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Rater: Fusion Architecture
JP Lardoux, jplardoux@fusionarchitects.com

FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: Options for Community Living
- Location: Patchogue, NY
- Layout: 3 bedrooms, 1 bath, 1 floor
- Conditioned Space: 1,436 ft²
- Climate Zone: IECC 4A, mixed-humid
- Completion: July 2014
- Category: Affordable

Modeled Performance Data:

- HERS Index: without PV 40, with PV -3
- Projected Annual Utility Costs: without PV \$1,669, with PV \$-446
- Projected Annual Energy Cost Savings (compared to a home built to the 2009 IECC): without PV \$351, with PV \$2,496
- Builder's Added Cost Over 2009 IECC: with PV \$24,325, with solar thermal \$10,219
- Annual Energy Savings: without PV and solar thermal: 456 kWh, 1,777 Therms; with PV and solar thermal 5,314 kWh, 1,197 Therms

The remodeled 1970s rancher in Patchogue, Long Island, New York, has a new roof, new entry porch, and a new paint job, but the changes to the home are far more than skin deep. The builder took the home down to the studs and remade the inside, transforming the three-bedroom 1,436 ft² home into a model of energy efficiency, achieving a Home Energy Rating System (HERS) score of 40, far below most new homes. Gut rehabs are nothing new for the builder, United Way of Long Island Housing Development Corporation, which remodels or builds about 10 homes a year. But this home is unique in that it is the first home United Way of Long Island has certified to the performance criteria of the U.S. Department of Energy's Zero Energy Ready Home program.

The DOE Zero Energy Ready Home program requires homes to meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency's Indoor airPLUS, as well as the hot water distribution requirements of the EPA's WaterSense program and the insulation requirements of the 2012 International Energy Conservation Code. In addition, homes are required to have solar electric panels installed or have the conduit and electrical panel space in place for it.

These criteria served as an excellent blue print for the United Way of Long Island Housing Development Corporation, which uses its remodeling and new construction homes as instructional projects for its training programs. The Housing Development Corporation operates several training programs including YouthBuild, VetsBuild, Green Job Corps, Weatherization Boot Camp, and Green Construction curriculum. The programs train dozens of individuals each year, preparing them for skilled jobs in the construction industry. In addition to working on the job site, the Housing Development Corporation also conducts classroom and hands-on training in its 5,000-square-foot training



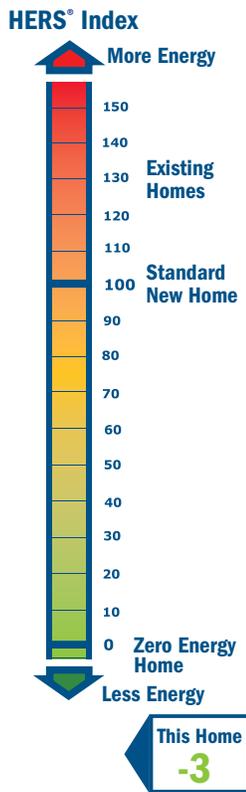
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.

United Way of Long Island Housing Development Corporation remodeled this 1970s-era ranch style home to the performance criteria of the U.S. Department of Energy Zero Energy Ready Home program.



What makes a home a DOE ZERO ENERGY READY HOME?

- 1 **BASELINE**
ENERGY STAR Certified Homes Version 3.0
- 2 **ENVELOPE**
meets or exceeds 2012 IECC levels
- 3 **DUCT SYSTEM**
located within 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.



facility. The organization collaborates with Suffolk Community College and State University of New York at Stonybrook and at Farmingdale for ongoing training opportunities. Students can earn certifications from the Building Performance Institute (BPI), RESNET for Home Energy Rater training, the Air Conditioning Contractors of America (ACCA), and other organizations. Every student gets an OSHA 10 certification for general construction safety. The training facility serves as a BPI Testing Center. Some graduates of their programs help operate their fee-for-service training division, which trains for-profit trades in air sealing and insulation. Fees from this program help fund the nonprofit training programs.

Students work on the homes that the Housing Development Corporation constructs. These homes go to over 100 community partners served by United Way of Long Island. Many are used for special needs or special purpose housing as group homes, or homes for the elderly or for those with disabilities.

While this is the Housing Development Corporation's first DOE Zero Energy Ready home, program director Rick Wertheim is enthusiastic about certifying all future homes. "We have made a 100% commitment moving forward for both our new and retrofit homes. For the folks we are housing, it's absolutely necessary," said Wertheim, who lauds the indoor air quality benefits of the EPA Indoor airPLUS. Wertheim notes they were already constructing to ENERGY STAR, but appreciates the comprehensive energy efficiency, durability, comfort, health, and renewable energy aspects that the DOE Zero Energy Ready Home program pulls together. "It's got everything I've been looking for," said Wertheim.

For this comprehensive retrofit project, implementing the DOE criteria meant starting with good water management details. The property was re-graded to provide positive drainage when the perimeter waterproofing and footing drains were installed. The elastomeric waterproofing membrane was installed over the full perimeter of the foundation wall and covered with a 1.5-inch protective rockwool board down to the footing. On the interior side of the existing 8-inch poured concrete walls, 2.5 inches of polyiso rigid foam (R-12.5) was installed up to the sill plate, then closed-cell spray foam was used to cover the sill plate and the rim joists.

The existing 2x4 16-inch on center walls were filled with 3.5 inches of dense-packed cellulose for an R-13 insulation value. The half-inch plywood sheathing was covered with house wrap then 1.5-inch-thick polyiso rigid foam insulation. Over the foam, they installed 1x3 furring strips to provide a drainage plane and air gap behind the fiber cement siding.



The 2x4 16-inch on-center walls were stripped down to the studs then filled with dense-packed cellulose. Over the plywood sheathing, an additional 1.5 inches of polyiso rigid foam was installed over house wrap, then 1x3 furring strips were added for a drainage plane behind the fiber cement siding.

The old roofing was pulled off, the original half-inch plywood sheathing over the original 2x8 roof rafters was repaired where needed, then topped with two layers of staggered 2-inch polyiso rigid foam board (4 inches total) then 5/8-inch plywood sheathing, then 15# felt, then architectural fiberglass shingles. Ice-and-water shield was installed on all rakes up 3 feet and in all valleys.

Inside the attic, the builders installed 6 inches of open-cell spray foam directly against the underside of the roof decking creating a “hot” roof assembly. The unvented attic had a total R-value of R-48. New gutters and downspouts were installed.

Wertheim’s crews were trained to do comprehensive air sealing, including caulking, taping, foaming, and wrapping all holes and seams before installing the insulation. These steps helped them achieve a very airtight home that tested at 1.92 air changes per hour at 50 Pascals pressure difference (ACH50).

To bring fresh air into the home, Wertheim’s crews installed a balanced ventilation system with an energy recovery ventilator (ERV). The ERV has ducts that bring fresh air into the home and ducts that expel stale air from the home. A heat exchanger transfers heat from the warmer duct to the cooler duct to help retain heat in the winter and remove heat in the summer. The ERV was attached to the home’s central heating system, a hydro air system, which has a HEPA air filter. The ERV is timer controlled in conjunction with the HVAC system to ensure consistent fresh air throughout the day. The ERV supplies fresh air through the heating system’s ductwork. It has separate returns to draw moist air from the laundry room closet and the kitchen.

The home’s heating system is a 95 AFUE wall-hung boiler that supplies hot water to a hydro-coil in the central air handler. Air conditioning is provided by a 16 SEER air conditioning unit. The heating and cooling system is located in the sealed, insulated attic. The duct system consists of rigid metal ductwork with flex duct at terminations using no more than 3 feet of flex duct. The duct is sealed with mastic and wrapped in R-3.8 insulation. The system has one central return register but jumper ducts were installed in the bedrooms to allow air to flow from the bedrooms to the central area for pressure balancing. The controls for the system are internet accessible to monitor and adjust as necessary.

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

EPA WaterSense

NAHB National Green Building Standards, gold level



Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE’s Building America research program.



Two 30-tube evacuated tube panels provide solar thermal water heating.

The wall-hung boiler feeds a 40-gallon storage tank for domestic hot water. The home is also equipped with a solar water heating system that includes two roof-mounted 30-tube evacuated tube panels plus a 120-gallon storage tank with a single-coil electric backup heating element. This was the first home that United Way of Long Island Housing Development Corporation has constructed with a solar thermal water heater. Wertheim noted that because their houses are so high use, with high occupancy numbers and almost 24/7 activity in the homes, the water heating savings from the solar water heater is substantial. The solar water heater should pay for itself in 7 years.

Vinyl double-pane windows were installed that had low-emissivity invisible coatings and argon gas fill to slow heat transfer and casement construction for additional airtightness. The windows had an insulation value of $U=0.2$ and a solar heat gain coefficient (SHGC) of 0.24.

The home's appliances include an ENERGY STAR-rated refrigerator, dishwasher, and front loading clothes washer. All of the home's lighting is high-efficiency compact fluorescent lighting. Occupancy and vacancy sensors help to keep lights off when not needed for additional energy savings.

The back of the home faces due south and the simple roof design lent itself to the solar thermal and solar electric panel installations. A 7.8-kW PV panel array was installed on the roof. This was not the first solar PV for the Housing Development Corporation. "We've been committed to solar PV for a long time," said Wertheim. "We have the second highest utility rates in the U.S., 18 to 21 cents per kWh. So the PV really helps offset the cooling costs."

Photos courtesy of United Way of Long Island

KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** 2x4; 16" on center; dense-pack cellulose (R-13.5); plywood sheathing; house wrap; 1.5" polyiso rigid foam; 1x3 furring strip drainage plane; fiber cement siding.
- **Roof:** 2x8 rafters; .5" sheathing; two 2" layers of polyiso rigid foam; 5/8" plywood; 15# felt; 3' ice and water shield at all valleys; fiberglass shingles.
- **Attic:** Unvented; 6" open-cell spray foam on underside of roof (R-48).
- **Foundation:** 8" concrete basement walls; 2.5" polyiso on interior; elastomeric waterproofing membrane; fiber protection board on exterior sill to footing.
- **Windows:** Double-pane; argon-filled; vinyl-framed; low-e; $U=0.2$; SHGC=0.24.
- **Air Sealing:** 1.92 ACH 50.
- **Ventilation:** ERV tied to HVAC ducts; separate air returns in laundry and kitchen; bath fans.
- **HVAC:** Wall-hung boiler for hydro coil; rigid metal ducts; jumper ducts in bedrooms; 16 SEER AC; 95 AFUE.
- **Hot Water:** Solar thermal water heater; 120-gallon tank; electric backup; wall-hung boiler with 40 gallon tank.
- **Lighting:** 100% CFL.
- **Appliances:** ENERGY STAR-rated refrigerator, clothes washer, and dishwasher.
- **Solar:** 7.8 kW; solar thermal evacuated tube system.
- **Water Conservation:** All EPA WaterSense-rated fixtures; native plants.
- **Other:** Electric management system; no-formaldehyde wood; aging in place features; low-VOC.