



Building America Best Practices Series

Volume 14. Builders Challenge Guide to 40% Whole-House Energy Savings in the Hot-Humid Climate

Case Study: Green Coast Enterprises

Project Home Again, New Orleans, LA

Green Coast Enterprises worked with the U.S. Department of Energy's Building America team lead Building Science Corporation on 100 energy-efficient new homes in New Orleans through Project Home Again.

BUILDER PROFILE

Builder: Green Coast Enterprises
New Orleans, LA
www.greencoastenterprises.com

Founded: 2007

Employees: 6

Development: Project Home Again
100 homes, 1,200 - 1,300 ft²,
\$140,000 - \$160,000 (market value)

Construction Date: 2008-2011

As New Orleans continues to rebuild from Hurricane Katrina, 100 lucky families will come home again to energy-efficient, storm-weathering new homes built by local developer Green Coast Enterprises with assistance from the U.S. Department of Energy's Building America and its research team lead Building Science Corporation.

The homes are expected to use 42% to 46% less energy and save home owners \$751 to \$1,015 annually in energy costs compared to the Building America benchmark (a home built to the 1993 Model Energy Code).

Construction of the homes is funded through Project Home Again, a nonprofit development organization founded by Leonard Riggio, president of Barnes and Noble bookstores, and his wife Louise. The new homes are given to low-income residents of New Orleans in exchange for the residents' former, storm-damaged homes. Green Coast Enterprises manages the construction project. TKTMJ Inc., and Sustainable Architecture, LLC, were the builder and the architect on phases 1 through 4 of Project Home Again.

Project Home Again is building 100 homes in six phases in the Gentilly neighborhood of New Orleans. Phase 1, which consisted of 20 homes, was completed in 2009. The 12 homes in phase 2 and the 13 homes in phase 3 were completed in 2010. Phase 4, 25 homes, was begun in 2010 and will be completed in 2011. Phases 5 and 6, which will add another 30 houses, started in early 2011.

All of the homes will meet the Builders Challenge target Home Energy Rating System (HERS) scores of 70 or lower, and 40% savings over the Building America benchmark. Through Building America, Building Science Corporation provided consulting services for Project Home Again and recommended numerous efficiency and durability improvements.



(Top) High-density closed-cell spray foam was sprayed under the flooring, in stud wall cavities, and along the underside of the roof decking to air seal and provide insulation valued at R-13 for floors, R-20 in walls, and R-21 in the attic.

(Bottom) The spray-foamed and unvented sealed attic provides an insulated temperature-controlled environment for the heat pump, dehumidifier, and ventilation system.

“HVAC is the area where doing it right represents the most improvement, and the one that had the most technical questions. Having the BSC expertise makes conversations with HVAC subs easier.”

REUBEN TEAGUE
Green Coast Enterprises

Energy-Efficient Features

The single-story, 1,213 to 1,316-square-foot homes were built on piers to help protect them from future floods. The homes are elevated 3 feet above grade, which is 1 foot above the base flood elevation. The piers are spaced approximately 7 feet apart and sunk 30 feet below grade. In phase 1 concrete piers were used; in phases 2 – 4, pressure-treated Class 5 wood piles were used to reduce costs and to accommodate different soil conditions. The homes were entirely framed with borate pressure-treated lumber, rendering them termite, mold, and mildew resistant. The floor framing is 2x10s at 16-inches on-center and the subfloor is $\frac{3}{4}$ -inch CDX plywood. Exterior walls are 2x6 borate-pressure-treated studs spaced at 24-inches on-center instead of 16-inches on-center to save lumber costs and reduce thermal bridging. Other advanced framing elements such as single top plates and two-stud corners were not used in this project because local code requirements would have required hiring a structural engineer to verify adequacy for a 130-mile-per-hour wind zone. The $\frac{15}{32}$ -inch Windstorm OSB serves as a structural sheathing on the exterior walls.

Light-colored hurricane-rated asphalt shingles were installed over 30# felt roofing underlayment over $\frac{5}{8}$ -inch CDX roof sheathing. The roof sheathing joints were taped with butyl-based adhesive-backed flashing strips. A fully adhered roofing membrane was installed at the eaves and gable ends.

The building envelope was covered with closed-cell, high-density spray foam insulation including R-21 (3.5 inches) of foam under the roof deck to create an unvented cathedralized attic, R-20 foam in the wall stud cavities, and R-13 in the floor joist bays. The high-density foam provides an excellent air, thermal, and vapor barrier, which is especially critical in the floor assembly. The low-permeability rate of the foam will resist any upward vapor drive.

Green Coast Enterprises chose dual-pane, vinyl-framed windows with a state-of-the-art “LoE3” spectrally selective glazing that blocks infrared and ultraviolet light while maintaining a high visual transmission. The low SHGC of 0.23 greatly reduces the solar gain, cutting cooling costs and enabling installation of a smaller heat pump.

Building Science Corporation performed full room-by-room Manual J system sizing and duct layout calculations on each of the floor plans used in Project Home Again. The very efficient enclosure enabled Green Coast Enterprises to install smaller, 2-ton, right-sized heat pumps that were 14 SEER/8.25 HSPF, the most efficient units allowed by the project budget.

For phase 1 and 2 Building Science Corporation recommended installing a dehumidifier that draws air from the common area and ducts dehumidified air to the heat pump air handler’s supply plenum for

distribution throughout the home. A remote dehumidistat was added to allow homeowners to adjust indoor humidity settings. Dehumidifiers were not included in homes in phases 3 through 6 due to costs.

Central fan-integrated supply ventilation was recommended via an insulated 6-inch flex duct that draws fresh outside air to the return plenum of the HVAC system whenever the space conditioning system is running. The dehumidifier also has fan cycling circuitry that can operate the air handler fan to cycle at 10 minutes on, 20 minutes off to provide fresh air through the house when the heat pump is not running. A mechanical damper on the outside air duct is controlled by the fan cycler to close automatically during periods of consistent space conditioning to prevent over-ventilation of the living space.

Bathroom exhaust fans and a kitchen hood were installed to provide spot ventilation and continuous exhaust in compliance with ASHRAE 62.2. Transfer grilles and door undercuts allow airflow when bedroom doors are closed. Screened-in porches and double-hung windows provide additional cross ventilation.

ENERGY STAR refrigerators, dishwashers, and clothes washers and 100% CFL screw-based lights add to the savings.

Green products that were incorporated with occupant health in mind included low- or no-VOC paints, sealants, flooring, and cabinetry products. Flooring surfaces are either wood or tile.

Quality Assurance and Commissioning

The Project Home Again team held weekly construction meetings and tours of the jobsite to maintain communication among the players, and to make sure construction was progressing on time and as specified. Building Science Corporation visited the site monthly and worked with Green Coast Enterprises to commission the homes' building enclosure and mechanical systems.

The homes were whole house air leakage tested by a third party with exceptional results, averaging 1.5 square inches of leakage area per 100 square feet of enclosure @ 50 Pa.

Green Coast Enterprises walks through each home with its homeowner and provides a one-hour training session to educate homeowners on the unique features of their homes, especially HVAC systems and appliances. Green Coast also provides homeowners with a comprehensive illustrated owner's manual that contains all necessary contact, warranty, and product information in the event that a repair or service call is needed.

Energy-Efficient Features

- HERS: 66-69
- Framing: 2x6 24-inch on-center, all borate pressure-treated lumber, framed on stilts
- Insulation: High-density closed-cell spray foam for R-20 in walls, R-21 in attic, R-13 under floor
- Air leakage: 1.5 in²/100 ft² @ 50 PA
- Ducts: R-8 flex ducts in unvented conditioned attic
- HVAC: 14 SEER/8.25 HSPF heat pump with variable-speed air handler in conditioned attic
- Windows: Vinyl frame, Low E3, U-0.36, SHGC 0.23
- Water Heating: 0.92 EF 50-gal electric
- Ventilation: Central fan-integrated supply system, jump ducts
- Humidity Control: Dehumidifier ducted to air handler, in phase 1 and 2 homes
- 100% CFL lighting and ENERGY STAR appliances



All of the Project Home Again homes met the energy efficiency requirements of DOE’s Builders Challenge and incorporated climate-specific durability features like pier foundations to raise them above the base flood elevation, hurricane strapping, and borate-treated lumber for all framing.

Dollars and Sense

The construction budget for the phase II homes is \$198,000 per home, slightly less than the budget for phase I. This is approximately \$150 per square feet. Local builders who are building code-minimum homes (to 2006 IECC) have construction costs of about \$120 per square foot. Construction costs dropped to \$185,000 per house for phase 4 and are expected to be lower in phase 5 and 6. The lower costs are due to simpler designs, better pricing from suppliers, increased contractor understanding of techniques, and economies of scale.

Table 1. Calculated Costs and Savings of Energy-Efficiency Features for Green Coast Enterprises, New Orleans, Louisiana

| | |
|-------------------------------------------------|---------|
| Total Energy Savings ¹ | 55% |
| Total Added Builder Costs ² | \$7,925 |
| Annual Utility Savings | \$719 |
| Annual Mortgage Payment Increase ^{2,3} | \$632 |
| Annual Net Cash Flow to the Homeowner | \$86 |

¹ Savings are in comparison to the Building America benchmark (a home built to the 1993 Model Energy Code)

² Builder costs were estimated by builders and Building America team. Costs include a 10% markup. Incentives and rebates are not included.

³ Mortgage costs are based on a 30-yr fixed mortgage at 7% interest; inflation is not considered.

“Builders Challenge and Building America is an extraordinary opportunity for builders who are interested but don’t know how to break into energy-efficient construction.”

WILL BRADSHAW, president
Green Coast Enterprises

For More Information

www.buildingamerica.gov
EERE Information Center
1-877-EERE-INF (1-877-337-3463)
eere.energy.gov/informationcenter



The Bottom Line

Green Coast Enterprises is now partnering with Building America and the New Orleans Redevelopment Authority (NORA) on another, larger Neighborhood Stabilization Program II project, funded under the American Recovery and Reinvestment Act of 2009. NORA decided that all 250 new homes and 125 rehabbed homes in this project will meet DOE’s Builders Challenge, and that Green Coast Enterprises and Building Science Corporation will provide the oversight and design review for all 12 of the nonprofit housing agencies involved in the project.

“The biggest lesson for us is that once you develop a working model, you can really reduce the costs. If you do things in a more thoughtful, climate-appropriate fashion, it doesn’t need to explode the budget. If you are careful, you can get the costs down to a totally reasonable, affordable level,” said Bradshaw.