

# Carl Franklin Homes & Green Extreme Homes

5th Street Deep Rehab  
Garland, TX



## BUILDER PROFILE

Carl Franklin Homes & Green Extreme Homes  
Lewisville, TX  
Steve Brown, [stevebcfh@cs.com](mailto:stevebcfh@cs.com)  
972-977-7398, [www.greenextremehomes.com](http://www.greenextremehomes.com)  
Rater: TexEnergy Solutions  
Eric Johnson  
[Eric.Johnson@texenergy.org](mailto:Eric.Johnson@texenergy.org)

## FEATURED HOME/DEVELOPMENT:

### Project Data:

- Name: 5th Street Deep Rehab
- Location: Garland, TX
- Layout: 3 bdrm, 2 bath, 1 fl, 1,108 ft<sup>2</sup>
- Climate Zone: IECC 3A, hot-humid
- Completion: November 2015
- Category: affordable

### Modeled Performance Data:

- HERS Index: without PV 58
- Projected Annual Energy Costs: without PV \$1,633
- Projected Annual Energy Cost Savings (vs home built to 2009 IECC): without PV \$570
- Projected Annual Energy Savings: without PV 4,755 kWh
- Added Construction Cost: without PV \$18,000

It was a hot summer day in August, but over 100 kids from local elementary schools stood outside waving American flags along 5<sup>th</sup> Street in Garland, Texas, to welcome veteran Leo Perez and his family to their new home. After suffering an injury in Afghanistan, Perez was unable to work fulltime and had few hopes of owning a home. But with the help of the non-profit community development corporation Green Extreme Homes (GEH), for-profit builder Carl Franklin Homes, and multiple volunteer groups, the Perez family now owns a completely refurbished 1953 vintage home. The home was renovated to the high energy efficiency and performance standards of the U.S. Department of Energy's Zero Energy Ready Home program, which means the family will be able to live comfortably in their home with lower energy and water bills.

The DOE Zero Energy Ready Home (ZERH) 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 program, 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, at a minimum, have the conduit and electrical panel space in place for future PV installation.

GEH and Carl Franklin Homes have a history of successfully collaborating on building or renovating homes to high performance standards for needy families. Two of their previous homes were DOE ZERH Housing Innovation Award winners. In 2015 they won an award for a new home constructed in Garland, Texas. In 2014 they won a DOE Housing Innovation Award for the first retrofit home in the nation to be certified to the DOE ZERH program.



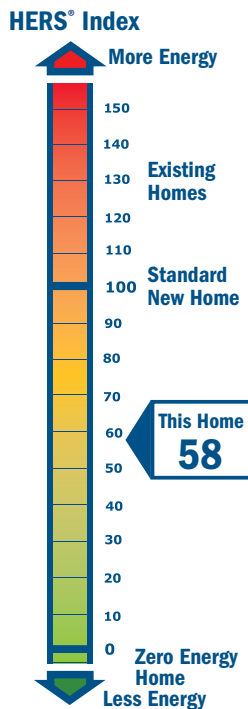
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 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.

Builder Carl Franklin Homes and non-profit community development corporation Green Extreme Homes (GEH) refurbished this 1,108 ft<sup>2</sup> vintage 1950s home to the high energy efficiency and performance standards of the U.S. Department of Energy's Zero Energy Ready Home program. Triple-pane windows and ENERGY STAR appliances and ceiling fans add to the savings.



### 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.



For this project, they assembled a team that included the City of Garland, and about 200 volunteers from Home Depot and Bank of America. The home's existing structure and layout presented multiple challenges but the team invested time and effort in upfront planning to ensure an affordable and high-quality retrofit. The 1950s "tract" home had two bedrooms and one bathroom, a low-pitched roof, original wooden siding (mostly rotted), and an 8-inch-thick slab with no steel reinforcement. "This type of slab, called a California slab, was common in this area after World War II," said Steve Brown, founder of Carl Franklin Homes, describing how the slab was tarred and covered with spaced 1x4 oak subflooring and quarter-sawn white oak flooring.

At some point over the years an additional bedroom was added on a wooden foundation. Moisture had come up from under this wooden box foundation and penetrated throughout the rest of the house, causing wood floors to buckle and rot. It also caused the floor to expand and actually push the exterior walls off the concrete foundation on two sides. The original house had no insulation in the walls, but about 3 inches of old (itchy) blown fiberglass in the attic.

The team completely stripped the home to the studs, removing old siding, dry wall, roofing, and windows. They removed the old rotting wood foundation of the addition. The existing foundation was leveled and the drainage plane was changed to flow water away from the slab. A new additional slab was poured for the new bedroom and bath. Then, they reframed the rest of the exterior walls back on the slab and re-supported the roof with new interior braced walls. The wall cavities were insulated with 3.5 inches of dense-packed blown fiberglass insulation and the exterior of the walls was covered with three layers of protection—a half-inch of rigid EPS foam board, a coated OSB sheathing with seams taped to replace house wrap as the weather-resistant barrier, and a half-inch-thick engineered wood siding product. Together this provided a total wall insulation value of R-21.

The low-pitched roof was completely gutted to the bare rafters. A new decking of half-inch OSB was installed. This was insulated on the underside with 8 inches of closed-cell spray foam which completely enclosed all of the wooden members to reduce thermal bridging, providing a conditioned attic space with an R-38 attic insulation level. On top, the roof decking was completely covered with a self-adhering solid membrane underlayment, before new EPA "Cool Roof" qualified roof shingles were installed.



As part of this deep retrofit, the old siding and drywall were removed, then the 2x4 stud walls were sheathed with 0.5 inches of rigid foam, 0.5-inch coated OSB, draining house wrap, and engineered wood siding. The wall cavities were filled with 3.5 inches of dense-packed blown cellulose.

The home was extensively air sealed in the walls and ceiling plane, then blower door tested for leaks, then resealed and tested again. The results showed an air leakage rate of 1.2 air changes per hour at 50 Pascals pressure difference (ACH 50), which is very tight for a retrofit home.

In addition to new siding and a new roof, the home also got new triple-paned vinyl-framed windows with heat-blocking low-emissivity coatings and an argon gas fill between the panes.

The home's HVAC system consists of a ducted high-performance heat pump with a heating efficiency of 9.1 HSPF and a cooling efficiency of 20 SEER. The unit is located in a conditioned closet in the middle of the house and all of the ductwork is in conditioned space in the attic. Because the attic is so low, small-diameter "mini" ducts were used. The ducts were insulated to R-8 and air sealed; duct leakage testing showed 0 leakage to the outside at 25 cfm. An energy recovery ventilator (ERV) with a MERV 10 filter was set on a separate timer from the heat pump to provide fresh air ventilation at levels exceeding the ASHRAE 62.2 requirements for homes.

A high-efficiency electric water heater with a 50-gallon tank provides hot water for the home and is centrally located in a hall closet no more than 15 feet to any hot water use (including bathrooms, the kitchen, and the clothes washer). WaterSense plumbing fixtures reduce both energy and water waste in the home. The house is equipped with energy-efficient lighting with CFLs and LEDs, and ENERGY STAR appliances are installed throughout.

The tighter envelope and improved systems result in a home with a Home Energy Rating System (HERS) score of only 58. (Code construction would result in a HERS score of approximately 80 to 100.) The estimated energy savings for this above-code home should result in energy bills of less than \$140 per month.

Drought-tolerant native landscaping was planted so minimal water will be needed for irrigation. The landscape design and plants were provided by the nationally known Texas A&M AgriResearch Center. Existing trees had blocked the flow of rainwater from the rear of the house, so trenching was done (in a way that didn't damage the existing root system) to carry water run-off to the front of the house to a storm water system. The home's existing 60-year-old oak trees provide shading for the back yard, but would block photovoltaic panels installed on the south roof of the house. However, electrical wiring and conduit were installed per

## HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

EPA WaterSense



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.



A high-efficiency heat pump provides all of the home's heating and cooling.

checked and waste was kept to a minimum. Specs were designed and checked against the ZERH guidelines before any demolition occurred. During demolition, students from the elementary school across the street toured the home as part of a lesson in sustainability.

“Now we have a three-bedroom, two-bath home for our disabled veteran and his family that is highly insulated, cooled and heated with a state-of-the-art mini-duct heat pump system, with a fresh air ERV, water-saving plumbing, and advanced technology lighting and appliances that still fits in the neighborhood architecturally, but performs like a ZERH home should,” said Brown.

“For this veteran and his family, this brings them out of poverty and gives them a stable start going forward,” says GEH Executive Director Jean Brown. “Not only are they getting a mortgage-free home, they are getting a home that will be very economical to operate with the technologies that are in here as part of the zero net energy program. Also they are getting a healthy home, with no VOCs. It’s going to be a life changing event for them.”

The Perez family agrees. “It’s our first home and we love it,” said Leo and Kimberly Perez. “Because of the way it’s built, we don’t have to worry about high utility bills, even in the summer. We just live comfortably year round.”

Carl Franklin Homes and Green Extreme Homes have been featured in many media outlets over the years including HGTV and The Discovery Channel. The builder, who also builds some market rate homes, notes “Because of what we build, we never have to advertise. Buyers seek us out for the high performance of our homes.” His passion, though, is affordable and “work force” housing. “We sell to the buyer with the least amount of expendable income at the end of each month and, with the performance of our homes, they don’t spend all their money on utility costs, thus giving them more money to spend on their families. This is the bottom line—zero energy ready homes with affordable pricing is the best investment a working family can make. We never fail with the DOE ZERH criteria.”

*Photos courtesy of Carl Franklin Homes & Green Extreme Homes*

DOE ZERH requirements in case PV panels are installed in the future.

The building team held meetings on site with a goal of keeping all rooms close to the hot water heater, yet continuing the natural flow of the old home. The team held charrettes with the framer, plumber, electrician, HVAC contractor, and multiple volunteers. The outcome was a concise demolition/build-back plan that addressed everyone’s concerns and solutions. Material lists were double

## KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** Total R-21: rehab gutted to 2x4 studs, 3.5" dense-pack blown cellulose, ½ rigid EPS, ½" coated OSB, draining house wrap, engineered wood siding.
- **Roof:** New ½" OSB deck, full self-adhering membrane, Cool Roof asphalt shingles.
- **Attic:** R-38 sealed conditioned attic with 8" closed-cell foam on underside of roof deck.
- **Foundation:** Existing uninsulated slab-on-grade.
- **Windows:** Vinyl-frame, triple-pane, low-e, argon-filled, U=0.23, SHGC=0.22.
- **Air Sealing:** 1.2 ACH 50.
- **Ventilation:** ERV.
- **HVAC:** Mini-duct heat pump, 9.1 HSPF, 20 SEER, unit in closet, ducts in conditioned attic.
- **Hot Water:** 50-gal electric tank, 0.95 EF, in hall closet < 15 feet to any hot water uses.
- **Lighting:** LED 20%, CFL 80%.
- **Appliances:** ENERGY STAR refrigerator, clothes washer, dishwasher, 4 ceiling fans.
- **Solar:** None
- **Water Conservation:** WaterSense-rated toilets and faucets.
- **Energy Management System:** Programmable thermostat.
- **Other:** No-VOC paints and sealants, green-certified plank vinyl flooring, native drought-tolerant plants in landscaping.