

# Deltec Homes & Old School Rebuilder & Co.

Custom Ridgeline F  
Wilmington, NC



## BUILDER PROFILE

Deltec Homes & Old School Rebuilder & Co.  
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## FEATURED HOME/DEVELOPMENT:

### Project Data:

- Name: Custom Ridgeline F
- Location: Wilmington, North Carolina
- Layout: 2 bdrm, 2 bath, 1 fl, 1,288 ft<sup>2</sup>
- Climate: IECC 3A, hot-humid
- Completed: March 2021
- Category: Custom for Buyer <3,000 ft<sup>2</sup>

### Modeled Performance Data:

- HERS Index: without PV: 50; with PV: -21
- Annual Energy Costs: without PV: \$850; with PV: \$150
- Annual Energy Cost Savings: (vs typical new homes) without PV: \$1,000; with PV: \$1,650
- Annual Energy Savings: without PV: 5,700 kWh; with PV: 15,400 kWh
- Savings in the First 30 Years: without PV: \$39,600; with PV: \$66,200

The tongue-and-groove vaulted wood ceilings and three-season room with large windows, ceiling fans, and wood stove lend a summer cottage feel to this 1,288-square-foot home located near the shore in Wilmington, North Carolina. But there is nothing campy about the efficiency of the small home, which is so packed with energy-saving features that it is literally a powerhouse of high performance, cutting utility bills to \$10/month and producing enough electricity to run the home and an electric car year-round. The custom home also earned a Housing Innovation Grand award from the U.S. Department of Energy's Zero Energy Ready Home program. The award is shared by the designer and manufacturer of the components of this kit home, Deltec Homes of Asheville, North Carolina, and Old School Rebuilder & Co., a Wilmington, North Carolina, builder who assembled the home on site from panels constructed by Deltec Homes at its Asheville plant.

Deltec has a unique business model—the company produces custom home kits of premade panels, which are shipped all over the United States for assembly on site by local builders. Deltec has developed ongoing relationships with builders in some nearby markets, including Old School Rebuilder & Co., in Wilmington. Although this home is only Deltec's second DOE Zero Energy Ready Home, the company, which ships about 50 homes a year, has developed a reputation for energy-efficient construction in the 55 years since its founding, thanks to CEO Steve Linton's passion for sustainable construction. This award-winning home was one of a line of Deltec homes designed for passive solar, with ductwork inside conditioned space, high-performance insulation, and stringent air tightness. Although Deltec had only certified one home to DOE Zero Energy Ready Home before this one, that home netted several interested clients including the owners of this home, according to Leigha Dickens, Deltec's Sustainability Manager.



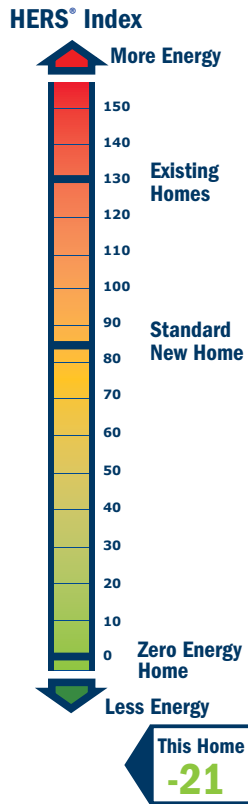
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0/3.1/3.2 for an energy-efficient home 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.

ENERGY STAR appliances and low-flow fixtures contribute to energy and water savings while low-e3 ENERGY STAR windows, LED lighting, six clerestory windows, and solar tubes fill the vaulted interiors with light.



### What makes a home a DOE ZERO ENERGY READY HOME?

- 1 **BASELINE**  
ENERGY STAR Certified Homes Version 3.0/3.1
- 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.



Every DOE Zero Energy Ready home must meet the requirements of the ENERGY STAR Certified Homes checklists. They must also be certified to the U.S. Environmental Protection Agency’s Indoor airPLUS criteria and meet the hot water distribution requirements of the EPA’s WaterSense program. DOE ZERH homes must also meet above-code insulation requirements, be blower door tested for air sealing, comply with moisture management guidelines, have ducts inside conditioned space, and use ENERGY STAR-labeled windows, lighting, and appliances. Homes must also have solar electric panels installed or have the conduit and electrical panel space in place for future installation of solar panels.

As Deltec’s in-house green homes consultant, Dickens shows home buyers the benefits of a DOE ZERH certified home and often tries to steer them toward certification. To make the program even more enticing, Deltec has recently created its own in-house rebate program to encourage buyers to get their homes certified. Explains Dickens, “The rebates are tiered where Deltec will offer our customers AND their builders each a rebate if they submit to us proof of certification, starting at \$150 for ENERGY STAR and going up to \$750 for DOE Zero Energy Ready Home, and \$1,200 for Passive House Institute U.S. (PHIUS+2015).” This project was the first to take advantage of this rebate. “Since many of our clients build in rural areas where there is less recognition of and fewer rebate opportunities from other sources, the rebate program is our way to try to assist homeowners and their builders in overcoming financial barriers to certification,” added Dickens.

Deltec is also known for its hurricane-resistant design. This home is located in a coastal area where high moisture load and significant wind speed risks needed to be considered. The panelized shell package from Deltec included passive resiliency features to reduce those risks, including a factory-applied borate mold- and termite-resistant treatment on all structural framing members, and a high-wind hardware package, including continuous metal strapping from the top plate to the bottom plate, wall panels held to the foundation with a hold-down unit anchoring system, and 5/8-inch plywood sheathing with tighter nailing patterns than required by code.

Construction of Deltec’s homes, including this award-winning home, starts in the factory, where the stud wall panels are assembled to order as specified in the chosen home design. The 2x6 24-inch on-center walls incorporate advanced framing techniques like insulated headers and ladder blocking at interior wall intersections. The sheathing, rigid foam, and windows are installed in the factory; cavity insulation, drywall, house wrap, and siding are installed on site. A low-expanding foam gasket is factory-installed on the outside face of the studs at the perimeter of each piece of





The borate-treated 2x6, 24-inch on-center wall panels are termite and moisture resistant and come to the site ready to attach with metal connector plates for quick assembly. The wall cavities will be filled with blown cellulose and wrapped with 1-inch R-5 graphite EPS foam boards and drainable house wrap to provide a continuous thermal break and drainage plane around the home under the durable fiber cement lap siding and trim.

plywood sheathing, prior to factory installation of the  $\frac{5}{8}$ -inch plywood sheathing, for increased wall air-tightness. One inch of graphite-enhanced expanded polystyrene (EPS) is installed over the plywood. “We use EPS rather than XPS because of the high-global-warming potential blowing agents in the XPS,” said Dickens, who noted the graphite-infused EPS product offers the same R-value but is more vapor open than XPS, allowing slightly better outward drying for mixed-humid climates.

All top plates, bottom plates, wall panel joints, wall panel centers, and electrical, plumbing, and HVAC penetrations are thoroughly caulked. A sill-sealing gasket is installed underneath the sill plate of each wall panel. Low-expanding foam is installed around all window and door openings. Open-cell spray foam is installed on the roof deck and at the outside perimeter of the truss band.

The windows are installed in the factory and are properly integrated with the house wrap following the sequencing details for “Window with House Wrap on OSB over a Wood-Framed Wall” as described by Joe Lstiburek in his book *Water Management Guide*. First the sill is lined with a formable pan flashing, then a 12-inch-wide piece of house wrap is installed around the perimeter of each window and integrated with the flashing. Factory-painted window trim is installed in the factory. “Factory installation results in a tighter rough opening due to our tight tolerances, and an ability to get the water-management flashing details applied consistently and in an ergonomic environment,” said Dickens.

Rolls of the drainable house wrap are shipped with the panel package for the builder to install on site so that the house wrap can wrap continuously around the house, without having a seam at every wall panel joint. This field-installed house wrap is integrated shingle-fashion with the pre-installed house wrap around the windows and any seams are taped. The wall cavities are filled on site with 5.5 inches of Grade 1 blown cellulose and surfaced with  $\frac{5}{8}$ -inch drywall covered with vapor-open paint. The exterior walls are covered with fiber cement lap siding and trim. The entire wall assembly has a total insulation value of R-24.

The home’s design incorporates a split monoslope roof with a 6/12 roof pitch on the back half of the house and a 3/12 roof pitch on the front. The panelized vertical 4-foot wall connecting the two halves provides space for six clerestory windows. The vaulted parallel chord roof trusses are manufactured with high-quality machine stress-rated truss lumber in the same Deltec panel plant that makes the wall panels. The 16-inch-deep open-web parallel-chord trusses are spaced at 24-inches on-center and are filled with R-21 (6 inches) of open-cell spray foam insulation along the roof

## HOME CERTIFICATIONS

ENERGY STAR Certified Homes  
Version 3.0

EPA Indoor airPLUS



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.



The home has 7.2 kilowatts of solar panels on the roof and an electrical vehicle charging station in the carport.

$\frac{5}{8}$ -inch drywall and vapor-open paint. The interior ceilings are dropped to 8 feet over the bathrooms, entry way, and center hallway. This dropped ceiling area creates a conditioned attic space for the heat pump, water heater, and fresh air system.

The foundation is a monolithic slab-on-grade with R-10 insulation on the slab edge and horizontally 3 feet in around the perimeter of the home.

The windows are double pane with frames that are fiberglass on the exterior and wood on the interior. The window panes have a low-emissivity coating on three sides (low-e3). The argon-filled windows have a U-factor of 0.27 and a solar heat gain coefficient (SHGC) of 0.20. The “Ridgeline” model, which this home is based on, is designed to take advantage of passive solar.

When faced south, as these clients did, the standard model features 16-inch overhangs on the east, west, and north sides with covered porches on the east and west ends and limited glass on the north. Most of the glass is south-facing and is protected from too much solar gain by 2-foot overhangs. In the right climate, clients can modify the design to add thermal mass and more south-facing windows to cover a large portion of their space heating needs with passive solar heating.

An energy recovery ventilator (ERV) was considered for this home but, upon the advice of the Home Energy Rating System (HERS) Rater, a ventilating dehumidifier was chosen instead due to the high humidity of the coastal climate. The dehumidifier is tied into the home's duct system. The fresh air intake operates continuously and the dehumidifier runs 30 minutes per hour.

The home is equipped with a heat pump water heater that operates at an efficiency rating or Uniform Energy Factor (UEF) of 3.55. The 50-gallon water heater is located in the conditioned dropped attic space along with the central air-source heat pump, whose branch ducts are all inside conditioned space with supplies and returns in the attic knee walls adjacent to each room. The heat pump operates at a heating efficiency of 11 HSPF and a cooling efficiency of 18.5 SEER, well above the federal minimum of 13 SEER. The heat pump uses a rigid plenum duct system with flex branches.

*Photos courtesy of Deltec Homes & Old School Rebuilder & Co.*

deck of the unvented vaulted attic space.

The roof is topped with  $\frac{5}{8}$ -inch plywood roof sheathing, synthetic roof underlayment, and ENERGY STAR cool roof-certified birch-colored asphalt shingles. The ceilings of the living areas and kitchen are vaulted and lined with  $\frac{3}{4}$ -inch tongue-and-groove wood ceilings.

The rest of the house has

## KEY FEATURES

- **Walls:** 2x6, 24" o.c., panelized, R-24 total: advanced framed, 5.5" cellulose in cavity,  $\frac{5}{8}$ " plywood sheathing, 1" R-5 graphite EPS, drain wrap, fiber cement lap siding and trim.
- **Roof:** Truss monoslope: vaulted parallel chord 16" open-web trusses at 24" o.c.,  $\frac{5}{8}$ " plywood sheathing, synthetic roof underlayment, Cool Roof-certified asphalt shingles.
- **Attic:** Unvented, vaulted ceilings: 6" R-21 open-cell spray foam on underside of deck.
- **Foundation:** Slab-on-grade: R-10 rigid foam at slab edge + under perimeter to 3 ft.
- **Windows:** Double-pane, argon-filled, low-e3, fiberglass-wood frames; U=0.27, SHGC=0.20.
- **Air Sealing:** 2.46 ACH50, open-cell spray foam at roof deck and rim joist; all plates, joints, and holes caulked; sill seal; factory-installed plywood-to-framing gasket.
- **Ventilation:** Dehumidifier with fresh air intake tied to air handler; MERV 13 filter; bath fans.
- **HVAC:** Central air-source heat pump, 11 HSPF, 18.5 SEER, AC variable speed compressor.
- **Hot Water:** Heat pump water heater, 50-gal, 3.55 UEF.
- **Lighting:** 100% LED, 2 solar tubes, 6 clerestory windows.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, clothes washer, heat pump dryer, bath fans.
- **Solar:** 7.2-kW rooftop panels, passive solar.
- **Water Conservation:** Low-flow fixtures. Hot water recirc. pump. Drip, predictive irrigation, rain garden, pervious driveway.
- **Energy Management System:** PV production and energy use tracking. Wi-Fi connected fridge, water heater, oven. Smart thermostat. Water leak detection.
- **Other:** EV charging. Accessible doorways, handles, showers, sinks. Sustainable-certified lumber and sheathing.