



Charis Homes

The Sanctuary
North Canton, OH



BUILDER PROFILE

Charis Homes

North Canton, Ohio; CharisHomes.com
Emily Meadows, 330-417-6536
emeadows@charishomes.com

FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: The Sanctuary
- Location: North Canton, OH
- Layout: 3 bdrm, 3 bath, 1 fl + bsmt, 4,294 ft²
- Climate: IECC 5A, cold
- Completed: November 2018
- Category: custom for buyer

Modeled Performance Data:

- HERS Index: without PV 44
- Projected Annual Energy Costs: without PV \$1,850
- Projected Annual Energy Cost Savings: (vs typical new homes) without PV \$1,900
- Projected Annual Energy Savings: without PV 15,700 kWh, 100 CCF
- Savings in the First 30 Years: \$90,700

This year's Housing Innovation Award is the fourth award Charis Homes has earned from the U.S. Department of Energy's Zero Energy Ready Home program. This is the first year the builder has achieved a coveted Grand Award from the DOE Zero Energy Ready Home program. The custom home builder from North Canton, Ohio, won a grand award in the custom for buyer category, for a 4,294-ft², 3-bedroom, 3-bath, one-story-plus-basement home in North Canton. Charis Homes joined the program in 2015 and has since built 18 homes certified to the program specifications. In 2018, Charis committed to building all of its homes to the DOE Zero Energy Ready Home criteria.

Charis Homes' co-founders Glenna Wilson and Todd Scott appreciate the credibility and product differentiation that the DOE certification provides them. Charis is one of only two builders in Ohio certifying homes to the DOE Zero Energy Ready Home designation. "It [DOE ZERH] has given us a marketing platform. The extra cost of building to the DOE ZERH standards for this home has been offset by the leads and traffic generated by the DOE ZERH designation. Many people have told us that when searching the internet, they found us because they were looking for an energy-efficient, healthy home builder."

Such marketing may attract home buyers, but quality construction is what makes happy homeowners. The owners of this home applauded the low \$35/month electric bills and described their home as "quiet, comfortable, and dust-free."

Quality construction does not happen by accident. The DOE ZERH program bundles several sets of criteria under the DOE ZERH label. Homes certified to the program must meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 or 3.1, the U.S. Environmental Protection Agency's Indoor airPLUS program, the hot water distribution requirements of the EPA's WaterSense program, and the insulation requirements of the 2015 International Energy Conservation Code. Charis also chose



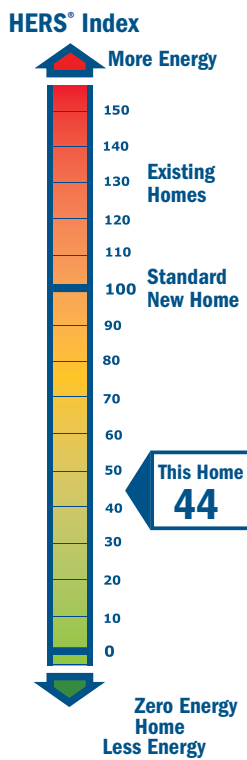
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0/3.1/3.2 for an energy-efficient home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

Charis Homes built this custom, 4,294-ft² home in North Canton, Ohio, to the high-performance requirements of the U.S. Department of Energy’s Zero Energy Ready Home program. Triple-pane windows provide natural daylighting while helping to ensure that heat and cooling are not lost. An energy recovery ventilator and use of only Zero-VOC paint and formaldehyde-free woods help support high levels of indoor air quality in the home and earned the builder a Leader Award from the U.S. Environmental Protection Agency’s Indoor airPLUS program.



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.



to meet DOE’s Zero Energy Ready Home quality management guidelines, which are a recommended but not required part of the ZERH requirements. The result is a home built to be healthy, comfortable, and durable.

Charis builds with insulated concrete forms (ICFs). ICFs are like hollow blocks made of rigid foam. The blocks are stacked like bricks, reinforced with rebar, and filled with a 6-foot core of recycled concrete, which hardens in place to form a very sturdy storm-resistant, moisture-resistant, fire-resistant, and bug-resistant structure that is also highly insulated and air sealed because of the continuous layers of insulation and concrete. The steel rebar runs both vertically and horizontally to provide walls that are rated to withstand winds up to 180 miles per hour.

Charis used 11-inch-thick, R-22 ICFs consisting of two 2.5-inch layers of rigid foam sandwiching 6 inches of reinforced concrete to form the full wall height from footing to roof line for the one-story plus full basement home. The ICF basement walls insulate the sides of the basement slab.

The footers were poured into a stay-in-place form product that has built-in channels to provide interior and exterior drainage of the foundation. The 9-foot-tall basement exterior walls were covered with a dimpled plastic polyethylene membrane that relieves hydrostatic pressure against the wall by providing a pathway for liquid water to flow down to the footing drains.

The first-floor ceiling drywall forms the air barrier between the house and the vented attic. To prevent air leakage, all drywall-to-top plate seams and joints were sealed with three inches of closed-cell spray foam. Crews carefully sealed around wiring, lighting fixtures, and bath exhaust fan ducts, etc., before installing 16 inches of R-50 blown cellulose. For the garage attic, R-20 blown cellulose was installed.

The hip-designed truss roof was sheathed with 7/16-inch OSB that was fastened with steel plywood clips. A 50-millimeter-thick ice-and-water shield was installed at all valleys and from the eaves up 36 inches past the wall line then 1.5-inch aluminum drip edge was installed before laying the synthetic water-resistant underlayment, which was topped with 30-year architectural shingles. Soffit vents and a 4-inch continuous ridge vent ventilate the attic.



The walls and foundation of this home are constructed using insulated concrete forms. The ICFs provide a mold-resistant, pest-resistant, storm-resistant and highly insulated shell for the basement and first-floor walls. House wrap protects the framed garage walls and gables. The exceptional air sealing and insulation levels provided by the ICFs helped the home achieve a low Home Energy Rating System (HERS) score of just 44.

A gas tankless boiler with an efficiency rating of 95 AFUE provides both domestic hot water and space heating. The space heating is provided via radiant floor loops beneath the subfloor in the basement and via a coil in the central air handler for the rest of the home. The specially designed indoor fan-coil unit is matched to an outdoor condensing unit for a SEER 16.3 heat pump so the air handler can provide heat from the boiler or cooling from the heat pump. This conditioned air is distributed throughout the home via a system of small-diameter ducts that discharge higher velocity jets of air into each room through multiple small, round supply vents. The main duct, or plenum, is one-fourth the size of a conventional duct and the branch ducts use flexible ducting with an inside diameter of only 2 or 2.5 inches so they easily fit within interior walls and floor joists, allowing more options for keeping the ducts within the conditioned envelope of the home. The branch ducts are factory-insulated and have gasket connections to minimize air and thermal losses. The system provides quiet operation and thorough mixing of air in the rooms for even temperatures.

The builder chose to install triple-pane windows that are argon filled and vinyl framed, with a U factor of 0.17 (R-5.9) and a solar heat gain coefficient of 0.21. These windows are easy-to-operate double-hung styles where both sashes in the frame are able to move up and down helping to facilitate cross ventilation of the home. A cove-molded sash replicates the look of classic wood windows. The engineered, sloped sills form a negative pressure pocket that keeps sashes securely in place and water flowing away from the home, even during the most adverse weather conditions.

In addition to the double-hung exterior windows, transom windows were installed above interior doorways on the main floor and in the basement to bring daylight into the interior of the home, reducing the need for artificial lighting during the day. When lighting is needed, all of the fixtures in the home used LED light sources.

This winning home, with its standard features, achieved a HERS index of 44, which is far better than the typical HERS score of 80 to 100 for new homes built to code across the country. Calculated energy cost savings for this home are \$1,875 a year. And, if homeowners wish to save more money, a smart thermostat includes mobile-phone-accessed budget control features that maximize system efficiency and real-time energy tracking. Also, as a requirement for the DOE Zero Ready Home certification, roof trusses were engineered to support future PV panels and electrical conduit for solar power was run from the attic to the electrical panel.

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program - 100% Commitment

ENERGY STAR Certified Homes Version 3.1

EPA Indoor airPLUS

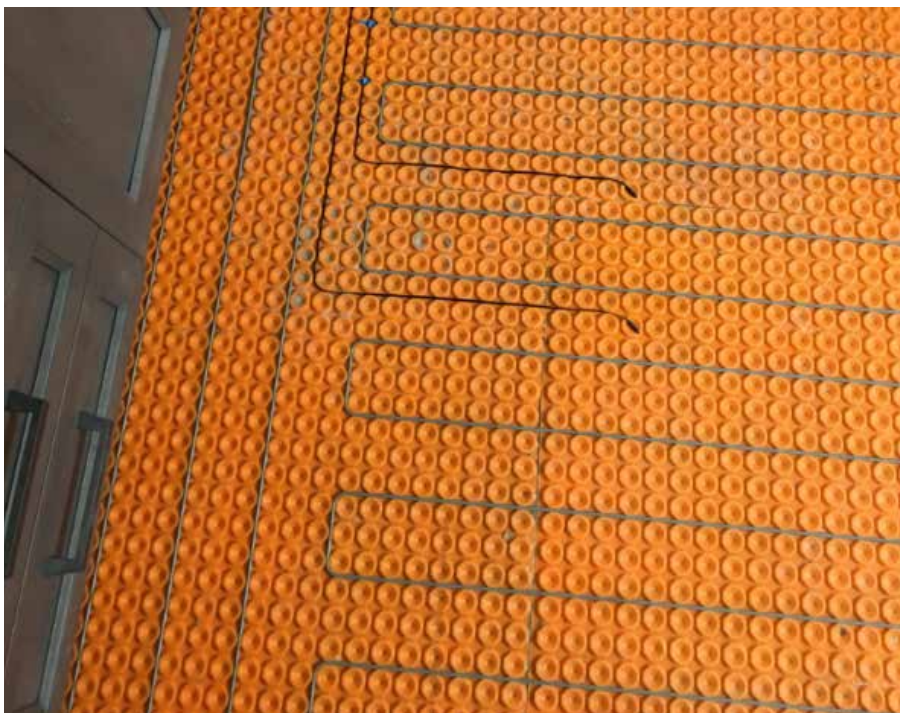
EPA WaterSense

DOE Zero Energy Ready Home Quality Management Guidelines

"The home is quiet, comfortable and dust-free. The utilities are low... Our yearly gas budget was just adjusted again. Down. \$35/month. Wow" *Homeowner*



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.



Radiant floor heating in the basement supplements the heating supplied by the high-velocity, small-diameter ducting system. A combination boiler provides hot water for space heating and domestic use.

Indoor air quality is a signature feature for Charis Homes. In 2019, Charis earned its second Leader Award from the U.S. Environmental Protection Agency's Indoor airPLUS program (whose specifications are required to be met to earn a DOE ZERH certification). The builder incorporates several features in the home to support clean indoor air, including installation of an energy recovery ventilator (ERV) that brings filtered fresh air into the home and exhausts stale air while efficiently recovering heating and cooling energy. Other features include drywall that absorbs formaldehyde and volatile organic compounds (VOCs), duct work that is self-cleaning and does not allow condensation to build up within the tubing, zero-VOC paint, formaldehyde-free hardwood and plywood, and water-based wood finishes.

Charis Homes uses its DOE ZERH home designation to both market and educate. "We have been able to use DOE's ZERH as an educational tool to educate customers in our learning center as to why building a DOE ZERH home is worth the additional investment. We visually have a money display showing customers the amount of money a ZERH home saves over the course of a 30-year mortgage," said Emily Meadows, marketing director at Charis Homes. "Showing them the data helps to prove the investment is worth it. But our biggest reward is comments from homeowners about how comfortable their home is and how low their utility bills are."

Photos courtesy of Charis Homes

KEY FEATURES

- **Walls:** ICF, 11" R-22 total: 2.5" EPS, 6" steel-reinforced concrete, 2.5" EPS, ½" drywall.
- **Roof:** Hip roof; engineered 24" o.c., 7/16" OSB sheathing, synthetic felt rain-and-ice guard in valleys and eaves, 4" ridge vent, 30-year shingles, 1.5" aluminum drip edge, 1-ft overhangs.
- **Attic:** Vented attic; 16" R-50 blown cellulose, 3" R-20 closed-cell spray foam on top plates; R-20 blown cellulose in garage attic.
- **Foundation:** Insulated basement, R-20 total: 11" ICFs, waterproof membrane, concrete footers with integral interior and exterior drainage system.
- **Windows:** Triple-pane, argon-filled, vinyl double-hung frames, U=0.17, SHGC=0.21.
- **Air Sealing:** 1.41 ACH 50.
- **Ventilation:** ERV, MERV 11 filter.
- **HVAC:** Combined heat and hot water with .95 EF gas tankless boiler, hydrocoil and small-diameter high-velocity ducts, radiant floor heat in basement; 16.3 SEER heat pump AC.
- **Hot Water:** Combi boiler, 0.95 EF; central manifold with PEX; smart recirc. pump.
- **Lighting:** 100% LED, motion sensors, transom windows, daylighting.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, microwave drawer.
- **Solar:** Solar ready.
- **Water Conservation:** EPA WaterSense fixtures.
- **Energy Management System:** Wi-Fi-enabled smart thermostat.
- **Other:** Electric vehicle charging; zero clearance shower and thresholds; no-VOC paints, low-VOC sealants and glues; formaldehyde-free hardwood, plywood, adhesives.

"The home is quiet, comfortable and dust-free. The utilities are low." *Homeowner*