

# Amaris Homes

Oakgreen Model  
Afton, MN



## BUILDER PROFILE

### Amaris Homes

Woodbury, Minnesota  
minnesotagreenhomebuilder.com  
Raymond Pruban, 651-426-0584  
rpruban@amariscustomhomes.com

## FEATURED HOME/DEVELOPMENT:

### Project Data:

- Name: Oakgreen Model
- Location: Afton, MN
- Layout: 4 bdrm, 3.5 bath, 1 fl + bsmt, 3,357 ft<sup>2</sup>
- Climate: IECC 6A, cold
- Completed: September 2019
- Category: Custom Spec

### Modeled Performance Data:

- HERS Index: without PV 34; with PV -2
- Annual Energy Costs: without PV \$1,400; with PV \$50
- Annual Energy Cost Savings: (vs typical new homes) without PV \$2,000; with PV \$4,700
- Annual Energy Savings: without PV 10,700 kWh, 800 Therms; with PV 24,800 kWh, 800 Therms
- Savings in the First 30 Years: without PV \$92,600; with PV \$218,900

Located on a high open bluff surrounded by corn fields, this Afton, Minnesota, home gets buffeted by winds nearly every day all year long. But no matter how strong the prairie winds blow, they are no match for the 11-inch-thick insulated concrete form walls wrapping this daylight basement farm house. The home was constructed to the high performance requirements of the U.S. Department of Energy's Zero Energy Ready Home program, by custom home builder Ray Pruban of Amaris Homes. The energy performance and other features of the 3,357-square-foot home impressed the judges enough to give the home a grand award in the custom home category of DOE's Housing Innovation Awards competition for 2020.

The home was certified through DOE's Zero Energy Ready Home program, which also requires homes to be certified to ENERGY STAR Version 3.0, the U.S. Environmental Protection Agency's Indoor airPLUS, and the hot water distribution requirements of EPA's WaterSense program, and meet above-code insulation levels. Appliances, windows, and lights should be ENERGY STAR rated and HVAC ducts must be in conditioned space. The homes must also have solar electric panels installed or have the conduit and electrical panel space in place for the future installation of solar panels. Every home is then performance tested by a third-party home energy rater to verify that the requirements have been met.

Although the program doesn't require the solar panels to be installed, Amaris Homes included 11.34 kilowatts of solar panels on the roof, giving the Prubans an estimated energy savings of \$4,700/year compared to a home built to the state code (the 2012 IECC) and achieving an impressive Home Energy Rating System (HERS) score of -2. The Prubans should make as much energy as they use over the course of the year, despite the cold northern location. Even without the PV, the home would score a HERS 34, far below the 80 to 100 HERS score of typical new homes.

Located on a high open bluff surrounded by corn fields, the home gets buffeted by winds nearly every day all year long. To protect the home and its occupants from



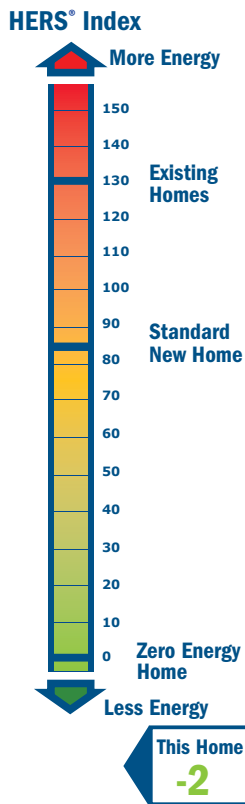
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0/3.1/3.2 for an energy-efficient home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

Amaris Homes built this 3,357-ft<sup>2</sup> single-story home in Afton, Minnesota, to the high performance requirements of the U.S. Department of Energy's Zero Energy Ready Home program. The builder has made a commitment to certify all of his homes to the requirements of the DOE program. A high efficiency 98 AFUE gas furnace, 5-stage 19 SEER heat pump, LED lighting, ENERGY STAR appliances, smart thermostats and lighting, and automated window blinds add to energy savings.



### 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.



the heat-robbing effects of the strong winds, Amaris Homes constructed the home's walls of 11-inch-thick insulated concrete form (ICF) blocks that provide solid 6-inch concrete walls covered inside and out with 2.5-inch layers of rigid foam. A 2-inch R-10 layer of rigid foam blankets the ground under the floor slab as well.

The above-grade walls of the basic ranch-plus-daylight basement are covered with house wrap and clad with engineered wood lap siding. The interior walls are framed with laminated-strand lumber (LSL) 2x4s, an engineered stud that is straight and smooth for level walls and fewer future nail pops and drywall cracks.

The attic is vented. The attic floor is covered with an air-sealing layer of two inches (R-14) of closed-cell spray foam that effectively air seals around every wire and pipe that pokes through the ceiling. It also effectively seals the notoriously leaky top plates over all of the exterior walls and covers up the 15.25-inch raised heel energy trusses, a truss design that allows more insulation over the eaves. The heels are backed by baffles, ventilating air chutes that extend several inches up the underside of each truss bay to provide a clear insulation-free path from the eaves to the continuous ridge vent. The spray foam is topped with R-46 of blown fiberglass for an R-60 total. Outside, the roof is covered with 1/2-inch OSB sheathing that is protected with ice-and-water shield 36 inches past the wall line, then topped with 15# roofing felt and covered with architectural asphalt shingles. Two-foot overhangs at the eaves and one-foot overhangs at the gable ends provide shade, rain, and snow protection for the walls and windows.

Fiberglass-framed windows were selected in part due to their rigid frame construction, which allowed for larger fixed glass in the great room and entertainment rooms to meet buyer expectations, since the home may also serve as a model home. The double-pane windows have two low-emissivity coatings that help minimize heat transfer and the windows have an insulation U factor of 0.23. Low-expanding foam at the window-to-frame connection as well as at the window jamb-to-framing connection helps to ensure an airtight seal at the windows.

The home is oriented to take advantage of south- and west-facing exposures in terms of orientation on the lot and window locations for maximum solar gain in this cold climate. There are only two windows on the north side. To control heat gain in the summer, all of the west- and south-facing windows in the great room have automated blinds.

The home is equipped with a 98% efficient natural gas furnace. A high-efficiency 19-SEER five-stage central heat pump supplements the home's heating and provides summer cooling and humidity control. All of the rigid metal ducts are located within the conditioned space of the home and the main and lower levels are zoned.



Rigid EPS foam board hugs both sides of the reinforced concrete that form the basement and above-grade walls providing a continuous blanket of insulation for this draft-free, disaster-resistant home. A dimpled plastic waterproofing board protects the basement walls from water intrusion and frost heave in the winter.

Blower door testing, which is required in the DOE Zero Energy Ready Home program, showed that the house had a whole house air leakage rate of 0.64 air changes per hour at 50 Pascals (ACH 50), making this the tightest home Pruban has built to date. To bring fresh air into the home, Pruban installed an energy recovery ventilator (ERV). The ERV brings in fresh air through an outside air intake while exhausting stale air that is pulled from returns throughout the house. The air ducts cross in a heat exchanger where heat and humidity are transferred from the warmer duct to the cooler duct, warming the incoming air in winter and cooling the incoming air in summer. The incoming air is also cleaned by passing through a high-filtration MERV 16 filter capable of removing particles as small as pollen, mold, dust, auto fumes, bacteria, and smoke. The bathrooms have local ventilation with ENERGY STAR-rated timer-controlled exhaust fans.

A 50-gallon gas water heater with an 0.88 efficiency factor provides domestic hot water and in-floor heating for the basement slab. The plumbing fixtures are all low-flow fixtures that are EPA WaterSense labeled. The main plumbing loop is ¾-inch PEX and all of the branch lines are ½-inch PEX. A recirculation pump speeds hot water to distant fixtures for shorter wait times.

ENERGY STAR appliances and 100% LED lighting add to the energy savings. Key lighting areas such as the exterior, great room, entertainment room, office, and master bedroom have smart wi-fi lighting and are smart phone controllable. The builder chose low-profile LED ceiling lights so that no recessed cans had to be installed in the ceiling.

While these energy-saving features are a financial plus for any home owner, residents will find many other benefits thanks to the DOE Zero Energy Ready Home requirements and Amaris' thoughtful design. The home meets all of the clean air and moisture management requirements of the EPA's Indoor airPLUS program (a DOE ZERH requirement); this equates to lower indoor humidity, better filtration and ventilation, and fewer contaminants in the home. Amaris specifies low-VOC paints, stains, and adhesives to help keep contaminants out of the house. A motion-sensor-controlled exhaust fan was installed in the garage to remove pollutants. An air quality sensor was installed to monitor indoor air quality. Pruban also added several aging-in-place features, like wider doors and hallways, lever-style door handles, a zero-barrier shower in the master, and below-counter drawers and microwaves for easy wheelchair access.

The home uses water-saving EPA WaterSense-rated irrigation and drought-resistant landscaping. To handle periods of heavy rain, the yard was landscaped with a 1,650-square-foot rain garden in the front yard south of the driveway that was designed, guttered, and graded to accept 100% of the garage roof rain water and 50%

## HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program - 100% Commitment

ENERGY STAR Certified Homes Version 3.1

EPA WaterSense

EPA Indoor airPLUS

Minnesota Green Path



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 highly insulated envelope and 11 kW of solar panels help this modern farmhouse achieve annual electricity bills of just \$50 a year.

mortgage, but that added cost is more than offset by the \$150 a month in estimated utility bill savings. This earns the homeowners \$84 in net savings each month.

In 2013 Pruban committed to constructing all of his homes to the standards of the DOE Zero Energy Ready Home program. According to Pruban, using green building programs such as DOE Zero Energy Ready Homes has attracted higher quality sub-contractors, who “tend to care more, are proud to be on our jobs, and even bring their families out to see what they are doing. This improvement in our team has allowed Amaris to take on higher dollar value projects with confidence. Our average sale price of a new home has increased approximately 50% over the last five years and has increased our business revenue by the same percentage,” said Pruban.

“Good execution starts with a good plan and we have learned over time that mistakes are most often made when the scope of work is not fully understood,” said Pruban. Our contract documents are extensive so that each sub-contractor knows what is expected, including but not limited to, the existing conditions survey, a site plan, landscaping plans (if applicable), an erosion control plan, an exterior hardscape plan, a septic design (if applicable), construction plans, truss plans, electrical plans, cabinet and countertop plans, specifications addressing each specialty...” said Pruban.

“Each project has two mandatory preconstruction meetings. The first meeting is from dig to drywall and the second is from drywall to finish. The project is reviewed in detail over 2 to 3 hours and key points and concerns are discussed by all present. Sub-contractors point out problem areas and those areas are documented by the design/drafts person who updates the final plans with any changes before the laminated set goes to the field,” said Pruban.

“Prior to delivery of the home, we do a walk-through with the builder and project manager to punch out the home. Any problem areas discovered are addressed and treated with the same process. We do a one-year walk-through as well and if anything is discovered that was not already found, again the same process is used. In summary, we have a closed-loop quality process. In addition to all of the above, every home receives third-party quality assurance verifications and performance testing,” as required by the DOE Zero Energy Ready Home program,” said Pruban.

of the house roof rain water plus any runoff from the driveway approach, landing, and turn-around.

The builder estimated that their added cost to meet the DOE Zero Energy Ready Home standards, compared to just building to the state energy code, was only \$17,600, including the cost of the 11.34-kW PV system (after incentives). When these costs are spread out over a 30-year mortgage, they add \$66 to the monthly

## KEY FEATURES

- **Walls:** ICF, R-24 total: 11.25" ICFs, house wrap, engineered wood lap siding.
- **Roof:** Truss gable roof, ½" OSB sheathing, ice & water shield, 15# felt, asphalt shingles, ridge vent, baffles every bay, 2-ft overhangs.
- **Attic:** Vented attic, R-60 total: 2" R-14 closed-cell spray-foam on attic floor and up 15.25" raised heels, 15" R-46 blown fiberglass.
- **Foundation:** Insulated basement, R-33 total: 13.25" R-23 ICF, water-proofing membrane, plastic dimple board, covered by synthetic stucco below and above grade, 2" R-10 under-slab rigid foam.
- **Windows:** Double-pane, argon-filled, low-e2, fiberglass casement frames, U=0.23, SHGC=0.25. Automated blinds on west and south windows.
- **Air Sealing:** 0.64 ACH 50; sill plates sealed with acoustic sealant, top plates spray foamed.
- **Ventilation:** ERV, MERV 16 furnace filter, timered bath fans, garage exhaust fan.
- **HVAC:** Gas furnace, 98 AFUE; radiant floor heat in basement, 19 SEER 5-stage heat pump.
- **Hot Water:** Gas tank, 0.88 EF, 50-gal. PEX piping; recirculation pump.
- **Lighting:** 100% LED, low-profile ceiling fixtures (not can), smart phone controllable.
- **Appliances:** ENERGY STAR smart refrigerator, dishwasher, and clothes washer.
- **Solar:** 11.34-kW PV, 36 panels, solar edge optimizers.
- **Water Conservation:** EPA WaterSense certified. Drought-resistant landscaping.
- **Energy Management System:** Smart thermostats, automated blinds, smart lighting, some smart outlets, smart irrigation system, PV tracking, smart refrigerator. All wi-fi controlled.
- **Other:** Electric vehicle charging station. Air quality sensor. Accessibility features.

*Photos courtesy of Amaris Homes*