

Amaris Homes

Dominica Way
Apple Valley, MN



BUILDER PROFILE

Amaris Homes, Maplewood, MN
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FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: Dominica Way
- Location: Apple Valley, MN
- Layout: 4 bdrm, 4 bath, 2 fl + bsmt, 3,716 ft²
- Climate: IECC 6A, cold
- Completion: June 2015
- Category: custom for buyer

Modeled Performance Data:

- HERS Index: without PV 46, with PV 13
- Projected Annual Energy Costs: without PV \$2,163, with PV \$736
- Projected Annual Energy Cost Savings: (vs home built to 2006 IECC): without PV \$1,270, with PV \$1,891
- Projected Annual Energy Savings: without PV 9,910 kWh, 407 therms, with PV 30,572 kWh, 570 therms
- Added Construction Cost: without PV 5%, with PV \$29,295

When you think of home building in the “land of 10,000 lakes,” water conservation may not be the first thing that comes to mind, but for the home buyers of this award-winning custom home, who were recent transplants from drought-stricken California, water conservation was near the top of the list of must-haves, along with energy efficiency.

The home buyers were delighted to find Amaris Homes, a fore-runner in energy-efficient construction in the Minneapolis-St. Paul area. Amaris Homes, operated by home builder Raymond Pruban, has built ten homes certified to the U.S. Department of Energy’s Zero Energy Ready Home criteria including Housing Innovation Award winning homes in 2015 and 2016. Amaris also built the first DOE Home in Minnesota, the most efficient home ever sold in the local Multiple Listing Service with a Home Energy Rating System (HERS) score of 3.

All DOE Zero Energy Ready homes must be certified to ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency’s Indoor airPLUS program. Each home meets 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 have the conduit and electrical panel space in place for future installation of solar panels. The 2016 home in Apple Valley, Minnesota, met these criteria, as well as all of the stringent water-saving requirements of the EPA’s WaterSense. The home was also certified for LEED for Homes at the platinum level.

The high-performance home started with a highly efficient shell. The poured concrete walls of the full, finished basement were wrapped in R-10 of rigid foam insulation, with R-10 under the entire basement slab as well. The interior of the foundation walls was covered with 2 inches of closed-cell spray foam, providing a total wall insulation value of R-23.



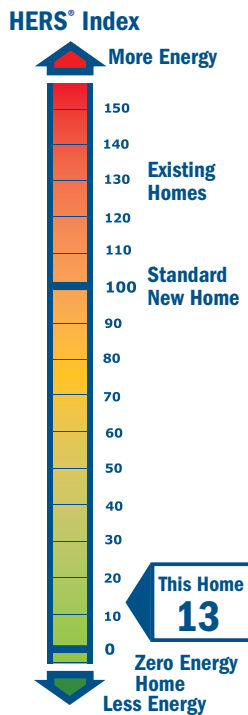
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE’s Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0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

Amaris Homes built this 3,716-ft² home in Apple Valley, Minnesota, to the performance criteria of the DOE Zero Energy Ready Home (ZERH) program. The home is equipped with a high-efficiency ENERGY STAR-rated refrigerator, dishwasher, and exhaust fans. All of the home's lighting needs are met by LED fixtures.



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.



The 2x6 above-grade walls were constructed using advanced framing techniques such as spacing the studs at 24 inches on center and aligning them with 24-inch on-center floor and roof trusses. OSB sheathing was installed over the foam for a positive nailing surface for windows and cladding. Non-load-bearing headers above doors and windows were constructed as single ply, i.e., the header space was filled with one piece of dimensional lumber rather than two or three, leaving space for closed-cell spray foam. The wall cavities were filled with R-19.5 of high-density spray foam and wrapped with a continuous layer of R-5.5 rigid foam, providing a total wall insulation value of R-25. The rigid foam was covered with OSB sheathing and house wrap that was taped at the seams to provide a drainage plane as well as a weather-resistant barrier behind the engineered wood siding and rock veneer on the one-story home.

The vented attic was first air sealed along the ceiling deck with 2 inches of closed-cell spray foam. This was topped with blown cellulose to increase the insulation value to at least R-60. The roof was constructed with raised heel energy trusses to allow room for the full depth of attic insulation all the way to the eaves. The vaulted ceiling areas were insulated to R-49 with closed-cell spray foam which covered the bottom chord of the trusses while full-length air chutes or baffles maintained a ventilation path in each truss bay from the soffit vents to the continuous ridge vent.

The roof decking was covered with ice and water shield from the eaves to 36 inches above the vertical wall line as well as at any higher concern areas of the roof. The rest of the roof deck was covered with 15-lb asphalt-impregnated felt underlayment. All valleys were flashed with metal. Metal roof edging was installed at all exposed roof decking. Step flashing and kick-out flashing were installed at any house-wall intersections. The 3-foot overhangs at the eaves provide shade and rain and snow protection for the walls and the windows, which are double paned and vinyl framed with low-emissivity coatings and an argon fill between the panes to reduce heat loss.

Extensive use of spray foam helped to create a very tight house. Blower door testing, which is required in the DOE Zero Energy Ready Home program, confirmed this showing that the house had a whole house air leakage rate of only 0.66 air changes per hour at 50 Pascals (ACH 50). That is nearly as tight as the 0.60 ACH 50 required in the Passive House Institute U.S. standard.



The poured-concrete basement walls are wrapped in a continuous layer of R-10 rigid foam. More R-10 rigid foam separates the slab from the footings and gravel beneath the slab.

To bring fresh air into the tight home, Amaris Homes installed a heat recovery ventilator (HRV). The 80-cfm, 76-Watt HRV brings in fresh air through an outside air intake that is ducted to the return side of the air handler of the furnace so fresh air is distributed to all rooms of the house. At the same time, the HRV exhausts stale air that is pulled from cold air returns in the house. The air ducts cross in a heat exchanger where heat is transferred from the warmer duct to the cooler duct, warming the incoming air in winter and cooling the incoming air in summer. ENERGY STAR rated exhaust fans are motion sensor controlled to provide spot exhaust in the bathrooms. Low-VOC paints, stains, and adhesives also help to keep contaminants out of the house.

The home is equipped with a highly efficient natural gas furnace with an annual fuel utilization efficiency (AFUE) of 98%. Cooling is provided by an air-source heat pump with a variable speed DC motor. The heat pump has a cooling efficiency (seasonal energy efficiency ratio [SEER]) of 16.5 and a heating efficiency (heating season performance factor [HSPF]) of 9.0. All HVAC ductwork is rigid metal ducting that is sealed with mastic at all seams and joints and located within the insulated, conditioned space of the home.

With all of these energy-saving features the 3,716-ft² home is estimated to save its home owners about \$1,270 per year compared to a similar sized home built to code. Energy analysis of the home shows it achieves a HERS of 46, far below the 80 to 100 HERS score of typical new homes. Amaris installed a 12.2-kW solar photovoltaic system on the roof. When the solar is included in the analysis, the HERS score drops to a low HERS 13, annual energy cost savings increase to \$1,891, and energy bills drop to \$61 per month. The home is equipped with a web-based PV monitoring system. Two electric car charging stations in the garage are separately metered and are participating in an off-peak charging program.

About that water conservation, one would expect low-flow plumbing fixtures in a high-performance home, and they are. All of the home's bathroom plumbing fixtures are EPA WaterSense compliant; in fact, the whole house is EPA WaterSense compliant. But the builder and home owners went well beyond that. They installed an extensive rain water management system with a 2,000-gallon cistern. "My customers are from Berkley, California, where there is a water crisis happening. They couldn't believe how Minnesotans waste water," said Pruban. With the cistern, they are able to capture 76% of the roof run-off from a 1-inch rain fall. The other 24% is dispersed high up on the hill behind the house where, under normal circumstances, it would saturate into the ground before reaching the

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

LEED for Homes, platinum

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.



Spray foam provides air sealing plus insulation values of R-19.5 in the walls and R-47 in the roof.

street and the storm sewers. The landscape plan includes a rock garden that serves as an emergency overflow for larger rain events. The water in the cistern is used for irrigation. Once the xeriscaped landscaping is established, it will water a vegetable garden. During seasons when irrigation isn't needed, Pruban said an ultraviolet purifier could be added and the water could be used for direct runs to the laundry, toilets, and an outside tap for car washing. Pruban added "since there was no specific plumbing code at the time in Minnesota, we had a series of meetings with the plumbing inspector who was concerned about contamination of the domestic water supply (since it was hooked up as a back-up for irrigation). Several extra steps were taken, including installing triple back-flow preventers to appease the inspector. Minnesota updated the code in 2016 and this project was a case study example."

Water conservation, photovoltaics, and a commitment to energy efficiency are among the things that have set Amaris Homes apart from other builders. Amaris has committed to building all of its homes to the DOE Zero Energy Ready Home program requirements and is often the first builder in a community to build high-performance homes, which has made Amaris the focus of several local news stories. "In the most recent two Parade of Homes, we averaged over 1,000 people coming to our model home, some traveling as far as 150 miles," said Pruban. "The early adopters find us, we are really the only game in town." That has put Amaris in the enviable position of not having to advertise. "We don't sell, we educate our clients on how our approach to home construction is different," said Pruban.

Pruban also spends considerable effort helping to educate lenders. "We developed a "Lenders Package" that maximizes the opportunity for an appraisal that recognizes the value of our homes. This package includes the following: a New Home Energy-Efficient Mortgage Report, the DOE ZERH certification, a copy of the ANSI/RESNET 301-2014 Standard, copies of slides from the Appraisal Institute demonstrating how to appraise an ENERGY STAR qualified home, a Letter to the Lender noting appraisal considerations, net present value calculations for PV, and a completed Appraisal Institute Residential Green and Energy-Efficient Addendum for the appraiser's reference."

Amaris Homes also has a unique approach with their financial data. "Our project books are completely open to the client, including all takeoffs, estimates, invoices, overhead costs, and profit line items. This total transparency removes any question or doubt about costs, or the status of the project," said Pruban. "Most clients come to Amaris Custom Homes as a result of referrals or through online research; therefore, we pay no realtor commissions and are able to invest that money in their new home."

Photos courtesy of Amaris Homes

KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** 2x6 24" o.c. aligned with floor & roof trusses, R-19.5 cc spray foam in cavities plus R-5.5 foam sheathing for R-25 total; house wrap, engineered wood siding.
- **Roof:** Ice and water shield 36" past wall line; metal valley, edge, and step flashing; kick out flashing; 3' overhangs at eaves; continuous ridge vent; vents and baffles in each truss bay; architectural asphalt shingles.
- **Attic:** Vented, 2" closed-cell foam on ceiling deck plus blown cellulose to R-60. R-49 cc spray foam in vaulted ceilings.
- **Foundation:** Basement of poured concrete, R-10 rigid exterior foam, R-10 rigid under slab; 2" closed-cell spray foam on interior separates framing from concrete.
- **Windows:** 2-pane, low-e, argon-filled, vinyl-framed, U=0.26; SHGC=0.18.
- **Air Sealing:** 0.66 ACH 50.
- **Ventilation:** HRV, motion-controlled exhaust fans. MERV 16 filter.
- **HVAC:** 98% AFUE gas furnace, air-source heat pump with variable-speed DC motor, 9.0 HSPF, 16.5 SEER. All HVAC ductwork is rigid metal, mastic-sealed, in thermal enclosure.
- **Hot Water:** 50-gallon, 96%-efficient, 100,000-Btu, electric water heater.
- **Lighting:** 100% LED.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, and three exhaust fans.
- **Solar:** 12.2-kW PV.
- **Water Conservation:** EPA WaterSense bathroom faucets, toilets, shower heads.
- **Energy Management System:** Web-based PV monitoring, programmable thermostat.
- **Other:** Two electric car charging stations in garage. Low-VOC paints, coatings, primers, glues.