

11500 Grey Oaks Estates Run

Bain-Waring Builders
Glen Allen, VA

CASE
STUDY



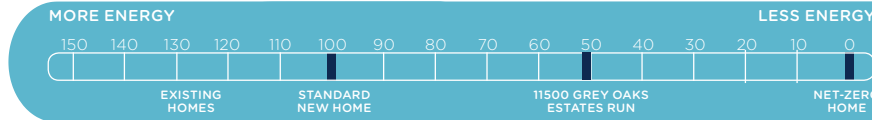
On June 15th, 2017, Viridiant, along with the Home Builders Association of Richmond's EarthCraft Builders Council, hosted a site-visit at an EarthCraft-certified, Bain-Waring home. Attendees experienced first-hand some of the impressive features of an EarthCraft home including mechanical ventilation, diagnostic testing, and energy monitoring.

ABOUT THE HOUSE

11500 Grey Oaks Estates Run, a new construction, EarthCraft-certified, single-family home in Glen Allen, VA, has an impressive HERS index of 52, indicating that it's 48% more efficient than a house built to code.

A number of efficiency improvements contributed to

this low HERS index. The crawlspace was conditioned and the 1st floor air handler is located there, keeping it in conditioned space. Instead of using oriented strand board (OSB) for sheathing, R-3 structurally insulated sheathing (SIS) was used in its place. Using this minimizes thermal bridging and improves the R-value of the wall assembly, making it a smart improvement over OSB. The properties of SIS also mean that house-wrap is not required, saving the builder a step while still providing a moisture barrier. Since SIS has its seams taped, it contributes to a tighter building envelope. This house tested in at a notable 2.5 ACH50. With a tight envelope, proper ventilation and safe combustion practices are essential. Supply side ventilation is provided. The furnace and tankless water heater are high efficiency condensing ones, greatly reducing the chances of any combustion byproducts affecting the occupants. A tight envelope also contributes to occupant comfort, as do the well-designed and well-sealed duct systems. Overall duct leakage in the house was less than 3% to the outside of the home and less than 6% total.



HOUSE SNAPSHOT

- 4,525 square feet
- 6 bedrooms, 5 bathrooms
- EarthCraft Certified, 174 points
- HERS Index: 52
- Central Fan Integrated System (CFIS) consisting of an AprilAire mechanical damper and controller programmed to provide fresh air ventilation
- Conditioned crawl space
- R-3 structurally insulated sheathing (SIS)
- High efficiency furnace
- Tankless water heater
- 2.5 ACH50
- <6% total duct leakage
- Sense Energy Monitoring system installed

PROJECT TEAM

- Builder: Bain-Waring Builders
- Technical Advisor: Bob Congdon
- Certified by: Viridiant

"Having this level of performance means we can talk to our clients about things that other builders can't. Our house-as-a-system approach means I can tell them their new home will be cleaner, quieter, healthier, and more comfortable than any code built home using the minimum standards."

MARK WARING, BAIN-WARING BUILDERS



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MECHANICAL VENTILATION

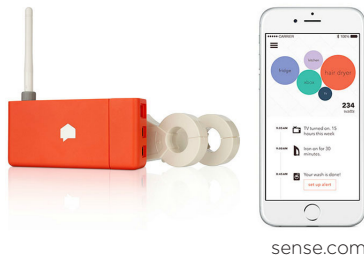
Fresh air is provided in energy efficient homes to promote healthy indoor environments with superior indoor air quality compared to standard housing. Ventilation systems consist of a fresh air system to provide odor control to occupants and dilute stale air, as well as intermittent, spot exhaust systems (e.g. bath fans and ducted kitchen range hoods) to remove point-source pollutants from the indoor environment. It is critical to occupant health and building durability to optimize the ventilation systems based on human factors and climate.

Ventilation is provided to Bain-Waring's home according to ASHRAE Standard 62.2 Ventilation for Acceptable Indoor Air Quality. The fresh air system is a Central Fan Integrated System (CFIS) consisting of an AprilAire mechanical damper and controller programmed to provide fresh air ventilation through the heating and cooling system based on the size of the home and the number of occupants. While there are several companies that manufacture the CFIS technology, Bain-Waring utilizes the AprilAire system due to its high/low temperature and high humidity lock out feature. This feature prevents fresh air from being brought in and distributed throughout the home when the outdoor conditions risk comfort and/or durability issues within the home.

ENERGY MONITORING

A Sense energy monitor was installed in this home, allowing real-time energy usage to be seen. The device installs in the electrical panel box and has an app to see energy use as it happens, as well as historical data. When lights turn on and off, or when the central air turns on, the app will

show the change in usage and quantify it. One of the selling points of the Sense is its ability to start to detect which devices in your home are using energy. When first installed, a grey circle shows on one of the app screens, simply labeled "unknown." As the Sense gets more data, usually after a week, additional circles will appear. For example, you may see one named "dishwasher" and one named "television." The size of the circles is based on the amount of energy the device uses. Over time, you'll have a visual representation of what is using energy in your home and how much. Armed with this information, it's possible to find devices that may be using more energy than they should, or devices that are on when they shouldn't be. If you have solar panels, this data can also help you see if it's worthwhile to shift some energy usage to daylight hours, when the solar panels are producing energy. It may also help shape your energy using behaviors.



sense.com

BLOWER DOOR AND DUCT BLASTER TESTING

Viridiant and Bain-Waring Builders have both been long-time believers in the importance of diagnostic testing homes. The car you drive, the cell phone in your hand, and the computer on which you are reading this - all are thoroughly diagnostically tested before hitting the market. Shouldn't your home be as well? Even though blower doors and duct blasters have been around for decades, the momentum toward diagnostic testing has picked up significantly in the last 10 - 15 years. All projects pursuing EarthCraft certification must be tested for overall envelope leakage, total duct leakage, and duct leakage outside the envelope. On average, existing homes in the U.S. show +/- 20% total duct leakage. That means air that you are paying to heat and cool is simultaneously being pushed outside of your home through holes in ductwork and subsequently holes in the building envelope. 2012 IECC Building Code, as enforced in Virginia, requires new homes reach 5 ACH50. This home by Bain-Waring tested even lower than code requirements at 2.5 ACH50.

By pressurizing or depressurizing ductwork and building enclosures, we are able to put a tangible number on the overall efficacy of the envelope at keeping the outside out and the inside in. This information can help homeowners, builders, and weatherization contractors make educated decisions about air sealing strategies and HVAC equipment sizing. Testing also provides a higher level of quality assurance for builders looking to build the highest quality product on the market and ensures their strategies for doing so are effective.



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