

Certificate No. H-027883



Certification Date: Feb. 15, 2024

# High-Performing Home

6606 Charnwood St, Crozet, VA 22932

**Gold**

This home's high-performing asset specifications can be found in the Pearl Certification Report and Appraisal Institute's *Residential Green and Energy Efficient Addendum* that accompany this certificate.

A handwritten signature in black ink that reads "W Casey Murphy".

W. Casey Murphy  
Pearl VP of Quality Management



Third Party Certification: See  
Certification Report for details

# Pearl Certification Engagement Guide

Congratulations on having your home's high-performing features certified! This Certification Package includes the documentation necessary to capture the value of those investments. To find out how you, your agent, and your appraiser can leverage Pearl's Certification Package, follow the guide below.



## HOMEOWNERS

This Certification Report captures high-performing features known to Pearl to provide an accurate record for future appraisal. If your home has additional features not captured in this report (e.g., ENERGY STAR appliances), please visit your Green Door account to update your home and request an updated Certification Package.

Important: scan or click the QR code to learn the correct process for using your Certification Package when selling or refinancing your home.



## REAL ESTATE PROS

Pearl Certification is a game changer for home value as it helps to maximize a home's marketability in order to get top dollar at the time of sale.

Ask your real estate agent to scan or click the QR code so they can use your customized marketing resources when listing your high-performing home. Studies show that homes marketed correctly with Pearl sell faster and for more money.



## CONTRACTORS

Pearl contractors represent the top firms nationwide.

They are vetted by Pearl for quality service and trained on how to properly document a home's high-performing features to increase its market value. For more information on the qualifications of your Pearl Contractor, scan or click the QR code.



## APPRAISERS

This Pearl Certification Package provides the investment grade documentation necessary to accurately value the high-performing features of this home.

Ask your appraiser to scan or click the QR code, so they can accurately take your home's features into consideration when forming their opinion of value. This information will be included in the Form 1004 Improvements section in the Additional Features field.

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Crozet, VA 22932

Gold Home  
Certificate No. H-027883



# Pearl Home Certification Report





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Certified on February 15, 2024  
Pearl Gold Certificate | Pearl Score: 875

## What You Need to Know

This home has many high-performing features, including its heat pump water heater, air sealing, attic insulation, attic hatch and heat pump.

This home will be healthier, more comfortable, cleaner and quieter, and cost less to operate, than most Virginia homes.



**This Pearl Gold home** has verified high-performing assets for a number of features that enhance the quality of life for its owners. Pearl Gold Certified: it's what value *feels* like.

### Certification Level



**Gold**  
**875 Pearl Points**



Building Shell:  
**275 / 300** points



Heating and Cooling:  
**201 / 360** points

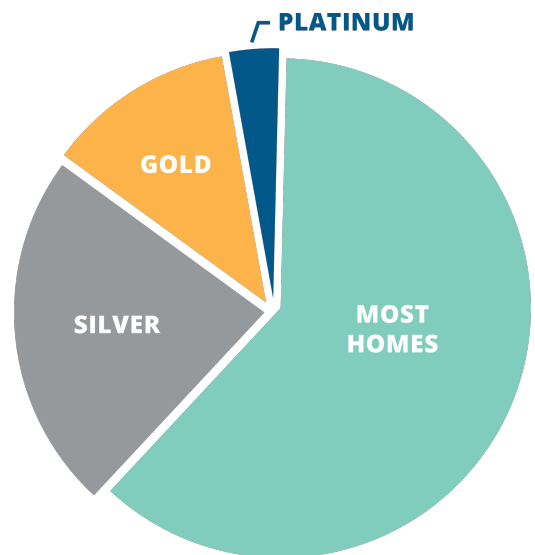


Baseload:  
**212 / 240** points



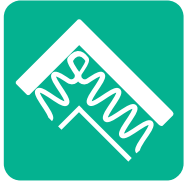
Home Management:  
**187 / 300** points

### U.S. Homes Eligible for Pearl Certification Levels



This home was enrolled in HERS Index. Further details are provided in this report.

## Special Performance Features of This Home



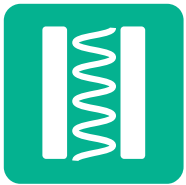
**Attic Insulation :**  
Top 31% of VA homes

This home's attic is well-insulated, which means lower utility bills and greater comfort - particularly in rooms located directly under the attic. Good attic insulation also protects against excessive heat loss in winter that can cause roof damage from snow melt.



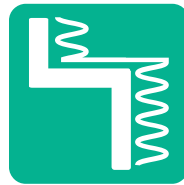
**Attic Hatch :**  
Very Well-insulated

This home's attic hatch has been insulated. Attic hatches are often the weakest link in a home's attic insulation, and can disproportionately impact a home's heat loss and heat gain. If an uninsulated attic hatch represents only 1% of an attic's surface area, it can decrease the attic's overall R-value by 27%.



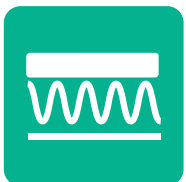
**Wall Insulation :**  
Top 15% of VA homes

At least some of this home's wall insulation is outstanding and better than most homes. It will be more energy efficient and quieter as a result. The additional insulation acts as a sound as well as a temperature barrier.



**Rim Joist Insulation :**  
Very Well-Insulated

The rim joist is the outside perimeter of the floor system and can often be overlooked when insulating and air sealing a home. Quality homes are insulated along the rim joist - like this one.



**Sealed crawlspace :**  
Top 2% of VA homes with a  
encapsulated crawlspace

This home's encapsulated crawlspace has been sealed and insulated - providing significant benefits for keeping energy costs down. It will also improve the indoor air quality of the home.



**Air Sealing :**  
Top 1% of VA homes

This home's air tightness has been tested using special diagnostic equipment. The home's air tightness meets many modern energy codes and as a result will be more comfortable and less drafty. A well-sealed home will also help manage humidity, prevent dust, and limit entry points for insects.

## Special Performance Features of This Home



**Windows :**  
High efficiency rating

Double-pane, argon-filled low-E windows like the ones in this home are better insulated and better at stopping heat transfer than regular single- or double pane windows. Low-E windows have a special coating that protects fabrics from the fading effects of UV light, while keeping the home warmer in winter and cooler in summer.



**Heat Pump :**  
Top 4% of electric-heated homes

This home's heat pump is one of the most energy efficient sold. Its year round energy savings will be significant compared to most homes' heating and cooling equipment.



**Heat Pump Water Heater :**  
Top 1% of VA homes

This home has an highly efficient heat pump water heater, offering significant savings. ENERGY STAR certified heat pump water heaters can save a household of 4 approximately \$330 per year on its electric bills compared to a standard electric water heater and over \$3,500 over the lifetime of the unit.



**Dishwasher :**  
Very efficient

ENERGY STAR certified dishwashers use advanced technology to get your dishes clean while using less water and energy. Dishwashers that have earned the ENERGY STAR are, on average, about 5 percent more energy efficient and 15 percent more water efficient than standard models.



**LED Lighting :**  
Very efficient lighting

More than half of this home's lights are LED bulbs, which not only use less energy, but also produce better light along the color spectrum, are dimmable, and last a very long time.



**Filters :**  
Very effective

The home's special air filter unit attracts and captures airborne particles and allergens, such as pollen, pet dander, and mold spores - promising healthier indoor air for residents.



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## About Pearl Certification

Pearl Certification is a national firm that provides third-party certification of **high-performing homes**: homes with "performance assets" that make them healthy, safe, comfortable, energy and water efficient.

Pearl's certification system enables home buyers to see and understand the value of a home's high-performing assets when the home is sold. Research from across the U.S. shows that third-party home performance certifications like Pearl's add an average of 4% to the sale price of high-performing homes, compared to similar homes lacking these assets.

Pearl is the only private certification firm to sponsor the U.S. Department of Energy's prestigious Home Performance with ENERGY STAR program.

Pearl is a National Association of Realtors (NAR) REACH Accelerator company.

## The Science Behind Pearl Certification

Pearl's certification system is based on building science. It was developed in consultation with national experts on energy efficiency and home performance, and with technical assistance from the National Renewable Energy Laboratory (NREL). This system is approved for use in the Department of Energy's Home Performance with ENERGY STAR program.

Pearl's certification system takes into account how well an asset like insulation or a cooling system was installed. It also takes into account tools that allow a homeowner to view, understand, and improve their home's performance.

**For more information on Pearl's Certification, please email us at: [help@pearlcertification.com](mailto:help@pearlcertification.com), or visit our website at [www.pearlcertification.com](http://www.pearlcertification.com)**

### PEARL'S PARTNERS

Pearl works in partnership with the U.S. Department of Energy and many of the nation's leading real estate, appraisal, contracting, and building science organizations.



## OVERVIEW OF PEARL CERTIFICATION SYSTEM

Pearl certifies a home's performance assets, such as insulation, heating and cooling, lighting, appliances, smart home devices, and solar energy.

### Building Shell

The building shell consists of the roof and attic, exterior walls, windows, doors, and basement or crawlspace. These assets provide an air, moisture, and thermal barrier that separates the inside from the outside.



Attic



Wall



Rim Joist



Floors &  
Foundation



Windows



Doors



Air Sealing



Roofs

### Heating and Cooling

A home's heating and cooling systems include furnaces, air conditioners, and heat pumps. This equipment heats and cools air, water, or steam. The ducts or pipes that circulate the air, water or steam through the home are also a part of the heating and cooling system.



Cooling



Heating



Heat Pump



Distribution  
System

### Baseload

A home's baseload includes devices that run year-round, not just in the heating or cooling season. Water heaters, refrigerators, dishwashers, clothes washers, lighting, and other features contribute to a home's baseload.



Ventilation



Water Heating  
System



Clothes Dryer



Dish Washer



Clothes Washer



Refrigerators



Lighting



Pool  
Equipment

### Home Management

A home's management assets include "smart" devices that control heating and cooling systems, lighting, and other technologies: dashboards that provide information about energy use; and plans for improving the home's performance assets.



Smart Home  
Devices



Planning

### Solar, Batteries, and Electric Vehicle Readiness

Solar panels, batteries, and electric vehicle charging: Pearl certifies if a home is pre-wired for these high-performing assets or has them installed. Our system captures critical information needed for appraisers. Pearl points are not awarded for these assets.



Solar  
Photovoltaic



Solar Inverter



Electric Vehicle  
Ready Home



Batteries





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### HOME ASSET DETAILS

# Building Shell



Platinum Level: **244**  
This Home: **275**  
Average Home: **150**

## Attic and Roof



Attic Hatch	<b>R-10 or higher</b>
R-Value	<b>R-38</b>
Insulation Type (predominant)	<b>Fiberglass - Loose Fill</b>
Installation Quality	<b>Grade I</b>

## Wall Insulation



R-Value	<b>R-15</b>
Insulation Type (predominant)	<b>Fiberglass - Batt</b>



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## HOME ASSET DETAILS

# Building Shell



Platinum Level: **244**  
This Home: **275**  
Average Home: **150**

### Floor and Foundation Insulation



Foundation Type	<b>Unvented Crawlspace</b>
R-Value	<b>R-11</b>
Insulation Type (predominant)	<b>Fiberglass - Batt</b>

### Rim Joist Insulation



R-Value	<b>R-15</b>
Insulation Type (predominant)	<b>Spray Foam - Open Cell</b>
Installation Quality	<b>Grade I</b>



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### HOME ASSET DETAILS

# Building Shell



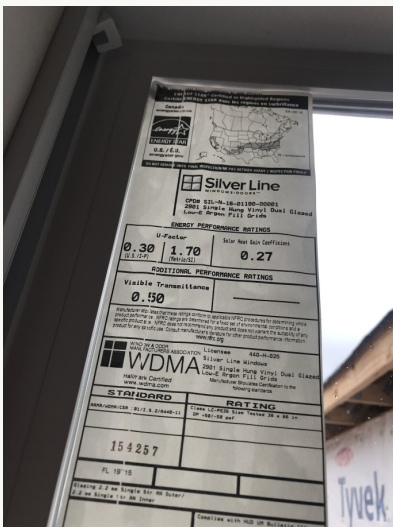
Platinum Level: **244**  
This Home: **275**  
Average Home: **150**

## Air Sealing



Tested and verified using blower door	<b>Yes</b>
Professionally air sealed	<b>Yes</b>
Blower door result	<b>1150 @CFM50</b>
Air leakiness: Air changes per hour	<b>3.4 @ACH50</b>

## Windows and Skylights: Type 1



Type	<b>Window</b>
U-Factor	<b>0.3</b>
SHGC	<b>0.27</b>
ENERGY STAR®	<b>Yes</b>

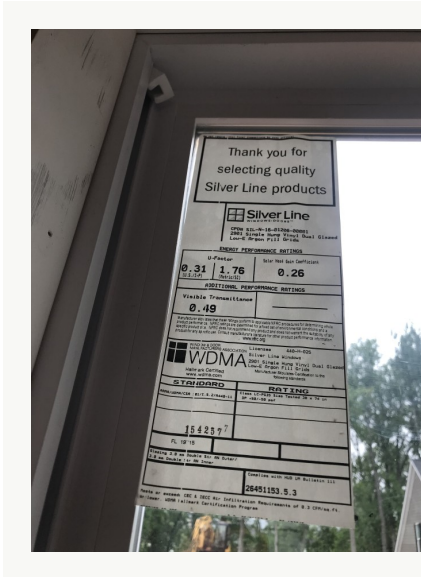
HOME ASSET DETAILS

# Building Shell



Platinum Level: **244**  
This Home: **275**  
Average Home: **150**

## Windows and Skylights: Type 2



Type	<b>Window</b>
U-Factor	<b>0.31</b>
SHGC	<b>0.26</b>
Panels	<b>Double-pane</b>
Framing	<b>Vinyl</b>
Glazing type	<b>Low-E</b>

## Doors: Type 1



SHGC	<b>0.06</b>
U-Factor	<b>0.19</b>
ENERGY STAR	<b>Yes</b>



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### HOME ASSET DETAILS

# Building Shell



Platinum Level: **244**  
This Home: **275**  
Average Home: **150**

## Doors: Type 2



SHGC **0.34**

U-Factor **0.36**

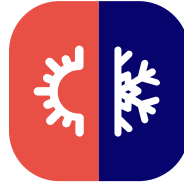


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## HOME ASSET DETAILS

# Heating and Cooling



Platinum Level:	<b>292</b>
This Home:	<b>201</b>
Average Home:	<b>180</b>

## Heat Pump



Type	<b>Air Source Heat Pump</b>
HSPF	<b>8.5</b>
SEER	<b>15</b>
ENERGY STAR®	<b>Yes</b>



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## HOME ASSET DETAILS

# Baseload



Platinum Level: **195**  
This Home: **212**  
Average Home: **120**

### Water Heating



Fuel	<b>Electricity</b>
Heat Pump	<b>Yes</b>
Tank Size	<b>Less or equal to 55 gallons</b>
Energy Factor	<b>3.5</b>
ENERGY STAR®	<b>Yes</b>

### Dishwasher



ENERGY STAR®	<b>Yes</b>



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### HOME ASSET DETAILS

# Baseload



Platinum Level: **195**  
This Home: **212**  
Average Home: **120**

## Lighting



Prevalence of LEDs **100%**

## Healthy Air



CO Detector(s) **Yes**

Filtration **MERV 12**

Whole house supply ventilation system **Yes**

Dedicated ventilation in kitchen **Yes**

Dedicated ventilation in every full bathroom **Yes**

Passive radon mitigation system **Yes**





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### HOME ASSET DETAILS

# Home Management



Platinum Level: **244**  
This Home: **187**  
Average Home: **150**

## Smart Home Devices



Thermostat

**Smart**

## Planning



Green Door Account

**Yes**



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## HOME ASSET DETAILS

# Home Management



Platinum Level:	<b>244</b>
This Home:	<b>187</b>
Average Home:	<b>150</b>

This home now has a Green Door account! Green Door is a homeowner's one-stop shop to learn about, manage, maintain and improve their home's performance.

Within 24hrs the homeowner will receive an email with instructions to log into their Green Door account.

Green Door is Pearl's virtual home management portal for homeowners. A home certification champion, Pearl is partnering with homeowners, contractors, and real estate agents to set the global standard in high-ROI home improvements and energy efficient performance. Designed to streamline your homeowner journey, Green Door gives homeowners easy access to Pearl Partners, a tracking system

for improvement records and detailed information about your certification. Pearl will elevate your home living experience and make value visible today.

**For more information on Pearl's certification, email at: [help@pearlcertification.com](mailto:help@pearlcertification.com), or visit our website: [www.pearlcertification.com](http://www.pearlcertification.com)**



## HOME ASSET DETAILS

# Third Party Programs

### HERS Index Score

	HERS Index Score	<b>60</b>
	Rating Type	<b>Confirmed Rating</b>
	Rater's Organization	<b>The Comfort Squad LLC</b>
	Builder	<b>Southern Development Homes</b>
	Date	<b>Aug. 31, 2022</b>

The HERS Index models the home energy consumption and rates it on a scale from zero (excellent) to over 100 (less efficient than a home built to code in 2006). The HERS Index is often used in conjunction with the ENERGY STAR Certified Homes program, and can be used to demonstrate code compliance in some jurisdictions. This home was rated and earned a HERS Index Score.



# Appendix A: Appraisal Institute's Green and Energy Efficiency Appraisal Addendum

## Instructions to homeowner or listing agent:

High-performance features can add significant value to a home. Recent studies have indicated that improvements such as air sealing and insulation, high efficiency heating and cooling systems, and other "green" and energy efficient features can add 3-9% onto a home's value, if verified by a third party.

A home may be appraised for different reasons:

- Mortgage refinance
- To discontinue mortgage insurance - if the home's value has increased enough, the homeowner may have sufficient equity in the home to no longer need insurance
- Immediately prior to selling a home to assist in pricing the home
- As part of the home sale process to meet the buyer's lending requirements

Pearl Certification has an AI REPORTS® License Agreement with the Appraisal Institute.

The following appendix can be provided to an appraiser to assist him or her in valuing the home. As stated in the Addendum:

"The objective of this Addendum is to standardize the communication of the high performing features of residential properties. Identifying the features not found on the 1004 form provides a basis for comparable selection and analysis of the features. Builders, contractors, homeowners, and third party verifiers are encouraged to complete this Addendum and present to appraisers, agents, lenders, and homeowners."

*The Appraisal Institute makes no representations, warranties or guarantees as to, and assumes no responsibility for, the data, analysis or work product provided by the individual appraiser(s) or any other individual in the specific contents of the AI Reports®*



<b>Client File #:</b>		<b>Appraisal File #:</b>	
<b>Residential Green and Energy Efficient Addendum</b>			
Client: Ken Gill			
Subject Property: 6606 Charnwood St			
City: Crozet		State: Virginia	Zip: 22932

**Additional resources to aid in the valuation of green properties and the completion of this form can be found at [http://www.appraisalinstitute.org/education/green\\_energy\\_addendum.aspx](http://www.appraisalinstitute.org/education/green_energy_addendum.aspx)**

**The appraiser hereby certifies that the information provided within this addendum:**

- Has been considered in the appraiser's development of the appraisal of the subject property only for the client and intended user(s) identified in the appraisal report and only for the intended use stated in the report.
- Is not provided by the appraiser for any other purpose and should not be relied upon by parties other than those identified by the appraiser as the client or intended user(s) in the report.
- Is the result of the appraiser's routine inspection of and inquiries about the subject property's green and energy efficient features.  
Extraordinary assumption: Data provided herein is assumed to be accurate and if found to be in error could alter the appraiser's opinions or conclusions.
- Is not made as a representation or as a warranty as to the efficiency, quality, function, operability, reliability or cost savings of the reported items or of the subject property in general, and this addendum should not be relied upon for such assessments.

**Green Building:** The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classic building design concerns of economy, utility, durability, and comfort (US EPA). High Performance building and green building are often used interchangeably.

**Six Elements of Green Building:** A green building has attributes that fall into the six elements of green building known as (1) site, (2) water, (3) energy, (4) materials, (5) indoor environmental quality, and (6) maintenance and operation. The energy and water elements are the most measurable elements of green or high performance housing. Appraisers need savings amounts to develop an income approach to support energy efficient contributory value.

**THIRD-PARTY VERIFICATIONS (See types defined in glossary).**

The following verified items are considered within the appraisal analysis of the subject property:

<b>Green Certification</b> Certifications attest that the home meets certain minimum thresholds.	Environmental Protection Agency (EPA):	<input type="checkbox"/> Indoor airPLUS	<input type="checkbox"/> WaterSense	<input type="checkbox"/> ENERGY STAR	
	Energy Department (DOE):	<input type="checkbox"/> Zero Energy Ready Home (ZERH)			
	Home Innovation Research Labs NGBS Home Remodel:	<input type="checkbox"/> Bronze	<input type="checkbox"/> Silver	<input type="checkbox"/> Gold	<input type="checkbox"/> Emerald
	Home Innovation Research Labs NGBS New Home:				
	Living Building Challenge (LBC):	<input type="checkbox"/> Living Building Certified	<input type="checkbox"/> Petal Certification		
	Passivhaus Standard:	<input type="checkbox"/> PHI Low Energy	<input type="checkbox"/> EnerPhit	<input type="checkbox"/> Passive House	
	Passivhaus Institute US:	<input type="checkbox"/> PHIUS+ 2015			
	USGBC LEED:	<input type="checkbox"/> Certified	<input type="checkbox"/> Silver	<input type="checkbox"/> Gold	<input type="checkbox"/> Platinum
Other: <b>Pearl Certification</b>					
Date Verified: 02/15/2024	Certificate of Efficiency Improvements Version: Organization URL: <input checked="" type="checkbox"/> Other: <a href="http://www.pearlcertification.com">www.pearlcertification.com</a>	<b>ABOVE VALID ONLY IF CHECKED:</b> <input type="checkbox"/> Verification reviewed on site <input checked="" type="checkbox"/> Verification attached to this report			

<b>Energy Label</b> Labels disclose the state of the home's energy assets.	RESNET's HERS Rating (0 to 150): <b>60</b> <input type="checkbox"/> Sampling Rating <input type="checkbox"/> Projected Rating <input checked="" type="checkbox"/> Confirmed Rating	Estimated energy savings for this home: \$ /year cKWh rate dated Energy Savings includes electricity, heating & cooling. Score below 100 indicates energy costs are expected to be lower than average code-built home. HERS Index Report occupancy estimates energy cost based on number of bedrooms plus one. Only a "confirmed rating" is diagnostically tested.
	DOE's Home Energy Score Score (1 to 10): <input type="checkbox"/> Official Score <input type="checkbox"/> Unofficial Score	Estimated energy savings for this home: \$ /year cKWh rate dated Energy Savings includes electricity, heating & cooling. Score above five indicates energy costs are expected to be lower than average local home. Home Energy Score estimates energy cost based on state average energy rates and the home's energy features.
	Other Energy Score: Pearl Score Range (0 to 1200): <b>875</b>	Estimated energy savings for this home: \$ /year cKWh rate dated Describe energy label system: Pearl's score is approved for use in the Department of Energy's Home Performance with ENERGY STAR program.
	Date Verified: 02/15/2024	Score or Rating Version: Organization URL: <input checked="" type="checkbox"/> <a href="http://www.resnet.us">www.resnet.us</a> <input type="checkbox"/> <a href="http://www.homeenergyscore.gov">www.homeenergyscore.gov</a> <input checked="" type="checkbox"/> <a href="http://www.pearlcertification.com">www.pearlcertification.com</a>

<b>Verified Energy Improvements</b> Only include improvements with verified documentation.	Explain energy-related improvements: Detailed in attached "Pearl Home Certification Report" Cost of improvements: \$	
	Date Verified: 02/15/2024	Certificate of Efficiency Improvements Version: Organization URL: <input type="checkbox"/> <a href="http://www.energystar.gov/homeperformance">www.energystar.gov/homeperformance</a> <input checked="" type="checkbox"/> Other: <a href="http://www.pearlcertification.com">www.pearlcertification.com</a>
		<b>ABOVE VALID ONLY IF CHECKED:</b> <input type="checkbox"/> Verification reviewed on site <input checked="" type="checkbox"/> Verification attached to this report

Completed by: W. Casey Murphy Title: Vice-President of Quality Systems Date: 02/15/2024

\*NOTICE: The Appraisal Institute publishes this form for use by appraisers where the appraiser deems use of the form appropriate. Depending on the assignment, the appraiser may need to provide additional data, analysis and work product not called for in this form. The Appraisal Institute makes no representations, warranties or guarantees as to, and assumes no responsibility for, the data, analysis or work product, or third party certifications, verifications, data specifications, scores, indexes, or valuation tools, used or provided by the individual appraiser(s) or others in the specific contents of the AI Reports®. AI Reports® AI-820.05 Residential Green and Energy Efficient Addendum. © Appraisal Institute 2017, All Rights Reserved. (May 2017)

<b>Client:</b>	Ken Gill	<b>Client File #:</b>	
<b>Subject Property:</b>	6606 Charnwood St, Crozet, VA 22932	<b>Appraisal File #:</b>	

### EFFICIENCY FEATURES (Water, Energy, and Environmental. See types defined in glossary).

The following items are considered within the appraisal analysis of the subject property:

<b>Insulation</b>	<input checked="" type="checkbox"/> Fiberglass Blown-In <input type="checkbox"/> Foam Insulation <input type="checkbox"/> Cellulose <input checked="" type="checkbox"/> Fiberglass Batt Insulation <input checked="" type="checkbox"/> R-Value Wall <b>R-15</b> Ceiling <b>R-38</b> <input checked="" type="checkbox"/> Other <b>R-11 Sealed crawlspace</b>		
<b>Building Envelope</b>	Envelope Tightness: <b>3.4</b> Unit: <input type="checkbox"/> CFM25 <input type="checkbox"/> CFM50 <input checked="" type="checkbox"/> ACH50 <input type="checkbox"/> ACH natural Instructions: Insert the rating as a number that could be 0.5 to 7ACH50 or higher. The lower the number, the more air tight the envelope. Building Codes for area show maximum Envelope Tightness allowed based on the climate zone. Not all areas have adopted a building code. <a href="http://bcap-energy.org/">http://bcap-energy.org/</a>		
<b>Windows</b>	<input checked="" type="checkbox"/> ENERGY STAR®	<input checked="" type="checkbox"/> Low E	<input type="checkbox"/> High Impact
<b>Day Lighting</b>	<input type="checkbox"/> # of Skylights:	<input type="checkbox"/> # of Solar Tubes:	<input type="checkbox"/> Other (Describe): % of lighting LEDs: <b>100</b>
<b>ENERGY STAR® Appliances</b>	ENERGY STAR®: <input checked="" type="checkbox"/> Dishwasher <input type="checkbox"/> Refrigerator <input type="checkbox"/> Washer/Dryer <input type="checkbox"/> Other Energy Source: <input type="checkbox"/> Propane <input type="checkbox"/> Electric <input type="checkbox"/> Natural Gas <input type="checkbox"/> Other (Describe): <b>Note:</b> ENERGY STAR® appliances do not result in an ENERGY STAR® Home.		
<b>Water Heater</b>	<input checked="" type="checkbox"/> ENERGY STAR®	Size: <b>&lt;=55</b> gallons <input type="checkbox"/> Tankless	<input type="checkbox"/> Solar (next page) <input checked="" type="checkbox"/> Heat Pump <input type="checkbox"/> Coil
<b>HVAC &amp; Related Equipment</b> Describe in comments area.	<input type="checkbox"/> High Efficiency HVAC SEER Efficiency Rating % AFUE* % *Annual Fuel-Utilization Efficiency	<input checked="" type="checkbox"/> Heat Pump Efficiency Rating: COP: HSPF: <b>8.5</b> SEER: <b>15.0</b> EER:	Thermostat/Controllers? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Programmable Thermostat? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Auxiliary Heat Source? <input type="checkbox"/> Yes <input type="checkbox"/> No Radiant Floor Heat? <input type="checkbox"/> Yes <input type="checkbox"/> No Geothermal? <input type="checkbox"/> Yes <input type="checkbox"/> No Electric Vehicle Ready? (car charger) <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Indoor Environmental Quality</b>	<input type="checkbox"/> Energy (ERV) or Heat Recovery Ventilator (HRV) <input checked="" type="checkbox"/> Other Measured Whole-House Ventilation Device (See glossary) <input type="checkbox"/> Humidity Monitoring Device installed	<input type="checkbox"/> Non Toxic Pest Control <input checked="" type="checkbox"/> Radon System: <input type="checkbox"/> Active <input checked="" type="checkbox"/> Passive	
<b>Water Efficiency</b>	<input type="checkbox"/> Reclaimed Water System (Describe): <input type="checkbox"/> Greywater reuse system <input type="checkbox"/> Water Saving Fixtures	<input type="checkbox"/> Rain Barrels Used in Irrigation <input type="checkbox"/> Cistern size: gallons <input type="checkbox"/> Location of cistern:	
<b>Utility Costs</b>	Annual Utility Cost: \$ /year, based on: to (full year). Includes (check all that apply): <input type="checkbox"/> Electric <input type="checkbox"/> Heating <input type="checkbox"/> Water <input type="checkbox"/> Other:		# Of Occupants:
<b>Comments</b> Include source for information provided in this section.	The following property has a number of high-performing features as detailed in the Pearl Certification report. With the cooperation and approval of the Appraisal Institute, Pearl Certification has an AI REPORTS® License Agreement. The Appraisal Institute makes no representations, warranties or guarantees as to, and assumes no responsibility for, the data, analysis or work product provided by the individual appraiser(s) or any other individual in the specific contents of the AI Reports®		

Completed by: W. Casey Murphy

Title: Vice-President of Quality Systems

Date: 02/15/2024

**The objective of this Addendum is to standardize the communication of the high performing features of residential properties. Identifying the features not found on the appraisal form provides a basis for comparable selection and analysis of the features. Builders, contractors, homeowners, and third party verifiers are encouraged to complete this Addendum and present to appraisers, agents, lenders, and homeowners. Complete the pages that apply to the property appraised and provide to appraiser prior to the completion of an appraisal. Provide the Addendum to the lender at the time of loan application to assist them in understanding the property type so an appraiser with sufficient knowledge of this property type will be engaged to provide an appraisal to meet secondary mortgage market guidelines.**

<b>Client:</b>	Ken Gill	<b>Client File #:</b>	
<b>Subject Property:</b>	6606 Charnwood St, Crozet, VA 22932	<b>Appraisal File #:</b>	

## Solar Panels

The following items are considered within the appraisal analysis of the subject property:

### Solar Photovoltaic (Electric) System

Type of Ownership	Array #1	Array #2 (if applicable)	
	<input type="checkbox"/> Leased <input type="checkbox"/> Owned <input type="checkbox"/> *Solar Loan with UCC Filing <input type="checkbox"/> Purchase Power Agreement (PPA)	<input type="checkbox"/> Leased <input type="checkbox"/> Owned <input type="checkbox"/> *Solar Loan with UCC Filing <input type="checkbox"/> Purchase Power Agreement (PPA)	
<b>Panel Specifications</b>	System Size: kW (1kW = 1000 Watts) Age of Panels: Energy Production: kWh Source of Energy Production Estimate: Manufacturer: Warranty on Panels: years	System Size: kW (1kW = 1000 Watts) Age of Panels: Energy Production: kWh Source of Energy Production Estimate: Manufacturer: Warranty on Panels: years	
<b>Array Placement</b> Affects energy production. *Orientation	Location (roof, ground, etc.): <input type="checkbox"/> Fixed Mount <input type="checkbox"/> Tracking Mount Tilt / Slope: *Azimuth:	Location (roof, ground, etc.): <input type="checkbox"/> Fixed Mount <input type="checkbox"/> Tracking Mount Tilt / Slope: *Azimuth: *Orientation (direction panels face):	
<b>Inverter Specifications</b>	Number of Inverters per Array: Age: Wattage: watts Manufacturer: Warranty Term: years	Number of Inverters per Array: Age: Wattage: watts Manufacturer: Warranty Term: years	
<b>Energy Storing Batteries</b>	Battery Type: <input type="checkbox"/> Lithium-ion <input type="checkbox"/> Lithium-ion Polymer <input type="checkbox"/> Lithium Iron Phosphate <input type="checkbox"/> Lead Acid <input type="checkbox"/> Lead Calcium <input type="checkbox"/> AGM <input type="checkbox"/> GEL Manufacturer: Storage Capacity: kWh Warranty Term: years Battery age:		
<b>Name of Utility Company:</b>		<b>Charge / kWh from Utility</b>	<b>\$/ kWh</b>

### Solar Thermal Water Heating System

<b>Type of System:</b>	Active: <input type="checkbox"/> Direct <input type="checkbox"/> Indirect Passive: <input type="checkbox"/> Integral collector <input type="checkbox"/> Thermo-syphon	<b>Storage Tank Size</b>	Gallons:
<b>Collector Type:</b>	<input type="checkbox"/> Flat-Plat <input type="checkbox"/> Integral <input type="checkbox"/> Evacuated-Tube Solar	<b>System Age</b>	Years:
<b>Back-Up System:</b>	<input type="checkbox"/> Conventional Water Heater <input type="checkbox"/> Tankless On Demand <input type="checkbox"/> Tankless Heat Pump	<b>Warranty Term</b>	
<b>Solar Energy Factor (SEF):</b>	*Rating ranges 1 to 11. Higher number is more efficient.	<b>Manufacturer</b>	

<b>Comments</b> Discuss incentives available for new panels, condition of current panels, and any maintenance issues. If leased, provide the lease terms.	<p><b>Note: Leased solar PV systems and Power Purchase Agreements</b>            should not be included in the value of the real property as these systems generally are considered personal property. If a system is a lease or a PPA the terms must be provided to the appraiser for analysis. Appraisers must analyze the effect any of the terms of the lease or PPA have on the price buyers are willing to pay for the property.</p> <p><b>Note: Solar loan with UCC filing</b>            If the solar installation is funded by a loan that is secured by UCC filing, the loan must be paid off, or the appraiser must indicate a value for the solar panels that is conditional upon the removal of the UCC.</p>		
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Completed by: W. Casey Murphy

Title: Vice-President of Quality Systems

Date: 02/15/2024

<b>Client:</b>	Ken Gill	<b>Client File #:</b>	
<b>Subject Property:</b>	6606 Charnwood St, Crozet, VA 22932	<b>Appraisal File #:</b>	

### Location - Site

The following items are considered within the appraisal analysis of the subject property:

<b>Walk Score</b>	Score	Source: <input type="checkbox"/> <a href="http://www.walkscore.com">http://www.walkscore.com</a> <input type="checkbox"/> Other:	
<b>Public Transportation</b>	<input type="checkbox"/> Bus Distance: Blocks	<input type="checkbox"/> Train Distance: Blocks	<input type="checkbox"/> Subway Distance: Blocks
<b>Site</b>	Orientation (front faces): <input type="checkbox"/> East/West <input type="checkbox"/> North/South	Landscaping: <input type="checkbox"/> Water Efficient <input type="checkbox"/> Natural <input type="checkbox"/> Pond/Lake on site <input type="checkbox"/> Rain Garden	
<b>Comments</b>			

### Incentives – Amount of Incentive and Terms

The following items are considered within the appraised value of the subject property and based on effective date of value.

<b>Federal</b>	
<b>State</b>	
<b>Local</b>	
<b>Comments</b>	Incentives offset cost and should be reported and described in the cost approach section of the report. Clearly identify the incentives that offset the gross cost of construction to meet appraisal standards. Incentives are typically not a sales concession in sales comparison approach since they do not transfer with the property and are not paid by the seller. Incentives are typically for a specified period and only those available as of the date of value should be addressed in the appraisal process. Incentives may be available to offset repairs or deferred maintenance items as well. Incentives, rebates, and tax credits for most U.S. properties can be found at <a href="http://www.dsireusa.org">www.dsireusa.org</a>

Completed by: W. Casey Murphy

Title: Vice-President of Quality Systems

Date: 02/15/2024

**The objective of this Addendum is to standardize the communication of the high performing features of residential properties. Identifying the features not found on the appraisal form provides a basis for comparable selection and analysis of the features.**

- Builders, contractors, homeowners, and third party verifiers are encouraged to complete this Addendum and present to appraisers, agents, lenders, and homeowners. Appraisers typically do not have sufficient information to complete this addendum without builder, contractor, or third party verifier documentation.
- Attach this completed document to the MLS listing to provide sufficient detail on sales and listings to assist buyers, appraisers, and real estate agents in understanding the high performance features of the property.
- Complete the pages that apply to the property appraised and provide to appraiser prior to the completion of an appraisal.
- Provide the Addendum to the lender at the time of loan application to assist them in understanding the property type so an appraiser with sufficient knowledge of this property type will be engaged to provide an appraisal to meet secondary mortgage market guidelines.



<b>Client:</b>	Ken Gill	<b>Client File #:</b>	
<b>Subject Property:</b>	6606 Charnwood St, Crozet, VA 22932	<b>Appraisal File #:</b>	

## Residential Green and Energy Efficient Addendum Additional Resources

**Appraised Value and Energy Efficiency: Getting it Right.** This document provides links to resources in understanding the secondary mortgage market guidelines on appraisals of energy efficient and green features. It addresses the following:

- What can builders do?
- For Buyers: Assuring a competent appraiser for your home
- For Lenders: A sample letter that should be completed and provided to the lender at the time of mortgage application alerts the lender to the special features that requires an appraiser with knowledge of the property type. [https://www.appraisalinstitute.org/assets/1/29/AI-BCAP\\_Flyer.pdf](https://www.appraisalinstitute.org/assets/1/29/AI-BCAP_Flyer.pdf)

**PV Value®.** PV Value® is a discounted cash flow (Income Capitalization Approach) to valuing energy produced. The solar PV system inputs on this form are necessary to use this program. [www.pvalue.com](http://www.pvalue.com)

**Residential Green Valuation Tools.** A textbook resource for completing the AI Residential Green and Energy Efficient Addendum is available. It can be purchased at the following website: <http://www.appraisalinstitute.org/residential-green-valuation-tools/>

# Glossary

**ASHRAE 700 / ICC National Green Building Standard (NGBS):** An ANSI-approved residential green building standard developed by the National Association of Home Builders (NAHB) and the International Code Council (ICC). It is applicable to single and multifamily projects, renovations and additions and residential land development. To comply, all buildings must incorporate sustainable lot development techniques and address energy, water & material resource efficiency and indoor environmental quality. Also, all owners must be educated about building operation and maintenance. <https://www.nahb.org/en/research/nahb-priorities/green-building-remodeling-and-development/icc-700-national-green-building-standard.aspx>

**Building Envelope:** The building envelope is everything that separates the building's interior from the exterior. This includes the foundation, exterior walls, roof, doors and windows. The envelope rating should be compared to the local building code requirements for this rating to identify a structure that exceeds the building code.

**Energy Recovery Ventilation System (ERV) or Heat Recovery Ventilators (HRV):** These systems provide fresh air without wasting all the energy already used to heat the indoor air. By recovering sensible (heat) or latent (moisture) energy from the stale indoor air, they offer fresh air ventilation with reduced energy loss.

**ENERGY STAR Certified New Homes:** EPA's ENERGY STAR certified homes are independently verified to be at least 15 percent more efficient than code-built homes, and include additional energy efficiency measures that can deliver savings of up to 30 percent compared to standard new homes. More than just a collection of ENERGY STAR products, an ENERGY STAR certified home includes a comprehensive package of energy efficiency systems and features that work together to deliver better performance, including a High-Efficiency Heating & Cooling System, a Complete Thermal Enclosure System; a Water Protection System; and Efficient Lighting & Appliances. [www.energystar.gov/newhomes](http://www.energystar.gov/newhomes)

**ENERGY STAR Products:** Behind each blue label is a product, building, or home that is independently certified to use less energy and cause fewer of the emissions that contribute to climate change. Today, ENERGY STAR is the most widely recognized symbol for energy efficiency in the world. In order to earn the label, ENERGY STAR products must be third-party certified based on testing in EPA-recognized laboratories. In addition to up-front testing, a percentage of all ENERGY STAR products are subject to "off-the-shelf" verification testing each year. The goal of this testing is to ensure that changes or variations in the manufacturing process do not undermine a product's qualification with ENERGY STAR requirements. [https://www.energystar.gov/about/origins\\_mission](https://www.energystar.gov/about/origins_mission)

**Geothermal:** A geothermal heat pump uses the constant below ground temperature of soil or water to heat and cool your home. <http://energy.gov/energysaver/articles/geothermal-heat-pumps>

**HERS Index:** The Home Energy Rating System (HERS) Index is an industry standard by which a home's energy efficiency is measured. It's also the nationally recognized system for inspecting and calculating a home's energy performance. A qualified third party certifier assesses the house based on its physical characteristics. The energy estimates from this assessment may vary depending on the lifestyle of the occupants, increasing utility expenses, and changes in the maintenance or characteristics of the energy features. There are three rating types: sampling rating, projected rating, and confirmed rating. A Sampling Rating is an application of the Home Energy Rating process whereby fewer than 100% of a builder's new homes are randomly inspected and tested to evaluate compliance with a set of threshold specifications. A Projected Rating: A Rating Type that encompasses one individual dwelling or dwelling unit and is conducted in accordance with Section 5.1.4.3.1 through 5.1.4.3.5 of the ANSI/RESNET/ICC Standard 301. A Confirmed Rating is a rating type that encompasses one individual dwelling or dwelling unit and is conducted in accordance with Sections 5.1.4.1.1 through 5.1.4.1.3. More information: <http://www.resnet.us/hers-index>. The ANSI standard utilized in the HERS Index is posted at <https://codes.iccsafe.org/public/chapter/content/7324/>.

**Home Energy Score (HES):** The Home Energy Score, developed and managed by the U.S. Department of Energy (DOE), is a national system that allows homes to receive an energy rating, like the MPG rating available for cars. The Home Energy Score uses a 10-point scale to reflect how much energy a home is expected to use under standard operating conditions. The Home Energy Score uses a standard calculation method and considers the home's structure and envelope (walls, windows, foundation) and its heating, cooling, and hot water systems. Only Assessors who pass DOE's Simulation Training can provide the Home Energy Score. [www.HomeEnergyScore.gov](http://www.HomeEnergyScore.gov)

**Indoor airPLUS:** EPA's Indoor airPLUS is a voluntary EPA label for new homes that integrate a set of construction practices and technologies to reduce indoor air pollutants and improve the indoor air quality in a new home beyond minimum code requirements. It is only available to homes that first meet ENERGY STAR® Certified Home requirements. <http://www.epa.gov/indoorairplus>

**LEED:** Leadership in Energy and Environmental Design is a green certification program created by the U.S. Green Building Council (USGBC). As an internationally recognized mark of excellence, LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>

**Living Building Challenge:** Created by the Living Future Institute, the Living Building Challenge is the world's most rigorous proven performance standard for buildings. People can use the regenerative design framework to create spaces that, like a flower, give more than they take. Living Building Challenge certification requires actual rather than modeled performance. Therefore, projects must be operational for at least twelve consecutive months prior to evaluation. <https://living-future.org/lbc/basics/>

**Low E:** "Low emissivity" indicates a coating is added to the glass surface. The coating allows visible light to pass through the glass while stopping radiant heat energy from entering the building by passing through the glass. Approximately 40% of the sun's harmful ultra violet rays are blocked and insulation enhanced. <https://energy.gov/energysaver/energy-efficient-windows>

**NGBS Small Project Remodel:** Run by the Home Innovation Research Labs, this program certifies whole house and small project remodels as energy efficient. Unlike the Whole-House Remodel, the Small Project certification is prescriptive. Chapter 12 of the National Green Building Standard includes a list of mandatory practices, related to materials use, sustainable products, energy efficiency, and indoor environmental quality. A Home Innovation Accredited NGBS Green Verifier gives a final inspection to verify Small Project certification. During inspection, the Verifier will ensure the applicable practices have been met. [http://www.homeinnovation.com/services/certification/green\\_homes/remodeling\\_certification/remodel\\_home\\_certification\\_process](http://www.homeinnovation.com/services/certification/green_homes/remodeling_certification/remodel_home_certification_process)

**NGBS Whole Home Remodel:** Run by the Home Innovation Research Labs, this program certifies whole house and small project remodels as energy efficient. Certification of a whole-building remodel requires demonstrating that there has been a minimum of a 15% reduction in energy consumption and at least a 20% reduction in water consumption over the pre-remodel condition. There are some mandatory practices that must be met. A minimum number of points must be obtained from practices related to Lot Design, Resource Efficiency, Indoor Environmental Quality, and Homeowner Education. [http://www.homeinnovation.com/services/certification/green\\_homes/remodeling\\_certification/remodel\\_home\\_certification\\_process](http://www.homeinnovation.com/services/certification/green_homes/remodeling_certification/remodel_home_certification_process)

**Passivhaus Standard:** German standard for low energy homes that began in the 1980s. Passivhaus is a rigorous, voluntary standard for energy efficiency in a building, reducing its ecological footprint. It results in ultra-low energy buildings that require little energy for space heating or cooling. The Passive House Institute (PHI) is an independent research institute that has played an especially crucial role in the development of the Passive House concept - the only internationally recognized, performance-based energy standard in construction. <http://passiv.de/en/>

**Passive House Institute US (PHIUS):** Buildings designed and built to the PHIUS+ 2015 Passive Building Standard consume 86% less energy for heating and 46% less energy for cooling (depending on climate zone and building type) when compared to a code-compliant building. PHIUS+ 2015 is the first and only passive building standard based upon climate-specific comfort and performance criteria aimed at presenting a cost-optimized solution to achieving the most durable, resilient, and energy-efficient building possible for a specific location. <http://www.phius.org/home-page>

**Passive Solar:** Passive solar is technology for using sunlight to light and heat buildings with no circulating fluid or energy conversion system. <http://rredc.nrel.gov/solar/glossary>. A complete passive solar building design has the following five elements: (1) aperture (collector) (2) absorber (3) thermal mass (4) distribution (5) control. <http://www.nrel.gov/docs/fy01osti/27954.pdf>

**Rain Garden:** A rain garden is a depressed area in the landscape that collects rain water from a roof, driveway or street and allows it to soak into the ground. Planted with grasses and flowering perennials, rain gardens can be a cost effective and beautiful way to reduce runoff from your property. Rain gardens can also help filter out pollutants in runoff and provide food and shelter for butterflies, songbirds and other wildlife. More complex rain gardens with drainage systems and amended soils are referred to as bio-retention. <https://www.epa.gov/soakuptherain/rain-gardens>

**SEER:** Seasonal energy efficiency ratio - The higher the SEER rating, the more energy efficient the equipment is. A higher SEER can result in lower energy costs. <https://energystar.zendesk.com/hc/en-us/articles/212111387-What-is-SEER-EER-HSPF->

**Smart House:** A smart house is a home that has highly advanced, automated systems to control and monitor any function of a house – lighting, temperature control, multi-media, security, window and door operations, air quality, or any other task of necessity or comfort performed by a home's resident. <http://architecture.about.com/od/buildyourhous1/g/smarthouse.htm>

**Water Heaters:** Types are described here: <http://energy.gov/energysaver/articles/solar-water-heaters>.

**WaterSense:** EPA released its Final Version 1.1 WaterSense New Home Specification. This specification will be effective January 1, 2013 and establishes the criteria for new homes labeled under the WaterSense program and is applicable to newly constructed single-family and multi-family homes. [http://www.epa.gov/watersense/new\\_homes/homes\\_final.html](http://www.epa.gov/watersense/new_homes/homes_final.html)

**Whole Building Ventilation System:** A whole building ventilation system assists in a controlled movement of air in tight envelope construction. Whole building ventilation equipment is often a part of the forced air heating or cooling systems. There are various methods of providing whole home ventilation including a heat recovery ventilator (HRV) or an energy recovery ventilator (ERV). Four primary types of systems here: <https://energy.gov/energysaver/whole-house-ventilation>

**Zero Energy Ready Home (ZERH):** To qualify as a DOE Zero Energy Ready Home, a home shall meet certain minimum requirements, be verified and field-tested in accordance with HERS Standards by an approved verifier, and meet all applicable codes. Builders may meet the requirements of either the Performance Path or the Prescriptive path to qualify a home. <http://energy.gov/eere/buildings/zero-energy-ready-home>



## Appendix B: Glossary of Terms

**AFUE:** It's important to choose an energy-efficient, ENERGY STAR rated heating system with a high annual fuel utilization efficiency (AFUE) rating. The higher the AFUE, the more efficient your new heater will be. The AFUE rating is determined by taking the amount of fuel the furnace will use in a year and comparing that to the amount of heat generated by the furnace. An older furnace that has a 70% rating uses 70% of its fuel to make heat. A newer gas fired furnaces are required to have a minimum AFUE rating of 80%. An ENERGY STAR rated furnace will have an AFUE of 90% or higher.

**ACH50:** This term is a measurement of a home's leakiness, and it refers to "Air Changes per Hour" (ACH). ACH means the number of times a home exchanges its volume of indoor air with the outside. Contractors use a "blower door test" for leakiness, and do so at a negative pressure of 50 pascals; hence, energy auditors record the value as ACH50. If an average home has a 15 ACH50, it means the home will exchange its entire volume of air 15 times an hour with the outside. Very efficient and well—sealed homes can be as low as 1 ACH50.

**AC:** This term is short-hand for "air conditioner", which is a piece of equipment that can generate cool air to make your home comfortable in warmer months. Heat pumps, a central AC, mini splits, and window units are kinds of air conditioners.

**Blower Door Test:** Professional contractors use a blower test to determine a home's leakiness (or conversely, its air tightness). To perform the test requires a large fan that pulls air from the house to create negative pressure and a special instrument called a manometer that reads the number of air exchanges your home has under industry standard conditions for testing.

**CAZ Test:** The term "CAZ" stands for "Combustion Appliance Zone", and it is a series of tests contractors perform on gas fueled equipment (furnace, stove, or water heater) for your safety. They will test the appliances for gas leaks, spillage, draft, and carbon monoxide backdrafting when the home is under what's known as "worst case" conditions (e.g., with the dryer, bathroom and oven exhaust fans running). If one or more of the appliances fail the test, your contractor will recommend how to solve for the apparent health and safety issue.

**CFL:** Compact fluorescent lightbulbs (CFLs) are more energy efficient than older incandescent lightbulbs, they do not add additional heat to a room, and they last longer too.

**Conditioned Space:** Rooms in your home which are insulated and heated or cooled by equipment are known as "conditioned space". Conditioned space can include an attic or basement, as well as other common living spaces like bedrooms, bathrooms, and your kitchen.

**Cooling Load:** This term refers to what percentage of the total use or load does a particular cooling unit and its associated duct system provide to the home. For example, if the home has a central air conditioner that provides cool air to the main portion of the home and a window unit that provides cool air to an addition, the cooling load would be a certain percentage split between them.

**Duct Sealing CFM:** Ducts are the tubes which connect your heating and cooling equipment to the floor or ceiling registers which allow the conditioned air into a room. Unfortunately, most homes have leaky ducts which waste a significant amount of energy and can cause comfort, mold, and mildew issues. Ducts should be sealed where they are connected or joined together, and they are tested based on the amount of leakage out of the ducts or air infiltrating (coming into) the ducts. The duct sealing cfm is a measurement of the efficiency of your ductwork.

**Ductless System:** Some heating and cooling equipment does not require ducts, such as radiant floor or radiator heat and window air conditioning units. They are known as "ductless systems".

**Efficiency Factor:** The efficiency factor of a water heater (sometimes referred to as the energy factor), describes a water heater's overall energy efficiency based on the amount of hot water it produces per unit of fuel consumed during a typical day. The water heater's efficiency factor is measured by its energy factor. The higher the number, the more efficient the water heater is. Electric water heaters with an EF of .93 or greater and gas water heaters with an EF of .62 or greater will be 10% more efficient than the standard 40 gallon water heater.



**Energy Management System:** Energy Management Systems have been around for commercial properties for some time, but new technologies have made them applicable and affordable for homeowners to use as well. Energy management is really a process whereby you monitor and control the home's energy usage, with an eye towards conserving it. Typically a Home Energy Management System will include some hardware device as well as software to analyze the data the device picks up from the home's equipment. These systems differ from simpler monitoring devices in that with them, the homeowner can also control features of their home, such as thermostat temperature and lighting, remotely through a website or phone app. They can also provide a report of the home's overall energy performance by analyzing the data they monitor.

**Energy Monitoring System:** In contrast to an energy management system, an energy monitoring system includes devices which help a homeowner see and track energy usage for individual devices or for heating and cooling systems. They measure energy use, but do not manage it.

**EPA Bypass Checklist:** This term refers to a checklist created for ENERGY STAR homes that looks at a list of building details where thermal bypass, or the movement of heat around or through insulation, occurs due to gaps between the air barrier and insulation. If an insulation is installed according to this checklist and can be documented, you are assured to receive the full benefit of that insulation's efficiency.

**ENERGY STAR:** ENERGY STAR is a federal program overseen by the federal government's Environmental Protection Agency. It was designed to encourage greater energy efficiency and bill savings for homeowners through a certified labeling system on appliances and new homes. This program has saved billions of dollars for property owners since its launch in more than 20 years ago.

**Filtration:** This term refers to the filters which are fitted to a home's heating and cooling equipment. A filter's basic function is to protect the longevity of the equipment by protecting it from dust and other airborne particles. Some filters are also designed to improve the indoor air for occupants as well – removing pet dander, pollen, and other impurities from the air passing through the home's ventilation system.

**Forced Air System:** Any home that relies on ducts and vents to move heated or cooled air around has a forced air system

installed. Furnaces, central air conditioners, and heat pumps are all examples of forced air systems. Heating Load: This term refers to what percentage of the total use or load does a particular heating unit and its associated duct system provide to the home. For example, if the home has a furnace that provides heat to the first level and a heat pump that provides heat to the second level, the heating load would be a certain percentage split between them.

**HEPA Filter:** To be classified as a High Efficiency Particulate Air (HEPA) filter, a filter must meet the Department of Energy standard of removing a minimum of 99.7% of pollen and other particles from the air. HEPA filters can be especially effective in mitigating allergies and asthma triggered by indoor air pollutants.

**HSPF:** This term stands for "Heat Seasonal Performance Factor", and it is used to measure a heat pump's efficiency. It measures the total heating output as compared to the total amount of energy used during the same period to create that heat. The higher the HSPF, the more efficient the unit. An ENERGY STAR unit must have an HSPF of an 8 or higher.

**Home Performance with ENERGY STAR:** Similar to the ENERGY STAR program for new homes and appliances, Home Performance with ENERGY STAR is a federal program designed to help homeowners of existing homes save money on their utility bills. Administered by the national Department of Energy (DOE), it is run by DOE approved sponsors who pre-qualify contractors for participation, perform independent quality assurance inspections, and issue a certificate of completion at the conclusion of qualifying projects.

**Hydronic System:** You are probably familiar with hot water radiators often found in older buildings – these are examples of a hydronic heating system. Some newer homes incorporate these systems (which can be glycol, water or electric) into the slab foundation or under tile floors.

**LED:** A "Light Emitting Diode" or LED is a special semiconductor device which emits light when electricity is passed through it. LEDs have a fuller light spectrum than CFLs, can turn on immediately, and their costs have come down dramatically in the past three years. LEDs are very energy efficient, and depending on the manufacturer and application, they can last for decades.



**MERV:** The Minimum Efficiency Rating Value or MERV of an air filter tells you how effective that filter is at removing indoor air pollutants from a home's ventilation system. MERV filters can be almost as effective as a HEPA filter, and they can be installed in more applications.

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**MERV # Typical controlled contaminant**

- 1 - 4 Pollen, dust mites, cockroach debris, sanding dust, spray paint dust, textile fibers, carpet fibers
  - 5 - 8 Mold, spores, dust mite debris, cat and dog dander, dusting aids
  - 9 - 12 Legionella, Humidifier dust, Lead dust, Milled flour, Auto emission particulates, Nebulizer droplets
  - 13 - 16 Bacteria, droplet nuclei (sneeze), cooking oil, most smoke and insecticide dust, most face powder, most paint pigments
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**Mini-Split:** Mini-splits are a kind of heat pump or air conditioner, and they are often used in remodels or retrofits where adding ducts is impractical or impossible. Mini-splits are small and can be zoned for individual rooms.

**Multistage Compressor:** A multistage compressor provides many benefits over a single-stage compressor in an air conditioning unit. With a single-stage compressor, the system is either on or off, and when it is on it is functioning at 100% of its capacity. A multistage compressor is on more often but functions at around 80% of its capacity, which actually save energy (and money) in the long run. It also means less temperature spikes and greater comfort for the home's occupants.

**Non-Programmable Thermostat:** A thermostat is used to sense the temperature of the room and will turn on and off the heating or cooling equipment to reach the desired temperature setting. Although they are the least costly thermostat, non-programmable thermostats are imprecise compared to programmable or wi-fi thermostats, and they provide the homeowner with only one option for controlling over their temperature setting – to manually change it.

**Photovoltaics:** This terms applies to solar power generation and solar panels. A photovoltaic converts solar energy from the sun into a stream of electrons that provides power for buildings and devices.

**Programmable Thermostat:** A thermostat is used to sense the temperature of the room, and based on how it is programmed, it will turn on and off the heating or cooling equipment to reach the desired temperature setting. Programmable thermostats can have many settings (set points): ones for weekday and weekends, ones for when the house is unoccupied due travel, and even daily settings timed according to when you're asleep, awake, away at work, etc. Programmable thermostats can save homeowners money by not running heating and cooling equipment at times or temperatures when not needed.

**R-Value:** R-value indicates how well an insulative material resists heat flow, and the higher the R-value, the better it insulates.

**RESNET Installation Grade:** This grading system applies to insulation installs, and it lowers the operative R-value for insulation installs which are poorly done. Missing areas, compressed insulation, and voids all lower the performance of insulation and lower the grading of it as well.

**Rim Joist:** This component of your home is critical to air leakage, and it is the perimeter joist often referred to as the sill plate when it lies between the foundation and the walls. It is one of the first places a contractor will go to apply insulating foam to reduce air leakage.

**Smart Thermostat:** This device functions like a regular thermostat in that it controls the home's heating and cooling equipment. However, it is also "learning" thermostat - the software "learns" the preferences of the occupants based upon adjustments occupants make over time, and it automatically adjusts the temperature for comfort and energy bills savings. In addition, they can be controlled remotely by phone apps and other desktop software.

**SEER:** This terms stands for "Seasonal Energy Efficiency Ratio", and it measures the efficiency of a central air conditioner. The higher the SEER number, the more efficiently the unit will operate all season long. It is similar to the HSPF but applies to cooling. An ENERGY STAR heat pump or air conditioner must have a SEER of 14 or higher.

**U-Factor:** U-factor is a rating of how well the window insulates. Generally the numbers range from .25 – 1.0. The lower the value the better it insulates.



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**Unconditioned Space:** This term refers to rooms you have in your home which are not insulated and/ or heated or cooled. Most attics are unconditioned, as are garages, and some basements. If you have ductwork in an unconditioned space, it is important to seal and insulate it for maximum comfort and energy cost savings.

**Wi-Fi Thermostat:** A wi-fi thermostat controls when your heating and cooling equipment turns on just like any other thermostat; however, because it can connect to a home's internet router, the homeowner has the option of controlling it remotely through a phone or web application. Some models of wi-fi thermostats "learn" the patterns of the home's occupants and adjust their settings accordingly.