

Certificate No. H-012253



Certification Date: Feb. 10, 2020

High-Performing Home

3273 Stapleford Chase, Virginia Beach, VA 23452-6175

Silver

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.

W. Casey Murphy
Pearl VP of Quality
Management

Sigora Solar

Logan Landry
Certifying Contractor



3273 Stapleford Chase
Virginia Beach, VA 23452-6175

Silver Home
Certificate No. H-012253



Pearl Home Certification Report



Contractor
Sigora Solar
sigorasolar.com

Homeowner
James Newman



3273 Stapleford Chase,
Virginia Beach, VA 23452-6175

Certified on February 10, 2020
Pearl Silver Certificate | Pearl Score: 799

What You Need to Know

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

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



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

Certification Level



Silver
799 Pearl Points



Building Shell:
224 / 300 points



Heating and Cooling:
208 / 360 points

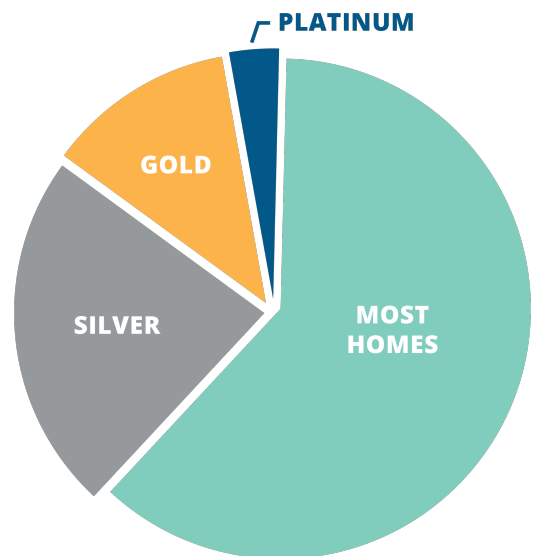


Baseload:
190 / 240 points



Home Management:
177 / 300 points

U.S. Homes Eligible for Pearl Certification Levels





Special Performance Features of This Home

Information below based on Virginia data from the National Renewable Energy Lab.



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.



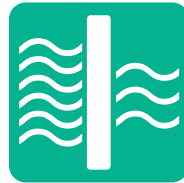
Attic Hatch :
Very Well-insulated

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%.



Vented crawlspace :
Top 8% of VA homes with a crawlspace

Foundation insulation is a significant benefit for keeping heating costs down. A lot of heat loss comes from an uninsulated basement or crawlspace in an otherwise well-sealed and insulated home. This home's foundation is, however, well-insulated.



Air Sealing :
Top 3% 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.



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.



Forced Air Ducts :
Ducts well-insulated

This home's air ducts are well-insulated, preventing loss of conditioned air before that air reaches your home's individual rooms. Well-insulated ducts are one critical component to maintain even temperatures throughout your home.



Special Performance Features of This Home



Tankless Water Heater :
Top 1% of VA homes

Water heating accounts for about 18% of a home's energy use. This home has a tankless gas water heater. These water heaters are exceptionally energy efficient and provide an "endless" supply of hot water. Unlike a storage tank water heater, a tankless model will heat the water only when it is being used.



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.



Clothes Washer :
Very efficient

ENERGY STAR certified clothes washers use about 25 percent less energy and 40 percent less water than regular washers.



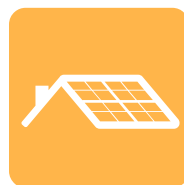
CFL/LED Lighting :
Very efficient

This home has CFL and LED lighting, which means its lamps not only use less energy, they last a very long time. LED lights also produce better light along the color spectrum and are dimmable.



Room Ventilation :
Lower indoor humidity

This home's kitchen and baths have vented exhaust fans. This provides for added protection against mold, mildew, cooking odors, and other pollutants that can trigger asthma, allergies, and other respiratory problems.



Solar panels :
Top 1% of U.S. homes

Energy reliance, energy security, and sustainable living are three reasons why solar panels are gaining in popularity. They also keep energy costs down for the homeowner – particularly when utility bills keep rising.



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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: cs@pearlcertification.com, or visit our website at 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 Pumps

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.



Controls



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: **224**
Average Home: **150**

Attic and Roof



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

Floor and Foundation Insulation



Foundation Type	Vented Crawlspace
R-Value	R-19
Insulation Type (predominant)	Fiberglass - Batt



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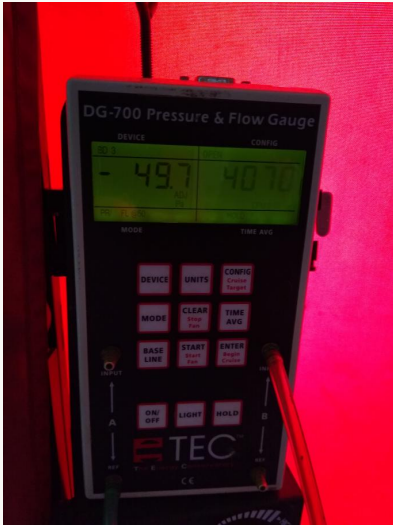
HOME ASSET DETAILS

Building Shell



Platinum Level:	244
This Home:	224
Average Home:	150

Air Sealing



Tested and verified using blower door	Yes
Professionally air sealed	Yes
Blower door result	4070 @CFM50
Air leakiness: Air changes per hour	4.6 @ACH50

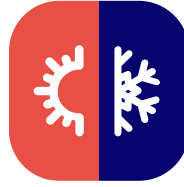


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HOME ASSET DETAILS

Heating and Cooling



Platinum Level: **292**
This Home: **208**
Average Home: **180**

Heat Pump: System 1



Type	Air Source Heat Pump
HSPF	9
SEER	15
ENERGY STAR®	Yes
Manufacturer	Trane
Outdoor Unit Model Number	4twx4042a1000ab
Indoor Unit Model Number	4tee3f40a1000ab

Heat Pump: System 2



Type	Air Source Heat Pump
HSPF	9
SEER	15
ENERGY STAR®	Yes
Manufacturer	Trane
Outdoor Unit Model Number	4twx4024a1000ab
Indoor Unit Model Number	4tee3f31a1000ab

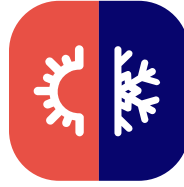


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HOME ASSET DETAILS

Heating and Cooling



Platinum Level: **292**
This Home: **208**
Average Home: **180**

Heat Pump: System 3



Type	Air Source Heat Pump
HSPF	8.5
SEER	14.5
ENERGY STAR®	Yes
Manufacturer	Trane
Outdoor Unit Model Number	4twx4018a1000ab
Indoor Unit Model Number	4tee3f31a1000ab

Distribution System



Type	Forced Air System
R-value	R-6



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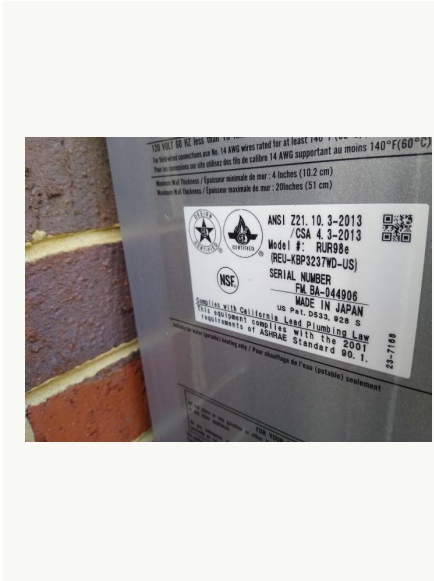
HOME ASSET DETAILS

Baseload



Platinum Level: **195**
This Home: **190**
Average Home: **120**

Water Heating: Water Heater 1



Fuel	Gas
Tank Size	none (Tankless / instantaneous)
Energy Factor	0.96
ENERGY STAR®	Yes
Manufacturer	Rinnai
Model Number	zur98e

Water Heating: Water Heater 2



Fuel	Gas
Tank Size	none (Tankless / instantaneous)
Energy Factor	0.95
ENERGY STAR®	Yes
Manufacturer	Rinnai
Model Number	ru80i



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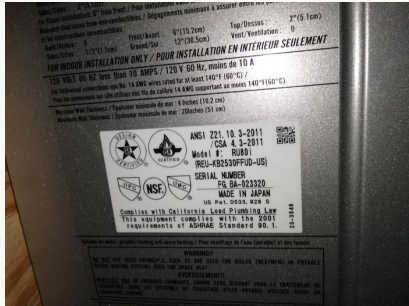
HOME ASSET DETAILS

Baseload



Platinum Level: **195**
This Home: **190**
Average Home: **120**

Water Heating: Water Heater 3



Fuel	Gas
Tank Size	none (Tankless / instantaneous)
Energy Factor	0.95
ENERGY STAR®	Yes
Manufacturer	Rinnai
Model Number	ru80i

Clothes Washer



ENERGY STAR®	Yes



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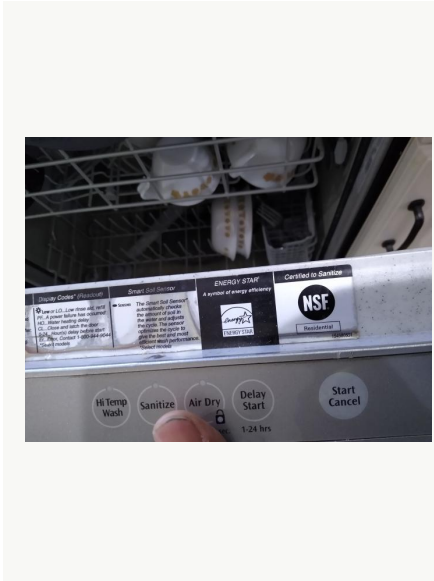
HOME ASSET DETAILS

Baseload



Platinum Level: **195**
This Home: **190**
Average Home: **120**

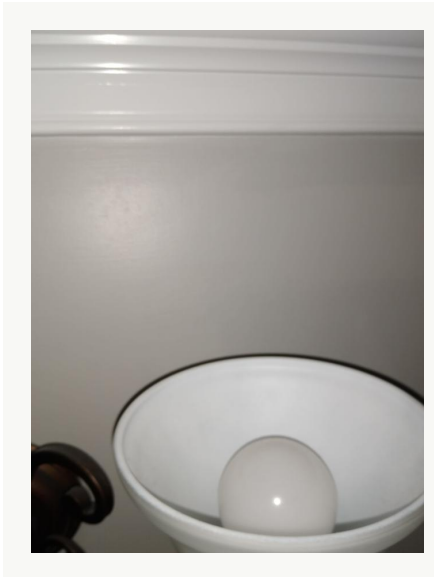
Dishwasher



ENERGY STAR®

Yes

Lighting



Prevalence of CFLs

30%

Prevalence of LEDs

40%



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HOME ASSET DETAILS

Baseload



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This Home: **190**
Average Home: **120**

Healthy Air



CO Detector(s)	Yes
Dedicated ventilation in kitchen	Yes
Dedicated ventilation in every full bathroom	Yes



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HOME ASSET DETAILS

Photovoltaic System



Type of Ownership:
Utility Name:
Utility Rate:

Owned
Dominion
\$.114 kWh

Panel Specifications



Electricity Offset	54 %
System Size (kW)	9.3
Energy Production (kWh)	11264
Source of Energy Production Estimate	Aurora
Manufacturer	HT SAAE
Warranty on Panels (years)	10
Warranty Offered By	HT SAAE

Your solar array is made up of one or more solar panels, which absorb the sun's energy and transform it into electrical energy. Your inverter transforms the direct current (DC) power generated by the panel into alternating current (AC) power that you can use in your home. Your panel's efficiency rating indicates the percentage of the sun's energy falling on your panels that is converted into usable electric energy under specified conditions. The higher your panel's efficiency rating, the more effective they are at converting sunlight into energy.

Panel efficiency ratings have been increasing due to technological innovation. Most panels have efficiencies in the 12% to 15% range, although top performing panels may have an efficiency above 20%. (Note that a high-efficiency panel may not be the right solution for all homeowners; a home with a large available roof space may be able to obtain all the solar energy it needs from a large number of lower-efficiency panels.)



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HOME ASSET DETAILS

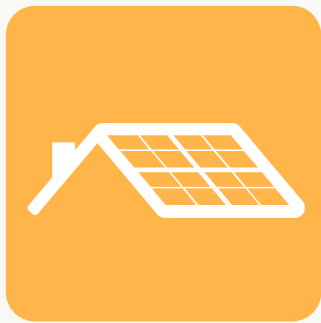
Photovoltaic System



Type of Ownership:
Utility Name:
Utility Rate:

Owned
Dominion
\$.114 kWh

Inverter Specifications



Number of Inverters Per Array	30
Inverter Manufacturer	Enphase
Warranty Term (years)	25
Warranty Offered By	Enphase
Inverter Type	Micro-Inverter

The inverter is less visible than the solar panels, but it's just as important. The inverter converts the electricity generated by the panels from direct current (DC) to alternating current (AC), allowing it to be used in the home. Inverters typically have a shorter life than panels. The length of a warranty is one indication of its quality. Manufacturers typically offer five- to ten-year warranties on inverters, although some offer longer warranties of up to twenty-five years.



Inverter Warranty





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HOME ASSET DETAILS

Home Management



Platinum Level: **244**
This Home: **177**
Average Home: **150**

Controls

Thermostat

Programmable



Planning

My Home Profile Issued

Yes





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HOME ASSET DETAILS

Home Management



Platinum Level:	244
This Home:	177
Average Home:	150

This home will have a “My Home Profile” account. This account gives the owner a tool to understand, manage, maintain, and improve the home’s performance.

The “My Home Profile” account access is expected in 2019. Interested in learning more? Please visit yourhomeprofile.com

Homeowners wanting to make smart home improvements that can add value to their property use Pearl’s certification for guidance. Descriptions of upgrades relevant to this home can be found in its My Home Profile, as well as general information on expense and complexity. Suggested improvements lower energy or water costs, and increase comfort and indoor air quality. Homeowners may also

choose to work with a Pearl Network Contractor who can create a Home Investment Plan with more specific advice on what home performance assets should be considered for upgrade or replacement.

For more information on Pearl’s certification, email at: cs@pearlcertification.com, or visit our website: www.pearlcertification.com



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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®



Client File #:		Appraisal File #:	
Residential Green and Energy Efficient Addendum			
Client: James Newman			
Subject Property: 3273 Stapleford Chase			
City: Virginia Beach		State: Virginia	Zip: 23452-6175

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

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:

Green Certification 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: Pearl Silver Certification					
Date Verified: 02/10/2020	Certificate of Efficiency Improvements Version: Organization URL: <input checked="" type="checkbox"/> Other: www.pearlcertification.com	ABOVE VALID ONLY IF CHECKED: <input type="checkbox"/> Verification reviewed on site <input checked="" type="checkbox"/> Verification attached to this report			

Energy Label Labels disclose the state of the home's energy assets.	RESNET's HERS Rating (0 to 150): <input type="checkbox"/> Sampling Rating <input type="checkbox"/> Projected Rating <input 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): 799	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: 02/10/2020	Score or Rating Version: Organization URL: <input type="checkbox"/> www.resnet.us <input type="checkbox"/> www.homeenergyscore.gov <input checked="" type="checkbox"/> www.pearlcertification.com

Verified Energy Improvements Only include improvements with verified documentation.	Explain energy-related improvements: Detailed in attached "Pearl Home Certification Report" Cost of improvements: \$		
	Date Verified: 02/10/2020	Certificate of Efficiency Improvements Version: Organization URL: <input type="checkbox"/> www.energystar.gov/homeperformance <input type="checkbox"/> Other: www.pearlcertification.com	ABOVE VALID ONLY IF CHECKED: <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: 02/10/2020
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*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)

Client:	James Newman	Client File #:	
Subject Property:	3273 Stapleford Chase, Virginia Beach, VA 23452-6175	Appraisal File #:	

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

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

Insulation	<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 Ceiling R-38 <input checked="" type="checkbox"/> Other R-19 Vented crawlspace						
Building Envelope	Envelope Tightness: 4.6 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. http://bcap-energy.org/						
Windows	<input type="checkbox"/> ENERGY STAR®	<input type="checkbox"/> Low E	<input type="checkbox"/> High Impact	<input type="checkbox"/> Storm	<input checked="" type="checkbox"/> Double Pane <input type="checkbox"/> Triple Pane	<input type="checkbox"/> Tinted	<input type="checkbox"/> Solar Shades
Day Lighting	<input type="checkbox"/> # of Skylights:		<input type="checkbox"/> # of Solar Tubes:	<input type="checkbox"/> Other (Describe): % of lighting LEDs: 40			
ENERGY STAR® Appliances	ENERGY STAR®: <input checked="" type="checkbox"/> Dishwasher <input type="checkbox"/> Refrigerator <input checked="" 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): Note: ENERGY STAR® appliances do not result in an ENERGY STAR® Home.						
Water Heater	<input checked="" type="checkbox"/> ENERGY STAR®		Size: gallons <input checked="" type="checkbox"/> Tankless	<input type="checkbox"/> Solar (next page) <input type="checkbox"/> Heat Pump <input type="checkbox"/> Coil			
HVAC & Related Equipment 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: 9.0 SEER: 15.0 EER:		Thermostat/Controllers? Programmable Thermostat? Auxiliary Heat Source? Radiant Floor Heat? Geothermal? Electric Vehicle Ready? (car charger)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		
Indoor Environmental Quality	<input type="checkbox"/> Energy (ERV) or Heat Recovery Ventilator (HRV) <input 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 type="checkbox"/> Radon System: <input type="checkbox"/> Active <input type="checkbox"/> Passive			
Water Efficiency	<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:			
Utility Costs	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:	
Comments 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: 02/10/2020
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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.

*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)

Client:	James Newman	Client File #:	
Subject Property:	3273 Stapleford Chase, Virginia Beach, VA 23452-6175	Appraisal File #:	

Solar Panels

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

Solar Photovoltaic (Electric) System

	Array #1	Array #2 (if applicable)	
Type of Ownership	<input type="checkbox"/> Leased <input checked="" type="checkbox"/> Owned <input type="checkbox"/> *Solar Loan with UCC Filing <input type="checkbox"/> Purchase Power Agreement (PPA) If solar loan has UCC Filing, it is considered personal property and should not be included in market value.	<input type="checkbox"/> Leased <input type="checkbox"/> Owned <input type="checkbox"/> Solar Loan <input type="checkbox"/> UCC Filing <input type="checkbox"/> Purchase Power Agreement (PPA)	
Panel Specifications	System Size: 9.3000 kW (1kW = 1000 Watts) Age of Panels: Energy Production: 11264 kWh Source of Energy Production Estimate: Aurora Manufacturer: HT SAAE Warranty on Panels: 10 years	System Size: kW (1kW = 1000 Watts) Age of Panels: years/months Energy Production: kWh Source of Energy Production Estimate: Manufacturer: Warranty on Panels: years	
Array Placement 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.): Tilt / Slope: *Azimuth: *Orientation (direction panels face):	
Inverter Specifications	Number of Inverters per Array: 30 Age: Wattage: watts Manufacturer: Enphase Warranty Term: 25 years	Number of Inverters per Array: Age: years Wattage: watts Manufacturer: Warranty Term: years	
Energy Storing Batteries	Battery Type: <input type="checkbox"/> Lithium-ion <input type="checkbox"/> Lithium-ion Polymer <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:		
Name of Utility Company:	Dominion	Charge / kWh from Utility	\$.114/ kWh

Solar Thermal Water Heating System

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

Comments Discuss incentives available for new panels, condition of current panels, and any maintenance issues. If leased, provide the lease terms.	Discuss source of information and define other renewable energy sources, such as wind, hydropower, biomass power, etc. Note: Leased solar PV systems and Power Purchase Agreements 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.
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Completed by: W. Casey Murphy

Title: Vice-President of Quality Systems

Date: 02/10/2020

Client:	James Newman	Client File #:	
Subject Property:	3273 Stapleford Chase, Virginia Beach, VA 23452-6175	Appraisal File #:	

Location - Site

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

Walk Score	Score	Source: <input type="checkbox"/> http://www.walkscore.com <input type="checkbox"/> Other:	
Public Transportation	<input type="checkbox"/> Bus Distance: Blocks	<input type="checkbox"/> Train Distance: Blocks	<input type="checkbox"/> Subway Distance: Blocks
Site	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	
Comments			

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.

Federal	
State	
Local	
Comments	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 www.dsireusa.org

Completed by: W. Casey Murphy

Title: Vice-President of Quality Systems

Date: 02/10/2020

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.

Client:	James Newman	Client File #:	
Subject Property:	3273 Stapleford Chase, Virginia Beach, VA 23452-6175	Appraisal File #:	

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

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

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

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

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

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

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

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

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 spits, 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.

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 |
-

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.



Appendix C: Solar Addendum

Your PV System Can Add Value to Your Home

Photovoltaic (PV) systems (or solar systems) save you money on electricity costs. But they can also increase the resale value of your home. Studies have consistently found that homes with PV systems sell for more than comparable homes without them. A large national study conducted by the Lawrence Berkeley National Laboratory in 2015, for example, found that PV panels added an average of \$4 per watt to a home's sales price. In other words, a typically-sized 5 kW (5,000 W) PV system can add \$20,000 to a home's value.

These numbers are averages, however. When the appraiser looks at a home, he or she isn't thinking about national averages, but about how that home's specific PV system will be valued by the local market.

Your Pearl Certification report is important because it can help the appraiser answer these questions. Most appraisers aren't experts on PV. This report provides the appraiser with key information about your PV system that can be used to estimate its value.

To understand how an appraiser will use your Pearl Certification Report, it is useful to understand the methods the appraiser uses to determine the value of a home and its features. There are three methods: the comparable sales, cost, and income-based approaches.

Comparable Sales

The Comparable Sales method requires the appraiser to find similar homes which have sold with and without a PV system to perform a "paired sales analysis". The sales price of the home which sold without a PV system is compared to the home which sold with a PV system to determine the additional value that the PV system adds to the home.

Income-Based Approach

The Income-Based Approach requires the appraiser to calculate the net present value of the PV system. That is, the appraiser looks at the total future benefits that the homeowner will receive from the PV system over its useful life, and calculates what the value of those future benefits is right now. The National Renewable Energy Laboratory has worked with private firms to develop a method to calculate the net present value of a PV system: this method can be accessed and used for free at the PV Value website (www.pvvalue.com).



Cost Method

The Cost Method calculates the cost of replacing the PV system, and uses this cost as the basis for calculating the additional value that the system will add to the home. Depreciation and incentives that the homeowner received may also be considered. The appraiser is unlikely to rely solely on this method to determine the value of the PV system, but it is useful as a means of combining validating results from the comparable sales and income approaches.

Pulling it Together

Lending institutions recommend that appraisers use comparable sales method. However, an appraiser may not be able to use this method if few other recently-sold homes in the local market have had PV systems installed. Use of the comparable sales method may also be limited if detailed data about the size and other features of the PV systems on the sold homes is not available. As a result, experts recommend that appraisers consider the other two methods to determine a value when appraising PV systems.

The appraiser may use the Pearl Certification report in several ways. The data in the report will help the appraiser understand how your PV system compares to the PV systems on other homes sold in the area. If there are few or no comparable homes with PV sold in the area, the appraiser can use the data in this report to generate the Net Present Value, using the PV Value calculator or a similar system. If your report includes cost data, the appraiser can use that as a check to refine the other two methods.

Owned and Leased Systems

Fannie Mae and the Federal Housing Administration (the FHA) recognize that PV systems can add value to a home. However, there's an important qualification: both recognize the value of a PV system only if it is owned outright by the homeowner. If the system is leased from a third party, these institutions do not recognize that it will add value. This does NOT mean that a leased system is not a benefit to a buyer: the home's electricity costs will be lower as a result of the PV system than they would otherwise be. However, a home with a leased PV system may be less likely to see an increase in sales price from the system.

More Information

Additional information and resources on appraising solar panels can be found on Pearl's Appraiser page <https://pearlcertification.com/appraiser-advantage/> and at the Appraisal Institute's website <https://www.appraisalinstitute.org/>