



ENERGY STAR + HVAC Grading

August 26, 2020



Introduction

ENERGY STAR Version 2

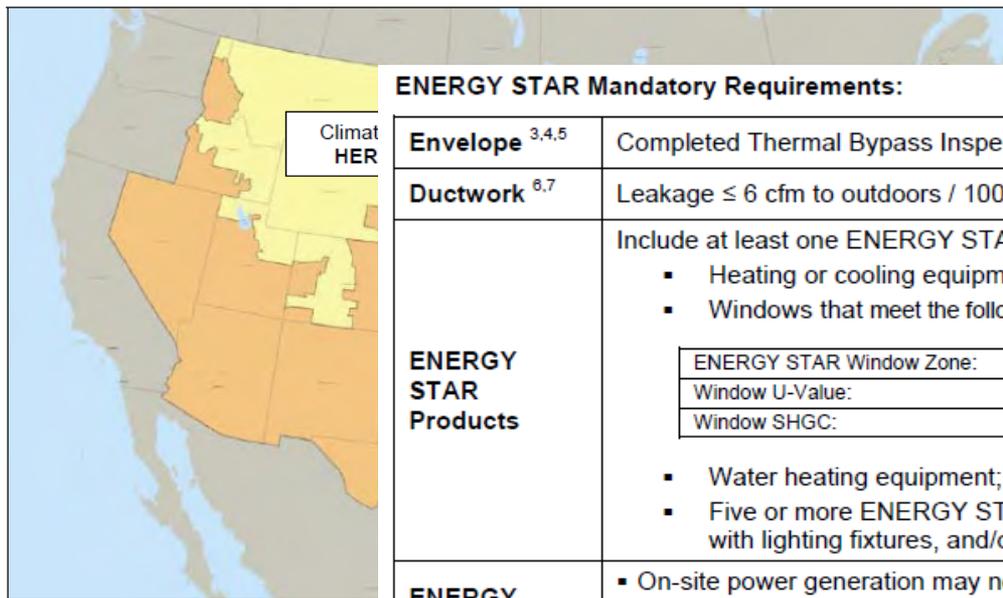


ENERGY STAR Qualified Homes National Performance Path Notes

ENERGY STAR Performance Requirements:

To qualify as ENERGY STAR, a home must meet the minimum requirements specified below and be verified and field-tested in accordance with the RESNET Standards by a RESNET-accredited Provider. Note that compliance with these guidelines is not intended to imply compliance with all local code requirements that may be applicable to the home to be built.¹

Maximum HERS Index Required to Earn the ENERGY STAR²



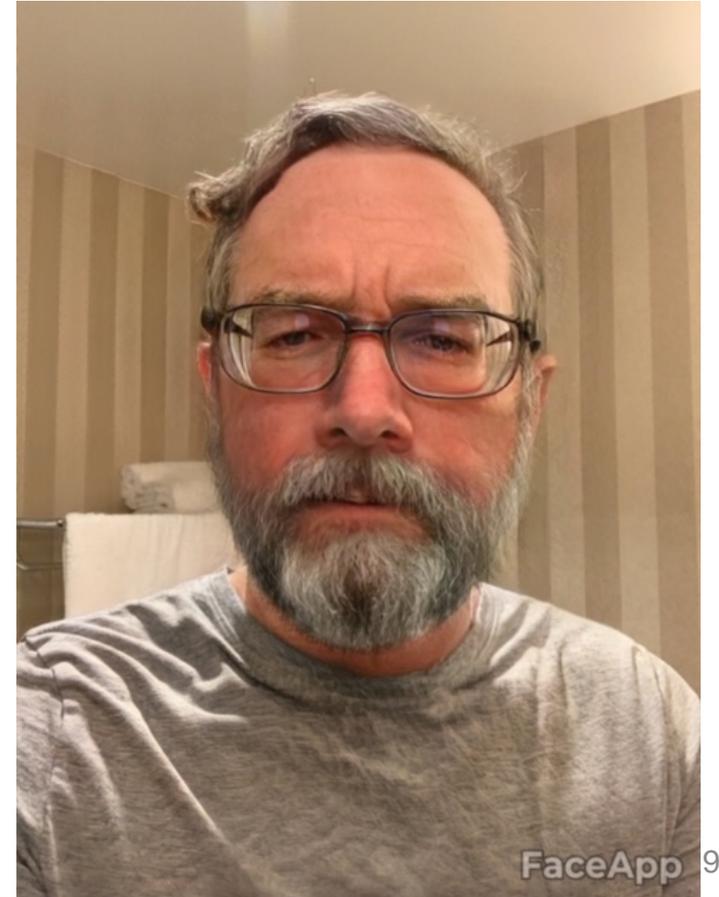
ENERGY STAR Mandatory Requirements:

Envelope ^{3,4,5}	Completed Thermal Bypass Inspection Checklist															
Ductwork ^{6,7}	Leakage \leq 6 cfm to outdoors / 100 sq. ft.															
ENERGY STAR Products	<p>Include at least one ENERGY STAR qualified product category:</p> <ul style="list-style-type: none"> Heating or cooling equipment^{8,9}; <u>OR</u> Windows that meet the following eligibility requirements¹⁰; <u>OR</u> <table border="1"> <thead> <tr> <th>ENERGY STAR Window Zone:</th> <th>Southern</th> <th>South / Central</th> <th>North / Central</th> <th>Northern</th> </tr> </thead> <tbody> <tr> <td>Window U-Value:</td> <td>\leq 0.65</td> <td>\leq 0.40</td> <td>\leq 0.40</td> <td>\leq 0.35</td> </tr> <tr> <td>Window SHGC:</td> <td>\leq 0.40</td> <td>\leq 0.40</td> <td>\leq 0.55</td> <td>Any</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Water heating equipment; <u>OR</u> Five or more ENERGY STAR qualified light fixtures^{11,12}, appliances¹³, ceiling fans equipped with lighting fixtures, and/or ventilation fans¹⁴ 	ENERGY STAR Window Zone:	Southern	South / Central	North / Central	Northern	Window U-Value:	\leq 0.65	\leq 0.40	\leq 0.40	\leq 0.35	Window SHGC:	\leq 0.40	\leq 0.40	\leq 0.55	Any
	ENERGY STAR Window Zone:	Southern	South / Central	North / Central	Northern											
Window U-Value:	\leq 0.65	\leq 0.40	\leq 0.40	\leq 0.35												
Window SHGC:	\leq 0.40	\leq 0.40	\leq 0.55	Any												
ENERGY STAR Scoring Exceptions	<ul style="list-style-type: none"> On-site power generation may not be used to achieve the HERS Index required to qualify the home. A maximum of 20% of all screw-in light bulb sockets in the home may use compact fluorescent lamps (CFLs) to achieve the HERS index required to qualify the home. CFLs used for this purpose must be ENERGY STAR qualified. 															



Version 3 Was a Big Lift

2010 2020



Version 3 Was a Big Lift



Version 3 Was a Big Lift



But how far we've come..

- More familiar with the HVAC design and installation process
- Have stronger relationships with HVAC contractors
- Have seen total duct leakage drop
- Integrated HVAC design & commissioning into your business

A World Divided



Bridging Two Worlds Through Revisions

Reduced Rater tasks by 1/3

Autocompletion of HVAC Design Report

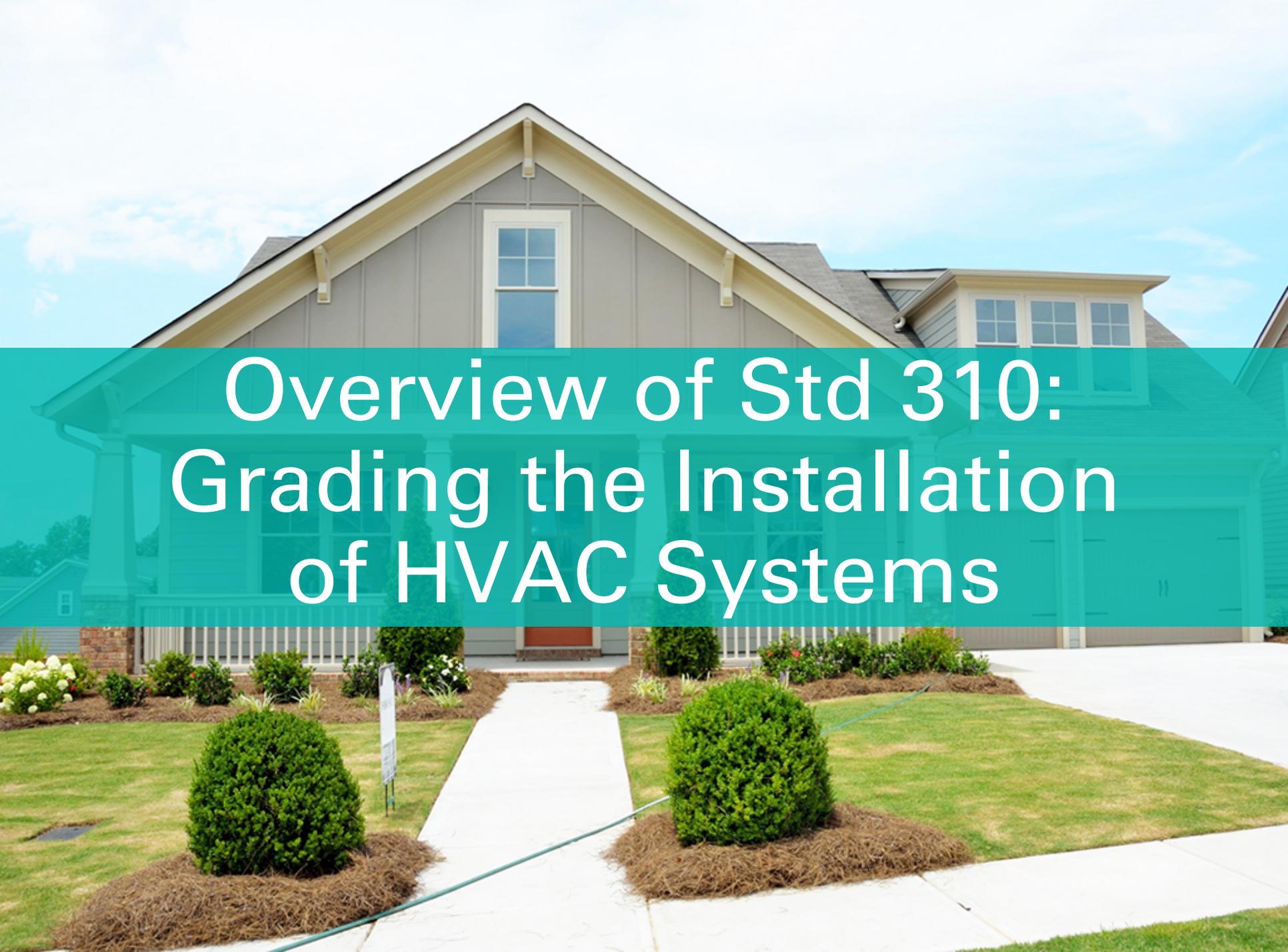


Removed collection of two checklists

HVAC Grading

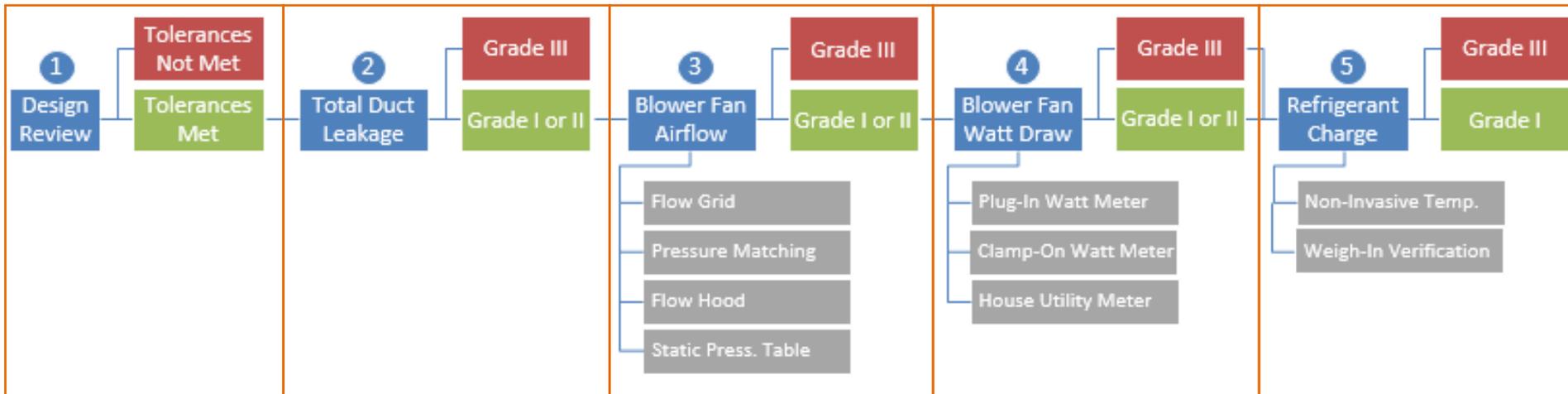
A Whole New World (Or, a New Whole World)



A photograph of a modern, two-story house with grey siding and a white gable. A teal semi-transparent banner is overlaid across the middle of the image, containing white text. The house has a central window in the gable and a dormer window on the right. A concrete walkway leads to the front door, flanked by green bushes and mulch. The sky is blue with light clouds.

Overview of Std 310: Grading the Installation of HVAC Systems

Std. 310: Standard for Grading the Installation of HVAC Systems





Task 1: Design Review

Task 1: Evaluate the design

1. Rater collects design documentation for the dwelling with the HVAC system being tested.
2. Rater reviews design documentation for completeness and compares it to the dwelling. Key features must fall within defined tolerances. For example:

Floor Area	Indoor Design Temps	Insulation Levels
Window Area	Outdoor Design Temps	Infiltration Rate
# Occupants	Window SHGC	Ventilation Rate

3. If tolerances are met, proceed to next task. Otherwise stop here.



Task 2: Total Duct Leakage

Task 2: Evaluate total duct leakage

1. Rater measures total duct leakage according to Std. 380, evaluates the results, and assigns a grade:

Grade	Test Stage	# Returns	Total Leakage Limit (CFM per 100 ft ² or Total CFM)
I	Rough-In	< 3	4 or 40 total
		≥ 3	6 or 60 total
	Final	< 3	8 or 80 total
		≥ 3	12 or 120 total
II	Rough-In	< 3	6 or 60 total
		≥ 3	8 or 80 total
	Final	< 3	10 or 100 total
		≥ 3	14 or 140 total
III	N/A	N/A	No Limit

2. If Grade I or II is achieved, proceed to next task. Otherwise stop here. 21



Task 3: Blower Fan Airflow

Task 3: Evaluate Blower Fan Airflow

- Raters measure the total volumetric airflow going through the blower fan using one of four test methods:
 - A. Flow Hood
 - B. Flow Grid
 - C. Pressure Matching
 - D. OEM Static Pressure Table
- This is just a single measurement. It is not measuring the airflow from each register and summing those.
- The result is compared to the design airflow. The closer the better. This difference is used to assign Grade I, II, or III.
- If Grade I or II is achieved, proceed to next task. Otherwise stop here.



Task 4: Blower Fan Watt Draw

Task 4: Evaluate Blower Fan Watt Draw

- Raters evaluate the watt draw of the blower fan using one of three test methods:
 - A. Plug-In Watt Meter
 - B. Clamp-On Watt Meter
 - C. Utility Meter
- The airflow and watt draw is used to calculate fan efficiency. The more efficient, the better. This is used to assign Grade I, II, or III.
- Regardless of grade, you can proceed to next task.



Task 5: Refrigerant Charge

Task 5: Evaluate Refrigerant Charge

- Raters evaluate the refrigerant charge of the system using one of two test methods:
 - A. Non-Invasive Method
 - B. Weigh-In Verification Method

Task 5: Evaluate Refrigerant Charge

A. Non-Invasive Method

- 'Non-invasive' means no gauges connected to refrigerant system.
- Instead, the temperature of the air and refrigerant lines are used.
- Triage systems into two bins:
 - Grade I – Charge is okay
 - Grade III – Charge is not okay



Refrigerant Gauges
Not Connected



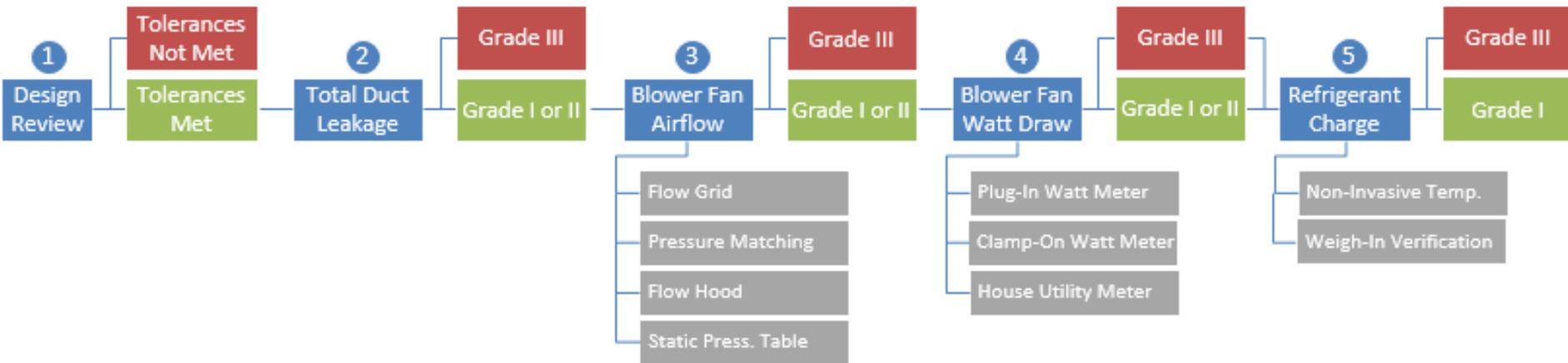
Temperature Sensors
Used Instead

Task 5: Evaluate Refrigerant Charge

B. Weigh-In Verification Method

- The weigh-in verification method can be used year-round and it must be used for:
 - Extreme outdoor conditions.
 - Mini/multi-split systems.
- This method is primarily a document review rather than a performance test.

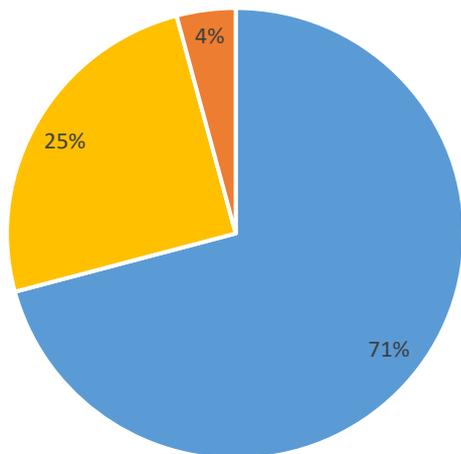
Std. 310: Standard for Grading the Installation of HVAC Systems



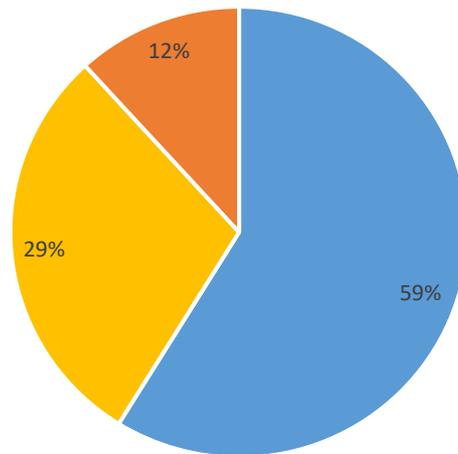
Field Test

- Six providers evaluated **18 systems** and performed **63 individual tests**.
- Required HVAC warm-up time is 15 minutes, but Raters can do other tasks during this time. After that, average time for all tests was **26 minutes**.
- Most systems achieved a **Grade I designation**:

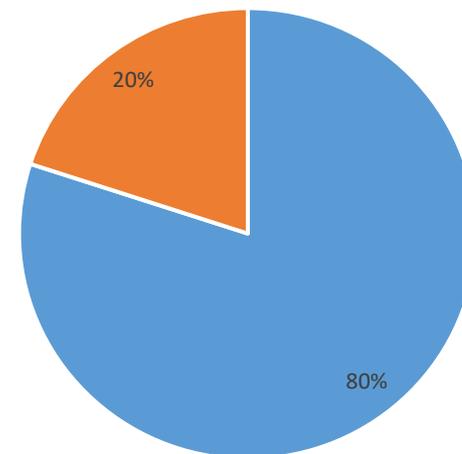
Blower Fan Airflow



Blower Fan Watt Draw



Refrigerant Charge

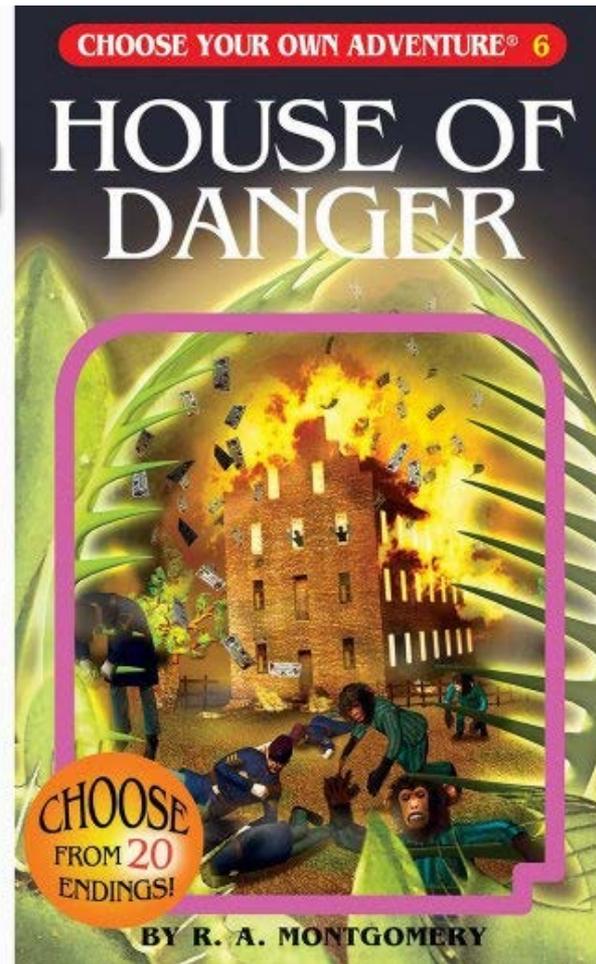


■ Grade I ■ Grade II ■ Grade III

A photograph of a modern, two-story house with a grey and white color scheme. The house features a prominent gable roof with a central window, a covered front porch with white railings, and a two-car garage. The front yard is landscaped with a concrete walkway, green lawn, and several bushes. A teal semi-transparent banner is overlaid across the middle of the image, containing the text 'Integration with ENERGY STAR' in white. The sky is blue with light clouds.

Integration with ENERGY STAR

Two HVAC pathways to certification



**Path A:
HVAC
Grading**

**Path B:
HVAC
Credential**

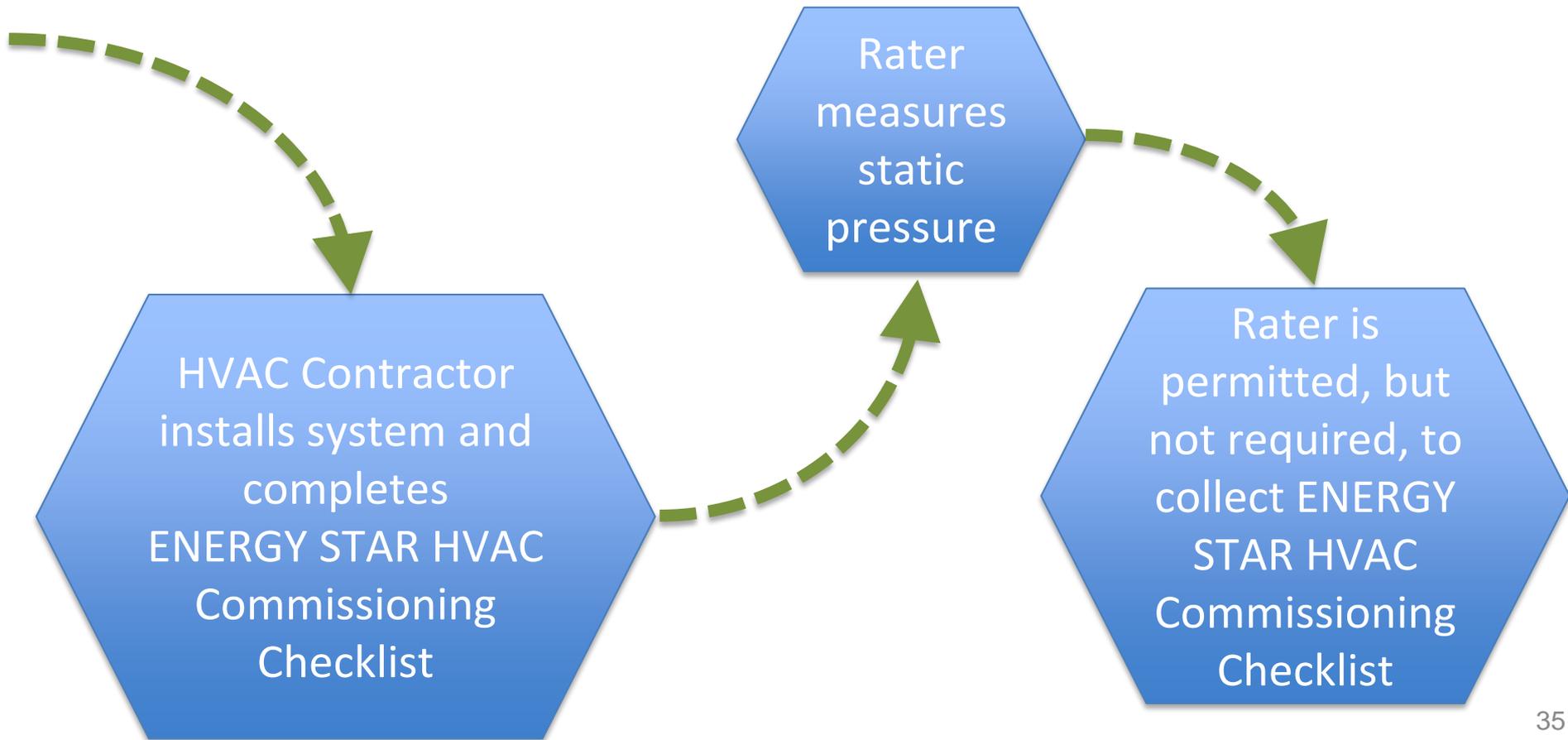
Path B: HVAC Credential

HVAC Designer
completes
ENERGY STAR
HVAC Design
Report

Rater collects
and reviews
design per
ENERGY STAR
Rater Design
Review Checklist

Rater verifies
HVAC
contractor is
credentialed

Path B: HVAC Credential



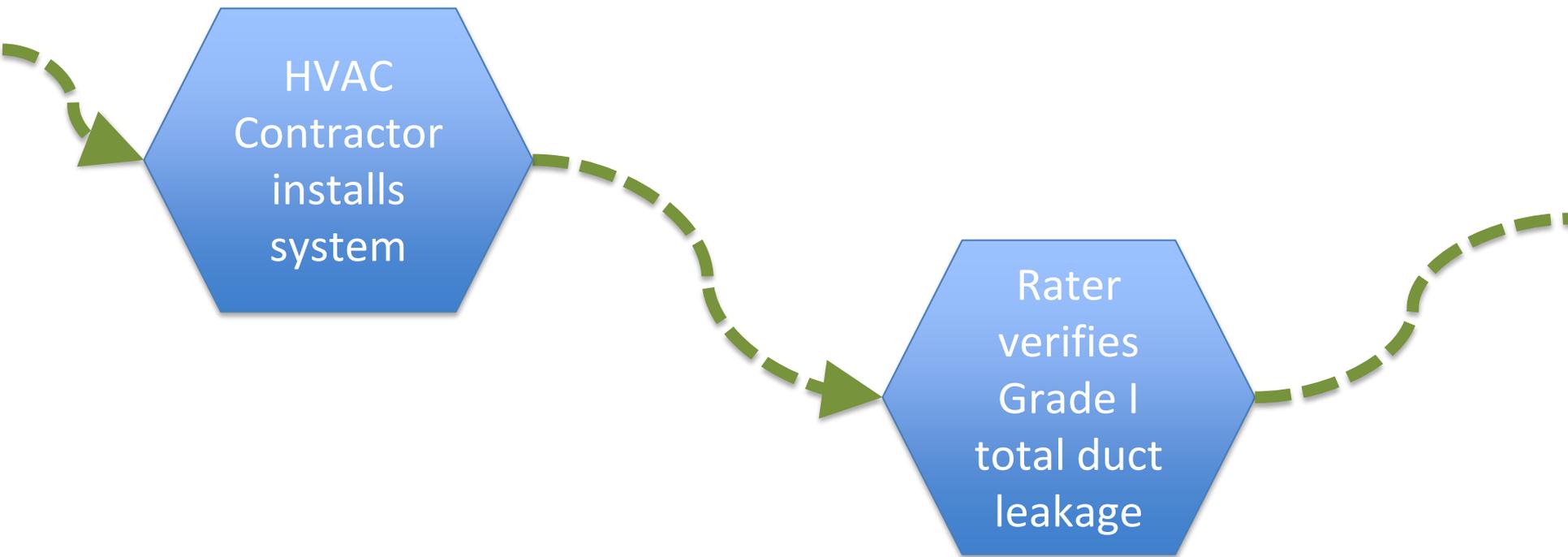
Path A: HVAC Grading

HVAC Designer
completes
Std. 310 HVAC
Design Report +
ENERGY STAR
Supplement

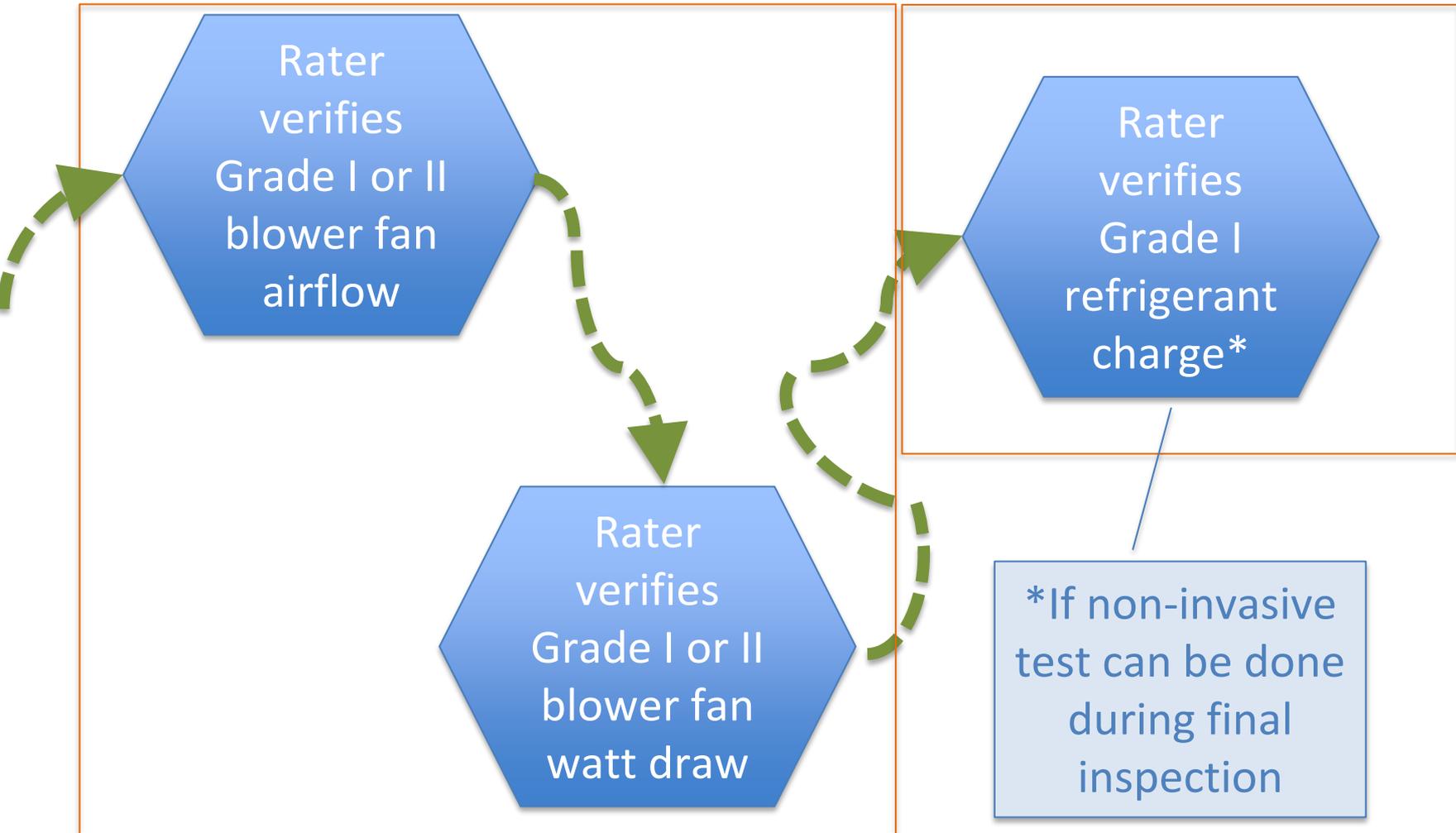
Rater collects
and reviews
design per Std.
310 Rater Design
Review Checklist
+ ES Checks

Rater
verifies
HVAC
contractor is
credentialed

Path A: HVAC Grading



Path A: HVAC Grading



Path A: HVAC Grading

Path B: HVAC Credential

HVAC designer completes..	..Std. 310 Design Report + ENERGY STAR Supplement	..ENERGY STAR Design Report
Rater reviews design report per..	..Std. 310 Review Checklist + ENERGY STAR Supplement	..ENERGY STAR Review Checklist
Rater verifies..	[n/a]	..HVAC contractors is credentialed
HVAC contractor installs..	..equipment	..equipment and completes ES HVAC Commissioning Checklist
Rater verifies..	..Grade I total duct leakage, Grade I / II blower fan airflow, Grade I / II blower fan watt draw, Grade I refrigerant charge*	..total duct leakage limits, static pressure, permitted to collect ES HVAC Commissioning Checklist

Program Requirements Document



National Program Requirements ENERGY STAR Certified Homes, Version 3.1 (Rev. 10)

Two paths are provided for satisfying the mandatory requirements for all certified homes, Exhibit 2. Path A - HVAC Grading utilizes ANSI / RESNET / ACCA Std. 310, a standard for grading the installation of HVAC systems. Path B - HVAC Credential utilizes an HVAC contractor credentialed by an EPA-recognized H-QUITO. Either path may be selected, but all requirements within that path must be satisfied for the home to be certified.

Exhibit 2: Mandatory Requirements for All Certified Homes

Party Responsible	Mandatory Requirements
Rater	<ul style="list-style-type: none"> • Completion of National Rater Design Review Checklist • Completion of National Rater Field Checklist
Builder	<ul style="list-style-type: none"> • Completion of National Water Management System Builder Requirements
If pursuing Path A - HVAC Grading:	
HVAC System Designer	<ul style="list-style-type: none"> • Completion of an HVAC design report compliant with ANSI / ACCA / RESNET Std. 310, plus the ENERGY STAR Supplement. *
HVAC Installing Contractor	<ul style="list-style-type: none"> • None. While the HVAC contractor plays a critical role in properly installing and commissioning a system, the Rater is the party responsible for assessing its installation quality in accordance with ANSI / RESNET / ACCA Std. 310.
If pursuing Path B - HVAC Credential:	
HVAC System Designer	<ul style="list-style-type: none"> • Completion of National HVAC Design Report
HVAC Installing Contractor	<ul style="list-style-type: none"> • Completion of National HVAC Commissioning Checklist.



Rater Design Review Checklist



National Rater Design Review Checklist ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

If pursuing Path A (HVAC Grading) complete this page.

Home Address: _____ City: _____ State: _____ Permit Date: _____

1. Partnership Status	Must Correct	Rater Verified
1.1 Rater has verified that builder is an ENERGY STAR partner using energystar.gov/partnerlocator .	<input type="checkbox"/>	<input type="checkbox"/>
2. High-Performance Fenestration		
2.1 Specified fenestration meets or exceeds 2009 IECC requirements. ³	<input type="checkbox"/>	<input type="checkbox"/>
3. High-Performance Insulation		
3.1 Specified ceiling, wall, floor, and slab insulation levels comply with one of the following options:	<input type="checkbox"/>	<input type="checkbox"/>
3.1.1 Meets or exceeds 2009 IECC levels ^{4, 5, 6} OR:	-	-
3.1.2 Achieves \leq 133% of the total UA resulting from the U-factors in 2009 IECC Table 402.1.3, per guidance in Footnote 4d, AND specified home infiltration does not exceed the following: ^{5, 6}	-	-
3 ACH50 in CZs 1, 2 2.5 ACH50 in CZs 3, 4 2 ACH50 in CZs 5, 6, 7 1.5 ACH50 in CZ 8		
4a. Review of ANSI / RESNET / ACCA Std. 310 HVAC Design Report with ENERGY STAR Supplement ⁷		
4a.1 HVAC design report compliant with ANSI / RESNET / ACCA Std. 310, with the ENERGY STAR supplement, collected for records, with no items left blank.	<input type="checkbox"/>	<input type="checkbox"/>
4a.2 ANSI / RESNET / ACCA Std. 310 Rater Design Review Checklist completed for applicable housing type, with all items marked, "Rater Verified".	<input type="checkbox"/>	<input type="checkbox"/>
4a.3 Cooling sizing % is within the cooling sizing limit selected by the HVAC designer.	<input type="checkbox"/>	<input type="checkbox"/>

Rater Name: _____ Date of Review: _____

Rater Signature: _____ Rater Company Name: _____



National Rater Design Review Checklist ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

If pursuing Path B (HVAC Credential) complete this page.

Home Address: _____ City: _____ State: _____ Permit Date: _____

1. Partnership Status	Must Correct	Rater Verified
1.1 Rater has verified that builder is an ENERGY STAR partner using energystar.gov/partnerlocator .	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Rater has verified that HVAC contractor holds credential required to complete National HVAC Commissioning Checklist. HVAC Contractor Company Name: _____ Exception 1: If all equipment installed in home to be certified is an exempted type, then check "N/A". ² <input type="checkbox"/> N/A	<input type="checkbox"/>	<input type="checkbox"/>
2. High-Performance Fenestration		
2.1 Specified fenestration meets or exceeds 2009 IECC requirements. ³	<input type="checkbox"/>	<input type="checkbox"/>
3. High-Performance Insulation		
3.1 Specified ceiling, wall, floor, and slab insulation levels comply with one of the following options:	<input type="checkbox"/>	<input type="checkbox"/>
3.1.1 Meets or exceeds 2009 IECC levels ^{4, 5, 6} OR:	-	-
3.1.2 Achieves \leq 133% of the total UA resulting from the U-factors in 2009 IECC Table 402.1.3, per guidance in Footnote 4d, AND specified home infiltration does not exceed the following: ^{5, 6}	-	-
3 ACH50 in CZs 1, 2 2.5 ACH50 in CZs 3, 4 2 ACH50 in CZs 5, 6, 7 1.5 ACH50 in CZ 8		
4b. Review of ENERGY STAR National HVAC Design Report ⁷		
4b.1 National HVAC Design Report collected for records, with no items left blank.	<input type="checkbox"/>	<input type="checkbox"/>
4b.2 National HVAC Design Report reviewed by Rater for the following parameters (National HVAC Design Report Item # in parenthesis):		
4b.2.1 Cooling season and heating season outdoor design temperatures used in loads (3.3) are within the limits defined for the State and County, or US Territory, where the home will be built, or the designer has provided an allowance from EPA to use alternative values. ⁸	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.2 Number of occupants used in loads (3.4) is within \pm 2 of the home to be certified. ⁹	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.3 Conditioned floor area used in loads (3.5) is between 100 sq. ft. smaller and 300 sq. ft. larger than the home to be certified. ¹⁰	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.4 Window area used in loads (3.6) is between 15 sq. ft. smaller and 60 sq. ft. larger than the home to be certified, or, for homes to be certified with $>$ 500 sq. ft. of window area, between 3% smaller and 12% larger. ¹¹	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.5 Predominant window SHGC used in loads (3.7) is within 0.1 of predominant value in the home to be certified. ¹⁰	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.6 Sensible, latent, & total heat gain are documented (3.10 - 3.12) for the orientation of the home to be certified. ¹¹	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.7 The variation in total heat gain across orientations (3.13) is \leq 6 kWh. ¹¹	<input type="checkbox"/>	<input type="checkbox"/>
4b.2.8 Cooling sizing % (4.13) is within the cooling sizing limit (4.15) selected by the HVAC designer.	<input type="checkbox"/>	<input type="checkbox"/>

Rater Name: _____ Date of Review: _____

Rater Signature: _____ Rater Company Name: _____



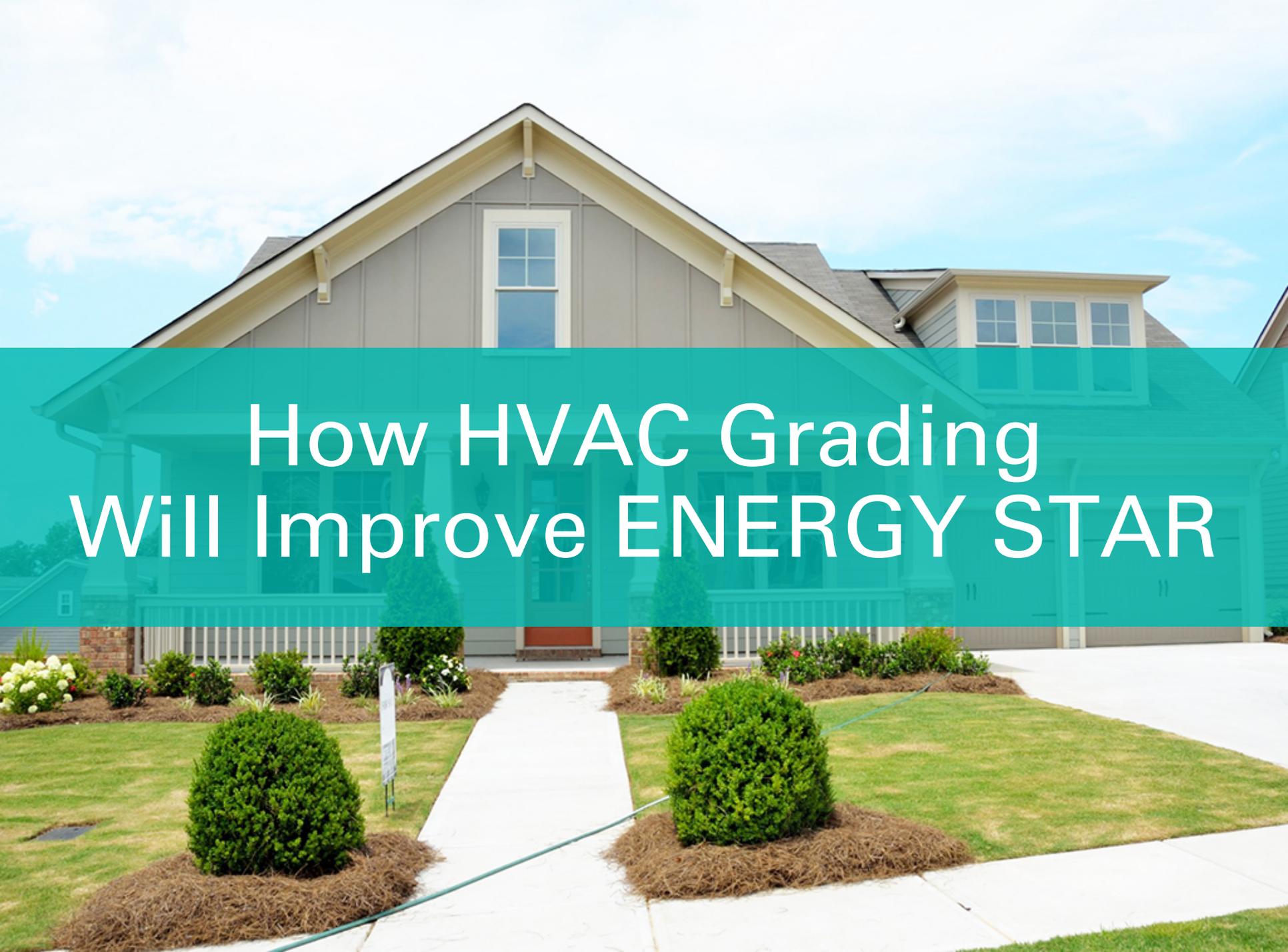
Rater Field Checklist



National Rater Field Checklist ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

HVAC System ³⁰ (National HVAC Design Report Item # in parenthesis)		Must Correct	Rater Verified ²	N/A ³
5. Heating & Cooling Eqpt. – Complete Path A - HVAC Grading or Path B - HVAC Credential				
Path A	5a.1 Blower fan airflow is Grade I or II per ANSI / RESNET / ACCA Std. 310	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5a.2 Blower fan watt draw is Grade I or II per ANSI / RESNET / ACCA Std. 310	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5a.3 Refrigerant charge is Grade I per ANSI / RESNET / ACCA Std. 310. See Footnote xx for exemptions. ^{xx}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Path B	5b.1 HVAC manufacturer & model number on installed equipment matches either of the following <input type="checkbox"/> National HVAC Design Report (4.3, 4.4, & 4.17) <input type="checkbox"/> Written approval received from designer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5b.2 External static pressure measured by Rater at contractor-provided test locations and documented below: Return-Side External Static Pressure: _____ IWC Supply-Side External Static Pressure: _____ IWC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5b.3 <u>Permitted, but not required</u> : National HVAC Commissioning Checklist collected, with no items left blank.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



A photograph of a modern, two-story house with grey siding and white trim. The house features a prominent gable roof with a central window and a smaller window in the dormer. A concrete walkway leads to the front door, flanked by green bushes and mulch. A teal semi-transparent banner is overlaid across the middle of the image, containing white text.

How HVAC Grading Will Improve ENERGY STAR

How HVAC grading will improve ENERGY STAR

1. Does not require use of credentialed contractor.
2. Rewards properly installed HVAC with ERI / HERS points and helps with tax credit. For an ENERGY STAR v3.1-caliber home:

Climate	AC	Heat Pump
Cold	~ 1	~ 3 - 4
Mixed	~ 1 -2	~ 3 - 4
Warm	~ 2 -3	~ 3 - 4
Hot	~ 3 - 4	~ 3 - 4

3. Integrates most of ENERGY STAR into a good energy rating, plus:
 - A. **Two comfort features:** TBC, bedroom comfort vents
 - B. **Four indoor air quality features:** Whole-house ventilation, kitchen & bath fans, a properly-installed filter, combustion safety
 - C. **One durability feature:** Water Management System

A photograph of a modern, two-story house with a gabled roof and a covered front porch. The house has grey siding and white trim. A teal semi-transparent banner is overlaid across the middle of the image, containing the text "Timeline for Use" in white. The foreground shows a concrete walkway leading to the porch, flanked by green bushes and a lawn.

Timeline for Use

1. Standard 310: HVAC Grading Standard

- **What is this?** Defines how the Rater completes the design review, field tests, and designates the grade.
- View standard at: <https://www.resnet.us/about/standards/resnet-ansi/>



Status: Complete!

2. Standard 301: Energy Ratings Update

- **What is this?** Integrates Std. 310 into the overall rating process; updates definitions, calculations, minimum rated features, and on-site inspection protocols.



Status: Complete!

3. RESNET Training & Evaluation

- **What is this?** Trains and evaluates Raters and RFI's on new requirements in Std. 310, prior to use.
- **Status:** Almost complete! Available in early September.

4. Rating software updates

- **What is this?** Rating software vendors must add the inputs and calculations to support Std 310.
- **Status:** Underway.

5. Std. 310 HVAC Design Report Template

- **What is this?** Create new Std. 310 HVAC design report and integrate into Wrightsoft and RHVAC.
- **Status:** Underway.

Timeline for Use

Path A – HVAC grading, which uses Std 310, can be used once:

1. Raters / RFI's have:
 - Completed their RESNET training,
 - Completed their RESNET graded field evaluation, and,
 - Their QAP has confirmed & reported their eligibility to RESNET registry;
2. Updated HERS software is available that incorporates Std 310;
3. Optional: the Std. 310 HVAC design report template is complete and automated.

A photograph of a modern two-story house with a grey and white color scheme. The house features a prominent gable roof with a central window, a covered front porch with white columns, and a two-car garage. The foreground shows a well-maintained lawn with a concrete walkway leading to the front door, flanked by small green shrubs and mulch. A teal semi-transparent banner is overlaid across the middle of the image, containing the text "Wrap Up" in white. The sky is bright blue with light clouds.

Wrap Up

Summary

- Standard 310 is a new standard for evaluating the design and installation quality of HVAC systems.
- ENERGY STAR Rev. 10 adds a new optional path for using Std. 310.
- New path can be used once updated training is complete and HERS software is available. Also working on HVAC design report template.
- This improves ENERGY STAR in three major ways.

ENERGY STAR Residential New Construction

Web & Email:

Single Family: www.energystar.gov/newhomesrequirements
Multifamily: www.energystar.gov/mfnc
Email: energystarhomes@energystar.gov

Dean Gamble

Technical Manager
ENERGY STAR SF New Construction
gamble.dean@epa.gov