



ENERGY STAR Qualified Homes, Version 3 (Rev. 03) County-Level Reference Design: Climate Zone 4¹

Qualifying Homes

The following homes are eligible to earn the ENERGY STAR:

- Single-family homes;
- Units in multi-family buildings that are three stories or less;
- Units in multi-family buildings that are four or five stories and have their own heating, cooling, and hot water systems, separate from other units

Homes may earn the ENERGY STAR using the following ENERGY STAR Prescriptive Path or Performance Path in all states except those with an energy code exceeding the 2009 IECC and for which EPA regional program requirements have been developed. See EPA's Web site for the latest list. 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.²

ENERGY STAR Prescriptive Path

The Prescriptive Path provides a single set of measures that can be used to construct an ENERGY STAR qualified home. Modeling is not required; however, no tradeoffs are allowed. Follow these steps to use the Prescriptive Path:

1. First, assess the eligibility to follow the Prescriptive Path by comparing the conditioned floor area (CFA) of the home to be built to the CFA of the Benchmark Home as specified in Exhibit 2.³ For the purposes of this step, calculate the number of bedrooms and the CFA of the home to be built using RESNET standards with the following exceptions: bedrooms and floor area in basements with at least half of the gross surface area of the basement's exterior walls below grade shall not be counted.⁴ If the CFA of the home to be built exceeds the CFA of the Benchmark Home, then the Performance Path shall be used. See www.energystar.gov/homes for more information on the Performance Path.
2. If the home to be built is eligible to follow the Prescriptive Path, build the home using all requirements of the ENERGY STAR Reference Design, Exhibit 3, and the Mandatory Requirements for All Qualified Homes, Exhibit 1. Note that EPA will provide modified Mandatory Requirements and ENERGY STAR Reference Design specifications for states with energy codes significantly more rigorous than the 2009 IECC. Once published, conformance to these modified guidelines will be required after a specified transition period, typically 60 days, to earn the ENERGY STAR in these states.
3. Using a Rater, verify that all requirements have been met in accordance with the Mandatory Requirements for All Qualified Homes and with RESNET's On-Site Inspection Procedures for Minimum Rated Features.⁵

Mandatory Requirements for All ENERGY STAR Qualified Homes

All ENERGY STAR Qualified New Homes must meet the requirements of the checklists in Exhibit 1. The Water Management System Builder checklist is not required for homes that also qualify for Indoor airPLUS.⁶

Exhibit 1: Mandatory Requirements for All Qualified Homes

Area of Improvement	Mandatory Requirements
1. Thermal Enclosure System	<ul style="list-style-type: none"> • Completed Thermal Enclosure System Rater Checklist
2. Heating, Ventilation, & Air Conditioning (HVAC) System	<ul style="list-style-type: none"> • Completed HVAC System Quality Installation Contractor Checklist • Completed HVAC System Quality Installation Rater Checklist
3. Water Management System	<ul style="list-style-type: none"> • Completed Water Management System Builder Checklist⁶

Exhibit 2: Benchmark Home³

Bedrooms in Home to be Built	1	2	3	4	5	6	7	8
Conditioned Floor Area ³ Benchmark Home	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

Checklist Instructions

The Rater must review all items in this county-level reference design checklist. The column titled "N/A," which denotes items that are "not applicable," should be used when the checklist item is not present in the home or conflicts with local requirements. In the event that a Rater finds an item that is inconsistent with this county-level reference design, the home cannot earn the ENERGY STAR until the item is corrected. If correction of the item is not possible, the home cannot earn the ENERGY STAR. In the event that an item cannot be inspected by the Rater, the home also cannot earn the ENERGY STAR.



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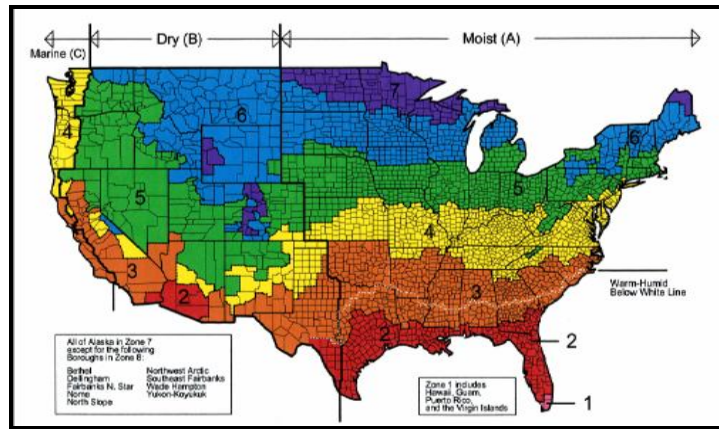
Exhibit 3: ENERGY STAR Reference Design

Home Address: _____		City: _____		State: _____	
System	Inspection Guidelines	Rater Verified	Must Correct	NA	
Benchmark Home Size	Home Size (ft ²) ≤ Benchmark Home Size (ft ²) # BR: _____ Home Size (ft ²): _____ Benchmark Home Size (ft ²): _____	<input type="checkbox"/>	-	-	
Cooling Equipment⁷	Cooling equipment, where provided, meets one of the options below (check one): <input type="checkbox"/> ≥ 13 SEER A/C <input type="checkbox"/> Heat pump (See Heating Equipment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Heating Equipment⁷	Heating equipment meets one of the options below (check one): <input type="checkbox"/> ≥ 90 AFUE gas furnace, ENERGY STAR Qualified <input type="checkbox"/> ≥ 85 AFUE oil furnace, ENERGY STAR Qualified <input type="checkbox"/> ≥ 85 AFUE boiler, ENERGY STAR Qualified <input type="checkbox"/> ≥ 8.5 HSPF / 14.5 SEER / 12 EER ENERGY STAR qualified air-source heat pump with electric backup ⁸ <input type="checkbox"/> ≥ 8.2 HSPF / 14.5 SEER / 12 EER ENERGY STAR qualified air-source heat pump with ENERGY STAR qualified dual-fuel backup <input type="checkbox"/> Ground source heat pump, any product type, ENERGY STAR qualified ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Envelope	Infiltration rate ≤ 5 ACH50 Insulation achieves Grade I installation per RESNET standards. ¹⁰ Ceiling insulation ≥ 38 R-Value ¹¹ Wall insulation ≥ 13 R-Value ¹¹ Floor insulation over unconditioned space ≥ 19 R-Value ¹¹ Slab insulation ≥ 10 R-Value; Depth ≥ 2 ft ^{11,12} Crawlspace wall insulation for unvented crawlspaces meets one of the options below (check one): ¹¹ <input type="checkbox"/> ≥ 10 R-Value Continuous <input type="checkbox"/> ≥ 13 R-Value Framed Wall Basement wall insulation next to conditioned space meets one of the options below (check one): ¹¹ <input type="checkbox"/> ≥ 10 R-Value Continuous <input type="checkbox"/> ≥ 13 R-Value Framed Wall	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Windows & Doors^{13,14}	Windows: ≤ 0.32 U-Value: 0.40 SHGC Skylights: ≤ 0.55 U-Value: 0.40 SHGC If total window-to-floor area ≥ 15%, then U-values or SHGCs adjusted as outlined in footnote 14. Door U-Value: Opaque: ≤ 0.21 ≤ ½ lite: 0.27 > ½ lite: 0.32 Door SHGC: Opaque: No Rating ≤ ½ lite: 0.30 > ½ lite: 0.30	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Water Heater	Energy Factor (EF) meets the requirements based upon fuel type and tank size. ¹⁵ Fuel Type: <input type="checkbox"/> Gas <input type="checkbox"/> Elec <input type="checkbox"/> Oil Tank Size (gal.): _____ Req. EF: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Thermostat & Ductwork	Programmable thermostat installed unless thermostat controls a zone with electric radiant heat, for which a manual thermostat is allowed. ¹⁶ Supply ducts in unconditioned attic ≥ R-8; All others in unconditioned space ≥ R-6 Total duct leakage ≤ 6 CFM25 per 100 sq. ft. of CFA. ^{17,18} Duct leakage to outdoors ≤ 4 CFM25 per 100 sq. ft. of CFA. ^{17,18,19}	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Lighting & Appliances	ENERGY STAR qualified refrigerators, dishwashers, ceiling fans, exhaust fans. ²⁰ ENERGY STAR qualified CFLs or pin-based lighting in 80% of fixtures. ²¹	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	



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1. The following map is shown to depict Climate Zone boundaries. It is for illustrative purposes only and is based on 2009 IECC Figure 301.1.



2. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, or regional ENERGY STAR programs overlap with the requirements of these guidelines, EPA offers the following guidance:
 - a. In cases where the overlapping requirements exceed the ENERGY STAR guidelines, these overlapping requirements shall be met;
 - b. In cases where overlapping requirements conflict with a requirement of these ENERGY STAR guidelines (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these guidelines shall not be met. Qualification shall only be allowed if the rater has determined that no equivalent option is available that could meet the intent of the conflicting requirement of these ENERGY STAR guidelines (e.g., switching from exterior to interior slab edge insulation).
3. The average-size home with a specific number of bedrooms is termed the "Benchmark Home". The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 2. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by multiplying 600 sq. ft. times the total number of bedrooms and adding 400 sq. ft.

Example: CFA Benchmark Home for a 10 bedroom home = (600 sq. ft. x 10) + 400 sq. ft. = 6,400 sq. ft.

A bedroom is defined by RESNET as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

An egress window, as defined in IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

- have a sill height of not more than 44 inches above the floor; AND
 - have a minimum net clear opening of 5.7 sq. ft.; AND
 - have a minimum net clear opening height of 24 in.; AND
 - have a minimum net clear opening width of 20 in.; AND
 - be operational from the inside of the room without the use of keys, tools or special knowledge
4. To determine whether at least at least half of the basement wall area is below grade, use the exterior gross wall area from the basement floor to the bottom of the basement ceiling framing (e.g., the bottom of the joists for the floor above). Exclude the area of all common walls in the basement. If, as a result of this policy, a home has zero applicable bedrooms with regard to the Benchmark Home Size determination, then the Benchmark Home Size for one bedroom shall be used. Note that this change is only for the purpose of determining a home's Benchmark Home Size, Size Adjustment Factor, and eligibility to use the Prescriptive Path. The full conditioned floor area and number of bedrooms, per RESNET's standards, should be used when rating the home (e.g., determining compliance with duct leakage requirements).



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5. The term "Rater" refers to the person completing the third-party inspections required for qualification. This party may be a certified Home Energy Rater, BOP Inspector, or an equivalent designation as determined by a Verification Oversight Organization such as RESNET.
6. A completed and signed Indoor airPLUS Verification Checklist may be submitted in lieu of the Water Management System checklists. Indoor airPLUS is a complimentary EPA label recognizing new homes equipped with a comprehensive set of Indoor Air Quality (IAQ) features. Indoor airPLUS verification can be completed by a Rater during the ENERGY STAR verification process. For more information, see www.epa.gov/indoorairplus
7. Where ENERGY STAR qualified heating or cooling systems are required, all installed equipment of that system type must be ENERGY STAR qualified.
8. The required efficiency for air source heat pumps in Climate Zones 4, 5, & 6 exceed the ENERGY STAR minimum of 8.2 HSPF. Air source heat pumps with electric resistance backup heating cannot be used in homes qualified in Climate Zones 7 & 8.
9. The following efficiency levels shall be used based on ground-source heat pump product type:
 - Closed Loop Water-to-Air: ≥ 3.5 COP / 16.1 EER
 - Open Loop Water-to-Air: ≥ 3.8 COP / 18.2 EER
 - Direct Geo-Exchange (DGX): ≥ 3.6 COP / 16 EER
 - Closed Loop Water-to-Water: ≥ 3.0 COP / 15.1 EER
 - Open Loop Water-to-Water: ≥ 3.4 COP / 19.1 EER
10. Insulation shall be verified by a Rater to achieve Grade I installation as defined in the RESNET Standards, except for ceiling, wall, floor, and slab framing systems with rigid insulation sheathing. For such homes, Grade II installation is acceptable for the cavity insulation only if the rigid insulation sheathing meets or exceeds the following levels: R-3 in Climate Zones 1 to 4; R-5 in Zones 5 to 8.
11. Insulation levels in a home shall meet or exceed the component insulation requirements in the 2009 IECC - Table 402.1.1. The following exceptions apply:
 - a. Steel-frame ceilings, walls, and floors shall meet the insulation requirements of the 2009 IECC – Table 402.2.5. In CZ 1 and 2, the continuous insulation requirements in this table shall be permitted to be reduced to R-3 for steel-frame wall assemblies with studs spaced at 24" on center. This exception shall not apply if the alternative calculations in d) are used;
 - b. For ceilings with attic spaces, R-30 shall satisfy the requirement for R-38 and R-38 shall satisfy the requirement for R-49 wherever the full height of uncompressed insulation at the lower R-value extends over the wall top plate at the eaves. This exemption shall not apply if the alternative calculations in d) are used;
 - c. For ceilings without attic spaces, R-30 shall satisfy the requirement for any required value above R-30 if the design of the roof/ceiling assembly does not provide sufficient space for the required insulation value. This exemption shall be limited to 500 square ft. or 20% of the total insulated ceiling area, whichever is less. This exemption shall not apply if the alternative calculations in d) are used;
 - d. An alternative equivalent U-factor or total UA calculation may also be used to demonstrate compliance, as follows:

An assembly with a U-factor equal or less than specified in 2009 IECC Table 402.1.3 complies.

A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 402.1.3 also complies. The insulation levels of all non-fenestration components (i.e., ceilings, walls, floors, and slabs) can be traded off using the UA approach under both the Prescriptive and the Performance Path. Note that fenestration products (i.e., windows, skylights, doors) shall not be included in this calculation. Also, note that while ceiling and slab insulation can be included in trade-off calculations, the R-value must meet or exceed the minimum values listed in items 4.1 through 4.3 of the Thermal Enclosure System Rater checklist to provide an effective thermal break, regardless of the UA tradeoffs calculated. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use a series-parallel path calculation method.



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12. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall.
13. All windows, doors, and skylights shall meet ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 5.0 as outlined at www.energystar.gov/windows. If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), select the U-factor and SHGC value from tables 4 and 14, respectively, in 2005 ASHRAE Fundamentals, Chapter 31. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color, and presence of low-e coating) Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion. The following exceptions apply:
- An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
 - An area-weighted average of fenestration products more than 50% glazed shall be permitted to satisfy the SHGC requirements;
 - 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;
 - One side-hinged opaque door assembly up to 24 square feet in area shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;
 - Fenestration utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above. Exempt windows shall be facing within 45 degrees of true south and directly coupled to thermal storage mass that has a heat capacity > 20 btu/ft³x°F and provided in a ratio of at least 3 sq. ft per sq. ft. of south facing fenestration. Generally, thermal mass materials will be at least 2" thick.
14. All decorative glass and skylight window areas count toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes using the prescriptive path that have a WFA ratio >15%, the following additional requirements apply:
- In Climate Zones 1, 2, and 3, an improved window SHGC is required and is determined by:
Improved SHGC = [0.15 / WFA] x [ENERGY STAR SHGC]
 Where the ENERGY STAR SHGC is the maximum allowable SHGC in Exhibit 3, ENERGY STAR Reference Design, for the Climate Zone where the home will be built.
 - In Climate Zones 4, 5, 6, 7, and 8, an improved window U-Value is required and is determined by:
Improved U-Value = [0.15 / WFA] x [ENERGY STAR U-Value]
 Where the ENERGY STAR U-Value is the maximum allowable U-Value in Exhibit 3, ENERGY STAR Reference Design, for the Climate Zone where the home will be built.
15. To determine domestic hot water (DHW) EF requirements use the chart below or, for additional tank sizes, the following equations: Gas DHW EF ≥ 0.69 - (0.002 x Tank Gallon Capacity); Electric DHW EF ≥ 0.97 - (0.001 x Tank Gallon Capacity); Oil DHW EF ≥ 0.61 - (0.002 x Tank Gallon Capacity). The minimum efficiency for instantaneous water heaters shall be determined using the above equations and assuming a 1 gallon capacity.
- Water heater systems that are integrated with a space-heating boiler may be used in place of a stand-alone system. However, an integrated indirect storage system shall be used rather than an integrated tankless coil system.

Minimum Water Heater Efficiencies by Fuel Type and Tank Size

Tank Size:	30 Gal	40 Gal	50 Gal	60 Gal	70 Gal	80 Gal
Gas:	0.63 EF	0.61 EF	0.59 EF	0.57 EF	0.55 EF	0.53 EF
Electric:	0.94 EF	0.93 EF	0.92 EF	0.91 EF	0.90 EF	0.89 EF
Oil:	0.55 EF	0.53 EF	0.51 EF	0.49 EF	0.47 EF	0.45 EF



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16. A manual thermostat is allowed if it controls a zone with electric radiant heat. For homes with heat pumps, the thermostat shall have 'Adaptive Recovery' technology to prevent the excessive use of electric back-up heating.
17. Duct leakage shall be determined and documented by a Rater using a RESNET-approved testing protocol only after all components of the system have been installed (e.g., air handler and register grilles). Leakage limits shall be assessed on a per-system, rather than per-home, basis. Testing of duct leakage to the outside can be waived if all ducts & air handling equipment are located within the home's air and thermal barriers AND envelope leakage has been tested to be less than or equal to half of the Prescriptive Path infiltration limit for the Climate Zone where the home is to be built.
18. For all homes that have less than 1,200 sq ft of conditioned floor area (CFA), total measured duct leakage shall be ≤ 8 CFM25 per 100 sq. ft. of CFA and measured duct leakage to outdoors shall be ≤ 5 CFM25 per 100 sq. ft. of CFA.
19. If total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area, or ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area, then leakage to outdoors need not be tested.
20. This only applies where refrigerators, dishwashers, ceiling fans, and exhaust fans are installed. All exhaust fans shall be ENERGY STAR qualified, except in half bathrooms. A half bathroom is any bathroom that does not contain a bathtub, shower, spa, or similar source of moisture.
21. This requirement applies to RESNET-defined Qualifying Light Fixture Locations. Also note that the ENERGY STAR Advanced Lighting Package (ALP), which requires a minimum of 60% ENERGY STAR qualified hard-wired fixtures and 100% ENERGY STAR qualified ceiling fans, where installed, may also be used to comply with the lighting requirements.