



DRAFT ENERGY STAR Qualified Homes 2011 National Program Requirements

To qualify as ENERGY STAR, a home shall meet the minimum requirements specified below, be verified and field-tested in accordance with HERS Standards by a Rater,¹ and meet all applicable codes. Builders may select either the performance path or the prescriptive path and meet its corresponding requirements to qualify a home.

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, but no tradeoffs are allowed. Follow these steps to use the prescriptive path:

1. First assess eligibility of using 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 3. The CFA of the Benchmark Home is determined based on the number of bedrooms in the home to be built. If the CFA of the home to be built exceeds this value, then the performance path shall be used.
2. If the home to be built is eligible to follow the prescriptive path, build the home using the mandatory requirements for all qualified homes, Exhibit 1, and all requirements of the ENERGY STAR Reference Design, Exhibit 2.
3. Verify that all requirements have been met using a Rater.

ENERGY STAR Performance Path

While all mandatory requirements in Exhibit 1 are required, the performance path provides flexibility to select a custom combination of measures that is equivalent in performance to the ENERGY STAR Reference Design Home, Exhibit 2. This is achieved with energy modeling that allows measures to be optimized for each particular home or builder. Follow the steps below to use the performance path with RESNET-accredited Home Energy Rating software programs:

1. The HERS Index of the ENERGY STAR Reference Design Home is first determined. The ENERGY STAR Reference Design Home is similar to the home that will be built, except that it is configured with the features summarized in Exhibit 2². Note that any state energy code requirements that exceed those specified in Exhibit 2 take precedence for purposes of configuring the ENERGY STAR Reference Design Home³.
2. A Size Adjustment Factor (SAF) is next calculated using the following equation:

$$SAF = [CFA_{\text{Benchmark Home}} / CFA_{\text{Home To Be Built}}]^{0.25}, \text{ not to exceed } 1.0$$

Where:

$CFA_{\text{Benchmark Home}}$ = Conditioned Floor Area of the Benchmark Home, using Exhibit 3

$CFA_{\text{Home to be Built}}$ = Conditioned Floor Area of the Home to be Built

Because the Size Adjustment Factor cannot exceed 1.0, it only modifies the HERS Index for homes with conditioned floor area that exceeds that of the Benchmark Home.

3. The ENERGY STAR HERS Index Target is calculated next⁴:

$$\text{ENERGY STAR HERS Index Target} = \text{HERS Index of ENERGY STAR Reference Design Home} \times \text{SAF}$$

4. Configure the preferred set of energy measures for the rated home and verify that the resulting HERS Index meets or exceeds the ENERGY STAR HERS Index Target, as defined in Step 3.
5. Construct the home using measures that result in a HERS Index at or below the ENERGY STAR HERS Index Target, calculated above, and the mandatory requirements for all qualified homes, Exhibit 1.
6. Verify that all requirements have been met using a Rater.



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Exhibit 1: ENERGY STAR Mandatory Requirements for All Qualified Homes^{3,5}

Area of Improvement	Mandatory Requirements
1. Envelope	<input type="checkbox"/> Completed Thermal Bypass Inspection Checklist <input type="checkbox"/> Completed Quality Framing Checklist
2. Cooling & Heating System	<input type="checkbox"/> Completed HVAC Quality Installation Contractor Checklist <input type="checkbox"/> Completed HVAC Quality Installation Rater Checklist
3. Water Efficiency	<input type="checkbox"/> Average flow-rate for all shower-heads shall be ≤ 2.0 gallons per minute <input type="checkbox"/> Hot water distribution system shall use demand pumping, manifold, or core layout
4. Lighting & Appliances	<input type="checkbox"/> All installed refrigerators, dishwashers, and clothes washers shall be ENERGY STAR qualified ⁶ <input type="checkbox"/> Advanced Lighting Package (ALP), or ENERGY STAR bulbs in 80% of sockets, shall be installed ⁷ <input type="checkbox"/> All installed bathroom exhaust and ceiling fans shall be ENERGY STAR qualified
5. IAQ & Durability	<input type="checkbox"/> Completed Indoor Air Quality Checklist <input type="checkbox"/> Completed Water-Managed Construction Checklist

Exhibit 2: ENERGY STAR Reference Design^{2, 3, 5}

Hot Climates (2006 IECC Zones 1,2,3) ⁸	Mixed and Cold Climates (2006 IECC Zones 4,5,6,7,8) ⁸
Cooling Equipment (Where Provided)	
<ul style="list-style-type: none"> ≥ 14.5 SEER / 12 EER ENERGY STAR qualified AC; <u>OR</u> Heat pump (See Heating Equipment) 	<ul style="list-style-type: none"> ≥ 13 SEER AC; <u>OR</u> Heat pump (See Heating Equipment)
Heating Equipment	
<ul style="list-style-type: none"> 80 AFUE gas / oil furnace; <u>OR</u> 80 AFUE boiler; <u>OR</u> ≥ 8.2 HSPF / 14.5 SEER / 12 EER ENERGY STAR qualified heat pump 	<ul style="list-style-type: none"> 92 AFUE gas furnace, ENERGY STAR qualified; <u>OR</u> 85 AFUE boiler, ENERGY STAR qualified; <u>OR</u> 85 AFUE oil furnace, ENERGY STAR qualified; <u>OR</u> ≥ 8.5 HSPF / 14.5 SEER / 12 EER ENERGY STAR qualified heat pump⁹
Envelope, Windows, & Doors	
<ul style="list-style-type: none"> If more than 10 linear feet of ductwork are located in an unconditioned attic, a radiant barrier shall be installed.¹⁰ 	<ul style="list-style-type: none"> Radiant barrier not required
<ul style="list-style-type: none"> Insulation levels shall meet or exceed the 2009 IECC and achieve Grade I installation, per RESNET standards.¹¹ Infiltration¹² (ACH50): 7 in CZs 1,2 6 in CZs 3,4 5 in CZs 5,6,7 4 in CZ 8 ENERGY STAR qualified or better windows and doors (additional requirements for CZ2 and CZ4)^{13,14,15,16} 	
Water Heater^{17, 18}	
<ul style="list-style-type: none"> Gas (EF): 30 Gal = 0.63 40 Gal = 0.61 50 Gal = 0.59 Electric (EF): 52 Gal = 0.92 66 Gal = 0.90 80 Gal = 0.89 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. 	
Thermostat¹⁹ & Ductwork	
<ul style="list-style-type: none"> ENERGY STAR qualified thermostat (except for zones with radiant heat) shall be installed. Ducts in unconditioned attics shall have insulation $\geq R-8$; All other ducts in unconditioned space shall have insulation $\geq R-6$.²⁰ Duct leakage to outdoors shall be ≤ 4 CFM per 100 sq. ft. of conditioned floor area.^{21, 22} 	
Lighting & Appliances	
<ul style="list-style-type: none"> For purposes of calculating the ENERGY STAR HERS Index Target, homes shall be modeled with an ENERGY STAR dishwasher, ENERGY STAR refrigerator, ENERGY STAR ceiling fans, and ENERGY STAR bulbs in 80% of sockets². 	



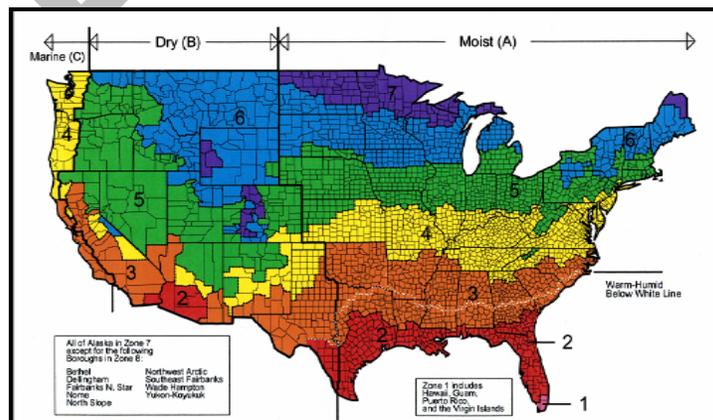
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Exhibit 3: Benchmark Home Size²³

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

Notes:

1. The term "Rater" refers to the person completing the third-party inspections required for qualification. Depending on the compliance path selected, 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.
2. For a complete definition of the reference design to be used when determining the ENERGY STAR HERS Index Target under the performance path, see the document titled "ENERGY STAR Reference Design Definition" located on EPA's website. Note that this definition assumes a framing fraction of 17% for exterior walls and 7% for ceilings, a mechanical ventilation system, window area and orientation as defined in footnote 15 of this document, and other important details.
3. State energy code specifications that exceed the ENERGY STAR National Program Requirements shall take precedence in determining ENERGY STAR compliance requirements, in the following manner. In states with both performance and prescriptive compliance paths for their energy codes, the prescriptive path specifications shall be used for comparing rigor to the ENERGY STAR National Program Requirements. In Exhibit 1, state energy code specifications that exceed Mandatory Requirements shall take precedence. In Exhibit 2, the ENERGY STAR Reference Design shall be modified to include any prescriptive requirement that is more rigorous than the level currently specified. In states with only a performance compliance path, EPA will provide corresponding modifications to the ENERGY STAR Reference Design in Exhibit 2. This modified Reference Design shall then be used to calculate the HERS Index of the ENERGY STAR Reference Design Home.
4. On-site power generation may only be used to meet the ENERGY STAR HERS Index Target for homes that are larger than the Benchmark Home and only for the incremental change in ENERGY STAR HERS Index Target that's caused by the size-adjustment factor.
5. Due to the unique nature of the Hawaiian climate, EPA offers a regionally-developed definition of ENERGY STAR for that state.
6. Further efficiency and savings can be achieved by installing ENERGY STAR qualified products in addition to those required.
7. To learn about the benefits of meeting this requirement through the installation of an ENERGY STAR Advanced Lighting Package (ALP), refer to www.energystar.gov/alp.
8. The following Map is shown to depict climate zone boundaries. It is for illustrative purposes only and is based on 2006 IECC Figure 301.1.





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9. Homes with heat pumps in Climate Zones 4 through 8 shall have an HSPF ≥ 8.5 , which exceeds the ENERGY STAR minimum of 8.2 HSPF. EPA recommends, but does not require, that air-source heat pumps not be used in Climate Zones 6, 7, and 8.
10. Any radiant barrier with a minimum reflectance of 0.90 and maximum emittance of 0.10 or an ENERGY STAR qualified roof product meets the requirement for a radiant barrier.
11. Insulation levels in a home shall meet or exceed those specified in the 2009 IECC. Compliance can be determined by meeting prescriptive insulation requirements, by using U-factor alternatives, or by using a total UA alternative. Note that the U-factor for steel-frame envelope assemblies shall be calculated using the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method. Additionally, reduction of ceiling insulation in space constrained roof/ceiling assemblies shall be limited to 500 sq. ft. or 20% of ceiling area, whichever is less. In all cases, insulation shall be inspected to Grade I installation as defined in the RESNET Standards by a Rater.
12. Envelope leakage shall be determined by a Rater using a RESNET-approved testing protocol.
13. All windows, skylights, and doors shall be ENERGY STAR qualified or meet latest specifications. Windows in Climate Zones 2 and 4 shall exceed ENERGY STAR specifications:

CZ 2: U-value ≤ 0.55 and SHGC ≤ 0.35 ;

CZ 4: U-value ≤ 0.40 and SHGC ≤ 0.45 .

Note that the ENERGY STAR window specification is currently under revision. It is EPA's intent to align the ENERGY STAR Homes specification with this revised specification upon its release. Visit www.energystar.gov/windows for the latest information on ENERGY STAR qualified windows and doors.

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 $>18\%$, the following additional requirements apply:
 - a. In Climate Zones 1, 2, and 3, an improved window SHGC is required and is determined by:
Required SHGC = $[0.18 / \text{WFA}] \times [\text{ENERGY STAR SHGC}]$
Where the ENERGY STAR SHGC is the minimum required SHGC of the climate-appropriate window specified.
 - b. In Climate Zones 4, 5, 6, 7, and 8, an improved window U-Value is required and is determined by:
Required U-Value = $[0.18 / \text{WFA}] \times [\text{ENERGY STAR U-Value}]$
Where the ENERGY STAR U-Value is the minimum required U-Value of the climate-appropriate window specified.
15. When determining the ENERGY STAR HERS Index Target under the performance path, the home shall be modeled with windows evenly distributed to four cardinal compass orientations (N, E, S, & W) and with total window area equal to 18% of conditioned floor area, except as follows - for homes with conditioned basements and for multi-family attached homes the following formula shall be used to determine total window area:

$$\text{AF} = 0.18 \times \text{AFL} \times \text{FA} \times \text{F}$$

Where:

- AF = Total fenestration area
- AFL = Total floor area of directly conditioned space
- FA = (Above-grade thermal boundary gross wall area) / (Above-grade boundary wall area + 0.5 x Below-grade boundary wall area)
- F = $1 - 0.44 \times (\text{Common wall area}) / (\text{Above-grade thermal boundary wall area} + \text{Common wall area})$



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And where:

- Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions;
- Above-grade thermal boundary wall is any portion of a thermal boundary wall not in contact with soil;
- Below-grade boundary wall is any portion of a thermal boundary wall in soil contact; and
- Common wall is the total wall area of walls adjacent to another conditioned living unit, not including foundation walls.

For a complete definition of the reference design to be used when determining the ENERGY STAR HERS Index Target under the performance path, see the document titled "ENERGY STAR Reference Design Definition" located on EPA's website.

16. Up to 0.75% WFA may be used for decorative glass that does not meet ENERGY STAR requirements. For example, a home with total above-grade conditioned floor area of 2,000 sq. ft. may have up to 15 sq. ft. (0.75% of 2,000) of decorative glass.
17. In addition to the options provided to enhance builder choices for water heating, EPA encourages builders to consider using water heaters that earn the ENERGY STAR.
18. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations: Gas DHW EF $\geq 0.69 - (0.002 \times \text{Tank Gallon Capacity})$; Electric DHW EF $\geq 0.97 - (0.001 \times \text{Tank Gallon Capacity})$.
19. In homes with heat pumps, programmable thermostats shall have "Adaptive Recovery" technology to prevent the excessive use of back-up heating.
20. EPA recommends, but does not require, locating ducts within conditioned space (i.e., inside the air and thermal barriers), and using a minimum of R-4 insulation for ducts inside conditioned space to prevent condensation.
21. Duct leakage shall be determined and documented by an EPA-approved verifier using a RESNET-approved or equivalent ASTM-approved testing protocol.
22. If total duct leakage is less than the required value, then leakage to outdoors does not need to be tested. Duct leakage testing can be waived if all ducts and air handling equipment are located in conditioned space (i.e., within the home's air and thermal barriers) AND the envelope leakage has been tested to be ≤ 3 ACH50 OR ≤ 0.25 CFM 50 per sq. ft. of the building envelope.
23. The average-size home with a specific number of bedrooms is termed "Benchmark Home". A bedroom is defined as a room or space 70 square feet or greater, 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 square feet or greater or other similar rooms shall count as a bedroom, but living rooms and foyers shall not. The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 3. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by multiplying 600 sq. ft. times the number of bedrooms and adding 400 sq. ft.

Example: CFA Benchmark Home for a 10 bedroom home = $(600 \text{ sq. ft.} \times 10) + 400 \text{ sq. ft.} = 6,400 \text{ sq. ft.}$