DRAFT ENERGY STAR Qualified Homes 2011 National Program Requirements

To earn the ENERGY STAR, a home shall meet the requirements of either the performance path or the prescriptive path, defined below. Due to the unique nature of the Hawaiian climate, EPA offers a regionally-developed definition of ENERGY STAR for that state. 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]

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 eligibility to follow the prescriptive path by comparing the conditioned floor area (CFA) of the home to be built, as calculated using RESNET Standards, to the CFA of the Benchmark Home as specified in Exhibit 3. The CFA of the Benchmark Home shall be determined based on the number of bedrooms in the home to be built.[2] 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 all requirements of the ENERGY STAR Reference Design, Exhibit 1, and the Mandatory Requirements for All Qualified Homes, Exhibit 2. 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 to earn the ENERGY STAR in these states.

3. Verify that all requirements have been met using a Rater in accordance with the Mandatory Requirements for All Qualified Homes and with RESNET's On-Site Inspection Procedures for Minimum Rated Features.[3]

ENERGY STAR Performance Path

The performance path provides flexibility to select a custom combination of measures for each home that is equivalent in performance to the ENERGY STAR Reference Design Home, Exhibit 1.[4] Equivalent performance is assessed through energy modeling. Follow these steps below to use the performance path:

1. Determine the ENERGY STAR HERS Index Target, which is the maximum HERS index value that each rated home may achieve to earn the ENERGY STAR. This target shall be specifically determined for each rated home by following the steps outlined in the document titled, "2011 ENERGY STAR HERS Index Target Procedure", available on EPA's Web site. This procedure defines how to configure the ENERGY STAR Reference Design Home and calculate its associated HERS index value and then how to apply the appropriate Size Adjustment Factor to determine the ENERGY STAR HERS Index Target.

   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, these modified specifications shall be used after a specified transition period to determine the ENERGY STAR HERS Index Target in these states.

   Note that this process shall be completed manually by a Rater until a version of the RESNET-accredited software program used by each Rater becomes available that automatically configures the ENERGY STAR Reference Design and calculates its associated HERS index value and then applies the appropriate Size Adjustment Factor to determine the ENERGY STAR HERS Index Target. Upon announcement of the release of such a version, Raters using that software program shall have 60 days to begin all new ratings with this updated version.

2. Using any RESNET-accredited Home Energy Rating software program, 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 determined in Step 1. Note that, regardless of the measures selected, Mandatory Requirements for All Qualified Homes in Exhibit 2 are also required. Also note that all insulation, windows, doors, and skylights shall meet or exceed 2009 IECC requirements.

   Furthermore, 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 caused by the Size Adjustment Factor, as outlined in the 2011 ENERGY STAR HERS Index Target Procedure.

3. Construct the home using measures selected in Step 2 and the ENERGY STAR Mandatory Requirements for All Qualified Homes, Exhibit 2.

4. Verify that all requirements have been met using a Rater in accordance with the Mandatory Requirements for All Qualified Homes and with RESNET's On-Site Inspection Procedures for Minimum Rated Features.[3]

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Exhibit 1: ENERGY STAR Reference Design

Hot Climates (2009 IECC Zones 1,2,3)[5]	**Mixed and Cold Climates** (2009 IECC Zones 4,5,6,7,8)[5]
Cooling Equipment (Where Provided)[6]	
• Cooling equipment shall meet the following applicable efficiency levels:	
• ≥ 14.5 SEER / 12 EER ENERGY STAR qualified AC; OR • Heat pump (See Heating Equipment)	• ≥ 13 SEER AC; OR • Heat pump (See Heating Equipment)
Heating Equipment[6]	
• All combustion appliances located within the home's pressure boundary shall be mechanically drafted or direct-vented[7,8] • Heating equipment shall meet the following applicable efficiency levels:	

• ≥ 80 AFUE gas furnace; OR
• ≥ 80 AFUE oil furnace; OR
• ≥ 80 AFUE boiler; OR
• ≥ 8.2 HSPF / 14.5 SEER / 12 EER air-source heat pump, ENERGY STAR qualified with electric backup or ENERGY STAR qualified dual-fuel backup heating; OR
• Ground-source heat pump, any product type, ENERGY STAR qualified:
	• ≥ 90 AFUE gas furnace, ENERGY STAR qualified; OR
	• ≥ 85 AFUE oil furnace, ENERGY STAR qualified; OR
	• ≥ 85 AFUE boiler, ENERGY STAR qualified; OR
	• Air-source heat pump, ENERGY STAR qualified with efficiency as follows:
	  • *CZ 4:* ≥ 8.5 HSPF / 14.5 SEER / 12 EER with electric backup; OR
	  • *CZ 5:* ≥ 9.25 HSPF / 14.5 SEER / 12 EER with electric backup; OR
	  • *CZ 6:* ≥ 9.5 HSPF / 14.5 SEER / 12 EER with electric backup; OR
	• Air-source heat pump, ENERGY STAR qualified, ≥ 8.2 HSPF / 14.5 SEER / 12 EER with ENERGY STAR qualified dual-fuel backup; OR
	• Ground-source heat pump, any product type, ENERGY STAR qualified[10]

Envelope, Windows, & Doors	
• If more than 10 linear feet of ductwork are located in an unconditioned attic, a radiant barrier or ENERGY STAR qualified roof product shall be installed.[11]	• No radiant barrier or ENERGY STAR qualified roof product required.
• Insulation levels shall meet or exceed 2009 IECC levels and achieve Grade I installation per RESNET standards.[12] • Infiltration rates shall be less than or equal to the following values:[13]	

6 ACH50 in CZs 1,2	5 ACH50 in CZs 3,4	4 ACH50 in CZs 5,6,7	3 ACH50 in CZ 8

• Windows, doors, and skylights shall be ENERGY STAR qualified, as illustrated below:[14,15,16]

Window U-Value:	0.60 in CZs 1,2	0.35 in CZ 3	0.32 in CZ 4	0.30 in CZs 5,6,7,8
Window SHGC:	0.27 in CZs 1,2	0.30 in CZ 3	0.40 in CZ 4	Any in CZs 5,6,7,8

• Homes with total window-to-floor area greater than 15% shall have adjusted U-values or SHGCs as outlined in footnote 14.

Water Heater

• All combustion appliances located within the home's pressure boundary shall be mechanically drafted or direct-vented[7,8]

• DHW equipment shall meet the following efficiency requirements:[17]

Gas:	30 Gal = 0.63 EF	40 Gal = 0.61 EF	50 Gal = 0.59 EF
Electric:	52 Gal = 0.92 EF	66 Gal = 0.90 EF	80 Gal = 0.89 EF

• 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.

Thermostat & Ductwork

• Programmable thermostat shall be installed unless the thermostat controls a zone with only electric radiant heat, in which case a manual thermostat is allowed.
• Supply ducts in unconditioned attics shall have insulation ≥ R-8; all other ducts in unconditioned space shall have insulation ≥ R-6.
• Total duct leakage shall be ≤ 6 CFM25 per 100 sq. ft. of conditioned floor area.[18,19]
• Duct leakage to outdoors shall be ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area.[20]

Lighting & Appliances

• Where refrigerators, dishwashers, ceiling fans, and exhaust fans[21] are installed, products shall be ENERGY STAR qualified.
• ENERGY STAR qualified CFLs or pin-based lighting in 80% of fixtures in RESNET-defined Qualifying Light Fixture Locations, shall be installed.[22]

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Exhibit 2: ENERGY STAR Mandatory Requirements for All Qualified Homes

Area of Improvement	Mandatory Requirements
1. Thermal Enclosure System	• Completed Thermal Enclosure System Rater Checklist
2. Heating, Ventilation, & Air Conditioning (HVAC) System	• Completed HVAC System Quality Installation Contractor Checklist • Completed HVAC System Quality Installation Rater Checklist
3. Water Management System	• Completed Water Management System Builder Checklist • Completed Water Management System Rater Checklist

Exhibit 3: Benchmark Home[2,23]

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 *(Unless specified otherwise, notes shall apply to both prescriptive and performance paths)*:

1. 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. Furthermore, qualification shall still 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).

2. The average-size home with a specific number of bedrooms is termed "Benchmark Home". A bedroom is defined by RESNET as a room or space 70 sq. ft. 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 sq. ft. or greater or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

   An egress window shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency and 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

3. 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.

4. *For Performance Path:* For a complete definition of the ENERGY STAR Reference Design to be used when determining the ENERGY STAR HERS Index Target under the performance path, see the document titled "2011 ENERGY STAR HERS Index Target Procedure" located on EPA's Web site.

5. 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.

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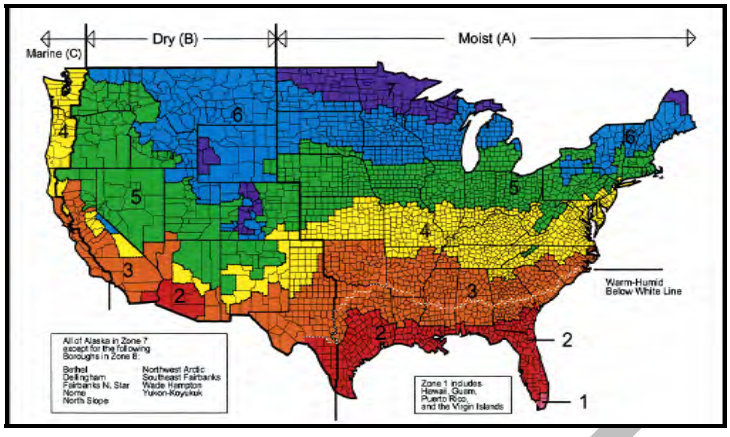

6. *For Prescriptive Path:* Where ENERGY STAR qualified heating or cooling systems are required, all installed equipment of that system type must be ENERGY STAR qualified.

7. The pressure boundary is the primary air enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to the conditioned space would be considered outside the pressure boundary.

8. A direct-vent appliance is a fuel-burning appliance with a sealed combustion system that draws all air for combustion from the outside atmosphere and discharges all flue gases to the outside atmosphere. A mechanical draft system is a venting system designed to remove flue or vent gases by mechanical means that consists of an induced draft portion under non-positive static pressure or a forced draft portion under positive static pressure.

9. Homes with heat pumps in Climate Zone 4 and Climate Zones 5 through 8 shall have an HSPF ≥ 8.5 and ≥ 9.25, respectively, which exceed the ENERGY STAR minimum of 8.2 HSPF.

10. The following efficiency levels shall be used based on ground-source heat pump product type:

    - Closed Loop: ≥ 3.3 COP / 14.1 EER
    - Open Loop: ≥ 3.6 COP / 16.2 EER
    - Direct Expansion (DX): ≥ 3.5 COP / 15 EER

11. Any radiant barrier with a minimum initial reflectance of 0.90 and maximum initial emittance of 0.10 meets the requirement for a radiant barrier.

12. *For Prescriptive Path:* Insulation levels in a home shall meet or exceed those specified in the 2009 IECC. Compliance can be determined by meeting component insulation requirements in Table 402.1.1 or using U-factor alternatives in Table 402.1.3 of the 2009 IECC. 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.

    Insulation shall be verified by a Rater to achieve Grade I installation as defined in the RESNET Standards, except for wall 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 3; R-6 in Zones 4 to 6; and R-10 in Zones 7 and 8.

13. Envelope leakage shall be determined by a Rater using a RESNET-approved testing protocol.

14. *For Prescriptive Path:* 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.

15. *For Prescriptive Path:* 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:

    a. In Climate Zones 1, 2, and 3, an improved window SHGC is required and is determined by:

    Required SHGC = [0.15 / WFA] x [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 = [0.15 / WFA] x [ENERGY STAR U-Value]

    Where the ENERGY STAR U-Value is the maximum required U-Value of the climate-appropriate window specified.

16. *For Prescriptive Path:* 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. *For Prescriptive Path:* To determine domestic hot water (DHW) EF requirements for additional tank sizes, use 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). The minimum efficiency for instantaneous water heaters shall be determined using the above equations and assuming a 1 gallon capacity.

18. Duct leakage shall be determined and documented by a Rater using a RESNET-approved testing protocol.

19. 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 CFM50 per sq. ft. of the building envelope.

20. If total duct leakage is ≤ 4 CFM25 then leakage to outdoors need not be tested.

21. 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.

22. *For Prescriptive Path:* 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.

23. 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 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.