



DRAFT ENERGY STAR Qualified Homes 2011 ENERGY STAR HERS Index Target Procedure

This document provides detailed instructions for determining the ENERGY STAR HERS Index Target, the highest HERS Index value that a home can achieve and still qualify under the performance path of the program. The performance path provides flexibility to select a custom combination of measures through energy modeling that achieves the required ENERGY STAR HERS Index Target. Note, however, that regardless of the measures selected, Mandatory Requirements for All Qualified Homes in Exhibit 2 of the ENERGY STAR Qualified Homes 2011 National Program Requirements document shall be met.

Follow these steps using any RESNET-accredited Home Energy Rating software program to calculate the ENERGY STAR HERS Index Target:

1. Determine the HERS Index of the ENERGY STAR Reference Design Home. To accomplish this, use Exhibit 2 below, Expanded ENERGY STAR Reference Design Definition, to model the Reference Design Home and determine its associated HERS Index value. Note that the ENERGY STAR Reference Design Home is virtually identical to the home that would have been built using the prescriptive path requirements. Also 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.
2. Calculate the Size Adjustment Factor (SAF) 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_{Benchmark Home} = Conditioned Floor Area of the Benchmark Home, using Exhibit 1 below

CFA_{Home to be Built} = Conditioned Floor Area of the Home to be Built, as calculated using RESNET Standards

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. Calculate the ENERGY STAR HERS Index Target, rounded to the nearest whole number:

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

4. Next, proceed with Step 2 of the performance path as outlined in the 2011 ENERGY STAR National Program Requirements.

Exhibit 1: Benchmark Home Size^{1,2}

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



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Exhibit 2: Expanded ENERGY STAR Reference Design Definition

Building Component	Expanded ENERGY STAR Reference Design Definition ^{3,4}									
Foundations:	Construction Type: Same as Rated Home, except:									
	<ul style="list-style-type: none"> For masonry floor slabs, modeled with 80% of floor area covered by carpet and 20% of floor directly exposed to room air For masonry basement walls, structural mass same as Rated Home, but with Masonry Basement Wall R-Value as listed below 									
	Conditioning Type: Same as Rated Home, except:									
	<ul style="list-style-type: none"> Crawlspaces shall be modeled as vented with net free vent aperture = 1sq. ft. per 150 sq. ft. of crawlspace floor area 									
	Gross Area: Same as Rated Home									
	Insulation: ⁵ Choose appropriate insulation level below; insulation layer located on the interior side of walls in conditioned basements									
		Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 4 M & 5	CZ 6	CZ 7	CZ 8
	Slab R-Value:	0	0	0	10	10	10	10	10	
	Slab Depth (ft):	0	0	0	2	2	4	4	4	
	Crawlspace Wall U-Factor:	0.477	0.477	0.136	0.065	0.065	0.065	0.065	0.065	
	Basement Wall U-Factor:	0.360	0.360	0.091	0.059	0.059	0.050	0.050	0.050	
	Masonry Basement Wall R-Value:	0	0	13	13	13	19	19	19	
Floors Over Unconditioned Spaces:	Construction Type: Wood frame									
	Gross Area: Same as Rated Home									
	Insulation: ⁵									
		Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 4 M & 5	CZ 6	CZ 7	CZ 8
	Floor U-Factor:	0.064	0.064	0.047	0.047	0.033	0.033	0.028	0.028	
Above-Grade Walls:	Interior and Exterior Construction Type: Wood frame									
	Gross Area: Same as Rated Home									
	Solar Absorptance = 0.75									
	Emittance = 0.90									
		Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 4 M & 5	CZ 6	CZ 7	CZ 8
	Wall U-Factor:	0.082	0.082	0.082	0.082	0.057	0.057	0.057	0.057	
Thermally Isolated Sunrooms:	None									
Doors:	Area: Same as Rated Home									
	Orientation: Same as Rated Home									
	U-Values and SHGCs, based on ENERGY STAR doors: ⁶									
		Climate Zone:	Opaque			≤ 1/2-Lite		> 1/2-Lite		
		U-Value:	0.21			0.27		0.32		
	SHGC:	N/A			0.30		0.30			
Glazing:	Total Area, except in homes with conditioned basements and multifamily attached homes: ⁷									
	<ul style="list-style-type: none"> Same as Rated Home, where Rated Home glazing area is less than 15% of conditioned floor area; <u>OR</u> 15% of the conditioned floor area, where the Rated Home glazing area is 15% or more of the conditioned floor area 									
	Orientation: Equally distributed to North, East, South, and West									
	Interior Shade Coefficient: Same as HERS Reference Home									
	External Shading: None									
	U-Values and SHGCs, based on ENERGY STAR Windows: ⁶									
		Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
	U-Value:	0.60	0.60	0.35	0.32	0.30	0.30	0.30	0.30	
	SHGC:	0.27	0.27	0.30	0.40	0.45	0.45	0.45	0.45	
Skylights:	None									
Ceilings:	Construction Type: Wood frame									
	Gross Area: Same as Rated Home									
	Insulation: ⁵									
		Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 4 M & 5	CZ 6	CZ 7	CZ 8
	Ceiling U-Factor:	0.035	0.035	0.035	0.03	0.03	0.026	0.026	0.026	
Attics:	Construction Type: Vented with aperture = 1sq. ft. per 300 sq. ft. ceiling area									
	Radiant Barrier: In climate zones 1-3, if > 10 linear ft. of ductwork are located in unconditioned attic									
Roofs:	Construction Type: Composition shingle on wood sheathing									
	Gross Area: Same as Rated Home									
	Solar Absorptance = 0.92									
	Emittance = 0.90									



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Heating Systems:	Heating loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2005 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Home.								
	Fuel Type: Same as Rated Home ⁸								
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump in climate zones 1-6 where Rated Home is modeled with ground-source heat pump and Reference Design shall be configured with ground-source heat pump in climate zones 7 & 8 where Rated Home is modeled with air-source or ground-source heat pump; applicable efficiency selected from below.								
	Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
	Gas Furn. AFUE:	80	80	80	90	90	90	90	90
	Oil Furn. AFUE:	80	80	80	85	85	85	85	85
	Gas/ Oil Boiler AFUE:	80	80	80	85	85	85	85	85
Air-Source Heat Pump HSPF:	8.2	8.2	8.2	8.5	9.25	9.5	n/a	n/a	
Air-Source Heat Pump Backup:	Electric	Electric	Electric	Electric	Electric	Electric	n/a	n/a	
Ground-Source Heat Pump COP:	n/a	n/a	n/a	n/a	n/a	n/a	3.3	3.3	
Cooling Systems:	Cooling loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2005 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Home.								
	Fuel Type: Same as Rated Home								
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump in climate zones 1-6 where Rated Home is modeled with ground-source heat pump and Reference Design shall be configured with ground-source heat pump in climate zones 7 & 8 where Rated Home is modeled with air-source or ground-source heat pump; applicable efficiency selected from below.								
	Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
	AC SEER:	14.5	14.5	14.5	13	13	13	13	13
	Air-Source Heat Pump SEER:	14.5	14.5	14.5	14.5	14.5	14.5	n/a	n/a
Ground-Source Heat Pump EER:	n/a	n/a	n/a	n/a	n/a	n/a	14.0	14.0	
Service Water Heating Systems:	Use (Gallons per Day): 30 x Number of Dwelling Units + 10 x Number of Bedrooms								
	Tank Temperature: 120 F								
	Fuel Type: Same as Rated Home								
	System Type: Conventional storage water heater. Select applicable efficiency from below using tank size of Rated Home. If Rated Home uses instantaneous water heater, then select the efficiency of the 40 gallon tank for gas systems and 66 gallon tank for electric systems.								
	Gas Storage Tank Capacity:⁹	30 Gallon		40 Gallon			50 Gallon		
	Gas DHW EF:	0.63		0.61			0.59		
Electric Storage Tank Capacity:⁹	52 Gallon		66 Gallon			80 Gallon			
Electric DHW EF:	0.92		0.90			0.89			
Thermal Distribution Systems:	Duct Leakage to Outside: 4 CFM25 per 100 sq. ft. of conditioned floor area								
	Duct Insulation: • R-8 on supply ducts located in unconditioned attic • R-6 on all other ducts located in unconditioned spaces								
	Duct Surface Area: Same as Rated Home								
	Supply and Return Duct Locations:								
	Foundation Type:	Slab		Crawlspace			Basement		
	One Story:	100% Attic		100% Crawlspace			100% Basement		
Two Story:	75% Attic / 25% Conditioned		50% Attic / 50% Crawlspace			50% Attic / 50% Basement			
Thermostat:	Type: Programmable								
	Temperature Setpoints: ¹⁰ • Cooling temperature setpoint = 78°F • Heating temperature setpoint = 68°F								
Infiltration & Mechanical Ventilation:	Infiltration Rates:								
	Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
	ACH50:	6	6	5	5	4	4	4	3
	Mechanical ventilation system without heat recovery								
	Rate: CFM = 0.01 * CFA + 7.5 * (Nbr + 1), where CFA = Conditioned Floor Area and Nbr = Number of Bedrooms								
	Hours per Day: 24								
	Fan Watts: Watts = CFM Rate / 2.2 CFM per Watt, where CFM Rate is determined above								
Climate Zone:	CZ 1	CZ2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	
Ventilation Type:	Supply	Supply	Supply	Supply	Exhaust	Exhaust	Exhaust	Exhaust	
Lighting and Appliances: ¹¹	Fluorescent Lighting: 80%								
	Refrigerator: 423 kWh per year								
	Dishwasher: 0.66 EF								
	Ceiling Fan: 122 CFM per Watt								
Internal Mass:	Where Home Energy Rating software programs allow user entry of internal mass, 8 lbs. per sq. ft. of floor area for furniture and contents shall be entered; otherwise, ignore.								



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Notes:

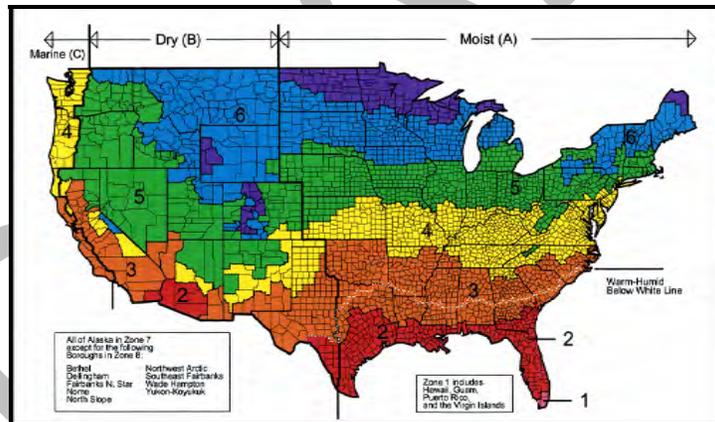
1. The average-size home with a specific number of bedrooms is termed "Benchmark Home". A bedroom is defined by RESNET as a room or space 70 sq. ft. or greater, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, 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
2. The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 1. 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.

3. Any parameter not specified in this exhibit shall be set to "Same as Rated Home".
4. 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.



5. For informative purposes, component U-factors are meant to correlate to typical assemblies with the nominal R-values as listed in 2009 IECC Table 402.1.1.
6. All Reference Design window and door U-value and SHGC requirements are based on the ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 5.0 as outlined at www.energystar.gov/windows, except that SHGC values have been assumed for CZ 5-8.



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7. When determining the ENERGY STAR HERS Index Target for homes with conditioned basements and for multi-family attached homes under the performance path, the following formula shall be used to determine total window area of the ENERGY STAR Reference Design:

$$AF = 0.15 \times AFL \times FA \times F$$

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 = $1 - 0.44 \times (\text{Common wall area}) / (\text{Above-grade thermal boundary wall area} + \text{Common wall area})$

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.
8. In the ENERGY STAR Reference Design, fuel type(s) shall be same as Rated Home, including any dual-fuel equipment where applicable. For a Rated Home with multiple heating, cooling, or water heating systems using different fuel types, the applicable system capacities and fuel types shall be weighted in accordance with the loads distribution (as calculated by accepted engineering practice for that equipment and fuel type) of the subject multiple systems.
9. 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 $\geq 0.97 - (0.001 \times \text{Tank Gallon Capacity})$.
10. Where Home Energy Rating software programs allow for user entry of programmable offsets, 2°F temperature control point offsets with an 11:00 p.m. to 5:59 a.m. schedule for heating and a 9:00 a.m. to 2:59 p.m. schedule for cooling shall be entered; otherwise, ignore.
11. Where Home Energy Rating software programs allow for user entry of internal gains, the following gains shall be modeled: $IGain = 17,900 + 23.8 \times CFA + 4104 \times Nbr$ (Btu/day per dwelling unit), except as provided by RESNET Section 303.4.1.7 for lighting and appliances; otherwise, ignore.