ENERGY STAR[®] Residential New Construction Programs

Historical Document

This document is provided for reference because it has been superseded by a more recent Version or Revision. Please find current program documents on the <u>Program</u> <u>Requirements</u> webpage.

Use of older Versions and Revisions, such as this document, are typically limited to homes and buildings with a permit date (or, for manufactured homes, a production date) prior to a specified date. Consult the <u>Implementation Timeline</u> table to assess whether a home or apartment is still eligible to be certified using this document.

For questions or more information, contact us at <u>energystarhome@energystar.gov</u>.



This document provides instructions for determining the ENERGY STAR ERI Target, the highest ERI value that each rated home may achieve to earn the ENERGY STAR. Note that, in addition to meeting the ENERGY STAR ERI Target, homes shall also meet all Mandatory Requirements for All Certified Homes in Exhibit 2 of the Pacific Program Requirements for ENERGY STAR Single-Family New Homes, Version 3.

An EPA-recognized Home Certification Organization's Approved Software Rating Tool shall automatically determine (i.e., without relying on a user-configured ENERGY STAR Reference Design) this target for each rated home using the following procedure:

- The software shall configure the ENERGY STAR Reference Design Home in accordance with Exhibit 2, The Expanded ENERGY STAR Reference Design Definition for the Pacific, and calculate its associated ERI value. The ERI value shall be calculated using ANSI / RESNET / ICC Standard 301 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the Home Certification Organization (HCO) that the home is being certified under, with approved exceptions listed at <u>www.energystar.gov/ERIExceptions</u>.
- 2. For all single-family detached homes, townhomes, rowhomes, duplexes, triplexes, and quadplexes the software shall calculate the Size Adjustment Factor (SAF) using the following equation:

Where:

SAF = [CFA Benchmark Home / CFA Home To Be Built]^{0.25}, not to exceed 1.0

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

For the purposes of this step, the software shall calculate the number of bedrooms and the CFA of the home to be built in accordance with the definitions in ANSI / RESNET / ICC Std. 301 with the following exception: 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. ¹ Because the SAF cannot exceed 1.0, it only modifies the ERI Target for homes with conditioned floor area greater than the Benchmark Home. For condos and apartments in multi-family buildings the SAF shall always equal 1.0.

3. The software shall calculate the ENERGY STAR ERI Target, rounded to the nearest whole number:

ENERGY STAR ERI Target = ERI of ENERGY STAR Reference Design Home x SAF

Bedrooms in Home to be Built	0	1	2	3	4	5	6	7	8
Conditioned Floor Area Benchmark Home	1,000	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

Exhibit 1: Benchmark Home Size ^{2, 3}



Exhibit 2: Expanded ENERGY STAR Reference Design Definition for the Pacific

Building Component	Expanded ENERGY STAR Reference Design Definition ⁴					
	Construction Type & Structural Mass: Same	as Rated Home, except:				
i oundations.	 For masonry floor slabs, modeled with 80 	% of floor area covered by carpet and 2	20% of floor directly exposed to room	n air		
	Conditioning Type: Same as Rated Home, • Crawlspaces shall be modeled as vented	except: with net free vent aperture = 1sq. ft. pe	er 150 sq. ft. of crawlspace floor area			
	Gross Area: Same as Rated Home ⁵					
	 Floor assemblies above crawlspace foun component section for Floors Over Unco Slab floors with a floor surface less than 	e appropriate insulation level below; ssembly U-factor only applies to conditioned bsmt.'s; if applicable, insulation shall be located on interior side of walls above crawlspace foundations shall be configured to meet the applicable floor assembly U-factor listed in the building				
	Location: Hawaii / Guam / Northern Mariana Islands					
	Slab Insulation R-Value: 0 Slab Insulation Depth (ft): 0					
	Basement Wall Assembly U-Factor:		0.360			
	Construction Type: Wood frame					
Unconditione	Gross Area: Same as Rated Home					
d Spaces:	Insulation: 6,7 Location:	Hawaii /	Guam / Northern Mariana Islands			
	Floor Assembly U-Factor:		0.257			
Above-	Interior and Exterior Construction Type: Woo	od frame				
Grade Walls:	Gross Area: Same as Rated Home Solar Absorptance = 0.75					
	Emittance = 0.90					
	Insulation: Location:	Hawaii ⁶	Guam / Northe	rn Mariana Islands		
	Wall Assembly U-Factor:	0.082	0.	401		
Thermally Isolated Sunrooms:	None					
Doors: ⁸	Area: Same as Rated Home					
20013.	Orientation: Same as Rated Home					
		paque	<u><</u> 1/2-Lite	> 1/2-Lite		
		0.21	0.27	0.32		
	SHGC:	N/A	0.30	0.30		
Glazing: ⁸	 Total Area: (except in homes with conditioned basements and attached homes ⁹) 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					
	Interior Shade Coefficient: Same as Energy	Rating Reference Home, as defined by	ANSI / RESNET / ICC Std. 301			
	External Shading: None					
	Location:	Hawaii /	Guam / Northern Mariana Islands			
	U-Value:		0.60			
	SHGC:		0.27			
Skylights:	None					
Ceilings:	Construction Type: Wood frame					
	Gross Area: Same as Rated Home					
	Insulation: 6 Location:	Hawaii /	Guam / Northern Mariana Islands			
	Ceiling Assembly U-Factor:		0.035			
Attics:	Construction Type: Vented with aperture = 1 Radiant Barrier: Included if > 10 linear ft. of	ductwork are located in unconditioned	attic in Hawaii;			
		uam / Northern Mariana Islands				
Roofs:	Construction Type: Composition shingle on	wood sheathing				
	Gross Area: Same as Rated Home					
	Solar Absorptance = 0.92					
la ta ma a l	Emittance = 0.90		1.004			
Internal	Same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301 Additional mass specifically designed as a Thermal Storage Element for the Rated Home shall be excluded.					
Mass:				ariar and server.		
Lighting,	Lighting: Fraction of qualifying Tier I fixtures to all fixtures in qualifying light fixture locations: 80% for interior; 0% for exterior and garage Refrigerator: 423 kWh per year					
Appliances, & Internal	Refrigerator: 423 kWh per year Dishwasher: Capacity Same as Rated Home, or Standard if no dishwasher in the Rated Home					
& Internal Gains:	Dishwasher: Capacity Same as Rated Home, or Standard if no dishwasher in the Rated Home For Standard capacity: LER = 270, GHWC = \$22.23, Elec\$ = \$0.12, Gas\$ = \$1.09, LCY = 208					
	For Standard capacity: LER = 270, GHWC = $$22.23$, Elec\$ = $$0.12$, Gas\$ = $$1.09$, LCY = 208 For Compact capacity: LER = 203, GHWC = $$14.20$, Elec\$ = $$0.12$, Gas\$ = $$1.09$, LCY = 208					
	Ceiling Fan: 122 CFM / Watt; Quantity = Number of bedrooms + 1 when ceiling fans present in Rated Home; otherwise Quantity = 0					
	Clothes Washer and Dryer: Same as Energy					
	Internal Gains: Same as Energy Rating Refe			istments for the lighting		
	refrigerator, dishwasher, and ceiling fans sp					



Exhibit 2: Expanded ENERGY STAR Reference Design Definition for the Pacific (Cont.)

			ce Design Definition for the				
Heating Systems:	Heating capacity shall be selected in accordance with ACCA Manual S based on building heating and cooling loads calculated in accordance with ACCA Manual J, Eighth Edition, ASHRAE Handbook of Fundamentals, or an equivalent computation procedure. For forced-air HVAC						
	systems, degraded capacity from Grade III install shall be accounted for using same methodology applied to Energy Rating Reference Home.						
	Fuel Type: Same as Rated Home ¹⁰						
	Installation Quality: For forced-air HVAC systems, Grade III airflow and watt draw; for air-source heat pumps, also Grade III ref. charge.						
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home is modeled						
		ce heat pump, electric strip heat, or	electric baseboard heat; applicable effi				
	Climate Zone: Hawaii / Guam / Northern Mariana Islands						
	Gas Furnace AFUE:		80				
	Oil Furnace AFUE:		80				
	Gas / Oil Boiler AFUE: Air-Source Heat Pump HSPF	-	80 8.2				
	Air-Source Heat Pump Back		o.z Electric				
	For non-electric warm furnaces and non-electric boilers, the Electric Auxiliary Energy shall be determined in accordance with the methodology						
		ce Home in ANSI / RESNET / ICC S					
Cooling Systems:	Cooling capacity shall be select with ACCA Manual J, Eighth E	cted in accordance with ACCA Manu dition, ASHRAE Handbook of Fund om Grade III install shall be account	ual S based on building heating and coo amentals, or an equivalent computation ted for using same methodology applied	procedure. For forced-air HVAC			
			u and watt drawn fan AQ'a 8 air aanmaa h	ant number also Orada III ref. shares			
			v and watt draw; for AC's & air-source h				
			hall be configured with air-source heat p				
	with air-source or ground-source heat pump, electric strip heat, or electric baseboard heat; applicable efficiency selected from below. ¹² Climate Zone: Hawaii / Guam / Northern Mariana Islands						
	AC SEER:		14.5				
	Air-Source Heat Pump SEER	-	14.5				
Service			as defined by ANSI / RESNET / ICC S	td 301 except for reduced usage			
Water		specified in the Light, Appliances, &					
Heating				301			
Systems:	Tank Temperature: Same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301 Fuel Type: Solar with electric backup, if Rated Home fuel type is electric and / or solar, otherwise, natural gas.						
,	<u>2</u>	1/ //	rs below for Solar Water Heater System	0			
		idensing Water Heater system type.		rype. In hataral gao, then abe the			
	Solar Water Heater	denong trater roater cyclerr ype					
	Collector Type and Area:	Liquid Direct; 12+8 ft ² per	bedroom Pipe Insulation:	None			
	Orientation/Azimuth:	180° of true North	Solar Fraction:	90%			
	Storage Tank Size:	50 gal	Tilt:	25°			
	Water Heater Efficiency (EF):	•		20			
	Gas Condensing Water Heat						
	Gas Storage Tank Capacity:						
	Gas DHW EF:	0.80					
Thermal			t. of conditioned floor area or \leq 40 CFM	25			
Distribution	Duct Insulation:			20.			
Systems:		ted in unconditioned attic	 R-6 on all other ducts located in ur 	conditioned spaces			
	• R-8 on supply ducts located in unconditioned attic • R-6 on all other ducts located in unconditioned spaces • R-6 on all other ducts located in unconditioned spaces						
	Supply and Return Duct Locations shall be configured according to the table below or, if Rated home does not meet any of the conditions						
			then duct locations shall be configured				
	Foundation Type:	Slab	Crawlspace	Basement			
	One Story Above-Grade:	100% Attic	100% Crawlspace	100% Basement			
	Two Story Above-Grade:	75% Attic / 25% Conditioned	50% Attic / 50% Crawlspace	50% Attic / 50% Basement			
Thermostat:	Type: Programmable						
	Temperature Setpoints: Same RESNET / ICC Std. 301	0, 0	e, but with offsets for a programmable th	ermostat, as defined by ANSI /			
Infiltration & Mechanical	Infiltration Rates: Climate Zone: ACH50:		Hawaii / Guam / Northern Mariana Islands 6				
Ventilation:	Mechanical ventilation system without heat recovery						
	Rate: CFM = 0.01 * CFA + 7.5	* (Nbr + 1), where CFA = Condition	ned Floor Area and Nbr = Number of Be	drooms			
	Hours per Day: 24						
	Fan Watts: Watts = CFM Rate / 2.2 CFM per Watt, where CFM Rate is determined above						
	Fan Watts: Watts = CFIM Rate	/ 2.2 CFIVI per Wall, where CFIVI Ra					
	Climate Zone:		Hawaii / Guam / Northern M Supply	ariana Islands			



Footnotes:

- To determine whether at least half of the basement wall area is below grade, use the gross surface area of the walls that are in contact with either the ground or ambient outdoor air, measured from the basement floor to the bottom of the basement ceiling framing (e.g., the bottom of the joists for the floor above). Note that the exception regarding the floor area in basements is only for the purpose of determining a home's Benchmark Home Size and Size Adjustment Factor. The full conditioned floor area should be used when rating the home (e.g., determining compliance with duct leakage requirements).
- 2. The average-size home with a specific number of bedrooms is termed the "Benchmark Home". A bedroom is defined by ANSI / RESNET / ICC Std. 301-2014 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 2009 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.
- The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit
 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.

- 4. Any parameter not specified in this exhibit shall be identical to the value entered for the Rated Home.
- 5. "Same as Rated Home" indicates that the parameter shall be identical to the value entered for the Rated Home.
- 6. Slab insulation R-values represent nominal insulation levels; and assembly U-factors for foundations, floors, walls, and ceilings represent the overall assembly, inclusive of sheathing materials, cavity insulation, installation quality, framing, and interior finishes.
- 7. If software allows the user to specify the thermal boundary location independent of the conditioned space boundary in the basement of the rated home, then the thermal boundary of the ENERGY STAR Reference Design shall be aligned with this boundary. For example, if the thermal boundary is located at the walls, then the wall insulation shall be configured as if it was a conditioned basement. If the thermal boundary is located at the floor above the basement, then the floor insulation shall be configured as if it was a floor over an unconditioned space.
- 8. Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion.
- 9. When determining the ENERGY STAR ERI Target for homes with conditioned basements and for attached homes, the following formula shall be used to determine total window area of the ENERGY STAR Reference Design:

$$AG = 0.15 \times CFA \times FA \times F$$

Where:

- AG = Total glazing area
- CFA = Total conditioned floor area
- FA = (Gross above-grade thermal boundary wall area) / (Gross above-grade thermal boundary wall area + 0.5 x Gross belowgrade thermal boundary wall area)
- F = 1 0.44 x (Gross common wall area) / (Gross above-grade thermal boundary wall area + Gross common wall area)

And where:

- Thermal boundary wall is any wall that separates Conditioned Space from Unconditioned Space, outdoor environment, or the surrounding soil;
- Above-grade thermal boundary wall is any portion of a thermal boundary wall not in contact with soil;
- Below-grade thermal 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.
- 10. 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 multiple systems.
- 11. For a Rated Home without a heating system, the ENERGY STAR Reference Design Home shall be configured with a 78% AFUE gas furnace system, unless the Rated home has no access to natural gas or fossil fuel delivery. In such cases, the ENERGY STAR Reference Design Home shall be configured with a 7.7 HSPF air-source heat pump.
- 12. For a Rated Home without a cooling system, the ENERGY STAR Reference Design Home shall be configured with a 13 SEER electric air conditioner.



13. That is to say, representative of standard-flow plumbing fixtures, reference clothes washer gallons per day, standard distribution system water use effectiveness, a hot water piping ratio of 1.0, no pipe insulation, and no drainwater heat recovery.