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Historical Document

This document is provided for reference because it has been superseded by a more recent Version or Revision.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 Program Requirements 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 Implementation Timeline 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 energystarhome@energystar.gov.

Pacific ERI Target Procedure
ENERGY STAR Certified Homes, Version 3 (Rev. 10)

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 Certified Homes, Version 3.

An EPA-recognized Verification Oversight 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:

1. 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 Effective Date and Transition Period End Date defined by RESNET. RESNET interpretations of Standard 301 shall also be followed. Any exceptions shall be approved by EPA and reported at www.energystar.gov/ERIExceptions.
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:

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

   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

   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

Exhibit 1: Benchmark Home Size [2, 3]

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

Pacific ERI Target Procedure
ENERGY STAR Certified Homes, Version 3 (Rev. 10)

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

Building Component	Expanded ENERGY STAR Reference Design Definition [4]			
Foundations:	Construction Type & Structural Mass: Same as Rated Home, except: • For masonry floor slabs, modeled with 80% of floor area covered by carpet and 20% of floor directly exposed to room air			
	Conditioning Type: Same as Rated Home, except: • 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, 6] Choose appropriate insulation level below; • Basement Wall Assembly U-factor only applies to conditioned bsmt.'s; if applicable, insulation shall be located on interior side of walls • Floor assemblies above crawlspace foundations shall be configured to meet the applicable floor assembly U-factor listed in the building component section for Floors Over Unconditioned Spaces • Slab floors with a floor surface less than 12" below grade shall be insulated to the Slab Insulation R-value. The insulation shall extend downward from the top of the slab on the outside of the foundation wall and then vertically below-grade to the Slab Insulation Depth			
	Location:	**Hawaii / Guam / Northern Mariana Islands**		
	Slab Insulation R-Value:	0		
	Slab Insulation Depth (ft):	0		
	Basement Wall Assembly U-Factor:	0.360		
Floors Over Unconditioned Spaces:	Construction Type: Wood frame			
	Gross Area: Same as Rated Home			
	Insulation: [5, 6] **Location:**	**Hawaii / Guam / Northern Mariana Islands**		
	Floor Assembly U-Factor:	0.257		
Above-Grade Walls:	Interior and Exterior Construction Type: Wood frame			
	Gross Area: Same as Rated Home			
	Solar Absorptance = 0.75			
	Emittance = 0.90			
	Insulation: **Location:**	**Hawaii** [5]	**Guam / Northern Mariana Islands**	
	Wall Assembly U-Factor:	0.082	0.401	
Thermally Isolated Sunrooms:	None			
Doors: [7]	Area: Same as Rated Home			
	Orientation: Same as Rated Home			
	Door Type:	**Opaque**	**≤ 1/2-Lite**	**> 1/2-Lite**
	U-Value:	0.21	0.27	0.32
	SHGC:	N/A	0.30	0.30
Glazing:[7]	Total Area: (except in homes with conditioned basements and attached homes [8]) • Same as Rated Home, where Rated Home glazing area is less than 15% of conditioned floor area; OR • 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 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: [5] **Location:**	**Hawaii / Guam / Northern Mariana Islands**		
	Ceiling Assembly U-Factor:	0.035		
Attics:	Construction Type: Vented with aperture = 1 sq. ft. per 300 sq. ft. ceiling area			
	Radiant Barrier: Included if > 10 linear ft. of ductwork are located in unconditioned attic in Hawaii; Included in all homes in Guam / Northern Mariana Islands			
Roofs:	Construction Type: Composition shingle on wood sheathing			
	Gross Area: Same as Rated Home			
	Solar Absorptance = 0.92			
	Emittance = 0.90			
Internal Mass:	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.			

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

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.
	Fuel Type: Same as Rated Home [9]
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home is modeled with air-source or ground-source heat pump, electric strip heat, or electric baseboard heat; applicable efficiency selected from below. [10]
	Climate Zone: — **Hawaii / Guam / Northern Mariana Islands** **Gas Furnace AFUE:** 80 **Oil Furnace AFUE:** 80 **Gas / Oil Boiler AFUE:** 80 **Air-Source Heat Pump HSPF:** 8.2 **Air-Source Heat Pump Backup:** Electric
	For non-electric warm furnaces and non-electric boilers, the Electric Auxiliary Energy shall be determined in accordance with the methodology for the Energy Rating Reference Home in ANSI / RESNET / ICC Std. 301, using the capacity determined in this Section.
Cooling Systems:	Cooling 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.
	Fuel Type: Same as Rated Home [9]
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home is modeled with air-source or ground-source heat pump, electric strip heat, or electric baseboard heat; applicable efficiency selected from below. [11]
	Climate Zone: — **Hawaii / Guam / Northern Mariana Islands** **AC SEER:** 14.5 **Air-Source Heat Pump SEER:** 14.5
Service Water Heating Systems:	Use (Gallons per Day): Same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301 except for reduced usage resulting from the dishwasher specified in the Light, Appliances, & Internal Gains Section. [12]
	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.
	System Type: If solar with electric backup, then use the parameters below for Solar Water Heater System Type. If natural gas, then use the parameters below for Gas Condensing Water Heater system type.
	Solar Water Heater **Collector Type and Area:** Liquid Direct; 12+8 ft² 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):** 0.90
	Gas Condensing Water Heater **Gas Storage Tank Capacity:** **All Capacities** **Gas DHW EF:** 0.80
Thermal Distribution Systems:	Duct Leakage to Outside: The greater of ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area or ≤ 40 CFM25.
	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 shall be configured according to the table below or, if Rated home does not meet any of the conditions below (e.g., multifamily dwelling unit with conditioned unit below), then duct locations shall be configured to be 100% in attic space.
	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 as Energy Rating Reference Home, but with offsets for a programmable thermostat, as defined by ANSI / RESNET / ICC Std. 301
Infiltration & Mechanical Ventilation:	Infiltration Rates: **Climate Zone:** — **Hawaii / Guam / Northern Mariana Islands** **ACH50:** 6
	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: — **Hawaii / Guam / Northern Mariana Islands** **Ventilation Type:** Supply
Lighting, Appliances, & Internal Gains:	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
	Dishwasher: 0.66 EF, Place Setting Capacity Same as Rated Home
	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 Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301
	Internal Gains: Same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301, except for adjustments for the lighting, refrigerator, dishwasher, and ceiling fans specified in this Section.

Footnotes:

1. 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.
3. 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.
4. Any parameter not specified in this exhibit shall be set to "Same as Rated Home".
5. For informative purposes, assembly U-factors are meant to correlate to typical assemblies containing the nominal R-values as listed in 2009 IECC Table 402.1.1.
6. 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.
7. Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion.
8. 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 below-grade 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.
9. 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 multiple systems.
10. 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.
11. For a Rated Home without a cooling system, the ENERGY STAR Reference Design Home shall be configured with a 13 SEER electric air conditioner.

12. 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.