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Historical Document

This document is provided for reference because it has been superseded by a more recent Version or Revision.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.

ENERGY STAR Single-Family New Homes
National ERI Target Procedure, Version 3.2 (Rev. 11)

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 National Program Requirements for ENERGY STAR Single-Family New Homes, Version 3.2.

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. This shall be done by configuring the ENERGY STAR Reference Design Home in accordance with Exhibit 1, the Expanded ENERGY STAR Reference Design Definition, and calculating 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 www.energystar.gov/ERIExceptions. This value, rounded to the nearest whole number, shall equal the ENERGY STAR ERI Target.

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Exhibit 1: Expanded ENERGY STAR Reference Design Definition

Building Component	Expanded ENERGY STAR Reference Design Definition [1]
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 [2]
	Insulation: [3, 4] 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 and crawlspace walls shall be uninsulated • 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 [5]

Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
Slab Insulation R-Value:	0	0	10	10	10	10	10	10
Slab Insulation Depth (ft):	0	0	2	4	4	4	4	4
Basement Wall Assembly U-Factor:	0.360	0.360	0.091	0.059	0.050	0.050	0.050	0.050

Floors Over Unconditioned Spaces:	Construction Type: Wood frame
	Gross Area: Same as Rated Home

Insulation: [3, 4]

Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
Floor Assembly 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

Insulation: [3]

Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
Wall Assembly U-Factor:	0.084	0.084	0.060	0.045	0.045	0.045	0.045	0.045

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 CZ 1-3** [6]	**> 1/2-Lite CZ 4-8** [6]
U-Value:	0.17	0.25	0.30	0.30
SHGC:	N/A	0.25	0.25	0.40

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	

Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
U-Value:	0.40	0.40	0.30	0.30	0.27	0.27	0.27	0.27
SHGC:	0.25	0.25	0.25	0.40	0.40	0.40	0.40	0.40

Skylights:	None

Ceilings:	Construction Type: Wood frame
	Gross Area: Same as Rated Home

Insulation: [3]

Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
Ceiling Assembly U-Factor:	0.035	0.026	0.026	0.024	0.024	0.024	0.024	0.024

Attics:	Construction Type: Vented with aperture = 1sq. ft. per 300 sq. ft. ceiling area
	Radiant Barrier: None
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.
Lighting, Appliances, & Internal Gains:	Lighting: Fraction of qualifying Tier II fixtures to all fixtures in qualifying light fixture locations 100% for interior, exterior, and garage
	Refrigerator: 450 kWh per year
	Dishwasher: Capacity: Same as Rated Home, or Standard capacity if no dishwasher in the Rated Home 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 per Watt; Quantity = Number of bedrooms + 1 when ceiling fans present in the Rated Home; otherwise, Quantity = 0
	Clothes Washer: If clothes washer present in the Rated Home, efficiency equal to "Std 2018-Present" Standard Clothes Washer Model; otherwise, same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301. Clothes 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.

Exhibit 1: Expanded ENERGY STAR Reference Design Definition (Continued)

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 other-than-Grade I installation shall be accounted for using same methodology applied to Energy Rating Reference Home.								
	Fuel Type: Same as Rated Home, except Reference Design shall be configured with gas where Rated Home has non-electric equipment [9]								
	Installation Quality: For forced-air HVAC systems, Grade II -20% blower fan airflow deviation, Grade II 0.52 W / CFM blower fan efficiency, and, for air-source heat pumps, Grade III refrigerant undercharge.								
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home has air-source or ground-source heat pump, electric strip heat, or electric baseboard heat; efficiency selected from below. [10]								
	Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
	Gas Furnace AFUE:	80	80	80	90	95	95	95	95
	Gas Boiler AFUE:	80	80	80	90	95	95	95	95
	Air-Source Heat Pump HSPF:	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
	Air-Source Heat Pump Backup:	Electric	Electric	Electric	Electric	Electric	Electric	Electric	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.								
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. For forced-air HVAC systems, degraded capacity from other-than-Grade I installation shall be accounted for using same methodology applied to Energy Rating Reference Home.								
	Fuel Type: Same as Rated Home, except Reference Design shall be configured with gas where Rated Home has non-electric equipment [9]								
	Installation Quality: For forced-air HVAC systems, Grade II -20% blower fan airflow deviation, Grade II 0.52 W / CFM blower fan efficiency, and, for AC's & air-source heat pumps, Grade III refrigerant undercharge.								
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home has air-source or ground-source heat pump, electric strip heat, or electric baseboard heat; efficiency selected from below. [11]								
	Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
	AC SEER:	16	16	16	16	14	14	14	14
	Air-Source Heat Pump SEER:	16	16	16	16	16	16	16	16
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 use resulting from the dishwasher and clothes washer as specified in the Lighting, Appliances, & Internal Gains Section. [12]								
	Tank Temperature: Same as Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. 301.								
	Fuel Type: Same as Rated Home, except Reference Design shall be configured with gas where Rated Home has non-electric equipment [9]								
	System Type: Where Rated Home has non-electric water heater, Reference Design shall be configured with a tankless gas water heater with 0.90 UEF. Where Rated Home has electric water heater, Reference Design shall be configured with an electric heat pump water heater with 2.20 UEF and tank size equal to that of Rated Home, or 60 gallon tank size if Rated Home uses tankless electric water heater.								
Thermal Distribution Systems:	Duct Leakage to Outside: 0 CFM25 per 100 sq. ft. of conditioned floor area								
	Duct Insulation: None								
	Duct Surface Area: Same as Rated Home								
	Supply and Return Duct Locations shall be 100% in conditioned space.								
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 Rate: 3 ACH50								
	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; Runtime: 24 Hours / Day								
	Fan Watts: Watts = CFM Rate / 2.8 CFM per Watt, where CFM Rate is determined above								
	Climate Zone: [6]	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 4C & 5**	**CZ 6**	**CZ 7**	**CZ 8**
	Ventilation Type:	Supply	Supply	Supply	Supply	Exhaust	Exhaust	Exhaust	Exhaust

Footnotes:

1. Any parameter not specified in this exhibit shall be identical to the value entered for the Rated Home.
2. "Same as Rated Home" indicates that the parameter shall be identical to the value entered for the Rated Home.
3. 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.
4. 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.
5. Note that, for the purposes of the ENERGY STAR Reference Design, the slab insulation R-value and depth shall be modeled even in jurisdictions designated by a code official as having Very Heavy Termite Infestation for the purpose of determining the ENERGY STAR ERI Target. This is in contrast to the total UA limit in Item 3.1 of the National Rater Design Review Checklist, which shall be calculated by replacing the code-required slab insulation R-value and depth with the slab insulation R-value and depth specified in the Rated Home for such jurisdictions.
6. 2021 IECC Climate Zone designations, as defined and illustrated in Section R301 of the code, shall be used to configure the ENERGY STAR Reference Design Home in Version 3.2. Note that some locations have shifted to a different Climate Zone in the 2021 IECC compared to prior editions.
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. 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 or "Std 2018-Present" Standard Clothes Washer Model gallons per day, standard distribution system water use effectiveness, a hot water piping ratio of 1.0, no pipe insulation, and no drainwater heater recovery.