



National ERIDRAFT HERS Index Target Procedure for National Program Requirements

ENERGY STAR Multifamily New Construction, Version 1.0

Note: This is a draft of a work in progress for the purposes of stakeholder feedback. There may be errors with formatting, numbering, etc.

This document provides detailed instructions for determining the ENERGY STAR ERIHERS Index Target, the highest ERI numerical HERS Index value that each rated multifamily unit may achieve to earn the ENERGY STAR. Note that, in addition to meeting the ENERGY STAR ERIHERS Index Target for each unit, unit projects shall also meet all Mandatory Requirements for All Multifamily New Construction Projects in Exhibit 2 of the National Program Requirements for ENERGY STAR Certified Multifamily New Construction, Version 1.0 / 1.1 / OR-WA 1.21 National Program Requirements.

A sRESNET-accredited Home Energy Rating software rating tool program approved by an EPA-Approved Verification Oversight Organization shall automatically determine (i.e., without relying on a user-configured ENERGY STAR Multifamily Reference Design) this target for each rated unit. This shall be done by configuring the ENERGY STAR Multifamily Reference Design in accordance with Exhibit 1, the Expanded ENERGY STAR Multifamily Reference Design Definition, and calculating its associated ERIHERS Index value. This value, rounded to the nearest whole number, shall equal the ENERGY STAR HERS Index ERI Target.



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Exhibit 1: Expanded ENERGY STAR Multifamily Reference Design Definition

Building Component	Expanded ENERGY STAR Multifamily Reference Design Definition ⁴¹								
Foundations:	Construction Type & Structural Mass: Same as Rated Unit ² , 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 								
	Conditioning Type: Same as Rated Unit ² , 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 Unit ²								
Floors Over Unconditioned Spaces:	Insulation: ^{3,4} Choose appropriate insulation level below:;								
	<ul style="list-style-type: none"> Basement Wall Continuous Insulation R-Value Assembly U-factor only applies to conditioned basements; 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 24" 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 								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8
	Slab Insulation R-Value:	0	0	0	10	10	15	15	20
	Slab Insulation Depth (ft):	0	0	0	2	2	2	2	2
Above-Grade Walls:	Basement Wall Assembly-Continuous Insulation R-Value:								
	0	0	0	7.5	7.5	7.5	10	12.5	
	Construction Type: Wood frame								
	Gross Area: Same as Rated Unit ²								
	Insulation: ^{3,4}								
Thermally Isolated Sunrooms:	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8
	Floor Assembly U-Factor:	0.282	0.052	0.033	0.033	0.033	0.033	0.033	0.033
	Interior and Exterior Construction Type: Wood frame								
	Gross Area: Same as Rated Unit ²								
	Solar Absorptance = 0.75								
Doors:	Emittance = 0.90								
	Insulation: ³								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8
	Wall Assembly U-Factor:	0.089	0.089	0.089	0.064	0.051	0.051	0.051	0.036
	None								
Glazing:	Area: Same as Rated Unit ²								
	Orientation: Same as Rated Unit ²								
	U-Factors and SHGCs, based on ENERGY STAR doors: ⁸⁵								
	Door Type:	Opaque			≤ 1/2-Lite		> 1/2-Lite		
	U-Factor Value:	0.21			0.27		0.32		
Attics:	SHGC:								
	nN/a			0.30		0.30			
	Total Area ⁶ : AGF = 0.15 x CFAAFL x FA x F, without exceeding available wall area ⁶								
	Orientation: Same as Rated Unit ² , by percentage of area								
	Interior Shade Coefficient: Same as Energy Rating HERS Reference Home, as defined by ANSI / RESNET / ICC Std. 301 RESNET's standard ⁷								
	External Shading: None								
	Assembly U-Factors and SHGCs, based on ENERGY STAR Windows: ⁵								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 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	0.40	0.40	0.40	0.40
Class AW Assembly U-Factors (i.e., Structural) Windows based on 2012 IECC									
Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8	
Fixed Window U-Factor	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29	
Operable Window U-Factor	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37	
SHGC:	0.27	0.27	0.30	0.40	0.40	0.40	0.40	0.40	
Ceilings:	None								
	Construction Type: Wood frame								
	Gross Area: Same as Rated Unit ²								
Roofs:	Insulation: ³								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8
	Ceiling Assembly U-Factor:	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
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 Unit ²								



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Solar Absorptance = 0.92

Emittance = 0.90



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

Heating Systems:	Heating capacity shall be selected in accordance with ACCA Manual S based on building heating and cooling loads may be calculated and equipment capacity selected in accordance with the latest edition of ACCA Manual J, Eighth Edition, ASHRAE 2009 Handbook of Fundamentals, or an substantively equivalent computation procedure; otherwise, same as Rated Home Unit.								
	Fuel Type: Same as Rated Unit ^{2, 8}								
	System Type: Same as Rated Unit ² , except Reference Design shall be configured with air-source heat pump in CZ 1-6 where Rated Unit is modeled with ground-source heat pump, electric strip or baseboard heat, and Reference Design shall be configured with ground-source heat pump in CZ 7 & 8 where Rated Unit is modeled with air-source or ground-source heat pump, electric strip or baseboard heat; applicable efficiency selected from below ⁹								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 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 Boiler AFUE:	80	80	80	85	85	85	85	85	
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	3.5	3.5	
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 may be calculated and equipment capacity selected in accordance with the latest edition of ACCA Manual J, Eighth Edition, ASHRAE 2009 Handbook of Fundamentals, or an substantively equivalent computation procedure; otherwise, same as Rated Home Unit.								
	Fuel Type: Same as Rated Unit ^{2, 8}								
	System Type: Same as Rated Unit ² , except Reference Design shall be configured with air-source heat pump in CZ 1-6 where Rated Unit is modeled with ground-source heat pump and Reference Design shall be configured with ground-source heat pump in CZ 7 & 8 where Rated Unit is modeled with air-source or ground-source heat pump; applicable efficiency selected from below. ¹⁰								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 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	16.1	16.1	
Service Water Heating Systems:	Use (Gallons per Day): Same as Energy Rating HERS Reference Home, as defined by ANSI/RESNET's / RESNET / ICC Std. 301, except for reduced usage resulting from the equipment specified in the Lighting, Appliances, Fixtures, & Internal Gains Section standard. ^{7, 11}								
	Tank Temperature: Same as Energy Rating HERS Reference Home, as defined by ANSI / RESNET / ICC Std. 301 RESNET's standard. ⁷								
	Recirculation Pump: 0 kWh per year								
	Fuel Type: Same as Rated Unit ^{2, 8}								
	System Type: Conventional storage water heater with tank size equal to that of Rated Unit, unless Rated Unit uses instantaneous water heater in which case select 50 gallon tank for gas systems and 60 gallon tank for electric systems. Select applicable efficiency from below using tank size of Reference Unit.								
	Gas Storage Tank Capacity: ⁴⁴	≤ 55 Gal				> 55 Gal			
	Gas DHW EF:	0.67 EF				0.77 EF			
Electric Storage Tank Capacity: ⁴⁴	≤ 55 Gal				> 55 Gal				
Electric DHW EF:	0.95 EF				2.00 EF				
Oil Storage Tank Capacity: ^{44, 12}	30 Gallon	40 Gallon	50 Gallon	60 Gallon	70 Gallon	80 Gallon			
Oil DHW EF:	0.64	0.62	0.60	0.58	0.56	0.54			
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:								
	<ul style="list-style-type: none"> R-8 on supply ducts located in unconditioned attic R-6 on all other ducts located in unconditioned space 								
	Duct Surface Area: Same as Rated Unit ²								
	Supply and Return Duct Locations shall be configured according to the table below:								
Ceiling Type:	Adiabatic					All Other			
One Story Above Grade Unit:	100% Conditioned					100% Attic			
Two Story Above Grade All other Units:	100% Conditioned					75% Attic / 25% conditioned			
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 RESNET's standard, including offsets for programmable thermostat. ⁷								
Infiltration & Mechanical Ventilation:	Infiltration Rates:								
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8
	cfm50/ft²-of Enclosure Area ¹³	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	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 / 2.2 CFM per Watt, where CFM Rate is determined above									
Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8	
Ventilation Type:	Supply	Supply	Supply	Supply	Exhaust	Exhaust	Exhaust	Exhaust	



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

Lighting, Appliances, Water Fixtures & Internal Gains:	Lighting: Fraction of qualifying <u>Tier I</u> fixtures to all fixtures in qualifying light fixture locations 90% for interior; 0% for exterior and garage						
	Refrigerator: 423 kWh per year						
	Dishwasher: 0.66 EF, -when dishwasher present in the Rated Unit; otherwise same as Rated Unit (i.e. RESNET default) <u>Place Setting Capacity Same as Rated Unit Home²; use 12 settings if no dishwasher installed in Rated Unit Home</u>						
	Clothes Washer: Use the ENERGY STAR values below, <u>even if no clothes washer is installed. Exception: -when specified in the Rated Unit or Common Space except if installed clothes washer is not available as ENERGY STAR certified (e.g., top-loading commercial clothes washers, Combination All-In One Washer-Dryers), model the -"Not available as ENERGY STAR" selected; otherwise same as the Rated Unit clothes washer</u>						
	ENERGY STAR	LER	\$/kWh	AGC	\$/therm	CAPw	IMEF
	15233	0.12	912	1.09	4.42	2.067	
	Clothes Dryer: <u>Field Use Factor is 1.04 and CEF is 3.93 for electric and 3.43 for gas, even if no clothes dryer is installed. Exception: If installed clothes dryer is not available as ENERGY STAR certified (e.g., commercial clothes dryers, Combination All-In One Washer-Dryers), model the same as the Rated Unit clothes dryer</u> <u>When specified in the Rated Unit or Common Space, Field Use Factor is 1.04 and CEF is 3.93 for electric and 3.43 for gas except if "Not available as ENERGY STAR" selected; otherwise same as Rated Unit</u>						
	Ceiling Fan: 122 CFM per Watt; Quantity = Number of bedrooms + 1 when ceiling fans present in the Rated Unit; otherwise Quantity = 0						
	Water fixtures: all showers and faucets ≤ 2.0 gpm; F_{eff} = 0.95						
	Internal Gains: <u>Same as Energy Rating Reference Home, as Ddefined by RESNET's standard ANSI / RESNET / ICC Std. 301, except for including adjustments to accounted for the high-efficiency lighting, refrigerator, dishwasher, clothes washer, clothes dryer, and ceiling fans specified in this section and & appliances listed above.</u> ⁷						
Internal Mass:	Same as <u>Energy Rating HERS Reference Home, as defined by ANSI / RESNET / ICC Std. 301</u> RESNET's standard. ⁷						
	Additional mass specifically designed as a Thermal Storage Element for the Rated Unit shall be excluded.						



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FootnNotes:

1. Any parameter not specified in this exhibit shall be identical to the value entered for the Rated Unit. Where envelope building components do not exist in the Rated Unit, such as a foundation or slab, they should not be modeled in the ENERGY STAR Multifamily Reference Design. Where the envelope component is adiabatic in the Rated Unit, it shall also be adiabatic in the Multifamily Reference Design.
2. "Same as Rated Unit" indicates that the parameter shall be identical to the value entered for the Rated Unit.
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 unit, then the thermal boundary of the ENERGY STAR Multifamily 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. All Reference Design window and door U-value-factor and SHGC requirements for non-structural windows 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 4C & 5-8. Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion.
6. When determining the ENERGY STAR ERIHERS Index Target, the following formula shall be used to determine total window area of the ENERGY STAR Multifamily Reference Design:

$$AGF = 0.15 \times CFAAFL \times FA \times F$$

Where:

- AGF = Total glazingfenestration area
- CFAAFL = Total floor area of directly conditioned floor areaspace
- FA = (Gross Aabove-grade thermal boundary gross-wall area) / (Gross Aabove-grade boundary wall area + 0.5 x Gross Bbelow-grade thermal boundary wall area)
- F = 1- 0.44 x (Gross cCommon wall area) / (Gross Aabove-grade thermal boundary wall area + Gross cCommon wall area)

And where:

- Thermal boundary wall is any wall that separates conditioned space from unconditioned space, outdoor environment, -or the surrounding soilambient 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; ANDand
 - Common wall is the total wall area of walls adjacent to another conditioned spaceliving-unit, not including foundation walls.
7. The version of ANSI / RESNET / ICC Std. 301 utilized by RESNET for HERS ratings shall be used to configure this parameterRESNET requires that all RESNET-accredited Home Energy Rating software programs automatically configure this parameter per ANSI / RESNET / ICC 301-2014 when calculating a HERS index value.
 8. Fuel type(s) shall be same as Rated Unit, including any dual-fuel equipment where applicable. For a Rated Unit 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.
- For a Rated Unit without a heating system, the ENERGY STAR Multifamily Reference Design Multifamily Unit shall be configured with a 78% AFUE gas furnace system, unless the Rated unit has no access to natural gas or fossil fuel delivery. In such cases, the ENERGY STAR Multifamily Reference Design Multifamily Unit shall be configured with a 7.7 HSPF air-source heat pump.

9.

9-10. For a Rated Unit without a cooling system, the ENERGY STAR Multifamily Reference Design Multifamily Unit shall be configured with a 13 SEER electric air conditioner.

11. 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 drain water heater recovery.

12. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equation: Oil DHW EF \geq 0.70 - (0.002 x Tank Gallon Capacity).



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~~40.13.~~ For a Rated Unit with conditioned space below, that does not indirectly use corridor air as the ventilation supply air, the ENERGY STAR Multifamily Reference Design shall be configured with an infiltration rate of 0.255 cfm50/ft² and software shall either automatically apply a 15% reduction to the compartmentalization results of the Rated Unit or instruct the Rater to apply the reduction. If automatically applied, the software shall make that known, such that the Rater does not also apply the same reduction, which is based on the *RESNET Guidelines for Multifamily Energy Ratings*.