



DRAFT HERS Index Target Procedure for National Program Requirements ENERGY STAR Multifamily New Construction, Version 1.1

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 instructions for determining the ENERGY STAR HERS Index Target, the highest 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 HERS Index Target, units shall also meet all Mandatory Requirements for All Multifamily New Construction in Exhibit 2 of the 'ENERGY STAR Certified Multifamily New Construction Version 1.0/1.1' National Program Requirements.

A RESNET-accredited Home Energy Rating software program shall automatically determine (i.e., without relying on a user-configured ENERGY STAR 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 Reference Design Definition, and calculating its associated HERS Index value. This value, rounded to the nearest whole number, shall equal the ENERGY STAR HERS Index 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 Unit, 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, 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									
	Insulation: ^{3,4} Choose appropriate insulation level below:									
	<ul style="list-style-type: none"> 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 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	
	Basement Wall Continuous Insulation R-Value:									
	0	0	0	7.5	7.5	7.5	10	12.5		
	Floors Over Unconditioned Spaces:	Construction Type: Wood frame								
		Gross Area: Same as Rated Unit								
		Insulation: ^{3,4}								
Climate Zone:		CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8	
	Floor Assembly U-Factor:									
	0.066	0.033	0.033	0.033	0.033	0.033	0.033	0.033		
	Above-Grade Walls:	Interior and Exterior Construction Type: Wood frame								
		Gross Area: Same as Rated Unit								
Solar Absorptance = 0.75										
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:									
	0.064	0.064	0.064	0.064	0.064	0.064	0.051	0.051	0.036	
	Thermally Isolated Sunrooms:	None								
Doors:	Area: Same as Rated Unit									
	Orientation: Same as Rated Unit									
	U-Values and SHGCs, based on ENERGY STAR doors: ⁵									
	Door Type:	Opaque			≤ 1/2-Lite		> 1/2-Lite CZ 1-3		> 1/2-Lite CZ 4-8	
	U-Value:	0.17			0.25		0.30		0.30	
Glazing:	SHGC:									
	N/A			0.25		0.25		0.40		
	Total Area ⁶ : AF = 0.15 x AFL x FA x F									
	Orientation: Same as rated unit, by percentage of area									
	Interior Shade Coefficient: Same as HERS Reference Home, as defined by RESNET's standard ⁷									
	External Shading: None									
	U-Values 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:	0.40	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	
	Class AW U-Values (i.e. Structural) Windows based on 2015 IgCC									
	Climate Zone:	CZ 1	CZ 2	CZ 3	CZ 4	CZ 4 C & 5	CZ 6	CZ 7	CZ 8	
	Fixed Window U-Value:	0.48	0.48	0.44	0.36	0.36	0.34	0.28	0.28	
	Operable Window U-Value:	0.62	0.62	0.57	0.43	0.43	0.41	0.35	0.35	
	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 Unit									
	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:									
Attics:	0.027									
	0.027									
Roofs:	Construction Type: Vented with aperture = 1sq. ft. per 300 sq. ft. ceiling area									
	Radiant Barrier: None									
	Construction Type: Composition shingle on wood sheathing									
	Gross Area: Same as Rated Unit									
	Solar Absorptance = 0.92									
	Emittance = 0.90									



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

Heating Systems:	Heating loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2009 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Unit.								
	Fuel Type: Same as Rated Unit ⁸								
	System Type: Same as Rated Unit, 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	95	95	95
	Oil Furn. AFUE:	80	80	80	85	85	85	85	85
	Gas Boiler AFUE:	80	80	80	90	90	90	90	90
Oil Boiler AFUE:	80	80	80	86	86	86	86	86	
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	3.6	3.6	
Cooling Systems:	Cooling loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2009 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Unit.								
	Fuel Type: Same as Rated Unit ⁸								
	System Type: Same as Rated Unit, 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:	15	15	15	15	14	13	13	13
Air-Source Heat Pump SEER:	15	15	15	15	15	15	n/a	n/a	
Ground-Source Heat Pump EER:	n/a	n/a	n/a	n/a	n/a	n/a	17.1	17.1	
Service Water Heating Systems:	Use (Gallons per Day): Same as HERS Reference Home, as defined by RESNET's standard. ⁷								
	Tank Temperature: Same as HERS Reference Home, as defined by RESNET's standard. ⁷								
	Recirculation Pump: 0 kWh per year								
	Fuel Type: Same as Rated Unit 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: ¹¹	≤ 55 Gal					> 55 Gal		
	Gas DHW EF:	0.67 EF					0.77 EF		
Electric Storage Tank Capacity: ¹¹	≤ 55 Gal					> 55 Gal			
Electric DHW EF:	0.95 EF					2.00 EF			
Oil Storage Tank Capacity: ¹¹	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: 0 CFM25 per 100 sq. ft. of conditioned floor area								
	Duct Insulation: None, because 100% of ducts are in conditioned space.								
	Duct Surface Area: Same as Rated Unit								
	Supply and Return Duct Locations shall be configured to be 100% in conditioned space.								
	Ceiling Type:	Adiabatic						All Other	
One Story Above Grade:	100% Conditioned						100% Conditioned		
Two Story Above Grade:	100% Conditioned						100% Conditioned		
Thermostat:	Type: Programmable								
	Temperature Setpoints: Defined by RESNET's standard, including offsets for programmable thermostat, ⁷								
Infiltration & Mechanical Ventilation:	Compartmentalization 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	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 / 2.8 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 Reference Design Definition (Continued)

Lighting, Appliances, Fixtures & Internal Gains:	Lighting: Fraction of qualifying 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)						
	Clothes Washer: Use the ENERGY STAR values below when specified in the Rated Unit or Common Space except if "Not available as ENERGY STAR" selected; otherwise same as Rated Unit						
		LER	\$/kWh	AGC	\$/therm	CAPw	IMEF
	ENERGY STAR	133	0.12	9	1.09	4.4	2.07
	Dryer: 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.						
	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; $F_{\text{eff}}=0.95$						
	Internal Gains: Defined by RESNET's standard, including adjustments to account for the high-efficiency lighting & appliances listed above. ⁷						
Internal Mass:	Same as HERS Reference Home, as defined by RESNET's standard. ⁷						
	Additional mass specifically designed as a Thermal Storage Element for the Rated Unit shall be excluded.						

Notes:

- Any parameter not specified in this exhibit shall be identical to the value entered for the Rated Unit.
- "Same as Rated Unit" indicates that the parameter shall be identical to the value entered for the Rated Unit.
- 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.
- 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 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.
- All Reference Design window and door U-value and SHGC requirements for non-structural windows are based on the ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 6.0 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.
- When determining the ENERGY STAR HERS Index Target, 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.
- RESNET 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.
 - 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 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 Reference Multifamily Design shall be configured with a 7.7 HSPF air-source heat pump.
 - For a Rated Unit without a cooling system, the ENERGY STAR Multifamily Reference Design shall be configured with a 13 SEER electric air conditioner.
 - To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equation: Oil DHW EF $\geq 0.70 - (0.002 \times \text{Tank Gallon Capacity})$.