



# National ERIDRAFT 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 detailed instructions for determining the ENERGY STAR ~~HERS-ERI Index~~ Target, the highest ~~numerical HERS-ERI 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/ERI~~ Target for each unit, units shall also meet all Mandatory Requirements for All Multifamily New Construction Projects in Exhibit 2 of the National Program Requirements for ENERGY STAR Multifamily New Construction, Version 1.0 / 1.1 / OR-WA 1.2 ~~National Program Requirements~~.

A ~~RESNET-accredited Home Energy Rating~~ software program-rating tool 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 ~~HERS-ERI Index~~ value. This value, rounded to the nearest whole number, shall equal the ENERGY STAR ~~HERS-ERI Index~~ Target.



# National ERIDRAFT HERS Index Target Procedure for National Program Requirements

## ENERGY STAR Multifamily New Construction, Version 1.1

Exhibit 1: Expanded ENERGY STAR Multifamily Reference Design Definition

Building Component	Expanded ENERGY STAR <u>Multifamily</u> Reference Design Definition <sup>1</sup>								
Foundations:	Construction Type & Structural Mass: Same as Rated Unit <sup>2</sup> , except:								
	<ul style="list-style-type: none"> <li>For masonry floor slabs, modeled with 80% of floor area covered by carpet and 20% of floor directly exposed to room air</li> </ul>								
	Conditioning Type: Same as Rated Unit <sup>2</sup> , except:								
	<ul style="list-style-type: none"> <li>Crawlspaces shall be modeled as vented with net free vent aperture = 1sq. ft. per 150 sq. ft. of crawlspace floor area</li> </ul>								
	Gross Area: Same as Rated Unit <sup>2</sup>								
Floors Over Unconditioned Spaces:	Insulation: <sup>3,4</sup> Choose appropriate insulation level below: <ul style="list-style-type: none"> <li>Basement Wall <u>Continuous Insulation R-Assembly-value</u> U-factor only applies to conditioned <u>basements</u>; if applicable, insulation shall be located on interior side of walls</li> <li>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</li> <li>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</li> </ul>								
	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>Slab Insulation R-Value:</b>	0	0	0	10	10	15	15	20
	<b>Slab Insulation Depth (ft):</b>	0	0	0	2	2	2	2	2
	<b>Basement Wall Continuous Insulation R-Value:</b>	0	0	0	7.5	7.5	7.5	10	12.5
Above-Grade Walls:	Construction Type: Wood frame								
	Gross Area: Same as Rated Unit <sup>2</sup>								
	Insulation: <sup>3,4</sup>								
	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>Floor Assembly U-Factor:</b>	0.066	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Thermally Isolated Sunrooms:	Interior and Exterior Construction Type: Wood frame								
	Gross Area: Same as Rated Unit <sup>2</sup>								
	Solar Absorptance = 0.75								
	Emittance = 0.90								
	Insulation: <sup>3</sup>								
Doors:	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>Wall Assembly U-Factor:</b>	0.064	0.064	0.064	0.064	0.064	0.051	0.051	0.036
	None								
	Area: Same as Rated Unit <sup>2</sup>								
	Orientation: Same as Rated Unit <sup>2</sup>								
Glazing:	U-Factor Values and SHGCs, based on ENERGY STAR doors: <sup>5</sup>								
	<b>Door Type:</b>	<b>Opaque</b>		<b>≤ 1/2-Lite</b>		<b>&gt; 1/2-Lite CZ 1-3</b>		<b>&gt; 1/2-Lite CZ 4-8</b>	
	<b>U-Factor Value:</b>	0.17		0.25		0.30		0.30	
	<b>SHGC:</b>	n/A		0.25		0.25		0.40	
	Total Area: $AGF = 0.15 \times CFA_{AFL} \times FA \times F$ , without exceeding available wall area <sup>6</sup>								
Skylights:	Orientation: Same as Rated Unit <sup>2</sup> , by percentage of area								
	Interior Shade Coefficient: Same as HERS Energy Rating Reference Home, as defined by ANSI / RESNET / ICC Std. RESNET's 301 standard <sup>7</sup>								
	External Shading: None								
	Assembly U-Factor Values and SHGCs, based on ENERGY STAR Windows: <sup>5</sup>								
	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>U-Factor Value:</b>	0.40	0.40	0.30	0.30	0.27	0.27	0.27	0.27
	<b>SHGC:</b>	0.25	0.25	0.25	0.40	0.40	0.40	0.40	0.40
	Class AW Assembly U-Factor Values (i.e., Structural) Windows based on 2015 IgCC								
	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>Fixed Window U-Factor:</b>	0.48	0.48	0.44	0.36	0.36	0.34	0.28	0.28
<b>Operable Window U-Factor:</b>	0.62	0.62	0.57	0.43	0.43	0.41	0.35	0.35	
<b>SHGC:</b>	0.25	0.25	0.25	0.40	0.40	0.40	0.40	0.40	
Ceilings:	Construction Type: Wood frame								
	Gross Area: Same as Rated Unit <sup>2</sup>								
	Insulation: <sup>3</sup>								
	<b>Climate Zone:</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 4 C &amp; 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>
	<b>Ceiling Assembly U-Factor:</b>	0.027	0.027	0.027	0.027	0.021	0.021	0.021	0.021
Attics:	Radiant Barrier: None								
Roofs:	Construction Type: Composition shingle on wood sheathing								



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## ENERGY STAR Multifamily New Construction, Version 1.1

Gross Area: Same as Rated Unit<sup>2</sup>

Solar Absorptance = 0.92

Emittance = 0.90



# National ERIDRAFT HERS Index Target Procedure for National Program Requirements

## ENERGY STAR Multifamily New Construction, Version 1.1

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

Heating Systems:	Heating <del>capacity shall be loads may be calculated and equipment capacity selected</del> in accordance <del>with to the latest edition of</del> ACCA Manual <del>S based on building heating and cooling loads calculated in accordance with ACCA Manual J, Eighth Edition, J, ASHRAE 2009 Handbook of Fundamentals, or an</del> <u>substantively equivalent computation procedure; otherwise, same as Rated Home Unit.</u>																																																																																
	Fuel Type: Same as Rated Unit <sup>2,8</sup>																																																																																
	System Type: Same as Rated Unit <sup>2</sup> , 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 <sup>9</sup>																																																																																
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Service Water Heating Systems:	Use (Gallons per Day): Same as <u>Energy Rating HERS Reference Home</u> , as defined by <u>ANSI / RESNET / ICC Std. RESNET's standard 301, except for reduced usage resulting from the equipment specified in the Lighting, Appliances, Fixtures &amp; Internal Gains Section.</u> <sup>7,11</sup>																																																																																
	Tank Temperature: Same as <u>Energy Rating HERS Reference Home</u> , as defined by <u>RESNET's standard ANSI / RESNET / ICC Std. 301.</u> <sup>7</sup>																																																																																
	Recirculation Pump: 0 kWh per year																																																																																
	Fuel Type: Same as Rated Unit <sup>2,8</sup>																																																																																
	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:																																																																																
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Thermal Distribution Systems:	Duct Leakage to Outside: 0 CFM/25 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 <sup>2</sup>																																																																																
	Supply and Return Duct Locations shall be configured to be 100% in conditioned space.																																																																																
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Thermostat:	Type: Programmable																																																																																
	Temperature Setpoints: Same as <u>Energy HERS Rating Reference Home</u> , <u>but</u> with offsets <u>for a programmable thermostat, as</u> defined by <u>ANSI / RESNET / ICC Std. RESNET's 301, standard.</u> <sup>7</sup>																																																																																
Infiltration & Mechanical Ventilation:	Compartmentalization Rates:																																																																																
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	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																																																																																	
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### Exhibit 1: Expanded ENERGY STAR Multifamily Reference Design Definition (Continued)

Lighting, Appliances, 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, <u>when dishwasher present in the Rated Unit; otherwise Place Setting Capacity sSame as Rated Unit <sup>2</sup>; use 12 settings if no dishwasher installed in Rated UnitHome (i.e. RESNET default)</u>														
	Clothes Washer: Use the ENERGY STAR values below, <u>even if no clothes washer is installed.</u> <u>Exception: If installed clothes washer is</u> <u>Not available as ENERGY STAR certified (e.g. top-loading commercial clothes washers, Combination All-In One Washer-Dryers), model</u> <u>the same as" selected; otherwise same as the Rated Unit clothes washer.</u>														
	<table border="1"> <thead> <tr> <th></th> <th>LER</th> <th>\$/kWh</th> <th>AGC</th> <th>\$/therm</th> <th>CAPw</th> <th>IMEF</th> </tr> </thead> <tbody> <tr> <td>ENERGY STAR</td> <td><u>15233</u></td> <td>0.12</td> <td><u>129</u></td> <td>1.09</td> <td><u>4.42</u></td> <td><u>2.067</u></td> </tr> </tbody> </table>		LER	\$/kWh	AGC	\$/therm	CAPw	IMEF	ENERGY STAR	<u>15233</u>	0.12	<u>129</u>	1.09	<u>4.42</u>	<u>2.067</u>
		LER	\$/kWh	AGC	\$/therm	CAPw	IMEF								
	ENERGY STAR	<u>15233</u>	0.12	<u>129</u>	1.09	<u>4.42</u>	<u>2.067</u>								
	Clothes Dryer: <u>When specified in the Rated Unit or Common Space,</u> Field Use Factor is 1.04 and CEF is 3.93 for electric and 3.43 for gas, <u>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),</u> <u>except if "Not available as ENERGY STAR" selectmodel the same ased; otherwise same as the Rated Unit clothes dryerdryer.</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 $\leq 2.0$ gpm; <u>F<sub>eff</sub>=0.95</u>														
Internal Gains: <u>Same as Energy Rating Reference Home, as Ddefined by ANSI / RESNET / ICC Std. 301RESNET's standard, except forincluding<sup>19</sup> and adjustments to accounted for the high-efficiency lighting, refrigerator, dishwasher, clothes washer, clothes dryer, and ceiling fan and &amp; appsliances specified in this sectionlisted above.</u> <sup>7</sup>															
Internal Mass: Same as <u>HERS Energy Rating Reference Home, as defined by RESNET's standardANSI / RESNET / ICC Std. 301.</u> <sup>7</sup>															
Additional mass specifically designed as a Thermal Storage Element for the Rated Unit shall be excluded.															



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

## FootNotes:

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-factor 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](http://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 HERS-ERI Index Target, the following formula shall be used to determine total window area of the ENERGY STAR Multifamily Reference Design:

$$AGF = 0.15 \times CFA \times AFL \times FA \times F$$

Where:

- $AGF$  = Total fenestration glazing area
- $AFL \times CFA$  = Total floor area of directly-conditioned floor areas space
- $FA$  = (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 coCommon wall area)

And where:

- Thermal boundary wall is any wall that separates conditioned space from unconditioned space, outdoor environment, or the surrounding soil 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 space/living unit, not including foundation walls.
7. The version of ANSI / RESNET / ICC Std. 301 utilized by RESNET for HERS ratings shall be used. 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.
  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 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.

9.

9.10. For a Rated Unit without a cooling system, the ENERGY STAR Multifamily Reference Design 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.

10.12. 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).



# National ERIDRAFT HERS Index Target Procedure for National Program Requirements

## ENERGY STAR Multifamily New Construction, Version 1.1

44.13. 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/ft<sup>2</sup> 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.