



# U.S. DOE Zero Energy Ready Home Multifamily National Program Requirements Version 2 (Rev. 1)

## 1. Building Eligibility Requirements

The following multifamily building types are eligible to participate in the DOE Zero Energy Ready Home (ZERH) program using the ZERH Multifamily Version 2 (ZERH MF V2) National Program Requirements.<sup>1</sup>

Eligible building types:

- Any multifamily building with dwelling units<sup>2</sup> or sleeping units<sup>3</sup> that is NOT a detached dwelling.<sup>4</sup>
- Any mixed-use buildings with dwelling units or sleeping units, where the dwelling units, sleeping units, and common space exceed 50% of the building square footage (parking garage square footage is excluded from this calculation).<sup>5</sup>
- Townhouses with permit dates<sup>6</sup> on or before 12/31/2025. Townhouses must follow requirements listed in the endnote.<sup>7</sup>

Throughout the remainder of this document, the term 'dwelling unit' is implied to also apply to 'sleeping units' unless otherwise stated.

Townhouses are eligible to participate in the DOE ZERH program, using either the ZERH MF V2 or the ZERH Single Family Homes Version 2 (ZERH SF V2) National Program Requirements. For more information about ZERH SF V2, visit: <https://www.energy.gov/eere/buildings/zerh-single-family-version-2>. Dwelling units in eligible multifamily and mixed-use buildings may only be certified under the ZERH program if the entire building (all dwelling units and covered common spaces) is certified to meet the ZERH MF V2 program requirements.<sup>8</sup> Certification under the ENERGY STAR Multifamily New Construction and Indoor AirPlus programs is also required for a building to be eligible. See Exhibit 1 below for additional details.

Compliance with these requirements does not imply compliance with all local code requirements that may be applicable to the building. In cases where local codes overlap with and/or exceed the ZERH program requirements, these local requirements must be met.<sup>9</sup>

To determine the required version and revision of DOE ZERH program requirements to use based on a project's location, building type, and permit date<sup>6</sup>, partners must reference the DOE ZERH implementation timeline information posted on the [DOE ZERH program requirements website](#). Note that these National Program Requirements do not apply to projects located in California, where the ZERH program has state-specific requirements. Partners are advised to check the [DOE ZERH website](#) and IRS Guidance on the 45L tax credit for information about tax credit eligibility.

## 2. Partnership, Training, and Credentialing Requirements

The following requirements must be met by program participants before a multifamily building can be certified:

- The builder or developer must [register as a ZERH partner](#) and sign the ZERH Builder Partner Agreement, available in [Partner Central](#) on the ZERH website.
- Energy Rating Companies (e.g., rater companies and Providers) are required to [register as a ZERH partner](#) and sign a ZERH Partnership Agreement, available in [Partner Central](#) on the ZERH website.
- Raters<sup>10</sup> are required to complete all ZERH training modules applicable to the ZERH MF V2 program specifications (according to the timeline posted on the [ZERH website](#)) prior to completing a ZERH project's first inspection. Please note that required training modules are subject to change and Raters will have an allocated time period to complete additional or updated training modules as they become available. If a Rater does not successfully complete these modules before the end of the allocated time period, they may not certify ZERH projects until the modules are complete.
- Raters must be (a) a Certified Rater, Approved Inspector, as defined by ANSI / RESNET / IECC 301, or (b) credentialed by a Home Certification Organization for the Zero Energy Ready Home program (HCO for ZERH), or (c) meet the credential requirements of a Multifamily Review Organization for the Zero Energy Ready Home program (MRO for ZERH). Learn more and find a current list of HCOs and MROs for ZERH [here](#).
- Where Functional Testing (FT) Agents are used for field verification of ZERH MF V2 HVAC requirements, the ESMFNC credentialing requirements for FT Agents shall apply. See the ENERGY STAR FT Agent requirements [here](#).



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## 3. DOE ZERH Multifamily Certification Process<sup>8</sup>

The certification process offers three paths to meet the ZERH MF V2 performance target. Each has varying levels of flexibility to select a custom combination of measures for each building. Dwellings may qualify using the Prescriptive path, the Energy Rating Index (ERI) path, or the ASHRAE 90.1 compliance path (“ASHRAE path”). Regardless of the path chosen or the efficiency measures selected, the DOE ZERH MF V2 Mandatory Requirements (Exhibit 1) are also required and impose certain constraints on the efficiency measures selected (e.g., insulation levels, window specifications). On-site power generation may not be used to meet the DOE ZERH MF V2 ERI target or the performance target in the ASHRAE path.

### 3.1 Prescriptive Path Certification Process

Under the Prescriptive path, each dwelling unit must be equivalent in performance to the applicable minimum requirements of the ZERH MF V2 Target Dwelling Design (Exhibit 2). Dwelling units and common spaces must also meet or exceed the requirements in the ZERH MF V2 National Rater Checklist, which includes meeting the applicable mandatory requirements as shown in Exhibit 1. Buildings following this path must be certified through an MRO for ZERH. DOE recommends that Raters and Builders identify their MRO for ZERH during the design stage, but at the latest, projects must be under MRO for ZERH oversight **prior to the first inspection**. MROs for ZERH have limited discretion to grant an exemption to the first inspection policy (e.g., when a building switches certification paths). The following process applies for certification under the Prescriptive path:

- 3.1.1. Select efficiency measures for dwelling units and common spaces that meet or exceed all applicable items in the ZERH MF V2 National Rater Checklist, which includes meeting the minimum requirements set in Exhibit 1. In addition, the efficiency features described in the ZERH MF V2 Target Dwelling Design (Exhibit 2) are mandatory within the dwelling units.
- 3.1.2. Upon completion of design, specific documentation (See Exhibit 4) may be submitted to an MRO for ZERH for review and approval. DOE strongly recommends submitting this documentation before construction; however, Raters may instead choose to submit the design documentation at final certification. MROs for ZERH may choose to implement alternative design review requirements.
- 3.1.3. Construct the building using the measures selected in Step 3.1.1, with all dwelling units meeting the minimum requirements in Exhibit 1 and the mandatory requirements in Exhibit 2, as they apply.
- 3.1.4. Use a Rater operating under a DOE-recognized MRO for ZERH to verify that all requirements for certification have been met in accordance with the inspection procedures for minimum rated features in ANSI/RESNET/ICC 301, Appendix B.<sup>11</sup> This will require a minimum of two inspections: one at pre-drywall and the other at final. For modular multifamily buildings, a Rater must verify any requirement in the plant not able to be verified on-site because a feature will be concealed prior to shipment.<sup>12</sup>
- 3.1.5. The Rater submits the whole building to the MRO for ZERH for final certification once verification on all units and common spaces is complete. The submission must include the documentation specified in Exhibit 4 based on as-built conditions. The Rater is required to keep electronic or hard copies of the completed and signed ZERH MF V2 National Rater Field Checklist.

### 3.2 Energy Rating Index (ERI) Path Certification Process

Under the ERI path, each dwelling unit must be at least equivalent in performance to the applicable minimum requirements of the ZERH MF V2 Target Dwelling Design (Exhibit 2), as assessed through energy modeling. Dwelling units and common spaces must also meet or exceed the requirements in the ZERH MF V2 National Rater Checklist, which includes meeting the applicable mandatory requirements as shown in Exhibit 1. On-site power generation may not be used to meet the ZERH MF V2 ERI Target. Buildings following this path must be certified through an HCO for ZERH. The following process applies:

- 3.2.1. Obtain the ERI score for the ZERH Multifamily Target Dwelling Design, which is determined using a DOE-recognized HCO for ZERH's Approved Software Rating Tool.<sup>13</sup>



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3.2.2. Using the same software program specified in Step 3.2.1, configure the preferred set of efficiency measures for the unit to be certified and verify that the resulting ERI meets or exceeds the ZERH Multifamily V2 Target Dwelling ERI score, as determined in Step 3.2.1. Select efficiency measures for units that also meet or exceed all applicable items in Exhibit 1 (Mandatory Requirements). Select efficiency measures for common spaces that meet or exceed all items in the ZERH MF V2 National Rater Checklist (which contains all Exhibit 1 Mandatory items) to the extent that they apply.

3.2.3. Construct the building using the measures selected in Step 3.2.2.

3.2.4. Use a Rater operating under a DOE-recognized HCO for ZERH to verify that all requirements for certification have been met in accordance with the inspection procedures for minimum rated features in ANSI/RESNET/ICC 301, Appendix B.<sup>11</sup> This will require a minimum of two inspections: one at pre-drywall and the other at final. For modular multifamily buildings, a Rater must verify any requirement in the plant not able to be verified on-site because a feature will be concealed prior to shipment.<sup>12</sup>

3.2.5. The Rater submits the whole building to the HCO for ZERH for final certification once verification on all units and common spaces is complete.<sup>14</sup> The submission must include all documentation specified by the HCO for ZERH, based on as-built conditions. The Rater is required to keep electronic or hard copies of the completed and signed ZERH MF V2 National Rater Checklist.

## 3.3. ASHRAE 90.1 Path Certification Process

Under the ASHRAE 90.1 compliance path, the building must meet or exceed the ASHRAE performance target, described in Exhibit 3. Buildings following this path must be certified through an MRO for ZERH. DOE recommends that Raters and Builders identify their MRO for ZERH during the design stage, but at the latest, projects must be under MRO for ZERH oversight **prior to the first inspection**. MROs for ZERH have limited discretion to grant an exemption to the first inspection policy (e.g., when a building switches compliance paths). Buildings using this path must follow the modeling requirements in the ENERGY STAR Multifamily Simulation Guidelines, located [here](#). The following process applies:

3.3.1. Meet or exceed the mandatory requirements specified in Exhibit 1. Following the ENERGY STAR Multifamily Simulation Guidelines, configure the preferred set of efficiency measures for the unit to be certified and verify that the resulting energy savings above the ASHRAE building baseline meets or exceeds the required performance target per Exhibit 3. **For buildings that are certified as PHIUS CORE 2021 or PHIUS ZERO 2021** (using PHIUS modeling protocols in lieu of ENERGY STAR Multifamily Simulation Guidelines), achieving 20% less energy use than the PHIUS CORE 2021 source energy criteria, without renewables, is accepted in lieu of achieving the ASHRAE performance target based on a baseline of ASHRAE 90.1-2019.

3.3.2. Upon completion of design, specific documentation may be submitted to an MRO for ZERH for their review and approval as described in Exhibit 4. DOE strongly recommends submitting this documentation before construction; however, Raters may instead choose to submit the design documentation at final certification. MROs for ZERH may choose to implement alternative design review requirements.

3.3.3. Construct the building using the measures selected in step 3.3.1 and the Mandatory Requirements in Exhibit 1.

3.3.4. Use a Rater operating under a DOE-recognized MRO for ZERH to verify that all requirements have been met in accordance with the inspection procedures for minimum rated features in ANSI/RESNET/ICC 301, Appendix B.<sup>11</sup> This will require a minimum of two inspections: one at pre-drywall and the other at final. For modular multifamily buildings, a Rater must verify any requirement in the plant not able to be verified on-site because a feature will be concealed prior to shipment.<sup>12</sup>

3.3.5. Once verification on all units and common spaces is complete, submit the whole building to the MRO for ZERH for final certification with the MRO for ZERH-specified documentation (Exhibit 4) based on as-built conditions. The Rater is required to keep electronic or hard copies of the completed and signed ZERH MF V2 National Rater Checklist.



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## Exhibit 1: DOE Zero Energy Ready Home Multifamily Mandatory Requirements

Where ZERH Mandatory requirements apply only to dwelling units and not to common spaces, common space requirements shall be met through compliance with [ENERGY STAR Multifamily New Construction Version 1.2 National Program Requirements](#). In this and following Exhibits, the terms 'in-unit' and 'in-dwelling' both reference equipment that is installed within or only serves a single dwelling unit.

Component	Mandatory Requirements	Applicability <sup>15</sup>
<b>1. ZERH National Rater Checklist</b>	1.1 Rater completes the DOE ZERH Multifamily Version 2 (Rev. 1) National Rater Checklist. <sup>16</sup>	Dwelling units; common spaces
<b>2. ENERGY STAR Baseline</b>	2.1 Building is certified under ENERGY STAR Multifamily New Construction National Program Version 1.2. <sup>17</sup>	Dwelling units; common spaces
<b>3. Building Envelope</b>	3.1a ERI and ASHRAE paths: ceiling, wall, floor, and slab insulation for the building meets specified efficiency levels from the 2021 IECC. <sup>18, 19, 20</sup> 3.1b Prescriptive path: ceiling, wall, floor, and slab insulation for the building meets or exceeds specified ZERH MF V2 Target Dwelling Design insulation levels in dwelling units, and specified efficiency levels from the 2021 IECC in common spaces. <sup>20, 21</sup> 3.2 Windows in dwelling units meet high performance requirements based on climate zone. <sup>22</sup>	Dwelling units; common spaces
<b>4. Duct System</b>	4.1 All in-unit heating and cooling system distribution ducts and in-unit heating and cooling system air-handling equipment are located within the thermal and air barrier boundary. <sup>23</sup>	Dwelling units
<b>5. Hot Water Efficiency</b>	5.1 WaterSense labeled fixtures for dwelling unit showerheads, and bathroom sink faucets and/or faucet accessories. <sup>24</sup> 5.2 Hot water delivery systems meet stored volume criteria. <sup>25</sup> 5.3 In-dwelling unit recirculation systems use on-demand controls. <sup>26</sup> 5.4 Recirculating central hot water distribution systems meet pipe insulation thickness criteria. <sup>27</sup>	Dwelling units
<b>6. Lighting &amp; Appliances<sup>28</sup></b>	6.1 All builder-supplied and builder-installed in-dwelling refrigerators <sup>29</sup> , dishwashers, clothes washers, and clothes dryers are ENERGY STAR certified. <sup>30</sup> 6.2 100% of in-dwelling, builder-installed lighting fixtures and lamps are LEDs. <sup>31, 32</sup> 6.3 All installed bathroom ventilation fans in dwelling units are ENERGY STAR certified. <sup>33</sup>	Dwelling units
<b>7. Indoor Air Quality</b>	7.1 Certified under EPA Indoor AirPlus (Version 1 or Version 2 (Certified or Gold), determined by permit date). <sup>34</sup> 7.2 Either in-unit or centralized energy efficient balanced ventilation (HRV or ERV) is provided for dwelling units in Climate Zones 6, 7, and 8. <sup>35, 36</sup>	Dwelling units
<b>8. Renewable Ready</b>	8.1 Provisions of the DOE ZERH Multifamily PV-Ready Checklist Version 2 (Rev. 1) are completed.	See Checklist
<b>9. Electric Vehicle Ready</b>	9.1 Provisions of the DOE ZERH Multifamily EV-Ready Checklist Version 2 (Rev. 1) are completed.	See Checklist



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<b>10. Heat Pump Water Heater Ready</b>	10.1 Dwelling units with in-unit water heaters meet minimum electric and space requirements. <sup>37</sup> 10.2 Dwelling units with in-unit water heaters have a condensate drain installed within three feet of existing water heater. <sup>38</sup>	Dwelling units
<b>11. Heat Pump Space Heating Ready</b>	11.1 For units with in-unit combustion space heaters, individual branch circuit outlet is installed, or conduit is installed to facilitate future wiring for a heat pump installation. Circuit or conduit labeled as "For future heat pump." <sup>39</sup>	Dwelling units
<b>12. HPWH Installation Quality Advisory Only</b>	<p>Where heat pump water heaters are installed in dwelling units, partners are encouraged, but not required, to adhere to these installation practices to achieve optimal performance:</p> <p>12.1 HPWH has direct access to manufacturer-specified volume of ambient air (typical specs range from 450 to 1200 ft<sup>3</sup>), free of major dust sources, in the space surrounding the water heater through the mechanical room volume or the use of a louvered door, wall vents, ducting, or other strategy.</p> <p>12.2 HPWH installation complies with the manufacturer's minimum clearance requirements to make the unit accessible for maintenance and filter cleaning/replacement.</p> <p>12.3 HPWH has a sound rating of ≤ 55 dBA and a louvered door is not used to separate the unit from living space, or the HPWH has a sound rating of ≤ 35 dBA when a louvered door is used. Alternately, the HPWH is separated from living spaces by sound-attenuating assemblies with STC 35 or greater (i.e., by adding batt insulation to the surrounding wall assembly).</p> <p><i>DOE will consider making these installation practices requirements in a future program update.</i></p>	

## Exhibit 2: DOE Zero Energy Ready Home Target Dwelling Design

The following requirements apply to all dwelling units, as well as to equipment, fixtures, building envelope assemblies, and appliances that apply to or serve both dwelling units *and* common spaces, unless otherwise specified. For equipment, fixtures, building envelope assemblies, and appliances serving *only* common spaces, follow ENERGY STAR Multifamily New Construction Version 1.2 National Program Requirements.

This Exhibit does not apply to projects pursuing the ASHRAE path. For ASHRAE path projects, see Exhibit 3.

<b>Residential Cooling Equipment (where provided) serving Dwelling Units<sup>16</sup></b> modeled at the applicable efficiency levels below. <sup>40</sup> If specified equipment type is not listed here, see Exhibit A.			
<b>2021 IECC Climate Zone</b>	<b>1, 2</b>	<b>3, 4A, 4B</b>	<b>4C, 5, 6, 7, 8</b>
Central A/C Cooling	18 SEER	16 SEER	14 SEER
Air Source Heat Pump Cooling	18 SEER	16 SEER	16 SEER
Ground Source Heat Pump Cooling	16 EER	14 EER	14 EER
<b>Residential Heating Equipment (where provided) serving Dwelling Units<sup>16</sup></b> modeled at the applicable efficiency levels below. <sup>41</sup> If specified equipment type is not listed here, see Exhibit A.			
<b>2021 IECC Climate Zone</b>	<b>1, 2</b>	<b>3, 4A, 4B</b>	<b>4C, 5, 6, 7, 8</b>
Gas Furnace, Gas Boiler (AFUE)	90%	CZ 3: 90%; CZ 4: 95%	95%
Air Source Heat Pump (HSPF)	9.2	9.2	9.5





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Ground Source Heat Pump (COP)	2.7			2.7		2.8		
HVAC Grading for Residential Heating and Cooling Equipment (where provided) in Dwelling Units								
Total Duct Leakage	Airflow Deviation			Watt Draw Efficiency		Refrigerant Grade		
Grade I <sup>42</sup>	Grade 1, -7.5%			Grade I, 0.45 W/cfm		Grade III (as applicable)		
Infiltration and Mechanical Ventilation in Dwelling Units <sup>16</sup>								
2021 IECC Climate Zone	1	2	3	4A, 4B	4C, 5	6	7	8
Mech. Ventilation Efficacy (cfm/W) <sup>43</sup>	2.9	2.9	2.9	2.9	1.2	1.2	1.2	1.2
Heat Recovery	None				Balanced, 65% ASRE			
Infiltration Rate <sup>44</sup>	0.25 CFM50/ft <sup>2</sup> of enclosure surface							
Mechanical Ventilation Rate	CFM = (0.01 x CFA) + (7.5 x (Nbr +1)), where CFA = Conditioned Floor Area and Nbr = Number of Bedrooms; Runtime: 24 hours/day							
Mechanical Ventilation Fan Watts	Watts = CFM Rate/Ventilation Efficacy, where CFM Rate and Ventilation Efficacy are determined above							
Dwelling unit insulation levels modeled to 2021 IECC levels (Residential, wood-frame) and Grade I installation per ANSI/RESNET/ICC 301. <sup>19</sup>								
2021 IECC Climate Zone	1	2	3	4A, 4B	4C, 5	6	7	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 U-Factor	0.360	0.360	0.091	0.059	0.050	0.050	0.050	0.050
Wood Framed Floor Assembly U-Factor <sup>45</sup>	0.064	0.064	0.047	0.047	0.033	0.033	0.028	0.028
Mass Floor U-Factor	0.322	0.087	0.074	0.051	0.051	0.051	0.042	0.038
Wall Assembly U-Factor	0.084	0.084	0.060	0.045	0.045	0.045	0.045	0.045
Celling Assembly U-factor	0.035	0.026	0.026	0.024	0.024	0.024	0.024	0.024
Dwelling Unit Windows (Prescriptive pathway: meet allowable U/SHGC combinations as listed in endnote 22. If Class AW, meet values listed in Class AW table below.)								
2021 IECC Climate Zone	1	2	3	4A, 4B	4C, 5	6	7	8
Window U-Value	0.40	0.40	0.30	0.30	0.27	0.25	0.25	0.25
Window SHGC	0.23	0.23	0.25	0.30	0.30	0.30	0.30	0.30
Dwelling Unit Doors (for Class AW, see below)								
Door type <sup>46</sup>	Opaque		≤ ½ Lite		> ½ Lite			
2021 IECC Climate Zone	Any		Any		1 – 3		4 – 8	
Whole Door U-Factor	0.17		0.25		0.30		0.30	
Door SHGC	Any		0.25		0.25		0.40	
Dwelling Unit Class AW Fenestration								
2021 IECC Climate Zone	1	2	3	4A, 4B	4C, 5	6	7	8
Fixed Window U-Factor	0.48	0.43	0.40	0.34	0.34	0.32	0.28	0.27
Operable Window U-Factor	0.59	0.57	0.51	0.43	0.43	0.40	0.34	0.30
Glazed Entrance Door U-Factor	0.79	0.73	0.65	0.60	0.60	0.60	0.60	0.60
SHGC	0.25	0.25	0.25	0.40	0.40	0.40	any	any



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Water Heater Serving Dwelling Units								
In-Dwelling Gas Water Heater: UEF = 0.95				In-Dwelling Electric Water Heater: UEF = 1.95				
Central System Gas Water Heater: E <sub>t</sub> = 95%				Central System Electric Water Heater: COP = 1.6				
Dwelling Unit Solar Water Heating System Solar Fraction <sup>47</sup> (only for use in Prescriptive path projects, not to be included in the ERI Target Dwelling)	1	2	3	4A, 4B	4C, 5	6	7	8
	0.80	0.80	0.64	0.64	0.47	0.47	0.28	0.28
Thermostat and Ductwork								
Programmable thermostat								
All ducts and air handlers located in conditioned space, uninsulated. <sup>48</sup>								
Dwelling Unit Lighting, Appliances, and Fixtures								
Lighting	ENERGY STAR light bulbs or fixtures with Tier II efficiency in 100% of Qualifying Light Fixture Locations, as defined by ANSI/RESNET/ICC 301.							
ENERGY STAR Certified Appliances	Refrigerator, Dishwasher, Ceiling Fans (if used)							
WaterSense Fixtures	WaterSense bathroom faucets, aerators, showerheads							

## Exhibit 3: DOE Zero Energy Ready Home ASHRAE Path Performance Targets

ASHRAE Energy Savings Requirements	Other Mandatory Requirements
20% energy cost savings or 20% source energy savings above ASHRAE 90.1-2019. The use of on-site renewable energy, including cogeneration, photovoltaics, or wind turbines, may not contribute to meeting the Performance Target (but may be used to exceed it).	All items from Exhibit 1, above.

Appendix G from ASHRAE 90.1 must be used, along with the [ASHRAE Standard 90.1 Performance Based Compliance Form](#) and ENERGY STAR's Multifamily Simulation Guidelines\_AppG2016, available on the ENERGY STAR Guidance Documents page which can be found at [www.energystar.gov/mfguidance](http://www.energystar.gov/mfguidance) at the bottom of the page under 'Supporting Documents.' DOE encourages the use of Appendix G from ASHRAE 90.1-2022, but will accept the use of Appendix G-based modeling for 90.1-2016 and 90.1-2019 until further notice.

Projects must demonstrate that a proposed building achieves a Performance Cost Index less than or equal to 80% of the Performance Cost Index Target calculated in accordance with Section 4.2.1.1c of ASHRAE 90.1. Regardless of which version of Appendix G is used, the modeling must demonstrate a Performance Cost Index that is ≤ 80% of the Performance Cost Index Target calculated using the following Building Performance Factors from 90.1-2019.

For energy cost savings use the BPFs from the Building Performance Factor (BPF) Energy Cost table and for source energy savings use the BPFs from the Building Performance Factor (BPF) Source Energy table:

Building Performance Factor (BPF) Energy Cost from ASHRAE 90.1-2019																
CZ	0A, 1A	0B, 1B	2A, B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
BPF, MF	0.68	0.70	0.66	0.69	0.68	0.59	0.74	0.76	0.74	0.70	0.73	0.75	0.68	0.71	0.68	0.72
Building Performance Factor (BPF) Source Energy from ASHRAE 90.1-2019																
CZ	0A, 1A	0B, 1B	2A, 2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
BPF, MF	0.68	0.71	0.66	0.70	0.69	0.60	0.72	0.76	0.74	0.68	0.73	0.75	0.66	0.70	0.66	0.70

## Exhibit 4: ASHRAE and Prescriptive Path MRO Documents



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Upon completion of design, documentation listed below (except the Photo Documentation) may be submitted to an MRO for ZERH for their review and approval. DOE strongly recommends submitting this documentation before construction; however, Raters may instead choose to submit the design documentation at final certification along with the Photo Documentation. *All documentation* listed below must be submitted at final certification. MROs for ZERH may choose to implement alternative design review requirements.

Party Responsible	Documents
<b>Requirements Applicable to the Prescriptive and ASHRAE Paths</b>	
Rater	ENERGY STAR Multifamily Workbook, including ZERH addenda
	ZERH Multifamily National Rater Checklist Version 2 <sup>49</sup>
	ZERH Multifamily PV-Ready Checklist Version 2 <sup>49</sup>
	ZERH Multifamily EV-Ready Checklist Version 2 <sup>49</sup>
	Construction Documents
	ZERH Multifamily Version 2 Photo Documentation (final only)
<b>Requirements Applicable to the ASHRAE Path Only</b>	
ASHRAE Modeler	<a href="#">ASHRAE Standard 90.1 Performance-Based Compliance Form</a>
	ESMFNC/ZERH Companion Tool to the ASHRAE Standard 90.1 Performance-Based Compliance Form
	Modeling file or modeling input and output files

## Exhibit A: Values for HVAC equipment serving Dwelling Units

For any equipment not listed, minimum efficiencies shall be based on 10% improvement over those listed in ASHRAE 90.1-2019. Use the values for “after 1/1/2023” where listed. For equipment types listed below that serve only common spaces, requirements may be found in the ESMFNC V1.2 National Rater Field Checklist, Exhibit X. Use the values that apply to common spaces.

Equipment Type	Equipment Size	CZ: 1-2	3	4A, B	4C, 5, 6, 7, 8
Room A/C (window, through-wall)		Certified under ENERGY STAR Version 5.0 Program Requirements for Room Air Conditioners (or subsequent versions once implemented)			
Air conditioners, air cooled (split system and single package)	< 65 kBtu/h	See Target Dwelling Design			
	≥ 65 and < 135 kBtu/h	16.3 IEER	15.7 IEER	14.6 IEER	
	≥ 135 and < 240 kBtu/h	15.6 IEER	15.1 IEER	14.0 IEER	
	≥ 240 and < 760 kBtu/h	14.5 IEER	14.1 IEER	13.0 IEER	
Warm-air furnace (gas)		See Target Dwelling Design			
Gas heating component of a Packaged Terminal Air Conditioner (PTAC)		80% Et	82% Et, with infiltration rate of 0.25 cfm50/ft <sup>2</sup> of enclosure area, (average across all units)		
Packaged Terminal Air Conditioner cooling efficiency		12.7 EER	12.5 EER	11.9 EER	
Packaged Terminal Heat Pump (PTHP) cooling efficiency*	< 7 kBtu/h	13.0 EER	12.5 EER	11.9 EER	
	≥ 7 and ≤ 10 kBtu/h CZ 1-4	15.0 - (0.340 x Cap/1000) EER	14.7 - (0.320 x Cap/1000) EER	14.0 - (0.300 x Cap/1000) EER	
	≥ 7 and ≤ 15 kBtu/h CZ 4C-8				





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	> 10 kBtu/h CZ 1-4 > 15 kBtu/h CZ 4C-8	11.6 EER	11.5 EER	9.5 EER
PTHP heating efficiency*	< 8 kBtu/h	3.3 COP		3.6 COP
	≥ 8 kBtu/h	3.7 - (0.052 x Cap/1000) COP		3.5 COP
Air cooled heat pump (split system and single package) cooling efficiency*	< 65 kBtu/h	See Target Dwelling Design		
	≥ 65 and < 135 kBtu/h	15.5 IEER	15.1 IEER	
	135 and < 240 kBtu/h	14.9 IEER	14.4 IEER	
Air cooled heat pump (split system and single package) heating efficiency*	< 65 kBtu/h	See Target Dwelling Design		
	≥ 65 and < 135 kBtu/h	3.5 COP		3.7 COP
	135 and < 240 kBtu/h	3.4 COP		3.6 COP
VRF air conditioners and heat pumps, cooling efficiency*		16.6 IEER	16.2 IEER	
VRF heat pumps, heating efficiency*		3.3 COP		3.5 COP
Water-loop heat pump (WLHP) cooling efficiency*	< 135 kBtu/h	15.0 EER		
WLHP heating efficiency*	< 135 kBtu/h	4.5 COP		
Boilers, hot water	< 300 kBtu/h	See Target Dwelling Design		
	≥ 300 kBtu/h	80% Et	86% Et (89% Et with WLHP)	95% Et (90% Et with WLHP)

Cap means the rated capacity of the product in Btu/h

\*For buildings where dwelling units are served by a heat pump water heater, space conditioning equipment that is marked with an asterisk in Exhibit A may instead meet the efficiency listed in ASHRAE 90.1-2019. Use the values for “after 1/1/2023” where listed.

## Endnotes

<sup>1</sup> Buildings that do not contain dwelling or sleeping units are not eligible for certification under ZERH. The term ‘building’ refers to a structure that encompasses dwelling/sleeping units and (if present) common spaces, sharing one or more of the following attributes: a common street address, a common entrance or exit, central/shared mechanical systems, or structurally interdependent wall or roof systems. Attached structures such as townhouses and 4-story two-unit structures (commonly referred to as “2-over-2s”) may be considered separate buildings if they are divided by a vertical fire separation wall from the foundation to the roof sheathing and share none of the other attributes listed above. A skyway or a breezeway that connects to structures is not considered a common entrance or exit. DOE adopts these parameters from the ENERGY STAR program, thus, building type eligibility for certification under ZERH Multifamily Version 2 is the same as building type eligibility for certification under ENERGY STAR Multifamily New Construction Version 1.2.

For the purposes of eligibility, hotels, motels, and senior care facilities are not considered multifamily buildings. For more information, visit:

[https://www.energystar.gov/partner\\_resources/residential\\_new/program\\_reqs/mfnc\\_building\\_eligibility](https://www.energystar.gov/partner_resources/residential_new/program_reqs/mfnc_building_eligibility).

<sup>2</sup> A dwelling unit, as defined by ANSI/RESNET/ICC 301, is a single unit that provides complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.



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<sup>3</sup> A sleeping unit, as defined by ANSI/RESNET/ICC 301, is a room or space in which people sleep that can also include permanent provisions for living, eating, and either sanitation or kitchen facilities, but not both. Such rooms and spaces that are part of a dwelling unit are not considered sleeping units, but rather part of the dwelling unit.

<sup>4</sup> A dwelling, as defined by ANSI/RESNET/ICC 301, is any building that contains one or two dwelling units used, intended, or designed to be built, used, rented, leased, let, or hired out to be occupied, or that are occupied for living purposes.

<sup>5</sup> The term 'common space' refers to any spaces in the building being certified that serve a function in support of the residential part of the building that is not part of a dwelling or sleeping unit. This includes spaces used by residents, such as corridors, stairs, lobbies, laundry rooms, exercise rooms, residential recreation rooms, and dining halls, as well as offices and other spaces used by building management, administration, or maintenance in support of the residents.

<sup>6</sup> The 'permit date' is the date on which the permit authorizing construction of the building was issued. Alternatively, the date of the Rater's first site visit or the application date of the permit is allowed to be used as the 'permit date'.

<sup>7</sup> A 'townhouse,' as defined by ANSI/RESNET/ICC 301, is a single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from the foundation to the roof and has open space on at least two sides. They must use the ERI path of the ZERH MF program, as they are not eligible to use the Prescriptive path or the ASHRAE 90.1 path. However, the ZERH ERI Target for townhouses must be determined using Exhibit 2 of the DOE ZERH Single Family Homes National Program Requirements Version 2. In addition, all ZERH requirements shall be verified for each certified townhouse and sampling protocols shall not be used to verify ZERH requirements in any townhouse.

<sup>8</sup> These requirements apply to all dwelling units and common spaces covered by the program, and garages (open or enclosed) in the building being certified, and where specified, parking lots. These requirements do not apply to commercial or retail spaces. These requirements do not apply to common spaces that are located in buildings on the property without any dwelling units. These requirements do not apply to parking garages or lots where the cost of the energy use of the parking garage or lot is not the responsibility of the builder/developer, building owner, or property manager.

Sampling of those requirements for ENERGY STAR Multifamily New Construction (ESMFNC) and Indoor airPLUS certification is allowed to the extent permitted by their respective program requirements and allowances for sampling. Sampling of these ZERH program requirements may be allowed if the Multifamily Review Organization (MRO) for ZERH or Home Certification Organization (HCO) for ZERH overseeing the project's certification has a sampling protocol approved by DOE as part of the MRO/HCO for ZERH approval process. Apartments participating in sampling must be within the same building, be the same construction type, and include the same envelope systems.

<sup>9</sup> While certification will result in compliance with many code requirements, a Rater is not responsible for ensuring that all code requirements have been met prior to certification. In the event that a code requirement, a manufacturer's installation instructions, or an engineering document conflicts with a requirement of the ZERH program, then the conflicting requirement within these program requirements shall not be met. Certification shall only be allowed if the Rater has determined that no equivalent option is available that could meet the conflicting requirement. Note that a dwelling unit must still meet its energy performance target. Therefore, other efficiency measures may be needed to compensate for the omission of the conflicting requirement.



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<sup>10</sup> The Rater is defined as the person(s) completing the third-party verification required for certification.

<sup>11</sup> The Rater must review all items on the ZERH MF V2 National Rater Checklist for the whole building to verify that each inspection checklist item has been met within program-defined tolerances.

If a Rater determines that a program requirement has not been met, the building cannot earn ZERH certification until the item is corrected. If correction of the item is not possible, the building cannot earn ZERH certification and individual units in the multifamily building also cannot be certified. If an item on the ZERH MF V2 National Rater Checklist cannot be inspected by the Rater, the building as well as individual dwelling units also cannot earn ZERH certification.

If a Rater is not able to determine whether a program requirement has been met, (e.g., an alternative method of meeting a checklist requirement has been proposed), then the Rater shall consult their Provider (e.g., rating company) or MRO for ZERH. If the Provider or MRO for ZERH also cannot make this determination, then the Rater, MRO for ZERH, or Provider shall report the issue to DOE prior to building completion at [zerh@doe.gov](mailto:zerh@doe.gov) and will typically receive an initial response within 10 business days. If DOE believes the current program requirements are sufficiently clear to determine whether the item in question has been met, then this guidance will be provided to the partner and enforced beginning with the building in question. However, if DOE believes the program requirements need revisions to make the intent clear, then this guidance will be provided to the partner but only enforced for buildings permitted after a specified transition period following the release of the revised requirements, typically 60 days in length. This process will allow DOE to make formal policy decisions as partner questions arise and to disseminate these policy decisions through the Policy Record and the periodic release of revised program documents to ensure consistent application of the program guidelines.

<sup>12</sup> A modular building is a prefabricated building that is made of multiple modules or sections that are manufactured and substantially assembled in a manufacturing plant. These pre-built sections are transported to the building site and constructed by a builder to meet all applicable building codes for site-built buildings.

<sup>13</sup> The software program shall automatically determine (i.e., without relying on a user-configured ZERH Multifamily Target Dwelling Design) the ERI target for each rated unit by following the DOE Zero Energy Ready Home Multifamily National Program, Version 2 ERI Target Procedure. DOE will review an HCO for ZERH's software tool(s) prior to the software being approved for use in ZERH certifications.

<sup>14</sup> Generally, buildings must be submitted for certification after verification on all units and common spaces is complete. Alternatively, at the discretion of the Provider, individual dwelling units that are part of ERI path projects may be conditionally certified prior to the building completion if the following process is observed:

- i. The Provider must generate a Conditional ZERH Certification Disclosure letter to be included with the label and certificate for the homebuyer of each conditionally certified unit.
- ii. Once verification on all dwelling units and common spaces is complete and the whole building is certified, the Provider must generate a ZERH Certification Confirmation letter, for the building to deliver to the applicable homebuyers.

If any dwelling unit or common space in the building is ultimately unable to be verified, the building will not be able to earn certification, the Provider must decertify any conditionally certified units, and the builder must notify the applicable homebuyers.

<sup>15</sup> "Applicability" refers to the space types covered by the provision, including the systems located within the listed spaces as well as the systems serving those spaces. The term 'dwelling unit' in Exhibits 1 and 2 includes both sleeping and dwelling units, unless otherwise noted.



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<sup>16</sup> Two tracks are provided for satisfying the ZERH MF National V2 Rater Checklist item for HVAC Systems. Track A – HVAC Grading by Rater allows a Rater to utilize ANSI/RESNET/ACCA 310 for grading the installation of residential HVAC systems serving individual spaces and a Functional Testing (FT) Agent to verify commercial and central systems and systems serving common spaces. Track B – HVAC Testing by FT Agent uses an FT agent to assessing all HVAC systems. Either track may be selected, but all requirements within that track must be satisfied for the building to be certified. See the ZERH MF V2 Rater Checklist for specific requirements for both tracks.

<sup>17</sup> DOE Zero Energy Ready Home Multifamily Version 2 requires compliance with ESMFNC V1.2, including in states where ESMFNC V1.1 (or an earlier version) is effective. In states where the ENERGY STAR Residential New Construction program requires additional measures or efficiency levels beyond ESMFNC V1.2, these measures are also mandatory for compliance with the ZERH MF V2 National Program.

<sup>18</sup> For dwelling units, projects may reference either the 2021 International Energy Conservation Code (IECC) Residential chapter or Commercial (Group R) chapter, but all dwelling unit envelope components must reference the same chapter (whether it be residential or commercial). For common spaces, projects may reference either 2021 International Energy Conservation Code (IECC) Residential or Commercial (All Other), but all common space envelope components must reference the same chapter (whether it be residential or commercial). For both dwelling units and common spaces, when referencing the R-value from the Residential chapter, steel-frame components must use Table R402.2.6 for steel-frame ceiling, walls, and floors.

Building envelope assemblies, including exterior walls and unvented attic assemblies (where used), shall comply with the relevant vapor retarder provisions of the 2021 International Residential Code (IRC).

<sup>19</sup> ERI and ASHRAE path projects may use a total UA calculation for the whole building envelope to demonstrate compliance with the mandatory envelope insulation requirements. The as-built UA shall be less than or equal to the target UA calculated using the method below.

- All envelope components (e.g., wall, ceiling, floor, slab, windows) which are part of dwelling units:
  - Multiply the assembly area of the component by the U-factor specified for that component in the 2021 International Energy Conservation Code (IECC) Residential or Commercial (Group R) chapter. The same chapter must be used for all dwelling unit envelope components. U factors shall be taken from the 2021 IECC - Table R402.1.2 (when using the Residential chapter) or Table C402.1.4 (when using the Group R values from the Commercial chapter).
- All envelope components which are part of common spaces:
  - Multiply the assembly area of the component by the U-factor specified for that component in the 2021 International Energy Conservation Code (IECC) Residential or Commercial (All Other) chapter. The same chapter must be used for all common space envelope components.
- The sum of these two calculations is the target UA for the whole building envelope.

The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method. The performance of components (i.e., fenestration, ceilings, walls, floors, slabs) can be traded off using the UA approach.

Note that the ZERH Mandatory window provisions (Exhibit 1) and Section 3 of the ESMFNC National Rater Field Checklist must also be met regardless of the UA tradeoffs calculated.



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<sup>20</sup> All insulation allowances, exceptions, and compliance alternatives (e.g., for slab edge (above-grade and on-grade), columns, balcony details) recognized by the most recent national version and revision of ENERGY STAR Multifamily New Construction (ESMFNC) are permitted. This includes adjustments to the UA calculations based on reduced insulation levels. These allowances and alternatives may be used by projects following the Prescriptive, ERI, or ASHRAE path (to the extent permitted by ESMFNC), and will be integrated into the ESMFNC workbook, with ZERH addenda, envelope UA calculation. A list of currently exempted slab-edge details is available at [www.energystar.gov/slabeledge](http://www.energystar.gov/slabeledge).

Note the following requirements for projects using any of these allowances, exceptions, or alternatives:

- ERI path projects must still achieve the Target ERI and the total building envelope UA requirement.
- ASHRAE path projects must still achieve the total building envelope UA requirement.
- Prescriptive path projects must still achieve the total building envelope UA requirement, as defined in the next endnote.

However, for jurisdictions designated by a code official as having Very Heavy Termite Infestation, the slab edge insulation value and depth shall be adjusted in the target UA calculation for all paths. The code-required insulation level and depth shall be set to the insulation level and depth found in the Rated Dwelling Unit.

<sup>21</sup> Prescriptive path projects may meet these requirements in one of two ways (including any allowances, exceptions, or alternatives provided in the prior endnote). Regardless of the tradeoffs calculated, all windows which are part of dwelling units must meet the ZERH Mandatory window provisions (see next endnote), and Section 3 of the ESMFNC National Rater Field Checklist must also be met.

(1) Meet the requirements for all individual building envelope components using the U or R method.

- All opaque envelope components which are part of dwelling units must meet or exceed values listed in the DOE ZERH Multifamily National Program Requirements Version 2, Exhibit 2: Envelope, Windows, and Doors for Dwelling Units. Equivalent R values to the U factors provided in Exhibit 2 may be taken from the 2021 IECC, Table R402.1.3. When using R values to demonstrate compliance for steel-frame assemblies, the steel-frame equivalent R-value from Table 402.2.6 must be used. All windows which are part of dwelling units must meet or exceed U-values listed in the ZERH Mandatory window provisions (see next endnote).
- All envelope components which are part of common spaces must meet or exceed values listed in either the 2021 International Energy Conservation Code (IECC) Residential or Commercial (All Other) chapter. The same chapter must be used for all common space envelope components. When referencing the R-value from the Residential chapter, steel-frame components must use Table R402.2.6 for steel-frame ceiling, walls, and floors.

(2) Meet the requirements by using the whole building UA. When using the UA method, the as-built UA shall be less than or equal to the target UA, which is calculated using the method below.

- All envelope components (e.g., wall, ceiling, floor, slab, windows) which are part of dwelling units:
  - Multiply the assembly area of the component by the U-factor specified for that component in the DOE ZERH Multifamily National Program Requirements Version 2, Exhibit 2: Envelope, Windows, and Doors for Dwelling Units.
- All envelope components which are part of common spaces:
  - Multiply the assembly area of the component by the U-factor specified for that component in the 2021 International Energy Conservation Code (IECC) Residential or Commercial (All Other) chapter. The same chapter must be used for all common space envelope components.





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- The sum of these two calculations is the target UA for the whole building envelope.

<sup>22</sup> Windows in dwelling units must meet the following performance criteria, based on 2021 IECC Climate Zone:

CZ 1-2		CZ 3		CZ 4A, 4B		CZ 4C, 5 *		CZ 6, 7, 8	
U-factor	SHGC	U-factor	SHGC	U-factor	SHGC	U-factor	SHGC	U-factor	SHGC
≤ 0.40	≤ 0.23	≤ 0.30	≤ 0.25	≤ 0.30	≤ 0.40	≤ 0.27	Any	≤ 0.25	Any
						= 0.28	≥ 0.32		
						= 0.29	≥ 0.37		
						= 0.30	≥ 0.42		

\* SHGC values listed for Climate Zones 4C and 5 may be paired with the U-factor in the same row.

If no NFRC rating is noted on the window or in product literature (e.g., for site-built windows), select the U factor and SHGC value from Tables 4 and 10, respectively, in 2013 ASHRAE Fundamentals, Chapter 15. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color, and presence of low-e coating) to determine the rating of the unrated window. This rating must comply with ZERH window specifications, above.

The following exceptions to the window performance criteria apply:

- An area-weighted average of windows (for all dwelling units) shall be permitted to satisfy the U-factor and SHGC requirements.
- Windows utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements and shall be excluded from area-weighted averages calculated using a) above. Exempt windows shall be facing within 45 degrees of true South and directly coupled to thermal storage mass that has a heat capacity > 20 btu / ft<sup>3</sup>×°F and provided in a ratio of at least 3 sq. ft. per sq. ft. of South facing windows. Generally, thermal mass materials will be at least 2 in. thick.
- For project sites located at an elevation ≥ 5,000 feet above sea level and located in Climate Zones 5 – 8, windows with a maximum U factor of 0.30 (with any SHGC) may be used to satisfy this program requirement. For project sites located at an elevation ≥ 8,000 feet above sea level and located in Climate Zones 5 – 8, windows with a maximum U factor of 0.32 (with any SHGC) may be used to satisfy this program requirement.
- Structural dwelling unit windows and doors that are classified as “Class AW” under the North American Fenestration Standard must instead meet the U and SHGC values listed in Exhibit 2.

<sup>23</sup> Exceptions and alternative compliance paths to this requirement are:

- Up to 10 ft. of total duct length is permitted to be outside of the thermal and air barrier boundary.
- Ducts (but not air handlers) may be located in a vented attic if minimum R-8 duct insulation is used, duct leakage to outdoors is measured ≤ 3 CFM25 per 100ft<sup>2</sup> of conditioned floor area, and:
  - In Moist (A) climate zones (per 2021 IECC Table R301.1), an additional 1.5 in. (min.) of closed-cell spray foam encapsulates the ducts and ductwork is buried under 2 in. (min.) of blown-in insulation; OR
  - In Dry (B) and Marine (C) climate zones (per 2021 IECC Table R301.1, ductwork is buried under at least 3.5 in. of blown-in insulation.
- Ducts which meet the criteria for “Ducts Located in Conditioned Space” as defined by the 2021 IECC Section R403.3.2.
- Jump ducts which do not directly deliver conditioned air from the heating/cooling equipment may be located in attics if all joints, including boot-to-drywall, are air sealed and the jump duct is fully buried under the attic insulation.



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- e. Ducts and air-handling equipment associated with dedicated outdoor air systems (DOAS), which may also provide supplemental heating and cooling, are permitted to be outside of the building's thermal and air barrier boundary.

This requirement does not apply to equipment or ductwork that only provides ventilation, including make-up air systems. This requirement does not apply to air handling equipment or ductwork serving multiple dwelling units.

<sup>24</sup> WaterSense labelling of products may be verified in one of two ways:

- a. A cut sheet for the installed product indicates that it is WaterSense labeled and field verification shows that the installed product is the one described on the cut sheet.
- b. The installed product can be found in the most recent WaterSense Product Search tool (<https://lookforwatersense.epa.gov/products/>) and field verification shows that the installed product matches the product described in the search tool.

<sup>25</sup> Hot water delivery systems meet the following efficiency requirements:

To minimize water wasted while waiting for hot water and water heating energy, the hot water distribution system shall store no more than 1.8 gallons (6.8 liters) of water in any piping/manifold between the hot water source (e.g., central or in-unit hot water tank, central or in-unit recirculation loop) and any in-dwelling hot water fixture. This provision applies to in-dwelling unit plumbing systems and central hot water distribution systems. In-dwelling unit system options include manifold-fed systems; structured plumbing systems; core plumbing layouts, and recirculation systems. This provision does not apply to fixtures in dwelling unit bathrooms without a shower or bathtub.

To verify that the distribution system stores no more than 1.8 gallons (6.8 liters), raters shall either use the Calculation method **or** the Field Verification method. In the Calculation method, the rater shall calculate the stored volume between the hot water source and the furthest fixture from the source using the piping or tubing inside diameter and the length of the piping/tubing. In the case of recirculation systems (either within the dwelling or central systems), the 1.8 gallon (6.8 liter) storage limit shall be measured from the point where the branch feeding the furthest fixture branches off the recirculation loop, to the fixture itself. An Excel-based tool is available on the DOE ZERH website for this calculation.

Using the Field Verification method, no more than 2 gallons (7.6 liters) of water shall be collected from the hot water fixture before hot water is delivered. This accounts for any water stored in the fixture in addition to the 1.8-gallon limit on pipe storage. Only the fixture with the greatest stored volume between the fixture and the hot water source (or recirculation loop) needs to be tested. To field-verify that the system meets the 2-gallon (7.6 liter) limit, raters shall first initiate operation of recirculation systems, if present, and let such systems run for at least 40 seconds. Next, a bucket or flow measuring bag (pre-marked for 2 gallons) shall be placed under the hot water fixture. The hot water shall be turned on completely and a digital temperature sensor used to record the initial temperature of the water flow. Once the water reaches the pre-marked line at 2 gallons, the water shall be turned off and the ending temperature of the water flow (not the collection bucket) shall be recorded. The temperature of the water flow must increase by  $\geq 10$  °F in comparison to the final to the initial temperature reading.

<sup>26</sup> In-dwelling unit hot water recirculation systems meet the following requirements:

- a. Must be based on an occupant-controlled switch or an occupancy sensor. A sensor or switch must be installed for each fixture or set of fixtures within a room (e.g., a bathroom with multiple fixtures) in the dwelling unit located beyond a 1.8 gallon stored-volume range from the water heater or central recirculation loop.



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- b. In-dwelling unit recirculation systems which operate based on “adaptive” scheduling, meaning that they “learn” the hot water demand profile in the dwelling unit and adapt their operation to anticipate this profile, are permitted at this time, and do not require the use of occupant-controlled switches or occupancy sensors.
- c. In-dwelling unit recirculation systems that are activated based **solely** on a timer and/or temperature sensor are not eligible.

These provisions do not apply to recirculating central hot water distribution systems.

<sup>27</sup> For recirculating central hot water distribution systems, the following pipe insulation thickness levels or R-values must be met or exceeded. Additionally, pipe insulation shall cover the entire length of the recirculation loop to the extent possible. If piping is routed in building cavities that prevent the noted thickness or R-value from being used due to space constraints, then the maximum thickness of insulation possible within the space shall be used.

Nominal Pipe or Tube Size (inches)	Insulation Thickness (inches)
< 1.5	1.5 (or R10 minimum)
≥ 1.5	2.0 (or R12 minimum)

<sup>28</sup> ENERGY STAR product certification must be verified with a visual confirmation that installed product is listed in the online ENERGY STAR product registry.

<sup>29</sup> Due to industry supply chain challenges, DOE is temporarily allowing the use of non-ENERGY STAR certified refrigerators for projects using the ERI and ASHRAE compliance paths. Any project utilizing this temporary alternative must account for the non-ENERGY STAR certified refrigerator in the energy model and still achieve the required performance threshold. DOE advises partners that this alternative may be rescinded in a future program update.

<sup>30</sup> Products in categories which are not covered by ENERGY STAR product criteria are exempt.

<sup>31</sup> Up to 5% of lighting, for task or decorative lighting, may be exempt from this provision. The Target Dwelling specification for lighting will remain at 100% regardless of whether this exemption is used. Projects following the prescriptive path may not use this 5% exemption.

<sup>32</sup> This requirement does not apply to lighting inside appliances (e.g., refrigerator, laundry, microwave, cooking equipment).

<sup>33</sup> This provision does not apply to H/ERVs that are used to provide exhaust ventilation for bathrooms or to exhaust ventilation systems serving more than one dwelling unit.

<sup>34</sup> Buildings permitted on or before 12/31/2025 must certify under either Indoor airPLUS (IAP) Version 1 (Rev 4), or the IAP Version 2 Certified or Gold tier. Buildings permitted on or after 1/1/2026 must certify under the IAP Version 2 Certified or Gold tier. See the Indoor airPLUS program site for information on Version 2 requirements: <https://www.epa.gov/indoorairplus/indoor-airplus-version-2>.

<sup>35</sup> An in-unit HRV or ERV is required to provide whole-dwelling mechanical ventilation for dwelling units in Climate Zones 6 – 8 and must meet or exceed the following specifications: ≥ 65% SRE (@ 32 °F) and ≥ 1.2 CFM/Watt (at one or more rating points). Alternatively, projects may utilize centralized H/ERVs serving multiple dwelling units with any efficacy and recovery efficiency.



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<sup>36</sup> Advisory: DOE encourages, but does not require, that partners use equipment listed in the Home Ventilating Institute (HVI) Certified Products Directory (CPD) to comply with this requirement. The listing may be used to demonstrate compliance with this program requirement.

<sup>37</sup> Each dwelling unit with an in-unit fossil fuel water heater must have:

- An individual branch circuit outlet that is installed and energized and terminates within 3 feet of each installed fossil fuel water heater. The individual branch circuit shall have a rating not less than 240V/30A or 120V/20A.
- A volume of open space located within the dwelling unit that is at least 3' x 3' wide and 7' high available surrounding or within 3 feet of the installed fossil fuel water heater, to facilitate future heat pump water heater installation. The 3' x 3' x 7' volume may contain the existing water heater. The 3' x 3' x 7' space does not need to be provided if the installed water heater is a tankless water heater system.

Dwelling units utilizing an electric water heater are exempt from these requirements.

<sup>38</sup> Drain is no more than two inches higher than the base of the installed water heater and allows draining without pump assistance. Drain is not required to be reserved exclusively for use with a future heat pump water heater. Drain does not need to be provided if the installed water heater is a tankless water heater or an electric system with a tank volume less than 50 gallons.

<sup>39</sup> If a branch circuit outlet is installed, it shall be in compliance with 2021 IRC Section E3702.11 based on heat pump space heating equipment sized in accordance with 2021 IECC R403.7 and shall terminate within three feet of each fossil fuel space heater. Alternatively, code-compliant wiring conduit to facilitate future wiring for a heat pump installation may be installed and shall terminate within three feet of each fossil fuel space heater.

Dwelling units utilizing in-unit electric heating systems as the primary heating for the dwelling unit are exempt from this requirement.

<sup>40</sup> Where equipment is rated in SEER2 or EER2, the following table shall be used to determine the required efficiency specification. The first row shows the efficiency listed in Exhibit 2, and below are rows for the converted metric by equipment type.

Efficiency as listed in Exhibit 2	SEER			EER	
	14	16	18	14	16
Equipment Type	SEER2			EER2	
Ductless System	14	16	18	14	16
Ducted Split System	13.3	15.2	17.1	13.3	15.2
Ducted Single Packaged System	13.3	15.2	17.1	13.3	15.2

<sup>41</sup> Where equipment is rated in HSPF2, the following table shall be used to determine the required efficiency specification. The first row shows the efficiency listed in Exhibit 2, and below are rows for the converted metric by equipment type.

Efficiency as listed in Exhibit 2	HSPF	
	9.2	9.5
Equipment Type	HSPF2	
Ductless System	8.2	8.5
Ducted Split System	7.8	8.0
Ducted Single Packaged System	7.7	7.9



# U.S. DOE Zero Energy Ready Home Multifamily National Program Requirements Version 2 (Rev. 1)

<sup>42</sup> The Target Dwelling's duct leakage shall be configured as the maximum allowable total duct leakage to achieve Grade I, per Standard 310, section 5.4.1, Table 2a (shown below):

Time of Test	Number of Returns	Leakage Limit (CFM at 25 Pa)
Rough-In	< 3	The greater of $\leq 4$ per 100 ft <sup>2</sup> of CFA or $\leq 40$
Rough-In	$\geq 3$	The greater of $\leq 6$ per 100 ft <sup>2</sup> of CFA or $\leq 60$
Final	< 3	The greater of $\leq 8$ per 100 ft <sup>2</sup> of CFA or $\leq 80$
Final	$\geq 3$	The greater of $\leq 12$ per 100 ft <sup>2</sup> of CFA or $\leq 120$

<sup>43</sup> Prescriptive path projects using in-dwelling unit H/ERVs in Climate Zones 1-4B may utilize an H/ERV with an SRE  $\geq 65\%$  (@ 32 °F) and CFM/Watt  $\geq 1.2$  (at one or more rating points) in lieu of meeting the 2.9 CFM/W requirement in the Target Dwelling Design. Prescriptive path projects in *all* climate zones may also use centralized H/ERVs serving multiple dwelling units with any efficacy and recovery efficiency.

<sup>44</sup> Field verification of infiltration levels must be done on a unit-by-unit basis. Infiltration requirements may not be verified with whole-building testing or with an average of results across all units.

<sup>45</sup> For all floor assemblies other than mass floors, prescriptive path projects must use the U-factor requirements listed in this row.

<sup>46</sup> ZERH has adopted the following definitions for door types (from the ENERGY STAR eligibility criteria in the Version 6.0 Product Specification for Residential Windows, Doors, and Skylights):

- Opaque: A Door or Sidelite with no glazing (per NFRC 100).
- $\leq \frac{1}{2}$ -Lite: A Door with  $\leq 900$  in<sup>2</sup> (6.25 ft<sup>2</sup>, 0.581 m<sup>2</sup>) of glazing or a Sidelite  $\leq 281$  in<sup>2</sup> (1.95 ft<sup>2</sup>, 0.181m<sup>2</sup>) of glazing (per NFRC 100). Includes  $\frac{1}{4}$ - and  $\frac{1}{2}$ -lite Doors and Sidelites.
- $> \frac{1}{2}$ -Lite: A Door with  $> 900$  in<sup>2</sup> (6.25 ft<sup>2</sup>, 0.581 m<sup>2</sup>) of glazing or a Sidelite with  $> 281$  in<sup>2</sup> (1.95 ft<sup>2</sup>, 0.181m<sup>2</sup>) of glazing (per NFRC 100). Includes  $\frac{3}{4}$ -lite and fully glazed Doors and Sidelites.

<sup>47</sup> The solar water heating system's Solar Fraction (SF) must be documented by an OG-300 certification. Alternatively, projects may find an equivalent system in the OG-300 directory which contains the same OG-100 elements as the chosen system and meets or exceeds the minimum required solar fraction. In this situation, documentation of the OG-100 elements and the comparable OG-300 system must be provided. All systems must be made up of OG-100 tested components.

When a solar water heating system meeting these specifications is used in a Prescriptive path project, gas and electric water heaters used for backup are exempt from the Uniform Energy Factor requirements of 0.95 and 1.95, respectively.

<sup>48</sup> While the Target Dwelling Design for ERI path projects must be configured with uninsulated ducts in conditioned space, Prescriptive path projects are permitted, but not required, to insulate ducts in conditioned space.

<sup>49</sup> When submitting the ZERH Checklists as part of a proposed design submittal (i.e., prior to construction), the Rater may indicate that checklist items have been completed if they have verified the intent to complete via a review of construction documents. The Rater shall provide a written explanation for all items that have been verified in this way.