



U.S. DOE Zero Energy Ready Home
Single Family Homes National Rater Field Checklist – Version 2

DOE Zero Energy Ready Home – Single Family Homes Version 2 National Rater Field Checklist			
Home Address:	City:	State:	Permit Date:
1. Partnership Status	Must Correct	Rater ¹ Verified	Exception or Alternate Used ² (Enter End Note #)
1.1 Rater has verified that builder is a registered DOE ZERH Builder Partner and identified the builder's Partner ID ³			
2. ENERGY STAR Single Family New Homes Baseline			
2.1 Home is certified under ENERGY STAR Single Family New Homes Version 3.2 ⁴			
3. Building Envelope			
3.1 Ceiling, wall, floor, & slab insulation meet or exceed 2021 IECC UA levels ⁵			
3.2 Windows meet high performance requirements based on climate zone ⁶			
4. Duct System			
4.1 All heating and cooling distribution ducts and heating and cooling air-handling equipment are located within the thermal and air barrier boundary ⁷			
5. Water Heating Efficiency (comply with 5.1 or 5.2; mark the other line N/A)			
5.1 Hot water delivery systems meet efficient design requirements ⁸			
5.2 Water heater and fixtures meet efficiency criteria ⁹			
6. Lighting & Appliances			
6.1 All builder-supplied and -installed refrigerators, dishwashers, clothes washers, and clothes dryers are ENERGY STAR qualified. ^{10, 11}			
6.2 100% of builder-installed lighting fixtures and lamps (bulbs) provided are LEDs. ¹²			
6.3 All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified ¹³			
7. Indoor Air Quality			
7.1 Certified under EPA Indoor airPLUS ¹⁴			
7.2 Energy efficient balanced ventilation (HRV or ERV) is provided in Climate Zones 6 - 8 ¹⁵			
8. Renewable Ready			
8.1 Provisions of the DOE Zero Energy Ready Home PV-Ready Checklist Version 2 are completed ¹⁶			
9. Electric Vehicle Ready			
9.1 One parking space is provided per dwelling unit that includes a powered 208/240V, 40A receptacle installed in garage or within 3 feet of driveway or dedicated parking space. The electric service panel identifies the branch circuit as "Electric Vehicle Charging." ¹⁷			



U.S. DOE Zero Energy Ready Home Single Family Homes National Rater Field Checklist – Version 2

10. Heat Pump Water Heater Ready			
10.1 Individual branch circuit outlet is installed and energized, and terminates within 3 feet of each installed fossil fuel water heater and a space located within the home or garage that is at least 3' x 3' wide and 7' high must be available surrounding or within 3 feet of the installed fossil fuel water heater, to facilitate future heat pump water heater installation. ¹⁸			
11. Heat Pump Space Heating Ready			
11.1 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." ¹⁹			
12. Energy Efficiency Threshold			
12.1 Home's ERI value \leq DOE ZERH Target Home ERI			
Rater Name: _____ Date of Review: _____ Rater Signature: _____ Rater Company Name: _____			

Endnotes:

The following endnotes are intended to relate the same exemptions and clarifications as noted in the National Program Requirements. However, if there are any inconsistencies the endnotes in the National Program Requirements shall take precedence.

¹ The Rater is defined as the person(s) completing the third-party verification required for certification. The person(s) shall: a) be a Certified Rater or Approved Inspector, as defined by ANSI / RESNET / ICC Standard 301, or an equivalent designation as determined by a DOE-recognized Home Certification Organization for ZERH (HCO for ZERH). All Raters for DOE ZERH projects must successfully complete a DOE ZERH orientation course. The Rater shall also have a signed partnership agreement in place with the DOE ZERH program.

² If an exception for a program requirement or an alternate compliance method is used, enter the number of the corresponding End Note from this document that lists the exception or alternate.

³ The DOE ZERH Partner ID number for the builder is required within the energy rating software for ZERH certification.

⁴ In some states, an earlier version of ENERGY STAR Single Family New Homes (ESSFNH), such as Version 3.1, may be required by the ENERGY STAR Residential New Construction program. However, compliance with DOE Zero Energy Ready Home V2 requires compliance with ESSFNH V3.2.

⁵ 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).

The total building envelope UA shall be less than or equal to the UA value that results from multiplying the U factors in the 2021 International Energy Conservation Code (IECC) – Table R402.1.2 by the same assembly areas as the home being certified. 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. However, note that the DOE ZERH Mandatory window provisions (Exhibit 1) and Items 3.1 through 3.3 of the ESSFNH National Rater Field Checklist must be met regardless of the UA tradeoffs calculated.



U.S. DOE Zero Energy Ready Home Single Family Homes National Rater Field Checklist – Version 2

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 UA calculation. The code-required insulation level and depth shall be set to the insulation level and depth found in the Rated Home for the purpose of determining compliance with this ZERH requirement.

Any slab edge insulation allowances permitted by the most recent version and revision of the ENERGY STAR Single Family New Construction program are permitted. A list of currently exempted details is available at www.energystar.gov/slabeledge. Note that projects using these exempted details must still achieve the Target ERI and the total building envelope UA requirement, which assume the use of slab edge insulation per the 2021 IECC prescriptive values.

⁶ Windows shall meet the performance criteria below based on climate zone:

Window Specs Required for DOE Zero Energy Ready Home Projects	IECC CZ 1-2		IECC CZ 3,4A, 4B		IECC CZ 4C, 5 (SHGC values listed below may be paired with the U-value in the same row)		IECC CZ 6-8	
	U-Value	SHGC	U-value	SHGC	U-Value	SHGC	U-Value	SHGC
	≤ 0.40	≤ 0.23	[CZ 3] ≤ 0.30 [CZ 4] ≤ 0.30	[CZ 3] ≤ 0.25 [CZ 4] ≤ 0.40	≤ 0.27 = 0.28 = 0.29 = 0.30	Any ≥ 0.32 ≥ 0.37 ≥ 0.42	≤ 0.25	Any

The following exceptions apply:

- An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
- An area-weighted average of fenestration products ≥ 50% glazed shall be permitted to satisfy the SHGC requirements;
- 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;
- One side-hinged opaque door assembly up to 24 square feet in area shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;
- Fenestration 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) and b), 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 / ft³·°F and provided in a ratio of at least 3 sq. ft. per sq. ft. of South facing fenestration. 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.

If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), 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).

More information on the ENERGY STAR V7.0 residential window specification may be found here: https://www.energystar.gov/products/res_windows_doors_skylights/partners DOE may initially consider phase in of the ENERGY STAR V7.0 window specifications prioritizing Climate Zones 7 and 8, due to the significant benefit of advanced windows in these very cold climate zones.



U.S. DOE Zero Energy Ready Home Single Family Homes National Rater Field Checklist – Version 2

⁷ Exceptions:

- a. Up to 10 ft. of total duct length is permitted to be outside of the home/unit's thermal and air barrier boundary.
- b. 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 100 ft² of conditioned floor area, and:
 - o In Moist (A) climate zones (per 2021 IECC Figure 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
 - o In Dry (B) and Marine (C) climate zones (per 2021 IECC Figure R301.1), ductwork is buried under at least 3.5 in. of blown-in insulation.
- c. Systems which meet the criteria for "Ducts Located in Conditioned Space" as defined by 2021 IECC Section R403.3.2.
- d. 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
- e. Ducts and air-handling equipment may be located within an uninsulated and unvented crawl space or basement when the applicable dehumidification requirements of the Indoor airPLUS program (Version 1) are met.
- f. Ducts and air-handling equipment associated with rooftop make-up air units or dedicated outdoor air systems (DOAS) that provide ventilation, and may also provide supplemental heating and cooling, are permitted to be outside of the building's thermal and air barrier boundary.

This provision does not apply to equipment or ductwork that only provides ventilation.

Ducts located in unvented attic assemblies meeting the requirements of Section 806.5 of the 2021 IRC satisfy this provision.

⁸ Hot water delivery systems meet the following efficiency requirements:

To minimize water wasted while waiting for hot water, the hot water distribution system shall store no more than 0.5 gallons (1.9 liters) of water in any piping/manifold between the hot water source and any hot water fixture. System options include manifold-fed systems; structured plumbing systems; core plumbing layouts, and on-demand recirculation systems. The following requirements apply to recirculation systems:

- a. Recirculation systems must be based on an occupant-controlled switch or an occupancy sensor, installed in each bathroom which is located beyond a 0.5 gallon stored-volume range from the water heater.
- b. Recirculation systems which operate based on "adaptive" scheduling, meaning that they "learn" the hot water demand profile in the home 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. Recirculation systems that are activated based **solely** on a timer and/or temperature sensor are not eligible.

To verify that the system stores no more than 0.5 gallons (1.9 liters), verifiers shall either use the Calculation method or the Field Verification method. In the Calculation method, the verifier shall calculate the stored volume between the hot water source and the furthest fixture using the piping or tubing inside diameter and the length of the piping/tubing. In the case of on-demand recirculation systems, the 0.5-gallon (1.9 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.



U.S. DOE Zero Energy Ready Home Single Family Homes National Rater Field Checklist – Version 2

Using the Field Verification method, no more than 0.6 gallons (2.3 liters) of water shall be collected from the hot water fixture before hot water is delivered. 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 0.6-gallon (2.3 liter) limit, verifiers shall first initiate operation of on-demand recirculation systems, if present, and let such systems run for at least 40 seconds. Next, a bucket or flow measuring bag (pre-marked for 0.6 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 0.6 gallons (approximately 24 seconds for a lavatory faucet), 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 ≥ 10 °F in comparing the final to the initial temperature reading. Under the DOE ZERH Single Family program, the approved verifier must confirm compliance with these requirements.

For production builders with house plans that offer an optional bathroom that does not include a shower or tub, the hot water distribution to this bathroom, when included, is not required to be evaluated under this requirement.

- ⁹ Water heaters and fixtures meet the following efficiency criteria:
- Gas water heaters, if present, shall have a Uniform Energy Factor ≥ 0.87
 - Electric water heaters, if present, shall have a Uniform Energy Factor ≥ 2.2
 - All showerheads and bathroom sink faucets and aerators shall be WaterSense labeled.
 - The hot water distribution system shall store no more than 1.2 gallons between the hot water source and the furthest fixture. In the case of on-demand recirculation systems, the hot water source is considered as the point at which the branch feeding the fixture branches off the recirculation loop. This storage limit shall be verified by either 1) a calculation using the piping or tubing interior diameter and the system length based on plans, or 2) by a field verification test, using the protocol described in the prior endnote, which demonstrates a minimum temperature rise of 10 °F by the time 1.4 gallons of water is delivered to the furthest hot water fixture.

Projects using this compliance option are not permitted to use hot water recirculation systems which operate continuously or operate based solely on a timer or temperature sensor.

¹⁰ For products in categories which are not covered by ENERGY STAR product criteria, such as combination all-in-one clothes washer-dryers, these products are exempt.

¹¹ Due to industry supply chain challenges, DOE is temporarily allowing the use of non-ENERGY STAR certified refrigerators. Any project utilizing this temporary alternative must account for the non-ENERGY STAR certified refrigerator in the energy model and achieve an ERI value equal to or lower than the ERI of the DOE ZERH Target Home. DOE advises partners that this alternative may be rescinded in a future program update.

¹² Up to 5% of lighting, for task or decorative lighting, may be exempt from this provision. The Target Home specification for lighting will remain at 100% regardless of whether this exemption is used.

¹³ This provision does not apply to H/ERVs that are used to provide exhaust ventilation for bathrooms.

¹⁴ Homes permitted on or before 12/31/2023 must certify under the Indoor airPLUS Version 1 program requirements. For homes permitted after 12/31/2023, DOE may consider a revision to these program requirements that specifies if an updated version of Indoor airPLUS must be used. See the Indoor airPLUS program site for information on program updates: <https://www.epa.gov/indoorairplus/indoor-airplus-program-documents>



U.S. DOE Zero Energy Ready Home Single Family Homes National Rater Field Checklist – Version 2

¹⁵ An HRV or ERV is required to provide whole-house mechanical ventilation for homes in Climate Zones 6 – 8 and must meet or exceed the following specifications: $\geq 65\%$ SRE (@ 32 °F) and ≥ 1.2 CFM/Watt.

¹⁶ The DOE ZERH Single Family program requires that the provisions of the PV-Ready Version 2 Checklist are completed, unless one or more of the exceptions below applies in which case the PV-Ready features in the Checklist are not required. The exceptions are:

- a. The home already includes an on-site PV system.
- b. The home receives renewable energy from a community solar system, and there is a legally binding agreement in place for the provision of this energy to the home with a duration ≥ 15 years and written to survive a full or partial transfer of ownership of the property.
- c. The location has significant natural shading (e.g., trees, tall buildings impacting the south-facing roof).
- d. The home as designed does not have at least 600 square feet of roof area oriented in between 110 degrees to 270 degrees of true north.

The Rater shall document which, if any, exceptions apply.

¹⁷ If the addition of the 40-amp Electric Vehicle Charging branch circuit increases the electrical service to the next nominal size (i.e., from 200-amp to 400-amp service), connecting the circuit to the electrical panel is not required. The conductor shall be labeled as “electrical vehicle charging.” The Rater shall retain a copy of the electrical sizing calculations or statement from the electrical designer for their records but need not evaluate the documentation.

Homes without a private driveway or garage are exempt from this requirement.

¹⁸ The individual branch circuit shall have a rating not less 240V/30A or 120V/20A. The 3' x 3' x 7' volume may contain the existing water heater. An exception to the requirement for the 3' x 3' x 7' space is provided when the installed water heater is an electric tankless system or a fossil fuel tankless water heater.

Homes utilizing an electric water heater are exempt from this requirement.

¹⁹ 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.

Homes utilizing electric heating systems as the primary heating for the home are exempt from this requirement.