**Revise as follows:**

This revision is a full replacement of REPI-18 that provides ~~strikethrough~~/undeline edits of the 2021 IECC and reflects the changes that were voted on and approved by the Economic, Modeling, and Whole-Building Metrics subcommittee on 6/8/2022. Highlighed sections indicate friendly amendments suggested after modeling subcommittee approved to be considered by the main committee.

**SECTION R401**

 **GENERAL**

**R401.1 Scope.** This chapter applies to residential buildings.

**R401.2 Application.** Residential buildings shall comply with ~~Section R401.2.5 and~~ either Section~~s~~ R401.2.1, R401.2.2, R401.2.3 or R401.2.4.

**Exception:** Additions, *alterations*, repairs and changes of occupancy to existing buildings complying with Chapter 5.

**R401.2.1 Prescriptive Compliance Option.** The prescriptive compliance option requires compliance with Sections R401 through R404 and R408.

**R401.2.2 Total Building Performance Option.** The total building performance option requires compliance with Section R405.

**R401.2.3 Energy Rating Index Option.** The total building performance option requires compliance with Section R406.

**R401.2.4 Tropical Climate Region Option.** The Tropical Climate Region Option requires compliance with Section R407.

**~~R401.2.5 Additional energy efficiency.~~** ~~This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.~~

1. ~~For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.~~
2. ~~For buildings complying with Section R401.2.2, the building shall meet one of the following:~~
	1. ~~One or more of the additional efficiency package options measure(s) in Section R408.2 shall be installed without including such measures in the proposed design under Section R405; or~~
	2. ~~The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.~~
3. ~~For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.~~

~~The option selected for compliance shall be identified in the certificate required by Section R401.3.~~

**R401.3 Certificate.** A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory *label*, service disconnect *label* or other required labels. The certificate shall indicate the following:

1. The predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls, crawl space walls* and floors and ducts outside *conditioned spaces*.

2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.

3. The results from any required duct system and building envelope air leakage testing performed on the building.

4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or base-board electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.

5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.

6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.

7. The code edition under which the structure was permitted, ~~and~~ the compliance path used, and where applicable, the additional efficiency measures selected for compliance with R408.

**SECTION R405**

**TOTAL BUILDING PERFORMANCE**

**R405.2 Performance-based compliance**. Compliance based on total building performance requires that a *proposed design* meets all of the following:

1. The requirements of the sections indicated within Table R405.2.

2. The building thermal envelope shall be greater than or equal to levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 *International Energy Conservation Code*.

3. An annual energy cost of the *proposed design* that is less than or equal to 90% of the annual energy cost of the *standard reference design~~.~~* or the additional efficiency credits as required in Section R408.2 shall be installed without including such measures in the proposed design under Section R405. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration’s State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

**Exception:** The energy used based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.

**SECTION R408**

**ADDITIONAL EFFICIENCY REQUIREMENTS ~~PACKAGE OPTIONS~~**

**R408.1 Scope.** This section establishes additional efficiency credits ~~package options~~ to achieve additional energy efficiency in accordance with Section R401.2.1~~5~~.

**R408.2 Additional energy efficiency credit requirements ~~package options~~.** Two of the ~~A~~additional efficiency ~~package options for compliance with Section R401.2.1 are set forth in Sections R408.2.1 through R408.2.5.~~ measures shall be selected from Table R408.2 that meet or exceed a total of ten credits. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as ~~indicated~~ specified in ~~the~~ Table R408.2 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

**TABLE R408.2**

**CREDITS FOR ADDITIONAL ENERGY EFFICIENCY**

| **Measure Number** | **Measure Description** |  | **Credit Value** |
| --- | --- | --- | --- |
| **CZ 0 & 1** | **CZ 2** | **CZ 3** | **CZ 4** | **CZ 4C** | **CZ 5** | **CZ 6** | **CZ 7** | **CZ 8** |
| R408.2.1.1 (1) | ≥ 2.5% reduction in total UA | 0 | 0 | 0  | 1 | 1 | 1 | 1 | 1 | 1 |
| R408.2.1.1 (2) | ≥ 5% reduction in total UA  | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 |
| R408.2.1.1 (3) | > 7.5% reduction in total UA  | 0 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 |
| R408.2.1.2 (1) | 0.22 U-factor windows | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 |
| R408.2.1.2 (2) | U factor and SHGC for windows per Table 408.2.1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 2 |
| R408.2.3 (1) | High performance cooling system option 1 | 7 | 6 | 5 | 3 | 3 | 3 | 1 | 1 | 1  |
| R408.2.3 (2) | High performance cooling system option 2 | 5 | 5 | 4 | 3 | 3 | 2 | 1 | 1 | 0 |
| R408.2.3 (3) | High performance gas furnace option 1 | 0 | 2 | 3 | 5 | 5 | 7 | 8 | 8 | 10 |
| R408.2.3 (4) | High performance gas furnace option 2 | 0 | 2 | 2 | 4 | 4 | 5 | 7 | 7 | 8 |
| R408.2.3 (5) | High performance heat pump system option 1 | 8 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 4 |
| R408.2.3 (6) | High performance heat pump system option 2 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 3 |
| R408.2.3 (7) | Ground source heat pump | 0 | 2 | 4 | 6 | 6 | 8 | 7 | 6 | 5 |
| R408.2.4 (1) | Fossil fuel service water heating system | 7 | 6 | 5 | 3  | 3 | 2 | 2 | 3 | 1 |
| R408.2.4 (2) | High performance heat pump water heating system option 1 | 12 | 11 | 11 | 8 | 8 | 6 | 5 | 5 | 3 |
| R408.2.4 (3) | High performance heat pump water heating system option 2 | 12 | 12 | 11 | 8 | 8 | 6 | 5 | 5 | 3 |
| R408.2.4 (4) | Solar hot water heating system | 4 | 5 | 6 | 6 | 6 | 6 | 5 | 5 | 4 |
| R408.2.4 (5) | Compact hot water distribution | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| R408.2.5 (1) | More efficient distribution system | 4 | 6 | 7 | 10 | 10 | 12 | 13 | 15 | 16 |
| R408.2.5 (2) | 100% of ducts in conditioned space | 4 | 6 | 8 | 12 | 12 | 15 | 17 | 19 | 20 |
| R408.2.5 (3) | Reduced total duct leakage | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| R408.2.6 (1) | 2 ACH50 air leakage rate with ERV or HRV installed | 1 | 4 | 5 | 10 | 10 | 13 | 15 | 8 | 8 |
| R408.2.6 (2) | 2 ACH50 air leakage rate with balanced ventilation | 2 | 3 | 2 | 4 | 4 | 5 | 6 | 6 | 6 |
| R408.2.6 (3) | 1.5 ACH50 air leakage rate with ERV or HRV installed  | 2 | 4 | 6 | 12 | 12 | 15 | 18 | 11 | 11 |
| R408.2.6 (4) | 1 ACH50 air leakage rate with ERV or HRV installed | 2 | 5 | 6 | 14 | 14 | 17 | 21 | 14 | 14 |
| R408.2.7 | Energy Efficient Appliances  | 9 | 8 | 8 | 7 | 7 | 5 | 5 | 5 | 4 |
| R408.2.8 | Renewable Energy Measure | 17 | 16 | 17 | 11 | 11 | 9 | 8 | 7 | 4 |

**R408.2.1 Enhanced envelope ~~peformance~~ options.** The *building thermal envelope* shall meet the requirements of Section R408.2.1.1 or R408.2.1.2.

**R408.2.1.1 Enhanced envelope performance UA.** The proposed total *building thermal envelope* UA, ~~the sum of~~*~~U~~*~~-factor times assembly area, shall be less than or equal~~~~to 95 percent of the total UA resulting from multiplying~~~~the U-factors in Table R402.1.2 by the same assembly~~~~area as in the proposed building.~~ shall be calculated in accordance with SectionR402.1.5 and shall meet one of the following: ~~The area-weighted average SHGC of all~~~~glazed fenestration shall be less than or equal to 95~~~~percent of the maximum glazed fenestration SHGC in~~~~Table R402.1.2.~~

1. Not less than 2.5% below the total UA of the *building thermal envelope*.
2. Not less than 5% below the total UA of the *building thermal envelope*.
3. Not less than 7.5% below the total UA of the *building thermal envelope*.

**R408.2.1.2 Improved fenestration.** *Vertical fenestration* shall meet one of the following:

1. U-factor equal to or less than 0.22.
2. U-factor and SHGC equal or less than that specified in Table R408.2.1.2

Table R408.2.1.2

|  |  |  |
| --- | --- | --- |
| Climate Zone | Fenestration U factor | Fenestration SHGC |
| 0 | 0.32 | 0.23 |
| 1 | 0.32 | 0.23 |
| 2 | 0.30 | 0.23 |
| 3 | 0.25 | 0.25 |
| 4 | ~~0.25~~ NA | ~~≤0.40~~ NA |
| 5 | ~~0.25~~ NA | ~~³0.17~~ NA |
| 6 | ~~0.25~~ NA | ~~³0.17~~ NA |
| 7 and 8 | 0.25 | ~~³0.17~~ NR |

**R408.2.3~~2~~ More efficient HVAC equipment performance options**. Heating and cooling *equipment* shall meet one of the following efficiencies:

1. Greater than or equal to ~~95 AFUE natural gas furnace and 16~~ 18 SEER and 14 EER air conditioner.
2. Greater than or equal to 16 SEER and 12 EER air conditioner.
3. Greater than or equal to 96 AFUE natural gas furnace
4. Greater than or equal to 92 AFUE natural gas furnace
5. Greater than or equal to 10 HSPF/~~16~~ 18 SEER air source heat pump.
6. Greater than or equal to 9 HSPF/16 SEER air source heat pump
7. Greater than or equal to 3.5 COP ground source heat pump.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

**R408.2.4~~3~~ Reduced energy use in service water-heating options.** The hot water system shall meet one of the following efficiencies:

1. Greater than or equal to 82 EF fossil fuel service water-heating system.
2. Greater than or equal to ~~2.0~~ 2.9 UEF electric service water-heating system.
3. Greater than or equal to 3.2 UEF electric service water-heating system
4. Greater than or equal to 0.4 solar fraction solar water-heating system.
5. Compact hot water distribution. For Compact Hot Water Distribution system credit, the volume shall store not more than 16 ounces of water in the nearest source of heated water and the termination of the fixture supply pipe when calculated using section R403.5.4.

To field or plan review verify that the system meets the prescribed limit, one of the following must be done:

* 1. At plan review, referencing ounces of water per foot of tube on plans as per Table R403.5.4.1
	2. At rough in (plumbing), referencing ounces of water per foot of tube installed as per Table R403.5.4.1
	3. At final inspection. In accordance with Department of Energy's Zero Energy Ready Home National Specification (Rev. 07 or higher) footnote on Hot water delivery systems.

**R408.2.5~~4~~ More efficient duct thermal distribution system option**. The thermal distribution system shall meet one of the following efficiencies:

1. ~~100 percent of ducts and air handlers located entirely within the~~ *~~building thermal envelope~~*~~.~~
2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.
3. 100 percent of duct thermal distribution system located in *conditioned space* as defined by Section R403.3.2.
4. When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with R403.3.5, shall be in accordance with one of the following:
	1. Where air handler is installed at the time of testing, 2.0 cubic feet per minute per 100 square feet of *conditioned floor area*.
	2. Where air handler is not installed at the time of testing, 1.75 cubic feet per minute per 100 square feet of *conditioned floor area*.

**R408.2.6~~5~~ Improved air sealing and efficient ventilation system option.** The measured air leakage rate shall be one of the following:

1. ~~l~~Less than or equal to ~~3~~2.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.
2. Less than or equal to 2.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 International Mechanical Code.
3. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.
4. Less than equal to 1.0 ACH50, with either an ERV or HRV installed.

Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m3/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/ Moisture Transfer (LRMT).

**R408.2.7 Energy efficient appliances.** Appliances installed in a dwelling unit shall meet the product energy efficiency specifications listed in Table R408.2.7, or equivalent energy efficiency specifications. Not less than three appliance types from Table R408.2.7 shall be installed for compliance with this section.

**TABLE R408.2.7 APPLIANCE SPECIFICATION REFERENCE DOCUMENT**

|  |  |
| --- | --- |
| Refrigerator  | Energy Star Program Requirements, Product Specification for Consumer Refrigeration Products, Version 5.1 (08/05/2021)  |
| Dishwasher | Energy Star Program Requirements for Residential Dishwashers, Version 6.0 (01/29/2016) |
| Clothes Dryer | Energy Star Program Requirements, Product Specification for Clothes Dryers, Version 1.1 (05/05/2017) |
| Clothes Washer  | Energy Star Program Requirements, Product Specification for Clothes Washers, Version 8.1 (02/05/2018) |

**R408.2.8 Renewable Energy.** *Renewable energy resources* shall be permanently installed that have the rated capacity to produce a minimum of 1.0 watt of *on-site renewable energy* per square foot of conditioned floor area. ~~The installed capacity shall be in addition to any onsite renewable energy required by Section R404.4.~~ To qualify for this option, ~~one of the following forms of~~ renewable energy cerftificate (REC) documentation shall meet the requirements of R404.4. ~~be provided to the code official:~~

* 1. ~~Substantiation that the RECs associated with the~~ *~~on-site renewable energy~~* ~~are owned by, or retired on behalf of, the homeowner.~~
	2. ~~A contract that conveys to the homeowner the~~*~~REC~~*~~s associated with the~~*~~on-site renewable energy~~*~~, or conveys to the homeowner an equivalent quantity of~~*~~REC~~*~~s associated with other renewable energy~~