International Energy Conservation Code Consensus Committee- Residential

Draft Meeting Agenda (6/10 posting)

Webex Meeting Link

June 16, 2022
2:00 PM EST to 5 PM EST (3 hours)

Committee Chair: JC Hudgison, CBO, Assoc. AIA
Committee Vice Chair: Bridget Herring & Robin Yochum, LEED Green Associate

1. Call to order.

2. Meeting Conduct.
   a. Identification of Representation/Conflict of Interest
   b. ICC Council Policy 7 Committees: Section 5.1.10 Representation of Interests
   c. ICC Code of Ethics: ICC advocates commitment to a standard of professional behavior that exemplifies the highest ideals and principles of ethical conduct which include integrity, honesty, and fairness. As part of this commitment it is expected that participants shall act with courtesy, competence and respect for others.
   d. ICC Antitrust Compliance Guideline

3. Roll Call.

4. Approve Agenda

5. Approval of Minutes

6. Administrative issues-staff

7. Subcommittee Reports

8. Action Items
   a. Code Change Proposals
      REPI-93-21 (HRV and ERV) (tabled from 6/9 meeting previous vote for disapproval failed 15-19-2)
      REPI-71-21 (Grid Integrated Thermostat Cntl)(HVACR as modified 10-1)
      REPI-84-21 (Duct testing) (HVACR as modified 6-5)
      REPI

TRC,

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REP-093-21 HRV and ERV
CDP ID #	443
Code	IECC RE
Code Section(s)	R403.6.1 New Section
Location	base
Proponent	Marian Goebes iecc-sf-hrv-erv@2050partners.com
Proposal Status	SC rev
Subcommittee	RE HVACR & WH

REVIEWED BY SUBCOMMITTEE VERSION 2

Single Family HRV: REPI-093-21 Supporting Documentation

Executive Summary

The proposed HRV measure expands the requirement for heat or energy recovery ventilation systems (HRVs or ERVs) for single-

2. Dwelling units in Group R occupancies that comply with Section C403.7.4.1.

Methodology supporting this proposal (RE-093)

- Energy savings:
  - Modeled with EnergyPlus v9.5 and PNNL detached single-family house prototype.
  - Assumed 2-story above grade (with conditioned basement for select climate zones), 3 bedroom, with 60 cfm continuous ventilation
- Cost Assumptions:
  - Estimated cost of HRV (proposed) compared to exhaust-only ventilation (base case)
  - Total incremental first cost for HRV $1,084, including:
    - Cost of HRV $738, based on average HRV/ERV product cost from online research
    - HRV ducted into supply side of Td (-mV1.4 (o0 538.0po)-4 (m)-5.5e(-m 10.02 -0)-0.6 (e

Table 2. Cost Effectiveness Results

LCC
Assumptions

Table 3. Estimate of ERV/HRV Prevalence by Climate Zone

RESNET single-family* home data by Climate Zone (CZ)	5A	5B	6A	6B
Single family homes with ERV or HRV				

NOT REVIEWED BY SUBCOMMITTEE VERSION 3

Single Family HRV: REPI-093-21: Executive Summary

Expands the requirement for heat or energy recovery ventilation systems (HRVs or ERVs) for single family homes to climate zones 5 and 6. The measure is already required in climate zones 7 and 8.

Original REPI 093 from Monograph

R403.6.1 Heat or energy recovery ventilation

Dwelling units shall be provided with a heat recovery or energy recovery ventilation ~~system in Climate Zones 7 and 8~~. The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.

Exceptions:

1. Dwelling units in single- and two-family dwellings and townhouses in Climate Zones 0-4.

2. Dwelling units in Group R occupancies in Climate Zone 3C.

Revised Proposal to Align with REPI-69:

REPI-69 requires heat recovery ventilation for multifamily units in all climate zones except 3C, with additional exceptions for dwelling units < 500 sf. REPI-69 was approved by the Residential Consistency and Administration subcommittee (2/15/22), and the Residential Consensus Committee (3/2/22).

Green = Our revis

2. Dwelling units in Group R occupancies that comply with Section C403.7.4.1.

Reason Statement

Goal: Expand current requirement in 2021 IECC for heat or energy recovery ventilation from CZ 7 and 8 to CZ 5 through 8, because it is cost effective in CZ's 5 and 6.

Cost Impact

Methodology supporting this proposal (REPI-93)

- Energy savings:

[redacted] zones analyzed (5 and 6) are cost effective. Results are more cost-effective when the SCC of [redacted] etric ton is included.

Table 5. Cost Effectiveness Results

Climate Zone	Ignores SCC SCC = $0	Accounts for SCC SCC = $51
LCC ($) CZ 5A	$1, [redacted]	037

[redacted]

*Single-family includes duplexes, but not low-rise multifamily

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Electric heat pump	11%	18%	U.S. 2020 census for split between gas furnaces and electric heat, with “gas furnaces” appropriated between natural gas and propane based on EIA (2017)
Propane furnace	6%	6%	EIA (U.S. Energy Information Administration, 2017)

Weather Locations

Representative cities and corresponding TMY3 weather stations for each Climate Zone were consistent with the DOE Energy Codes website (US Department of Energy, 2021), as summarized in Table 7

ERV	Aldes[8]	E110-TF	65	32	2.0	$656	68
Average			68	36	1.9	$738	70

This analysis only included sensible energy recovery (from both heating and cooling), which would be captured by an HRV or ERV. It does not include latent energy recovery which would be captured by an ERV. Consequently, ERV energy savings would be higher than what is shown in this analysis.

In addition to the 37.5 W assumed for the HRV, the proposed case also assumes the same supply and ventilation fans as the base case: 10.7 W each. Consequently, the HRV energy savings are underestimated in this analysis, since it assumes fan energy of the balanced ventilation system without heat recovery (the supply fan and exhaust fan) and the fan energy of the HRV.

Incremental Cost

This section describes the incremental cost associated with an HRV. The analysis assumes a replacement of equipment at year 15 (a typical assumption for residential HVAC equipment[9]), when the HRV is assumed to be replaced (at the end of its estimated Effective Useful Life). The analysis assumes no maintenance costs, because many HRVs have washable filters. To estimate the incremental cost for the proposed case (HRV), this analysis considered the following differences between the base case: exhaust only ventilation without heat recovery, and proposed case: balanced ventilation with an HRV, including:

- Materials and labor for the HRV (proposed) case
- Additional ductwork needed for the HRV
- Additional return register needed for the HRV
- Insulation for the HRV for the ductwork connecting it to the outdoors – i.e., for the outdoor air supply duct to the HRV to prevent condensation.[10]

To determine duct lengths, the proposal team developed a floor plan for the prototype home, and identified differences for the base case (exhaust only ventilation) and proposed case (HRV).

The proposed case assumes one HRV serving the home. The proposed requirement affects ventilation equipment only, so does not affect ductwork. But for cost assumptions, the proposal team assumed that HRV return grille is located in the middle of the home, close to the heating system return grille. The team assumed the HRV's supply duct (providing pre-heated or precooled fresh air) connects to the heating and cooling system ductwork, which would distribute the ventilation air. For heating and cooling

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[8] Pricing: HVACQuick.com , HRV SRE, cfm, W: HVACQuick.com

[9] The PNNL study of HRVs, PNNL (2018) assumed 20 years. The proposal team assumed 15 years, to be conservative, and since many resources (such as the California Database of Energy Efficiency Resources) assume 15 years for residential HVAC equipment.

[10] The exhaust duct running from the return register to the HRV was not assumed to be insulated, since it is in conditioned space. The exhaust duct running from the HRV to the outside was not assumed to be

systems with no ductwork, such as ductless heat pumps, the HRV's supply air would simply be discharged at one location in the home. Thus, there is no significant difference in HRV costs for a home with a ductless heating system (e.g., ductless heat pump) than one with a ducted system (e.g., ducted furnace). HRV/ERV savings associated with single package unit heat pumps will be higher than split-system heat pumps, since split-system heat pumps have higher minimum federal efficiency requirements than split systems

Figure 2. Floor plan of HRV, exhaust fans, and duct layout for proposed case.

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Duct Insulation	1.5 sf	$3.81	$6	Q9	$66	0.163	$16	$22
Return register	1 register	$23.00	$23	1 Sheet metal worker	$73	0.333	$24	$47
HRV	1 HRV	$738.00	$738	Q20	$68	1	$68	$806
Total cost								$1,084

As shown in Table 9, this a

Energy prices used to calculate savings are based on national averages of projected prices. The LCC is calculated both with the social benefit of avoided carbon, and assuming a zero societal cost of carbon (SCC). When included, the SCC is calculated using the energy savings, U.S. EIA emissions factors, and social cost data from the technical support document of the Interagency Working Group on Social Cost of Greenhouse Gases (2021). Specifically, this proposal used the 2020-2050 5-year time series of social cost of carbon dioxide at a 3% discount rate in Interagency

6B-Great
Falls,

The proposal team calculated the LCC for each climate zone, for each heating system, using the approach described above. As an example, Table 12 shows the LCC inputs and results for Climate Zone 6A, for the natural gas furnace.

Table 15. Example LCC Calculation for Climate Zone 6A and Natural Gas Furnace

Net measure cost	$1,084	2021$
Measure electric savings	-305	kWh/year

The cost effectiveness results excluding the SCC (assuming a zero cost for carbon) are shown in Table 13 below for each heating system type, and for the weighted average for each climate zone. As shown, the proposed measure is cost-effective in all climate zones analyzed using the approach of weighting results by heating-fuel prevalence.

Table 16. LCC Results for All Climate Zones, excluding SCC

Scenario	Heating System Prevalence for CZ5 (% of single family homes)	Heating System Prevalence for CZ6 (% of single family homes)	LCC ($) 5A	LCC ($) 5B	LCC ($) 5C	LCC ($) 6A	LCC ($) 6B
Natural gas furnace	83%	76%	$625	($93)	$569	$1,111	$673
Electric heat pump	11%	18%	$3,668	$1,203	$1,350	$4,304	$3,078
Propane furnace	6%	6%	$5,240	$3,180	$5,010	$6,386	$5,288
Weighted LCC Results	100%	100%	$1,237	$337	$976	$1,779	$1,383

Assuming social cost of carbon (SCC) = $51 per metric ton:

Table 17

Prevalence for most climate zones analyzed ranged from 3% to 14%. The value for 6A is surprisingly

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REP-071-21 Grid Integrated Thermostat Controls
CDP ID #	181
Code	IECC RE
Code Section(s)	R403.1.1.1 (New), R407.2 New Section
Location	base
Proponent	Kim Cheslak kim@newbuildings.org
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Modification received by the subcommittee and a note as this Proposal is similar to REP-070 on the commercial side of code.
Recommendation	The Proponent has been working with AHRI and DOE for months to align the latest version of the modification aligns with REP-70 (commercial). Multiple positive comments regarding. Motion to approve with a second vote 10/0/0 motion carried
Vote	Motion to approve as modified 10/0/0
Recommendation Date	6/6/2022

Next Step To

REPI-71 As Modified: Revision/Coordination with AHRI, NBI, DOE and REPI-CEPI-99

IECC®: SECTION R202 (New), R403.1.2 (New), R407.2, CTA (New)

Proponents:

Kim Cheslak, representing New Buildings Institute (kim@newbuildings.org)

2021 International Energy Conservation Code

SECTION R202

GENERAL DEFINITIONS

Add new definitions as follows:

DEMAND RESPONSE SIGNAL. A signal that indicates a price or a request to modify electricity consumption for a limited time period.

DEMAND RESPONSIVE CONTROL. A control capable of receiving and automatically responding to a demand response signal

SECTION R403

SYSTEMS

Revise text as follows:

R403.1 Controls. Not less than one thermostat shall be provided for each separate heating and cooling system. The primary heating or cooling system serving the dwelling unit shall comply with Sections R403.1.1 and R403.1.2.

R403.1.1 Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55°F (13°C) to not greater than 85°F (29°C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F (21°C) and a cooling temperature setpoint of not less than 78°F (26°C).

R4031.2 Demand responsive thermostat. The thermostat shall be provided with a demand responsive control capable of communicating with the Virtual End Node (VEN)

OpenADR OpenADR Alliance 111 Deerwood Road Suite 200 San R CA 94583
OpenADR OpenADR Alliance

OpenADR 2.0a and 2.0b-2019: Profile Specification Distributed Energy Resources

Proposal Originally Submitted

SECTION R202

GENERAL DEFINITIONS

Add new definitions as follows:

GRID-INTEGRATED CONTROL. An automatic control that can receive, automatically respond to demand response requests from and indicate demand response status

The thermostat shall be capable of performing all other functions provided by the control when the grid integrated controls are not available.

Exception: Assisted living facilities.

Revise as follows:

R407.2 Tropical climate region.

Compliance with this section requires the following:
1. Not more than one-half of the occupied space is air conditioned and is controlled by a

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-084-21 Duct testing
CDP ID #	430
Code	IECC RE

Date	

REPI-84-21
IECC®: R403.3.5, R403.3.6
Proponents:
Robby Schwarz, BUILDTank, Inc., representing Colorado Chapter of the ICC (robby@btankinc.com)
2021 International Energy Conservation Code

Revise as follows:

Definition
DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to supply and return ducts, includes air handlers, duct fittings, boots and elbows, dampers, plenums, filter boxes, ~~fans~~ and accessory air handling equipment and appliances.

R403.3.5 Duct testing.
Duct systems

being heated or cooled to the design parameters. This causes the occupant to adjust the thermostat to tryto compensate for comfort issues associated with duct leakage. This causes more leakage and potential increased stratification of temperature in the home, building durability and potential safety problems in the house. Sticking with efficiency of the system, the thermostat adjustment leads to short cycling as the system that was design to specific set point temperatures tries to achieve arbitrary set points. A consistent duct leakage allowance requirement of 4CFM across the board regardless of duct location simplifies things for contractors and ensure better performance of ducts locating both inside and outside the building.

The duct leakage section of the proposal restructures the requirement with exceptions, one of which is currently awkwardly in the body of the code and one of which is being proposed. For duct work servicing small square footages, it become unreasonable to require the duct to be tighter than 50 CFM. At 1200 sqft the 4 CFM duct leakage target would be 48 CFM, so this appeared to be the perfect starting point for this exception.

Cost Impact:
The code change proposal will increase the cost of construction. This proposal may increase cost in jurisdiction that have not concentrated on total system duct leakage and that have allowed ducts to leak more if they are within the building envelope. The increased cost comes down quickly as installers better understand installation techniques that ensure tighter systems and are also mitigated by better system performance, efficiency, and fewer call backs.

Vote	Affirmative__________ Negative___________ Table____________ To Subcommittee_________________________
Date	

REPI-89-21

IECC®: R403.5.2, TABLE C403.12.3, TABLE R405.2, TABLE R406.2

Proponents: Gary Klein, representing on behalf of the California Statewide Utility Codes and Standards Team (iecc-pipe-insulation@2050partners.com); Mark Lyles, representing New Buildings Institute (markl@newbuildings.org); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)

From the Monograph:

Revise as follows:

R403.5.2 Hot water pipe insulation.

~~Insulation for e~~Service hot water piping ~~with a thermal resistance, R-value, of not less than R-3~~ shall be thermally insulated in accordance with Table R403.5.2 and be applied to the following:

1. Piping ¾ inch (19.1 mm) and larger in nominal diameter located inside the conditioned space.

~~2. Piping serving more than one dwelling units.~~

2~~3~~. Piping located outside the conditioned space.

3~~4~~. Piping from the water heater to a distribution manifold.

4~~5~~. Piping located under a floor slab.

5~~6~~. Buried piping.

6~~7~~. Supply and return piping ~~in circulation and recirculation systems~~ in circulating hot water systems ~~other than cold water pipe return demand recirculation systems~~.

Exception: Cold water pipe returns in demand recirculation water systems.

TABLE R403.5.2 MINIMUM PIPE INSULATION THICKNESS (in inches)

R403.5.2	Hot water pipe insulation
R403.5.3	Drain water heat recovery units

As modified by the proponents:

R403.5.2 Hot water pipe insulation.

Insulation for service hot water piping with a thermal resistance, R-value, of not less than R-3 shall be applied to the following:

1. Piping ¾ inch (19.1 mm) and larger in nominal diameter located inside the conditioned space.

~~2. Piping serving more than one dwelling units.~~

2~~3~~. Piping located outside the conditioned space.

3~~4~~. Piping from the water heater to a distribution manifold.

4~~5~~. Piping located under a floor slab.

5~~6~~. Buried piping.

6~~7~~. Supply and return piping ~~in circulation and recirculation systems~~ in circulating hot water systems ~~other than cold water pipe return demand recirculation systems~~.

Exception: Cold water ~~pipe~~ returns in demand recirculation water systems

TABLE R405.2 REQUIREMENTES FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Mechanical	
R403.5	Service hot water systems
~~R403.5.1~~	~~Heated water circulation and temperature maintenance systems~~
~~R403.5.3~~	~~Drain water heat recovery units~~

TABLE R406.2 REQUIREMENTES FOR ENERGY RATING INDEX

SECTION	TITLE
Mechanical	

R403.5	Service hot water systems
~~R403.5.1~~	~~Heated water circulation and temperature maintenance systems~~
~~R403.5.3~~	~~Drain water heat recovery units~~

Reasons:

1. First paragraph: We are proposing to remove the change to wall thickness and k-value and retain the R-value designation in the existing section. We are also proposing to retain the R-value not less than R-3. While the supporting analysis done for the original proposal shows that a 1-inch wall thickness is economically justified, it is only true if the pipe insulation material is changed from foam to fiberglass or mineral wool. This results in an increase of R-1 over the current requirements, a very small change for a big change in common practice. Getting R-3 pipe insulation (1/2-inch foam) done well is more important than having 1-inch wall thickness installed poorly. We recommend moving the proposal to increase pipe insulation R-value to Section R408 as part of an efficient SHW distribution system measure. 2.2 (]TJ [(2.2224 Td [.7 (em)- 0 Td (-)T

Vote	Affirmative__________Negative___________ Table____________ To Subcommittee_________________________
Date	

REPI-91-21

IECC®: R403.5.4 (New), R403.5.4.1 (New)

Proponents:

Dan Wildenhaus , representing Northwest Energy Efficiency Alliance (dwildenhaus@trccompanies.com); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)

2021 International Energy Conservation Code

Add new text as follows:

~~R403.5.4 Compact Hot Water Distribution systems (CHWD).~~

~~Where installed, CHWD systems shall comply with the provisions of section R403.5.4.1.~~

~~R403.5.4.1 Water Volume in Pipe Method.~~

~~The hot water distribution system shall store not more than 0.5 gallons (1.9 liters) of water in any piping/manifold between the hot water source and any hot water fixture when calculated using approved engineering calculations. These calculations will use the nominal diameter and length of the piping or tubing, and the longest pipe run from water heater, including both horizontal and vertical run of pipe, shall not be more than 20 feet.~~

R403.5.4.1 Water Volume Determination

The water volume in the piping shall be calculated in accordance with this section. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered to be sources of heated water. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from Table R403.5.4. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water

1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48

For SI: 1 foot = 304.8 mm, 1 inch = 25.4 mm, 1 liquid ounce = 0.030 L, 1 oz/ft^2 = 305.15 g/m^2.
N/A = Not Available.

Reason Statement:

This new section uses the same Water Volume Determination that already exists in the IECC Commercial Code in section C404.5.2.1. This update has been provided to most easily align residential and commercial hot water service volume calculations in piping. Language needs to be introduced into the prescriptive portion of the code's Systems section to be referenced in new R408 Additional Efficiency Package Options (REPI-142-21).

Inefficient hot water distribution systems have been recognized as a problem for many years as they result in energy and water waste, and result in long hot water delay times that are the cause of a significant number of complaints by new home buyers. Recirculation systems are a solution to two of the three problems (water and wait time), but the thermal energy impact of different recirculation system options has already been addressed in section R403.5.1.1 Circulation system.[1]

In all non-recirculation distribution options, water heater energy consumption and hot water waste are correlated. A decrease in water heater energy consumption follows a reduction in wasted water; therefore, improving insulation and reducing the piping length and/or pipe diameter have equal benefits for energy and water waste. In recirculation systems, water heater energy consumption and wasted hot water are independent, and often have an inverse effect (when recirculation is not demand based).[2] This distribution system problem exists for a variety of factors including:

- An outdated pipe sizing methodology in the plumbing code that results in oversized hot water distribution systems since the assumed fixture flow rates are much higher than current requirements
- Municipalities with design recommendations that force plumbers and designers to assume low supply water pressure, resulting in larger distribution piping, which waste more water and energy.
- Increasing efforts to conserve water has resulted in the realization of water savings due to improvements in showerhead and lavatory maximum flow rates; however, reduced flow rates often result in increased wait times if

Bibliography:

Residential Compact Domestic Hot Water Distribution Design: Balancing Energy Savings, Water Savings, and Architectural Flexibility Farhad Farahmand, TRC Companies, Yanda Zhang, ZYD Energy

Evaluating Domestic Hot Water Distribution System Options With Validated Analysis Models E. Weitzel and M. Hoeschele, Alliance for Residential Building Innovation

California Energy Codes & Standards Case Report for Compact Hot Water Distribution; Measure Number: 2019-RES-DHW1-F, Residential Plumbing

Home

~~Where installed, CHWD systems shall comply with the provisions of section R403.5.4.1.~~

~~403.5.4.1 (N11035.4.1)Water Volumein PipeMethod.~~

~~The hot water distribution system shall store not more than 0.5 gallons (1.9 liters) of water in any piping /manifold between the hot water source and any hot water fixture when calculated using approved engineering calculations. These calculations will use the nominal diameter and length of the piping or tubing, and the longest pipe run from water heater, including both horizontal and vertical run of pipe, shall not be more than 20 feet (6.1m).~~

408.2.6 (N1108.2.6) Compact Hot Water Distribution

For Compact Hot Water Distribution system credit, the volume shall store not more than 16 ounces of water between the nearest source of heated water and the termination of the fixture supply pipe where calculated using section R403.5.4 Construction documents shall indicate the ounces of water in piping between the hot water source and the termination of the fixture supply.

Reason Statement:

This section is being re-submitted to better align with credit provided for compact hot water distribution outlined in section R405.4 and Table R405.4.2(1), building component "service water heating," utilizing HWDS or the factor for the compactness of the hot water distribution system. Inefficient hot water distribution systems have been recognized as a problem for many years as they result in energy and water waste, and result in long hot water delay times that are the cause of a significant number of complaints by new home buyers. Recirculation systems are a solution to two of the three problems (water and wait time), but the thermal energy impact of different recirculation system options has already been addressed in section R403.5.1.1 Circulation system.[1]

In all non-recirculation distr

Savings:

The following savings have been calculated for compact domestic hot water

	On-Site Indoor Water Savings (gal/yr)
Per Dwelling Unit Impacts (single family)	962
PerDwelling Unit Impacts (Casin	

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International Energy Conservation Code
Code Change Proposal Tracking Sheet

June 8th

2. The Energy Rating Index value shall be at least X5 percent less than the Energy Rating Index target

4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard 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 gas0l.1 (n)]TJ 0 Tc 0 Tw 5.027 0 Td (-)Tj 0.311 0 Td [(s)-2.4 (i)-0.6 (t)1.7 (e)0.8 ( )]TJ /TT

orientation shall be noted on the certificate.

an Energy Rating Index score determined in accordance with Section

where applicable, the additional efficiency measures selected for compliance with R408

SECTION R408

ADDITIONAL EFFICIENCY REQUIREMENTS CREDITS PACKAGE

R408.1 Scope. This section establishes additional efficiency credits package options to achieve additional energy efficiency in accordance with Section R401.2 R405.2

R408.2

R408.2.11 (3) >

R408.2.1 Enhanced Envelope 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 of the building thermal envelope as designed shall be one of the following and 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 Section R402.1.5 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. 20% reduction in glazed area-weighted average SHGC.
2. Have a U-

6	0.25	~~0.25~~ t0.17
7 and 8	0.25	~~0.25~~ t0.17

R408.2.3 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 95 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 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 5.56imun load.dum7 ( )5 (d s)-eeehan

R408.2.8 Renewable Energy.

Renewable energy resources shall be permanently installed that have the 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 documentation shall be provided to the code official:

a. Substantiation that the RECs associated with the on-site renewable energy are owned by, or retired on behalf of, the homeowner.
b. A contract that conveys to the homeowner the RECs associated with the on-site renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-33-21 (Mod) Modify envelope table and add points to R408
CDP ID #	
Code	IECC RE
Code Section(s)	R402, R408
Location	base
Proponent	Amanda Hickman, LBA
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Initially considered alongside REPI-18-21 – and other R408 measures, this proposal was modified to align with the REPI-018 points-based approach to R408. This proposal weakens the ceiling insulation requirements in R402 and compensates by offering either electrification options or 3 additional points in R408. Note: it also impacts R405
Recommendation	Motion to Approve as Modified from Gayathri Vijayakumar, 2nd by Thomas Marston. This was a close vote in subcommittee with multiple abstentions and non-votes
Vote	7-5 motion to approve as modified (4 abstain, 4 not present)
Recommendation Date	6-8-22
Next Step	To Subcommittee __________ To Advisory Group __________ To Consensus Committee X________

Replace REPI-33 in its entirety with the following:

TABLE R402.1.2

MAXIMUM ASSEMBLY U-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION U-FACTOR[f]	SKYLIGHT U-FACTOR	GLAZED FENESTRATIO	488 -2.308 Td .7 (85 Td [(488 -20.00443.4 680443.4 680443.c 0 5983 07J 4.(488 -2.34595.02 T13 (f)Tj 0.29

3	.30	0.55	0.25	38 ~~49~~	20 or 13&5ci[h] or 0 & 15ci[h]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	.30	0.55	0.40	49 ~~60~~	30 or 20& 5ci[h] or 13& 10ci[h] or 0& 20ci[h]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30[i]	0.55	0.40	49 ~~60~~	30 or 20& 5ci[h] or 13& 10ci[h] or 0& 20ci[h]	13/17	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 &5ci
6	0.30[i]	0.55	NR	49 ~~60~~	30 or 20& 5ci[h] or 13& 10ci[h] or 0& 20ci[h]	15/20	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 &5ci
7 and 8	0.30[i]	0.55	NR	49 ~~60~~	30 or 20& 5ci[h] or 13& 10ci[h] or 0& 20ci[h]	19/21	38	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 &5ci

Modification to the modified RE ~~11~~ 18:

R408.2 Additional efficiency credits ~~package options~~. Two ~~of the~~ Aadditional 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 are cumulatively equal to or greater than ~~meet or exceed~~ ten credits Each measure selected shall meet the relevant subsections of Section R408 and receive credit as ~~indicated~~ specified in ~~the~~ Table 408.2 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

R408.2.1 Opaque wall option. For buildings in climate zones 4 and 5, the maximum U-factor of 0.060 shall be permitted to be used for wood frame walls for compliance with Table R402.1.2 where complying with one or more of the following:

1. A heat pump is installed for space heating
2. All installed water heaters have a UEF equal to or greater than 2.0 or a COP of greater than 1.0
3. In addition to the number of credits required by Section R408.2, three additional credits are achieved.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-167-21 (Mod June 1st) R402 envelope reduction for R408 points
CDP ID #	

Replace original proposal with the following:

TABLE R402.1.2 MAXIMUM ASSEMBLY U-FACTORS[a] AND FENESTRATION REQUIREMENTS

Portions of table not shown remain unchanged.

0.40	0.65	0.25	<u>0.030</u>	0.084	0.165	0.064	0.360	0.477 ~~0.026~~	3

TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[illegible]

Portions of table not shown remain unchanged

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	20 or 13&10ci	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 except [illegible]

R408.2 Additional efficiency credits package options. Two of the Aadditional 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 the total of thirteen credits in climate zones 4 and 5 or the total of ten credits in other climate zones. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as indicated in the Table for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.