IECC RESIDENTIAL COMMITTEE ACTION REPORT ON THE RESULTS ON THE 2023 PUBLIC COMMENTS/CODE CHANGES TO PUBLIC COMMENT DRAFT 2 TO THE INTERNATIONAL ENERGY CONSERVATION CODE-RESIDENTIAL (9/18/23)

Introduction

On May 17, 2023, energy.cdpaccess.com was open for comment on substantive technical changes made to legislative changes to Public Comment Draft #1. In an effort to expedite the schedule, this comment period was open during the balloting process by the Consensus Committee. Public Comment Draft #2 (PCD #2) incorporates all text revisions to the Public Comment Draft #1 IECC/Chapter 11 of the IRC based on those code changes which have achieved the voting majorities in Section 9.4 of the ICC CP (approval by at least a majority of the committee and at least two-thirds of those voting, excluding abstentions). The submittal deadline was June 30, 2023. 131 comments were submitted. 56 proposals either provided new technical content or portions addressed section that were not available for comment during this period and under ICC Consensus Procedures 9.7 these comments would not be considered in this public comment period.
The balloting process resolved 1 additional public comment to move into Public Comment Draft #2. Proposal RECD1-13-22 was posted for comment on July 17 with a submittal deadline of August 16, 2023. 19 Public comments were received on proposal RECD1-13-22. The IECC Residential Project Team made a recommendation on August 24, 2023 to the Consensus Committee of proposals to be heard during this round based on Consensus Procedures 3.5 and 9.7. At the August 31 meeting of the Consensus Committee the committee modified the recommendation of the project team to hear all 19 comments. In addition, 10 committee proposals were submitted bringing the total number of proposals to 94.
Proposals are identified as follows:

- Residential Energy Public Comment Draft 2 proposed code changes (RE2D)
- Residential Energy Committee Public Comment Draft 2(REC2D) (committee proposal)
- The “Part” listed after the code change indicates the respective items of the code change that involve possible coordination issues between the Commercial and Residential provisions or between the IECC-RE and IRC Chapter 11.
- Commercial Energy Public Comment Draft 2 proposed code changes (CE2D)
- Commercial Energy Committee Public Comment Draft 2(CEC2D) (committee proposal)

The process for consideration of the proposals included:

- Posting of the proposals on July 14, 2023
- An open process of review by one of the Subcommittees established by the Consensus Committee, including interested parties
- Subcommittee recommended action on the proposals to the Consensus Committee

- Consensus Committee action on the proposals with an open process including posting of documents and participation by interested parties. The required majority for approval was 2/3 majority in accordance with Section 9.4 of the ICC Consensus Procedures.

This **Committee Action Report (CAR)** includes the following:

- A summary of the actions taken by the respective IECC Consensus Committee from July 2023-September 2023 on each proposal. The Consensus Committee action is noted by one of the following: Approve (as submitted); Approved as Modified; or Disapproved along with the vote count and percentages for a successful action. As noted previously, In accordance with Section 9.4(b) of the ICC Consensus Procedures (ICC CP), the disposition of an item during the public input process required a 2/3 majority . Those proposals that were withdrawn by the proponent are so noted.
- All approved proposals (approve and approved as modified) are included in the CAR in legislative format, including the reason(s) for the committee action. These proposals form the basis for the ballot process below.

The results of the balloting process by the Consensus Committee will be the basis for the final draft of the 2024 IECC Residential and 2024 IRC Chapter 11.

Further information will be posted on ICC's Energy website.

Ballot Instructions

Ballot format

The ballot process will utilize a link to a single electronic ballot, structured below in accordance with Section 9.1 of the ICC CP. This ballot format will be used for subsequent ballots as well. On the signature page of the ballot, instructions will be included with direction for members to vote on the results of the approved code changes by selecting one of the following:

(*The annotation in italics will not be included in the ballot)*

- Affirmative (all code changes)
  - *An affirmative vote is a single vote to ratify approval of all the proposals approved by the committee.*

- Affirmative with comment (comments on separate file; send to Secretariat)
  - *An affirmative with comment vote is a single vote to ratify approval of all the proposals approved by the committee and allows the voting member to offer comments on specific proposals. Such comments must be identified by code change number on a separate file and sent to the Secretariat for reproduction as part of the recirculation ballot process for all committee members to view. Comments can be in favor, in opposition or neutral but in all cases such comments will not affect the single ratification vote cast on all the proposals. Comments provided with an affirmative vote are for information only, no action is required by the committee.*

- Negative, with reasons (the reasons for a negative vote shall be given and, if possible, should include specific wording or actions that would resolve the objection)
  - *This single vote identifies that the voting member has an objection to one or more of the approved proposals. On a separate file, the proposals must be identified by code*

change number and a reason for the negative vote on the proposal. If there are text revisions for the committee to consider that would resolve the negative vote, such revisions should be included as well. This file is to be sent to the Secretariat for reproduction as part of the recirculation ballot process for all committee members to view.

- *Negative votes to code changes without a reason "shall not be factored into the numerical requirements for consensus" (Section 2.7 (3); 2022 ANSI Essential Requirements).*
- *Proposals not identified as receiving a negative vote are considered as an affirmative vote.*

In some cases, committee members may wish to abstain on voting on a specific proposal(s). If this is the case, be sure to vote as directed above and in a separate file identify the code change number(s) for which you are abstaining and send to the Secretariat for reproduction as part of the recirculation ballot process for all committee members to view. This abstention can be combined in the same file as an "Affirmative with comment" or "Negative, with reasons". See Section 9.4 of ICC CP for abstentions - such abstentions are excluded from numerical requirements for required voting majorities.

Ballot #1

The initial ballot, Ballot #1, initiates the balloting process of the CAR.

- Ballot #1 will be open for 30 days. The 30-day deadline requires both the completion of the online ballot as well as the submittal of any comments/reasons.
- Comments received with "Affirmative with comment" ballots will be compiled per proposal as well as reasons for abstentions.
- For each proposal receiving a negative comment, the reasons for the negative and any proposed text revisions to resolve the negative will be compiled per proposal, along with the vote tally on that proposal from Ballot #1.

Ballot #2

The results from Ballot #1 will be recirculated to the committee for review to give committee members an opportunity to review comments provided and, if they choose, to change their vote. See Section 9.6 of the ICC CP for a discussion on recirculation ballots.

- Ballot #2 will be open for 14 days. The 14-day deadline requires both the completion of the online ballot as well as the submittal of any comments/reasons.
- Unless a committee member records a vote change on a given proposal, that committee member's Ballot #1 vote is presumed to be unchanged. If additional comments are included with their ballot, these comments will be compiled and recirculated as done with Ballot #1.
- If the requisite majorities of Section 9.4 of the ICC CP are achieved on Ballot #2 with affirmative or affirmative with comment, this is final approval of the text revisions to be incorporated into Public Comment Daft #1. Ballot #3 and the remaining steps below are not required.
- If the requisite majorities of Section 9.4 are not achieved on Ballot #2 with affirmative or affirmative with comment, the negative votes and reasons and all other comments will be compiled per proposal, along with the vote tallies per proposal.

Consensus Committee Meeting

The results of Ballots #1 and #2 for those code changes that did not achieve the requisite majorities of Section 9.4 will be compiled and distributed to the committee. These code changes will serve as the agenda for a meeting of the Consensus Committee. Any revisions to the code changes to be considered at the meeting must be developed and submitted at a time to be determined in advance of the meeting. The committee will discuss and vote on the code changes at this meeting. This meeting will be open to interested parties.

Ballot #3

The results of the Consensus Committee meeting will be compiled and sent to the committee. Ballot #3 will be a recirculation ballot sent to those not in attendance at the Consensus Committee meeting. This is the last step in the approval process of the CAR and the determination of the resulting text to be included in Public Comment Draft #2.

- The ballot will be open for 14 days. The 14-day deadline requires both the completion of the online ballot as well as the submittal of any comments/reasons.
- All code changes considered at the Consensus Committee meeting require the requisite majorities of Section 9.4 in order to be incorporated into Public Comment Draft #2.
- Code changes that do not meet these majorities will not be included in Public Comment Draft #2.

As per the instructions provided in the CAR your electronic ballot must submitted along with any comment/reason statement emailed to the Secretariat (kstenger@iccsafe.org) by **Wednesday, October 18, 2023 at 11:59 pm Pacific**. If you have further questions or issues with your ballot please contact the Secretariat.

Results of the Residential Consensus Committee Public Comment Draft #2 Process July 2023-September 2023

Proposal Number	CC action	vote yes	vote no	abstain	%
CE2D-37-23 PII	disapproved	33	3	0	92%
CE2D-78-23 PII	approve	31	0	0	100%
CE2D-95-23 PII	approve	36	0	0	100%
CEC2D-04-23 PII	approve	26	0	1	100%
RE2D-01-23	disapproved	34	2	1	94%
RE2D-02-23	approve	36	0	0	100%
RE2D-03-23	approve	37	0	0	100%
RE2D-04-23	heard by committee				
RE2D-05-23	heard by committee				
RE2D-06-23	approve	34	1	0	97%
RE2D-07-23	disapproved	25	9	1	74%
RE2D-08-23	approve	30	3	3	91%
RE2D-09-23	withdrawn				
RE2D-10-23	approve	38	0	0	100%
RE2D-11-23	disapproved	23	18	1	56%
RE2D-12-23	withdrawn				
RE2D-13-23	withdrawn				
RE2D-14-23	disapproved	25	12	2	68%
RE2D-15-23	disapproved	31	3	0	91%
RE2D-16-23	disapproved	19	18	0	51%
RE2D-17-23	withdrawn				
RE2D-18-23	disapproved	22	13	1	63%
RE2D-19-23	disapproved	35	0	0	100%
RE2D-20-23	approved as modified	35	0	0	100%
RE2D-21-23	approve	27	7	0	79%
RE2D-22-23	disapproved	18	17	1	51%

Proposal Number	CC action	vote yes	vote no	abstain	%
RE2D-23-23	disapproved	29	3	0	91%
RE2D-24-23	approved as modified	33	0	0	100%
RE2D-25-23	approved as modified	32	0	1	100%
RE2D-26-23	approved as modified	34	1	0	97%
RE2D-27-23	withdrawn				
RE2D-28-23	approve	39	0	0	100%
RE2D-29-23	withdrawn				
RE2D-30-23	disapproved	32	1	2	97%
RE2D-31-23	approve	31	3	1	91%
RE2D-32-23	approve	30	4	2	88%
RE2D-33-23	approve	32	0	1	100%
RE2D-34-23	withdrawn				
RE2D-35-23	withdrawn				
RE2D-36-23	disapproved	29	0	2	100%
RE2D-37-23	approved as modified	31	0	0	100%
RE2D-38-23	approved as modified	31	0	0	100%
RE2D-39-23	withdrawn				
RE2D-40-23	approve	39	0	0	100%
RE2D-41-23	withdrawn				
RE2D-42-23	approved as modified	34	0	0	100%
RE2D-43-23	approve	31	1	0	97%
RE2D-44-23	approved as modified	23	4	5	85%
RE2D-45-23	disapproved	29	7	0	81%
RE2D-46-23	approved as modified	30	1	2	97%
RE2D-47-23	disapproved	27	2	0	93%
RE2D-48-23	disapproved	29	3	1	91%

Proposal Number	CC action	vote yes	vote no	abstain	%
RE2D-49-23	disapproved	19	15	2	56%
RE2D-50-23	withdrawn				
RE2D-51-23	withdrawn				
RE2D-52-23	disapproved	34	2	1	94%
RE2D-53-23	disapproved	31	1	1	97%
RE2D-54-23	disapproved	33	2	0	94%
RE2D-55-23	withdrawn				
RE2D-56-23	withdrawn				
RE2D-57-23	withdrawn				
RE2D-58-23	heard by committee				
RE2D-59-23	approved as modified	32	1	0	97%
RE2D-60-23	withdrawn				
RE2D-61-23	withdrawn				
RE2D-62-23	disapproved	32	2	1	94%
RE2D-63-23	withdrawn				
RE2D-64-23	disapproved	24	10	0	71%
RE2D-65-23	withdrawn				
RE2D-66-23	approved as modified	22	7	4	76%
RE2D-67-23	approve	30	2	2	94%
RE2D-68-23	disapproved	19	10	1	66%

Proposal Number	CC action	vote yes	vote no	abstain	%
RE2D-69-23	disapproved	20	15	1	57%
RE2D-70-23	withdrawn				
RE2D-71-23	withdrawn				
RE2D-72-23	withdrawn				
RE2D-73-23	disapproved	28	1	1	97%
RE2D-74-23	disapproved	28	1	3	97%
RE2D-75-23	withdrawn				
RE2D-76-23	disapproved	31	0	2	100%
RE2D-77-23	disapproved	29	0	1	100%
RE2D-78-23	disapproved	27	7	1	79%
REC2D-01-23	approved as modified	32	0	0	100%
REC2D-02-23	editorial				
REC2D-03-23	approve	32	0	0	100%
REC2D-04-23	approve	31	0	0	100%
REC2D-05-23	disapproved	20	8	2	71%
REC2D-06-23	approve	32	1	1	97%
REC2D-07-23	approve	33	0	0	100%
REC2D-08-23	approved as modified	28	1	1	97%
REC2D-09-23	disapproved	16	14	2	53%
REC2D-10-23	approved as modified	29	1	0	97%

IECC Residential Committee Action Report on Public Comment Draft #2

Publication Date: September 2023

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CE2D-78-23 Part II

IECC CE: NEMA (New

Proponents:

Bryan Holland representing **NEMA**

2024 International Energy Code[CE Project] R3

Add new text as follows:

NEMA 1300 North 17th Street, Suite 900, Rosslyn, VA 22209.
OS 4-2016 Requirements for Air-Sealed Boxes for Electrical and Communication Applications

Workgroup Recommendation
Commercial Energy Committee Action: As Submitted
Commercial Energy Committee Reason:
Provides the needed reference standard.

CE2D-95-23 Part II

IECC CE: CG103.2.5.1

Proponents:

Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org

2024 International Energy Code[CE Project] R3

Revise as follows:

CG103.2.5.1 Low indoor design conditions.

Space heating systems sized for spaces with indoor design conditions of not greater than 40°F (4.5°C and intended for freeze protection, including temporary systems in unfinished spaces, shall be permitted to use electric resistance. The *building thermal envelope* ~~building envelope~~ of any such space shall be insulated in compliance with Section C402.1.

Workgroup Recommendation
Commercial Energy Committee Action: As Submitted
Commercial Energy Committee Reason:
Provides consistency with previous updates made.

CEC2D-4-23 Part II

IECC CE: SECTION C110, SECTION C110 (New)

Proponents:

Duane Jonlin, representing IECC Commercial committee

2024 International Energy Code[CE Project] R3

Revise as follows:

SECTION ~~C110~~C109 — MEANS OF APPEALS

SECTION ~~C109~~C110 — STOP WORK ORDER

Reason:

Editorial change to align ordering of Chapter 1 sections with other I-Codes

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial change

Workgroup Recommendation
Commercial Energy Committee Action: As Modified
Commercial Energy Committee Reason:
Consistent with other I-Codes.

RE2D-2-23

IECC RE: R110.4

Proponents:

Greg Johnson, representing National Multifamily Housing Council (gjohnsonconsulting@gmail.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R110.4 Administration.

The *code official* shall take action ~~without delay~~ in accordance with the decision of the board.

Reason Statement:

This change will correlate the provisions of the IECC-R with the IECC-C, which cays this: *"C110.4 Administration The code official shall take action in accordance with the decisions of the board."*

There is no reason for 'without delay.' The code official will act as necessary to comply with the intent of the appeals board; any other conclusion is misinformed about how a building department works.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This is an administrative provision with no direct financial implications.

RE2D-3-23

IECC RE: SECTION 202

Proponents:

Emily Lorenz, representing International Institute of Building Enclosure Consultants (emilyblorenz@gmail.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

IECC2024D3RERE_RE_Ch02_SecR202_DefEMITTANCE EMITTANCE. The ratio of the radiant heat flux emitted by a specimen measured on a scale from 0 to 1, where a value of 1 indicates perfect release of thermal radiation~~emission~~.

Reason Statement:

When changing the definition of "emittance" during the last round of public comments, potential confusion was introduced. The word "emission" is frequently used to describe pollutants. However, in this case, we are referring to the property of a material that is related to the release of thermal radiation (or heat). The edit included in this code change proposal corrects the definition for technical accuracy related to the property of "emittance."

Bibliography:

U.S. Environmental Protection Agency. 2008. "Reducing urban heat islands: Compendium of strategies." Draft. https://www.epa.gov/heat-islands/heat-island-compendium. (see Section 2.2, Properties of Urban Materials)

VanGeem, M. G., and A. E. Fiorato. 1983. "Thermal Properties of Masonry Materials for Passive Solar Design – A State-of-the-Art Review." U.S. Department of Energy Report No. DOE/CE/30739. Also PCA R&D Serial No. 0888, Portland Cement Association. http://www.vangeemconsulting.com/SN_888_Thermal_Properties_of_Masonry_Materials_VanGeem_Fiorato.pdf

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This CCP only clarifies a definition; it does not change any requirements.

RE2D-6-23

IECC RE: SECTION 202

Proponents:

Jay Crandell, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

IECC2024D3RERE_RE_Ch02_SecR202_DefALTERATION ALTERATION.
Any construction, retrofit or renovation to an existing structure other than *repair* or *addition* . Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation.
~~construction or renovation to an *existing structure* other than a *repair* or *addition.*~~

IECC2024D3RERE_RE_Ch02_SecR202_DefREPAIR REPAIR. The reconstruction~~, replacement~~ or renewal of any part of an existing *building* for the purpose of its maintenance or to correct damage.

Reason Statement:

This proposal is errata (the underlining and strike-out restores the existing code language). Changes to the “alteration” and “repair” definitions as shown in the legislative draft and cdpACCESS were actually removed from the original RED1-264 proposal in its final amended version that the committee approved (as also recommended by the subcommittee from its deliberation on these definitions and their application in Chapter 5). This was the subject of considerable discussion at subcommittee level and changes to these definitions were not made because it creates conflicts in how these terms are coordinated with provisions in Chapter 5. For example, certain alteration requirements in Chapter 5 specifically include or address replacements. If replacements are broadly defined as a “repair” then the definitions will conflict with the provisions and cause confusion in compliance and enforcement. These definitions were purposefully designed for the IECC Chapter 5 to be different than those used in the IEBC which does not include energy efficiency provisions for existing buildings with nuances that require specifically tailored definitions for IECC Chapter 5 application. So, there are both procedural and technical reasons for restoring these definitions to their original form.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal is errata so there is no cost impact. Making this correction will tend to decrease cost of enforcement and compliance simply by ensuring the definitions are restored and are not in conflict with provisions in Chapter 5 of the IECC.

RE2D-8-23

IECC RE: SECTION 202

Proponents:

Greg Johnson, representing National Multifamily Housing Council (gjohnsonconsulting@gmail.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

IECC2024D3RERE_RE_Ch02_SecR202_DefSUBSTANTIAL_IMPROVEMENT SUBSTANTIAL IMPROVEMENT. Any *repair*, reconstruction, rehabilitation, *alteration*, *addition* or other improvement of a *building* or structure, the cost of which equals or is more than 50 percent of the market value of the structure before the improvement. Where the structure has sustained substantial damage, as defined in the *International Building Code*, any repairs are considered *substantial improvement* regardless of the actual *repair* work performed. *Substantial improvement* does not include the following:
1. Improvement of a *building* ordered by the *code official* ~~required~~ to correct health, sanitary or safety code violations ~~ordered by the *code official*~~.
2. *Alteration* of a historic *building* where the *alteration* will not affect the designation as a historic *building*.

Reason Statement:

The definition of substantial improvement is substantially improved in terms of clarity.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial

RE2D-10-23

IECC RE: R402.1

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R402.1 General.

The *building thermal envelope* shall comply with the requirements of one of the following:

1.	Sections R402.1.1 through R402.1.4 and R402.1.6, or
2.	Sections R402.1.1, ~~and~~ R402.1.5, and R402.1.6

Exceptions:

1.	The following low-energy *buildings*, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the *building thermal envelope* provisions of Section R402. 1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h × ft^2 (10.7 W/m^2) or 1.0 watt/ft^2 of floor area for space-conditioning purposes. 1.2. Those that do not contain *conditioned space*.
2.	Log homes designed in accordance with ICC 400.

Reason Statement:

In the last round, R402.5.4 was relocated to R402.1.6, but the change was not reflected in R402.1.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

RE2D-20-23

IECC RE: R404.7.1, R404.7.2, R404.7.5, R404.7.6

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R404.7.1 Quantity.

New one- and two-family dwellings and townhouses with a designated attached or detached garage or other onsite private parking provided adjacent to the *dwelling unit* shall be provided with one *EV-capable*, *EV-ready*, or *EVSE* space per *dwelling unit*. R-2 occupancies or allocated parking for R-2 occupancies in mixed-use buildings shall be provided with an *EV capable space*, *EV ready space*, or *EVSE spac*e for 40 percent of ~~each~~ *dwelling units* or *automobile parking spaces*, whichever is less.

Exceptions:

1. Where the local electric distribution entity ~~has certified~~ certifies in writing that it is not able to provide 100 percent of the necessary distribution capacity within 2 years after the estimated ~~date of the~~ certificate of occupancy date. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.

2. Where substantiation ~~has been~~ is *approved* that meeting the requirements of Section R404.7.5 will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the builder or developer by more than $450.00 per *dwelling unit*.

R404.7.2 EV Capable Spaces.

Each *EV capable space* used to meet the requirements of Section R404.7.1 shall comply with all of the following:

1. A continuous raceway or cable assembly shall be installed between ~~an enclosure or outlet located within 6 feet (1828mm) of the *EV capable space* and~~ a suitable panelboard or other onsite electrical distribution equipment and an enclosure or outlet located within 6 feet (1828mm) of the *EV capable space*.
2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section R404.7.5.
3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a 2-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: "For future electric vehicle supply equipment (EVSE)."

R404.7.5 Electrical distribution system capacity.

The branch circuits and electrical distribution system serving *each EV capable space, EV ready space* and *EVSE space* used to comply with Section R404.7.1 shall comply with one of the following:

1. Sized for a calculated EV charging load of not less than 6.2 kVA per *EVSE, EV ready*, or *EV capable space*. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

2. The capacity of the electrical distribution system and each branch circuit serving multiple *EVSE spaces, EV ready spaces*, or *EV capable spaces* designed to be controlled by an energy management system in accordance with NFPA 70 shall be sized for a calculated EV charging load of not less than 2.1 kVA per space. Where an energy management system is used to control EV charging loads for the purposes of this section, it shall not be configured to turn off electrical power to *EVSE* or *EV ready spaces* used to comply with Section R404.7.1.

Delete without substitution:

~~R404.7.6 EVSE installation~~.

~~For one- and two-family dwellings and townhouses, EVSE shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 or UL 2594. For R-2 occupancies, EVSE shall be installed in accordance with NFPA 70 and Section R404.7.5.1 and shall be listed and labeled in accordance with UL 2202 and UL 2594.~~

Reason:

Any certification from a local electric distribution entity should be current, not from the past.

In R404.7.6:

- Should the reference to Section R404.7.5.1 be R404.7.5?
- Does R404.7.5 apply to one- and two-family dwellings and townhouses as well?

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

Removes duplicate language. Modification to remove section R404.7.6 as reference is covered in R404.7.4.

RE2D-21-23

IECC RE: R404.7.6

Proponents:

Daniel Carroll, representing Department of State (daniel.carroll@dos.ny.gov); Hendrik Shank, representing NYS Dept. of State (hendrikus.shank@dos.ny.gov)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R404.7.6 EVSE installation.

~~For one- and two-family dwellings and townhouses,~~ EVSE shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 or UL 2594. ~~For R-2 occupancies, EVSE shall be installed in accordance with NFPA 70 and Section R404.7.5.1 and shall be listed and labeled in accordance with UL 2202 and UL 2594.~~

Reason Statement:

The reference to Section R404.7.5.1 for R-2 occupancies is wrong. That section does not exist. I believe it was meant to be R404.7.6.1 which required a minimum charging rate and is proposed to be deleted. If Section R404.7.6.1 is deleted, then there is no need for the extra language in Section R404.7.6. There will be no difference in the requirements for one- and two-family dwellings and townhouses and the requirements for R-2 buildings.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial Change

RE2D-24-23

IECC RE: R405.2

Proponents:

Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R405.2 Simulated building performance compliance.

Compliance based on simulated building performance requires that a *building* comply with the following:

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total *building thermal envelope* thermal conductance TC shall be less than or equal to the *building thermal envelope* thermal conductance TC using the prescriptive U-factors and F-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, and 2, and 1.15 in Climate Zones 3 through 8 in accordance with Equation 4-2 and Section R402.1.5. The area-weighted maximum *fenestration* SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

$$\text{For Climate Zones 0-2: } \underline{\text{TC}}\sout{\text{UA}}_{\text{Proposed design}} \leq 1.08 \times \underline{\text{TC}}\sout{\text{UA}}_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } \underline{\text{TC}}\sout{\text{UA}}_{\text{Proposed design}} \leq 1.15 \times \underline{\text{TC}}\sout{\text{UA}}_{\text{Prescriptive reference design}}$$

3. For each *dwelling unit* with one or more fuel burning appliances for space heating, or water heating, or both, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 80 percent of the annual *energy cost* of the *standard reference design*. For all other *dwelling units*, the annual *energy cost* of the *proposed design* shall be less than or equal to 85 percent of the annual *energy cost* of the *standard reference design*. For each dwelling unit with greater than 5,000 square feet (465 m^2) of *living space* located above *grade plane*, the annual *energy cost* of the *dwelling unit* shall be reduced by an additional 5 percent of annual *energy cost* of the standard reference design. Energy prices shall be taken from an *approved* source , 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.

   Exceptions:

   1. The energy use 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 2.51. The source energy ~~multiplier for fuels other than electricity~~ multipliers shall be 1.09 for natural gas, 1.15 for propane, 1.19 for fuel oil, and 1.30 for imported liquified natural gas.

   2. The energy use based on site energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the energy cost.

Reason:

Based on the information provided in ASHRAE Standards 105, 189.1, and 240P, different fossil fuels have significantly different source energy factors.

This proposed change updates the language to be consistent with the estimates in other published standards.

Bibliography:

ASHRAE Standard 105-2021

ASHRAE Standard 189.1-2020 and addenda

ASHRAE 240P Advisory Public Review April 2023

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This only updates the estimated source energy factors and does not affect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

clarifying appropriate default factors for fuel types other than electricity.

RE2D-25-23

IECC RE: R405.3

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R405.3 Compliance documentation.

The following compliance reports, which document that the performance of the *proposed design* and the performance of the as-built *dwelling unit* comply ~~complies~~ with the requirements of Section R405, shall be submitted to the *code official*.

1. A compliance report, in accordance with Section R405.5.4.1, shall be submitted with the application for the *building* permit.

2. ~~Upon completion of the building, a confirmed~~ A compliance report, in accordance with Section R405.5.4.2~~, based on the confirmed condition of the *building*~~ shall be submitted ~~to the *code official*~~ before a certificate of occupancy is issued.

Reason:

This section was created in the last round. The first sentence speaks only to the proposed design; it does not include the other half of the compliance documentation.

The proposed change makes clear that compliance reports apply to both the proposed design and the as-built dwelling unit (or as-built building, if preferred).

The language is consistent with the language approved in RED1-249 for R405.3.2. (In the reconciliation between RED1-249 and RECD1-8, R405.3.2 was deleted.)

The changes made to (2) are not technical. But perhaps they can be considered with the other. They make (1) and (2) parallel and remove excess words. For example, "submitted to the code official" is in the first sentence.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

support editorial updates

RE2D-26-23

IECC RE: R405.4.2

Proponents:

Vladimir Kochkin, representing NAHB (vkochkin@nahb.org)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R405.4.2 Residence specifications.

The *standard reference design, proposed design, and as-built dwelling unit* shall be configured and analyzed as specified by Table R405.4.2(1). Table R405.4.2(1) shall include, by reference, all notes contained in Table R402.1.2. Proposed *U*-factors and slab-on-grade *F*-factors shall be taken from Appendix RF, ANSI/ASHRAE/IES Standard 90.1 Appendix A, or determined using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials.

Reason:

This modification adds IECC Appendix RF to the list of compliance options.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Clarification of intent.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

Support editorial modifications

RE2D-28-23

IECC RE: R405.5.2

Proponents:

Shane Hoeper, representing SEHPCAC

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R405.5.2 Testing required by software vendors.

Prior to approval, software tools shall be tested by the software vendor in accordance with ANSI/ASHRAE Standard 140 Class II, Tier 1 test procedures. During testing, hidden inputs that are not normally ~~accessible~~ available to the user shall be permitted to avoid introducing source code changes strictly used for testing. Software vendors shall publish, on a publicly available website, the following ANSI/ASHRAE Standard 140 test results, input files, and modeler reports for each tested version of a software tool:

1.	Test results demonstrating the software tool was tested in accordance with ANSI/ASHRAE Standard 140.
2.	The modeler report in ANSI/ASHRAE Standard 140, Annex A2, Attachment A2.7.

Reason Statement:

Because the term ‘accessible’ is most commonly understood as requiring access for persons with disabilities we are making the changes to delete the word accessible from the remaining codes and replace it with other words, defined terms or phrases that are not attributed to requiring access for the physically disabled. Many of the codes use the defined term ‘access (to)’ or ‘ready access (to)’ for access by maintenance and service personnel or fire departments. This proposal provides clarity and consistency in the remaining codes where those coordination modifications missed or came in as part of new code changes.

This a correlation piece for proposals over the last couple of cycles. This effort was started by the CACs in 2015/16 code change cycle, and continued in 2018/19. This proposal is to provide coordination with the action taken with -P84-15, M2-15, RB2-16, F12-16, CE137-16 Part 1, CE29-19 Part 1 and 2 . G1-21 Part 1 was disapproved; however Part 2 through 7 were approved

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial. Will not change the cost of construction.

RE2D-31-23

IECC RE: TABLE R407.1; IRCECC: TABLE N1107.1

Proponents:

Glen Clapper, representing National Roofing Contractors Association (gclapper@nrca.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R407.1 MINIMUM LOW SLOPE ROOF REFLECTANCE AND EMITTANCE OPTIONS[a]

Three-year-aged solar reflectance[b] of 0.55 and 3-year aged thermal emittance[c] of 0.75
Three-year-aged solar reflectance index[d] of 64

a.	The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal *emittance* shall be assigned both a 3-year-aged solar reflectance in accordance with Section C402.4.1 and a 3-year-aged thermal *emittance* of 0.90.
b.	Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.
c.	Aged thermal *emittance* tested in accordance with ASTM C1371 or ASTM E408 or CRRC-S100.
d.	Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h × ft^2 × °F (12 W/m^2 × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal *emittance*.

IRC Chapter 11 ENERGY R3

Revise as follows:

TABLE N1107.1 MINIMUM LOW SLOPE ROOF REFLECTANCE AND EMITTANCE OPTIONS[a]

a.	The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with Section C402.4.1 and a 3-year-aged thermal emittance of 0.90.
b.	Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.
c.	Aged thermal emittance tested in accordance with ASTM C1371 or ASTM E408 or CRRC-S100.
d.	Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h × ft^2 × °F (12 W/m^2 × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance.

Reason Statement:

This table and it's requirements were formerly referenced and now imported from Section C402.4 and Table C402.4, which specifically stated only applied to low slope roofs.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal will neither increase nor decrease the cost of construction.

RE2D-31-23

RE2D-32-23

IECC RE: R407.2; IRCECC: N1107.2

Proponents:

Glen Clapper, representing National Roofing Contractors Association (gclapper@nrca.net)

2024 International Energy Code [RE] [RE Project] R3

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.
2.	The *occupied* space is not heated.
3.	Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for *service water heating*.
4.	Glazing in *conditioned spaces* has a *solar heat gain coefficient* (SHGC) of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5.	Permanently installed lighting is in accordance with Section R404.
6.	The exterior low slope roof surface complies with one of the options in Table R407.1 or the roof or ceiling has insulation with an *R-value* of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7.	Roof surfaces have a slope of not less than $^1/_4$ unit vertical in 12 units horizontal (2-percent slope). The finished roof does not have water accumulation areas.
8.	Operable *fenestration* provides a *ventilation* area of not less than 14 percent of the floor area in each room. Alternatively, equivalent *ventilation* is provided by a *ventilation* fan.
9.	Bedrooms with *exterior walls* facing two different directions have operable *fenestration* on exterior walls facing two directions.
10.	Interior doors to bedrooms are capable of being secured in the open position.
11.	A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

IRC Chapter 11 ENERGY R3

Revise as follows:

N1107.2 Tropical climate region.

Compliance with this section requires the following:

1.	Not more than one-half of the occupied space is air conditioned.
2.	The occupied space is not heated.
3.	Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4.	Glazing in conditioned spaces has a solar heat gain coefficient (SHGC) of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5.	Permanently installed lighting is in accordance with Section N1104.
6.	The exterior low slope roof surface complies with one of the options in Table N1107.1 or the roof or ceiling has insulation with an *R*-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7.	Roof surfaces have a slope of not less than $^1/_4$ unit vertical in 12 units horizontal (2-percent slope). The finished roof does not have water accumulation areas.
8.	Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9.	Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10.	Interior doors to bedrooms are capable of being secured in the open position.
11.	A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

Reason Statement:

This proposal clarifies that the requirements contained in Table C407.1 (N1107.1) apply only to low slope roofs.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal will neither increase nor decrease the cost of construction.

RE2D-32-23

RE2D-33-23

IECC RE: TABLE R407.1

Proponents:

Greg Johnson, representing National Multifamily Housing Council (gjohnsonconsulting@gmail.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R407.1 MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS[a]
Portions of table not shown remain unchanged.

a.	The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal *emittance* shall be assigned both a 3-year-aged solar reflectance in accordance with Section R408.2.1.3.1 ~~C402.4.1~~ and a 3-year-aged thermal *emittance* of 0.90.
b.	Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.
c.	Aged thermal *emittance* tested in accordance with ASTM C1371 or ASTM E408 or CRRC-S100.
d.	Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h × ft^2 × °F (12 W/m^2 × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal *emittance*.

Reason Statement:

This comment replaces a reference to the IECC-C with an internal reference to the IECC-R. There is no technical change - R408.2.1.3.1 and Section C402.4.1 have identical formula and content.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

No technical change is made.

RE2D-37-23

IECC RE: TABLE R408.2, R408.2.1, R408.2.1.1, R408.2.1.4, R408.2.2, R408.2.3, R408.2.4, R408.2.5

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Portions of table not shown remain unchanged.

~~R408.2.3(6)~~R408.2.3(8) [c]	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)[c]	~~More efficient distribution system~~Ductless or hydronic thermal distribution	4	6	7	10	10	12	13	15	16
R408.2.4(2)[c]	100% of *duct systems* in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)[c]	≥80% of ductwork inside *conditioned space*	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.4(4)[c]	Reduced total duct system leakage	1	1	1	1	1	1	2	2	2
R408.2.5(2)[c]	≤2.0 ACH50 with ERV or HRV installed	1	4	5	10	10	13	TBD	TBD	TBD
R408.2.5(3)[c]	≤2.0 ACH50 with a *balanced ventilation system*	2	3	2	4	4	5	TBD	TBD	TBD
R408.2.5(4)[c]	≤1.5 ACH50 with ERV or HRV installed	2	4	6	12	12	15	TBD	TBD	TBD
R408.2.5(5)[c]	≤1.0 ACH50 with ERV or HRV installed	2	5	6	14	14	17	TBD	TBD	TBD

a. Where the measure is selected, each dwelling unit, sleeping unit, and common ~~areas~~ area where the measure is applicable must have the measure installed.

b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.

d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

~~SEER2: Seasonal Energy Efficiency Ratio, HSPF2: Heating Season Performance Factor, EER2: Energy Efficiency Ratio, COP: Coefficient of Performance~~

R408.2.1 Enhanced building thermal envelope options.

~~For the enhanced envelope credits, the~~ The *building thermal envelope* shall comply with one or more of the following:

1. Either Section R408.2.1.1 or R408.2.1.2. Credit shall only be permitted from one measure.
2. Section R408.2.1.3.
3. Section R408.2.1.4.

R408.2.1.1 Enhanced building thermal envelope performance.

The total *building thermal envelope* thermal conductance TC shall be calculated for the proposed *building* in accordance with Section R402.1.5 and ~~it~~ shall be reduced by not less than the percentage indicated in Table R408.2 in comparison to the reference *building*.

R408.2.1.4 Reduced air leakage.

~~For the reduced air leakage credit, the~~ The building shall have a measured air leakage rate no less than 2.0 ACH50 and no greater than 2.5 ACH50 or the dwelling units in the building shall have an average measured air leakage rate no greater than 0.24 cfm50/ft2.

R408.2.2 More efficient HVAC equipment performance ~~option~~options.

Heating and cooling *equipment* shall meet one of the following ~~efficiencies~~ measures as applicable for the *climate zone*, where multiple heating or cooling efficiencies are represented by Annual Fuel Utilization Efficiency (AFUE), Coefficient of Performance (COP), Energy Efficiency Ratio (EER and EER2), Heating Season Performance Factor (HSPF2), and Seasonal Energy Efficiency Ratio (SEER2). Where multiple heating and cooling systems are installed serving different zones, credits shall be earned based on the weighted average of square footage of the *zone* served by the system.

HVAC options applicable to all climate zones:

1. Ground source Heat Pump -Greater than or equal to 16.1 EER and 3.1 COP ground source heat pump.
2. Cooling (Option 1)-Greater than or equal to 15.2 SEER2 and 12.0 EER2 air conditioner.
3. Cooling (Option 2)-Greater than or equal to 16.0 SEER2 and 12.0 EER2 air conditioner.
4. Gas Furnace (Option 1)-Greater than or equal to 97 % AFUE *fuel gas* furnace.
5. Gas Furnace (Option 2)- Greater than or equal to 95% AFUE *fuel gas* furnace.

HVAC options applicable to climate zones 0, 1, 2, and 3:

6. Gas Furnace (Option 3)-Greater than or equal to 90% AFUE *fuel gas* furnace.

7. Gas Furnace and Cooling (Option 1)- Greater than or equal to 90% AFUE *fuel gas* furnace and 15.2 SEER2 and 10.0 EER2 air conditioner.

8. Gas Furnace and Cooling (Option 2) - Greater than or equal to 95% AFUE *fuel gas* furnace and 16.0 SEER2 and 10.0 EER2 air conditioner.

9. Gas Furnace and Heat Pump (Option 1) - Greater than or equal to 90% AFUE *fuel gas* furnace and 7.8 HSPF2, 15.2 SEER2 and 10.0 EER2 air source heat pump.

10. Heat Pump (Option 1)–Greater than or equal to 7.8 HSPF2, 15.2 SEER2, and 11.7 EER2 air source heat pump.

HVAC options applicable to climate zones 4, 5, 6, 7, and 8:

11. Gas Furnace and Cooling (Option 3)-Greater than or equal to 95% AFUE *fuel gas* furnace and 15.2 SEER2 and 12.0 EER2 air conditioner.

12. Gas Furnace and Cooling (Option 4)-Greater than or equal to 97% AFUE *fuel gas* furnace and 16.0 SEER2 and 12.0 EER2 air conditioner.

13. Gas Furnace and Heat Pump (Option 2)- Greater than or equal to 95% AFUE *fuel gas* furnace and 8.1 HSPF2 and 15.2 SEER2 air source heat pump capable of meeting a capacity ratio ≥ 70% of heating capacity at 5 °F versus rated heating capacity at 47 °F.

14. Heat Pump (Option 2)-Greater than or equal to 8.1 HSPF2 and 15.2 SEER2 air source heat pump capable of meeting a capacity ratio ≥ 70% of heating capacity at 5 °F versus rated heating capacity at 47 °F.

R408.2.3 Reduced energy use in service water-heating options.

For measure numbers R408.2.3 (1) through R408.2.3(7), the installed hot water system shall meet one of the Uniform Energy Factors (UEF) or Solar Uniform Energy Factors (SUEF) in Table R408.2.3. For measure number R408.2.3(8), ~~a compact~~ the hot water distribution system shall comply with R408.2.3.1.

R408.2.4 More efficient thermal distribution system ~~option~~options.

The thermal distribution system shall comply with one of the following :

1. The ductless thermal distribution system or hydronic thermal distribution system is located completely on the conditioned side of the *building thermal envelope*.

2. The *space conditioning* equipment is located inside conditioned space. In addition, 100 percent of the *ductwork* is located completely inside *conditioned space* as defined by item 1 and item 2 Section R403.3.4.

3. The *space conditioning equipment* is located inside *conditioned space* and no less than 80 percent of *ductwork* is located completely inside conditioned space as defined by item 1 and item 2 of Section R403.3.4. In addition, no more than 20 percent of *ductwork* iscontained within building assemblies separating unconditioned from *conditioned space* as defined by item 3 of Section R403.3.4.

4. Where *ductwork* is located outside *conditioned space*, the total leakage , of the *duct system* measured in accordance with R403.3.7 is one of the following:

4.1. Where the *space conditioning equipment* is installed at the time of testing, total leakage is not greater than 2.0 cubic feet per minute (0.94 L/s) per 100 square feet (9.29 m^2) of *conditioned floor area*.

4.2. Where the *space conditioning equipment* is not installed at the time of testing, total leakage is not greater than 1.75 cubic feet per minute (0.83 L/s) per 100 square feet (9.29 m^2) of *conditioned floor area*.

R408.2.5 Improved air sealing and efficient ventilation system ~~option~~options.

The measured air leakage rate and *ventilation* system shall meet one of the following:

1. Either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.
2. Less than or equal to 2.0 ACH50, with either an ERV or HRV installed.
3. Less than or equal to 2.0 ACH50, with a *balanced ventilation system* .
4. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.
5. Less than or equal to 1.0 ACH50, with either an ERV or HRV installed.

In addition, for measures requiring either an ERV or HRV, HRV and ERV Sensible Recovery Efficiency (SRE) shall be no less than 75 percent at 32°F (0°C), at the lowest *listed* net airflow. ERV Latent Recovery/Moisture Transfer (LRMT) shall be no less than 50 percent, at the lowest *listed* net airflow. In *Climate Zone* 8, recirculation shall not be used as a defrost strategy.

Reason:

The "technical" aspect of this proposal is the request for review of the inclusion of footnote "c" in certain rows of Table R408.2. Footnotes "a" through "d" were an excellent addition. However, they were approved en masse, with very little to no discussion regarding their application to individual rows. Footnote "c" may not apply to the nine rows listed above.

As to the stricken line, it is unclear why it is under the footnotes beneath Table R408.2. It is not labeled as a footnote and the abbreviations do not appear in the table. The abbreviations are used in R408.2.2 and R408.2.3. The few editorial changes can be processed quickly.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

Editorial change improves the section

RE2D-38-23

IECC RE: TABLE R408.2, R408.2.1.3, TABLE R408.2.1.3, R408.2.1.3.1

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Credit Value								
		Climate Zone 0 & 1	Climate Zone 2	Climate Zone 3	Climate Zone 4 except Marine	Climate Zone 4 Marine	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1 (1)	≥2.5% Reduction in total TC	0	0	0	1	1	1	1	1	1
R408.2.1.1 (2)	≥5% reduction in total TC	0	1	1	2	2	3	3	3	3
R408.2.1.1 (3)	>7.5% reduction in total TC	0	1	2	2	2	3	3	4	4
R408.2.1.1 (4)	>10% reduction in total TC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1 (5)	>15% reduction in total TC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1 (6)	>20% reduction in total TC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1 (7)	>30% reduction in total TC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

R408.2.1.2 (2)	U-factor and SHGC for vertical fenestration per Table R408.2.1	1	1	1	1	1	1	1	2	
R408.2.1.3	Roof reflectance (roof is part of the *building thermal envelope* and directly above cooled, conditioned space)	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.1.3 (1)	Roof solar reflectance index (roof is above an unconditioned space that contains a duct system)	~~TBD~~1	~~TBD~~0	TBD	TBD	TBD	0	0	0	0
R408.2.1.3 (2)	Roof solar reflectance index (roof is above an unconditioned space that contains a duct system)	1	1							
R408.2.1.4	Reduced air leakage	TBD	TBD	TBD	TBD	TBD	TBD	0	0	0
R408.2.2(1)[b]	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2) [b]	Cooling (Option 1)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)[b]	(Cooling Option 2)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4) [b]	Gas furnace (Option 1)	0	0	0	0	0	TBD	TBD	TBD	0

R408.2.2(5)[b]	Gas furnace (Option 2)	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
R408.2.2(6)[b]	Gas furnace (Option 3)	TBD	TBD	TBD	TBD	-	-	-	-	-
R408.2.2(7)[b]	Gas furnace and cooling (Option 1)	TBD	TBD	TBD	TBD	-	-	-	-	-
R408.2.2(8)[b]	Gas furnace and cooling (Option 2)	TBD	TBD	TBD	TBD	-	-	-	-	-
R408.2.2(9)[b]	Gas furnace and heat pump (Option 1)	TBD	TBD	TBD	TBD	-	-	-	-	-
R408.2.2(10)[b]	Heat pump (Option 1)	TBD	TBD	TBD	TBD	-	-	-	-	-
R408.2.2(11)[b]	Gas furnace and cooling (Option 3)	-	-	-	-	TBD	TBD	TBD	TBD	TBD
R408.2.2(12) [b]	Gas furnace and cooling (Option 4)	-	-	-	-	TBD	TBD	TBD	TBD	TBD
R408.2.2(13)[b]	Gas furnace and heat pump (Option 2)	-	-	-	-	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)[b]	Heat pump (Option 2)	TBD -	-	-	-	TBD	TBD	TBD	TBD	TBD
R408.2.3(1)[d]	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
R408.2.3(2)[d]	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(3)[d]	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(4)[d]	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(5)[d]	Solar hot water heating system	4	5	6	6	6	6	5	5	4

R408.2.3(6) [c]	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)[c]	More efficient distribution system	4	6	7	10	10	12	13	15	16
R408.2.4(2)[c]	100% of *duct systems* in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)[c]	≥80% of ductwork inside *conditioned space*	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.4(4)[c]	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	ERV or HRV installed	TBD	TBD	TBD	TBD	TBD	TBD	0	0	0
R408.2.5(2)[c]	≤2.0 ACH50 with ERV or HRV installed	1	4	5	10	10	13	TBD	TBD	TBD
R408.2.5(3)[c]	≤2.0 ACH50 with a *balanced ventilation system*	2	3	2	4	4	5	TBD	TBD	TBD
R408.2.5(4)[c]	≤1.5 ACH50 with ERV or HRV installed	2	4	6	12	12	15	TBD	TBD	TBD
R408.2.5(5)[c]	≤1.0 ACH50 with ERV or HRV installed	2	5	6	14	14	17	TBD	TBD	TBD
R408.2.6[a]	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	On-site renewable energy measures	17	16	17	11	11	9	8	7	4

R408.2.8	Off-site renewable energy measures	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.9[c]	Demand responsive thermostat	1	1	1	1	1	1	1	1	1
R408.2.11	Whole home lighting control	1	1	1	1	1	1	1	1	1
R408.2.12	Higher efficacy lighting	1	1	1	1	1	1	1	1	1

a. Where the measure is selected, each dwelling unit, sleeping unit, and common areas where the measure is applicable must have the measure installed.

b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.

d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

SEER2: Seasonal Energy Efficiency Ratio, HSPF2: Heating Season Performance Factor, EER2: Energy Efficiency Ratio, COP: Coefficient of Performance

R408.2.1.3 Roof solar reflectance index.

~~Roofs in Climate Zones 0-2~~4 and ~~4C~~ shall comply with one or more of the options in Table R408.2.1.3. ~~The following roofs and portions of roofs are excluded from the roof reflectance credit:~~Low slope roofs in Climate Zones 0-2 shall earn credit for Table R408.2 measure numbers R408.2.1.3(1) and R408.2.1.3(2) where the three-year aged solar reflectance index (SRI) is greater than or equal to 75. To earn credit, not less than 95 percent of the roof area shall comply. The combined area of the following portions of roof shall not be greater than 5 percent of the roof area:.

1.Portions ~~of the roof~~ that include or are covered by the following:

1.1. Photovoltaic systems or components.

1.2. Solar air or water-heating systems or components.

1.3. Vegetative roofs or landscaped roofs.

1.4. Above-roof decks or walkways.

1.5. Skylights.

1.6. HVAC systems and components, and other opaque objects mounted above the roof.

2. Portions ~~of the roof~~ shaded during the peak sun angle on the summer solstice by permanent features of the *building*, ~~or by~~ permanent features of adjacent buildings, or natural objects.

3. Portions ~~of roofs~~ that are ballasted with a minimum stone ballast of 17 pounds per square foot (74 kg/m^2) or 23 psf (117 kg/m^2) pavers.

4. ~~Roofs where not less than 75 percent of the roof area complies with one or more of the exceptions to this section.~~

The three-year aged SRI shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h x ft^2 x °F (12 W/m^2 x K). Calculation of aged SRI shall be based on three-year aged solar reflectance values tested in accordance with ASTM C1549, ASTM E903, ASTM E1918, or CRRC S100 and three-year aged thermal emittance values tested in accordance with ASTM C1371, ASTM E408, or CRRC S100

~~TABLE R408.2.1.3 MINIMUM ROOF REFLECTANCE[a]~~

~~ROOF SLOPE~~	~~THREE-YEAR-AGED SOLAR REFLECTANCE INDEX[b]~~
~~*Low slope*~~	~~75~~
~~*Steep slope*~~	~~16~~

~~a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for solar reflectance shall be assigned a 3-year-aged solar reflectance in accordance with Section R408.2.1.3.1.~~

~~b. Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h × ft^2 × °F (12 W/m^2 × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance tested in accordance with ASTM C1549, ASTM E903, ASTM E1918, or CRRC S100 and thermal emittance tested in accordance with ASTM C1371, ASTM E408, or CRRC S100.~~

R408.2.1.3.1 Aged solar reflectance.

Where ~~an~~a tested 3-year aged solar reflectance value is not available, ~~it~~ an assigned value shall be determined in accordance with Equation 4-4.

$$R_{aged} = [0.2+0.7(R_{initial}-0.2)]$$

(Equation 4-4) where:

R_{aged} = The aged solar reflectance

$R_{initial}$ = The initial solar reflectance determined in accordance with ASTM C1549, ASTM E903, ASTM E1918, or ~~with~~ CRRC S100

Reason:

This measure needs further development before it's ready for rollout.

For example, the measure needs to specify what percentage of roof area is required to meet the reflectance criteria, and that percentage must be in line with the points available.

The list of exclusions comes from the IECC-C where they exempt roofs from a **requirement**. That is very different from qualifying for a **credit**. R408.2.1.3(4) provides that a roof could qualify for credit with only 25% of the roof area available to meet the reflectance criteria.

The measure does not reference the two rows in Table R408.2.

Per PNNL analysis and RECD1-13-22, the measure will be applicable only to Climate Zones 0-2.

A modification will be submitted shortly, taking into account the results of PNNL's analysis (RECD1-13-22), in addressing these and other issues.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
more clearly reflects the point total based on more appropriate conditions.

RE2D-40-23

IECC RE: R408.2.11

Proponents:

Michael Jouaneh, representing Lutron Electronics Co., Inc. (mjouaneh@lutron.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R408.2.11 Whole home lighting control.

The dwelling unit shall have a ~~switch~~ *manual* control by the main entrance that turns off all the permanently installed interior lighting or have a lighting control system that has the capability to turn off all permanently installed interior lighting from remote locations.

Exceptions:

1.	Up to 5 percent of the total lighting power may remain uncontrolled.
2.	Spaces where lighting is controlled by a count-down timer or *occupant sensor control*.

Reason Statement:

This change provides some clarity as the term "switch" has a specific meaning in the NEC. The provision did not intend to require only a toggle switch but any manual control that can provide the functionality. It could be a toggle switch but more often it would be a keypad or button not a toggle switch. So manual control is the more appropriate word.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

editorial change.

RE2D-42-23

IECC RE: TABLE R408.2.3

Proponents:

Shilpa Surana, representing California Investor Owned Utilities (shilpasurana@2050partners.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2.3 Service water-heating efficiencies

Measure Number	Water Heater	Size and Draw Pattern	Type	Efficiency
R408.2.3(1)(a)	Gas-fired storage water heaters (option 1)	All storage volumes, all draw patterns	-	UEF≥ 0.81
R408.2.3(1)(b)	Gas-fired storage water heaters (option2)	~~<=55 gallons, Medium~~	-	~~UEF≥ 0.81~~
-	-	<=55 gallons, High	-	UEF≥ 0.86
-	-	>55 gallons, Medium or High	-	UEF≥ 0.86
-	-	Rated input capacity > 75,000 Btu/h	-	UEF≥ 0.86 or Et≥94%
R408.2.3(2)(a)	Gas-fired instantaneous water heater (option 1)	All storage volumes, Medium or High	-	UEF≥ 0.92
R408.2.3(2)(b)	Gas-fired instantaneous water heater (option 2)	All storage volumes, Medium or High	-	UEF≥ 0.95
R408.2.3 (3)(a)	Electric water heaters(option 1)	<u>All storage volumes,</u> Low, Medium, or High	Integrated HPWH	UEF ≥ 3.30
R408.2.3(3)(b)	Electric water heaters(option 2)	All storage volumes, Low, Medium, or High	Integrated HPWH	UEF ≥ 3.75
R408.2.3 (4)	Electric water heaters(option 3)	<u>All storage volumes,</u> Low, Medium, or High	Integrated HPWH, 120 Volt/15 Amp Circuit	UEF ≥ 2.20
R408.2.3(5)(a)	Electric water heaters(option 4)	<u>All storage volumes,</u> Low, Medium, or High	Split-system HPWH	UEF ≥ 2.20
R408.2.3(5)(b)	Electric water heaters(option 5)	<u>All storage volumes,</u> Low, Medium, or High	Split-system HPWH	UEF ≥ 3.75

R408.2.3(~~5~~6)	Electric water heaters (option 6)	Rated input capacity >12 kW	-	COP≥3.00
R408.2.3(~~6~~7)(a)	Solar water heaters(option 1)	All storage volumes, all draw patterns	Electric backup	SUEF ≥ 3.00
R408.2.3(~~6~~7)(b)	Solar water heaters(option 2)	All storage volumes, all draw patterns	Gas backup	SUEF ≥ 1.80

UEF = Uniform Energy Factor, E_t = Thermal Efficiency, COP = Coefficient of Performance

Reason:

This proposal deletes R408.2.3(1)(b) Option 2 as it is redundant to the measure (R408.2.3(1)(a) Option 1) above. It fixes a few formatting errors and introduces the language 'all storage volumes' before the draw patterns to ensure consistency with the options above.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal makes editorial clarifications only.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

proposal deletes R408.2.3(1)(b) Option 2 as it is redundant to the measure (R408.2.3(1)(a) Option 1) above. It fixes a few formatting errors and introduces the language 'all storage volumes' before the draw patterns to ensure consistency with the options above.

RE2D-43-23

IECC RE: R408.2.3.1

Proponents:

Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R408.2.3.1 Compact hot water distribution system option.

The pipe shall store not more than 16 ounces of water between the nearest source of heated water and the termination of the fixture supply pipe when calculated using section R408.2.3.1.1. Where the source of heated water is a circulation loop, the loop shall be primed with a *demand recirculation water system* that complies with R403.5.1.1.1. There shall be a dedicated return line for the loop that begins after the branch to the last fixture on the supply portion of the loop and runs back to the water heater.

Reason Statement:

In the last round, measures were added to R403.5.1.1.1 to modestly increase the energy efficiency of *demand recirculation water systems*. A demand recirculation system qualifying for R408 credit should be at least as efficient as one that does not qualify for that credit.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

RE2D-44-23

IECC RE: R408.2.6, TABLE R408.2.6

Proponents: Alisa McMahon, representing self (mcmahon.gbac@cox.net)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R408.2.6 Energy efficient appliances. ~~appliances~~ Each appliance of a type listed in Table R408.2.6 installed in a *residential building* shall comply with the efficiency requirements specified in ~~Table R408.2.6~~ that table. ~~Not less than three~~ Each appliance ~~types from~~specified in Table R408.2.6 shall be installed. A clothes washer shall be installed at each location plumbed for a clothes washer.

Exception : In dwelling units of Group R-2 occupancies, where a dishwasher is not installed in each unit ~~*dwelling unit*~~, not less than two appliance types complying with Table R408.2.6 shall be installed. ~~In common areas, each appliance type shall comply with Table R408.2.6.~~

TABLE R408.2.6
MINIMUM EFFICIENCY REQUIREMENTS: APPLIANCES

APPLIANCE TYPES	EFFICIENCY IMPROVEMENT	TEST PROCEDURE
Refrigerator	Maximum Annual Energy Consumption (AEC)~~,~~ ~~No~~ no greater than 620 kWh/yr	10 CFR 430, Subpart B, Appendix A
Dishwasher	Maximum Annual Energy Consumption (AEC)~~,~~ ~~No~~ no greater than 240 kWh/yr	10 CFR 430, Subpart B, Appendix C1
Clothes washer	Clothes washer located within *dwelling units*: Maximum Annual Energy Consumption (AEC)~~, No~~ no greater than 130 kWh/yr,and Integrated Modified Energy Factor (IMEF) > 1.84 cu.ft/kWh/cycle Clothes washer not located within dwelling units and where *dwelling units* are not provided with ~~laundry facilities~~ rough-in plumbing for washers: Modified Energy Factor (MEF)>2.0 cu.ft/kWh/cycle	10 CFR 430 Subpart B, Appendix J2 and 10 CFR 430, Subpart B, Appendices D1 and D2

Reason: A new version of R408.2.6 was approved in the last round. Like many new code sections, it has some loopholes. This proposal closes those loopholes.

A modification will be submitted shortly, taking into account the results of PNNL's analysis (RECD1-13-22). This reason statement covers the revisions submitted herein.

Compact Appliances Loophole

R408.2.6 criteria are based on standard-size appliances. The annual energy use of compact appliances is much lower. Compact appliances are not chosen to save energy. Rather, they are used when there is limited space and/or no need for standard-size appliances. Allowing compacts to qualify for R408 credit would not incentivize lower energy use; it would provide freebie credit for smaller appliances that will be used in those locations regardless. Therefore, compacts should not qualify for R408 credit.

All Appliances Must Comply To Earn Credit

Many larger homes have multiple appliances of one or more types. R408.2.6 does not require that all appliances in each type comply, nor does it exclude compacts. So, for example, a compact refrigerator in a wet bar can qualify a home for R408 credit even when the energy consumption of the standard-size refrigerator in the kitchen exceeds the maximum allowed!

Table R408.2 footnote "a" does not protect against this situation. It requires the measure (in this case, a qualifying appliance) to be installed in each location listed. However, it does not require that all appliances in each location comply. So, for example, the footnote does not prevent the installation of just one qualifying washer in a common area laundry room with ten washers.

Clothes Washers Located Outside Dwelling Units

"Where dwelling units are not provided with laundry facilities" in Table R408.2.6 is commonly interpreted as 'where dwelling units are not provided with a common area laundry room.' That is not what the proponents intended. The proposed change conveys the proponents' intent.

Reference: IRC definition of "rough-in."

Prevent Future Installation of Less-Efficient Clothes Washers at Plumbed Locations

In some buildings, some (typically the larger) dwelling units are plumbed for washers and common area laundry facilities are provided. In this situation, footnote "a" to Table R408.2 provides that washers must be installed in both the plumbed dwelling units and the common area(s). But that should be stated explicitly in this section. The idea is to avoid future (e.g., post-COO) installation of less efficient appliances in plumbed dwelling units.

Exception 2 Loophole

An early version of RED1-360 included a footnote that made clear that all washers in a common area must comply. That footnote was deleted. Footnote "a" to Table R408.2 does not ensure this. Thus, Exception 2 could be interpreted that compliance is achieved by a single appliance of each appliance type.

All the loopholes described above are closed by the proposed changes.

Clarifications

The term "appliance types" is used three times. Its meaning is clarified by changing the left column heading to "appliance types."

"Not less than three appliance types . . ." is a remnant from PCD#1 when the Table contained four appliance types. Since there are now only three, to avoid confusion, that phrase has been replaced by "all."

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

Editorial improvements

RE2D-46-23

IECC RE: R503.1.1.3

Proponents:

Amy Martino, representing Building Site Synergy (amartino@buildingsitesynergy.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R503.1.1.3 Above-grade wall alterations.

Above-grade wall alterations shall comply with the following as applicable:

1. Where wall cavities are exposed, ~~and~~ the exposed cavities shall be filled with insulation complying with Section R303.1.4. New cavities created shall be insulated in accordance with Section R402.1 or an *approved* design that minimizes deviation from Section R402.1. An interior vapor retarder shall be provided where required in accordance with Section R702.7 of the *International Residential Code* or Section 1404.3 of the *International Building Code,* as applicable.
2. Where *exterior wall* coverings and *fenestration* are added or replaced for the full extent of any exterior ~~,~~ facade of one or more elevations of the *building*, continuous insulation shall be provided where required in accordance with Section R402.1 or the wall insulation shall be in accordance with an *approved* design~~;~~ that minimizes deviation from Section R402.1; Where specified, the continuous insulation requirement also shall comply with Section R702.7 of the *International Residential Code*. Replacement exterior wall coverings shall comply with the water resistance requirements of Section R703.1.1 of the *International Residential Code* or Section 1402.2 of the *International Building Code*, as applicable, *and manufacturers' instructions.*
3. Where new interior finishes or *exterior wall* coverings are applied to the full extent of any exterior wall assembly of mass construction, insulation shall be provided in accordance with Section R402.1 or an approved design that minimizes deviation from Section R402.1.

Reason:

Every climate zone offers a cavity only alternative. By specifying "continuous" insulation it is confusing and more restrictive than new construction. With existing construction there are many instances that make adding continuous insulation difficult to install without affecting the existing construction not part of the alteration (ex. Existing decks & attachment to the structure, changes in materials such as water tables, porch roofs, flush roof rakes, etc.) which may create a moisture intrusion and flashing problem. If an *approved* design is permitted, specifying "continuous" insulation is not required. "Full extent" is poor code language and should be better quantified. Lastly, in anticipation that local jurisdictions may make amendments, it is likely alternatives which allow cavity only insulation may be adopted.

Bibliography:

none

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial for clarification and consistency.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

Add “as applicable” after “following” at the beginning of the section, remove “and” from the 1st sentence of item #1, and keep “continuous” in section #2

RE2D-59-23

IECC RE: TABLE R408.2, TABLE R408.2.3

Proponents: Robert Salcido, representing PNNL

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	**Measure Description**	**Credit Value**								
		Climate Zone 0 & 1	**Climate Zone 2**	**Climate Zone 3**	**Climate Zone 4 except Marine**	**Climate Zone 4 Marine**	**Climate Zone 5**	**Climate Zone 6**	**Climate Zone 7**	**Climate Zone 8**
R408.2.1.1(1)	≥2.5% Reduction in total TC	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total TC	0	1	1	2	1	2	2	2	2
R408.2.1.1(3)	>7.5% reduction in total TC	0	1	2	2	2	2	3	3	3
R408.2.1.1(4)	>10% reduction in total TC	1	1	2	3	3	4	4	5	5
R408.2.1.1(5)	>15% reduction in total TC	1	2	2	4	4	5	6	7	8
R408.2.1.1(6)	>20% reduction in total TC	2	4	4	5	6	7	8	9	11

R408.2.1.1(7)	>30% reduction in total TC	3	6	6	8	8	11	12	13	16
R408.2.1.2(~~2~~1)	U-factor and SHGC for vertical fenestration per Table R408.2.1	1	1	1	2	1	1	1	1	
R408.2.1.3(1)	Roof reflectance (roof is part of the *building thermal envelope* and directly above cooled, conditioned space)	1	~~1~~0	0	0	0	0	0	0	0
R408.2.1.3(2)	Roof reflectance (roof is above an unconditioned space that contains a duct system)	1	1	0	0	0	0	0	0	0
R408.2.1.4	Reduced air leakage	1	1	1	2	1	3	NA	NA	NA
R408.2.2(1)[b]	Ground source heat pump	4	8	12	19	14	25	32	35	46
R408.2.2(2) [b]	High Performance Cooling (Option 1)	5	4	3	2	1	1	1	1	1
R408.2.2(3)[b]	High Performance Cooling (Option 2)	6	4	3	2	1	1	1	1	1
R408.2.2(4)[b]	High Performance	~~NA~~0	~~NA~~1	~~NA~~2	~~NA~~5	~~NA~~3	6	7	7	~~NA~~9

	Gas furnace (Option 1)									
R408.2.2(5)[b]	High Performance Gas furnace (Option 2)	0	1	2	4	3	~~NA~~5	~~NA~~6	~~NA~~7	8
R408.2.2(6)[b]	High Performance Gas furnace (Option 3)	0	1	1	~~3~~NA	NA	NA	NA	NA	NA
R408.2.2(7)[b]	High Performance Gas furnace and cooling (Option 1)	5	5	4	~~5~~NA	NA	NA	NA	NA	NA
R408.2.2(8)[b]	High Performance Gas furnace and cooling (Option 2)	6	5	5	~~6~~NA	NA	NA	NA	NA	NA
R408.2.2(9)[b]	High Performance Gas furnace and heat pump (Option 1)	~~13~~15	~~12~~13	~~9~~11	~~7~~NA	NA	NA	NA	NA	NA
R408.2.2(10)[b]	HIgh Performance Heat pump with electric resistance backup (Option 1)	13	12	11	~~12~~NA	NA	NA	NA	NA	NA
R408.2.2(11)[b]	High Performance Gas furnace and cooling (Option 3)	NA	NA	NA	~~NA~~5	4	6	7	7	9
R408.2.2(12)[b]	High Performance Gas furnace	NA	NA	NA	~~NA~~6	5	7	8	8	10

	and cooling (Option 4)									
R408.2.2(13)[b]	High Performance Gas furnace and heat pump (Option 2)	NA	NA	NA	~~NA~~1 2	8	~~0~~11	~~-1~~11	~~-3~~12	~~-7~~12
R408.2.2(14)[b]	High Performance Heat pump with electric resistance backup (Option 2)	NA	NA	NA	~~NA~~1 2	8	12	13	14	16
R408.2.3(1)(a)[d]	Gas-fired storage water heaters(option 1)	8	7	7	5	6	4	4	3	2
R408.2.3(1)(b)[d]	Gas-fired storage water heaters ~~Fired Storage Water Heater~~(option 2)	9	8	8	6	7	5	4	4	3
R408.2.3(2)(a)[d]	Gas-fired instantaneous water heaters (option 1)	10	9	9	6	7	5	5	4	3
R408.2.3(2)(b)[d]	Gas-fired instantaneous water heaters (option 2)	11	10	9	6	7	6	5	4	3
R408.2.3(3)~~(a)~~[d]	Electric water heaters (option 1)	~~12~~10	~~11~~9	~~11~~9	~~8~~7	~~8~~6	~~5~~4	~~4~~3	~~4~~3	~~3~~2
~~R408.2.3(3)(b)[d]~~	~~Electric water heaters (option 2)~~	~~12~~	~~11~~	~~11~~	~~8~~	~~8~~	~~5~~	~~4~~	4	~~3~~

R408.2.3(4)[d]	Electric water heaters (option ~~3~~2)	~~11~~8	~~11~~8	~~11~~8	~~8~~6	~~8~~5	~~5~~4	~~4~~3	~~4~~3	~~3~~2
R408.2.3(5)(a)[d]	Electric water heaters (option 43)	~~8~~7	~~10~~8	~~11~~8	~~8~~6	~~11~~7	~~7~~5	~~5~~4	~~5~~3	
R408.2.3(5)(b)[d]	Electric water heaters (option ~~5~~4)	~~9~~8	~~11~~9	~~12~~10	~~8~~7	~~11~~8	~~7~~5	~~6~~5	~~5~~4	43
R408.2.3(~~5~~6)[d]	Electric water heaters (option ~~6~~5)	~~12~~10	~~11~~9	~~11~~9	~~8~~7	~~8~~6	~~5~~4	~~4~~3	~~4~~3	~~3~~2
R408.2.3(~~6~~7)(a)[d]	Solar hot water heating system (option 1)	13	13	13	9	8	5	4	4	3
R408.2.3(~~6~~7)(b)[d]	Solar hot water heating system (option 2)	10	9	9	6	7	6	5	4	3
~~R408.2.3.1~~[e] R408.2.3(8)[c]	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)[c]	More efficient distribution system	3	4	5	7	8	10	10	10	14
R408.2.4(2)[c]	100% of *duct systems* in conditioned space	2	3	4	6	7	9	9	9	13
R408.2.4(3)[c]	≥80% of ductwork inside *conditioned space*	2	3	3	5	6	7	7	7	9
R408.2.4(4)[c]	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)[c]	ERV or HRV installed	0	0	0	0	1	3	2	2	2

R408.2.5(2)[c]	≤2.0 ACH50 with ERV or HRV installed	0	0	0	4	4	8	5	5	5
R408.2.5(3)[c]	≤2.0 ACH50 with a *balanced ventilation system*	0	0	0	0	0	0	4	4	4
R408.2.5(4)[c]	≤1.5 ACH50 with ERV or HRV installed	0	0	0	6	5	10	9	9	9
R408.2.5(5)[c]	≤1.0 ACH50 with ERV or HRV installed	0	0	1	7	6	12	12	12	12
R408.2.6[a]	Energy efficient appliances	1	1	1	1	1	1	0	0	0
R408.2.7	On-site renewable energy measures	17	16	17	11	~~9~~11	~~8~~9	~~7~~8	~~4~~7	
~~R408.2.8~~	~~Off-site renewable energy measures~~	~~71~~	~~65~~	~~62~~	~~55~~	~~46~~	~~41~~	~~43~~	~~41~~	~~39~~38
~~R408.2.8b~~	~~Off-site renewable energy measure~~	~~1~~0	~~1~~0	~~1~~0	~~1~~0	~~1~~0	~~1~~0	~~1~~0	~~1~~0	~~1~~0
R408.2.~~9~~8[c]	Demand responsive thermostat	1	1	1	1	1	1	1	1	1
R408.2.~~11~~10	Whole home lighting control	~~0~~1	~~0~~1	~~0~~1	0	0	0	0	0	0
R408.2.~~12~~11	Higher efficacy lighting	0	0	0	0	0	0	0	0	0

a. Where the measure is selected, each dwelling unit, sleeping unit, and common areas where the measure is applicable must have the measure installed.

b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.

d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

SEER2: Seasonal Energy Efficiency Ratio, HSPF2: Heating Season Performance Factor, EER2: Energy Efficiency Ratio, COP: Coefficient of Performance

TABLE R408.2.3 Service water-heating efficiencies

Measure Number	Water Heater	Size and Draw Pattern	Type	Efficiency
R408.2.3(1)(a)	Gas-fired storage water heaters (option 1)	All storage volumes, all draw patterns	UEF ≥0.81	
R408.2.3(1)(b)	Gas-fired storage water heaters (option 2)	~~≤ 55 gallons, Medium~~	~~UEF ≥0.81~~	
		≤ 55 gallons, High	UEF ≥0.86	
		>55 gallons, Medium or High	UEF ≥0.86	
Rated input capacity > 75,000 Btu/h	UEF ≥0.86 or E_t ≥94%			
R408.2.3(2)(a)	Gas-fired instantaneous water heaters (option 1)	All storage volumes, Medium or High	UEF ≥ 0.92	
R408.2.3(2)(b)	Gas-fired instantaneous water heaters (option 2)	All storage volumes, Medium or High	UEF ≥0.95	
R408.2.3(3)~~(a)~~	Electric water heaters(option 1)	All storage volumes, Low, Medium, or High	Integrated HPWH	UEF ≥ 3.30
~~R408.2.3(3)(b)~~	~~Electric water heaters(option 2)~~	~~Low, Medium, or High~~	~~Integrated HPWH~~	~~UEF ≥ 3.75~~
R408.2.3 (4)	Electric water heaters(option ~~3~~2)	<u>All storage volumes,</u> Low, Medium, or High	Integrated HPWH, 120 Volt/15 Amp Circuit	UEF ≥ 2.20
R408.2.3(5)(a)	Electric water heaters(option ~~4~~3)	<u>All storage volumes,</u>Low, Medium, or High	Split-system HPWH	UEF ≥ 2.20
R408.2.3(5)(b)	Electric water heaters(option ~~5~~4)	<u>All storage volumes,</u>Low, Medium, or High	Split-system HPWH	UEF ≥ 3.75

R408.2.3(~~5~~6)	Electric water heaters (option ~~6~~5)	Rated input capacity >12 kW	COP≥3.00	
R408.2.3(~~6~~7)(a)	Solar water heaters(option 1)	All storage volumes, all draw patterns	Electric backup	SUEF ≥ 3.00
R408.2.3(~~6~~7)(b)	Solar water heaters(option 2)	All storage volumes, all draw patterns	Gas backup	SUEF ≥ 1.80

UEF = Uniform Energy Factor, E_t = Thermal Efficiency, COP = Coefficient of Performance

Reason:

See PNNL methodology posted in 6.29.23 IECC R Agenda

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

See PNNL methodology posted in 6.29.23 IECC R Agenda

Workgroup Recommendation
Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
Committee supported the 'modified' PNNL proposal which initially included a few corrections to the table of points, but through the MOD was further revised in some measures to reflect updates to the simulations, as well as a few editorial revisions to align with Committee action on AHRI's RED1-351-22 proposal.

RE2D-66-23

IECC RE: TABLE R408.2 (New), R408.2.2.1 (New)

Proponents:

Vladimir Kochkin, representing NAHB (vkochkin@nahb.org)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Credit Value								
		Climate Zone 0 & 1	Climate Zone 2	Climate Zone 3	Climate Zone 4 except Marine	Climate Zone 4 Marine	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total TC	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total TC	0	1	1	2	1	2	2	2	2
R408.2.1.1(3)	>7.5% reduction in total TC	0	1	2	2	2	2	3	3	3
R408.2.1.1(4)	>10% reduction in total TC	1	1	2	3	3	4	4	5	5
R408.2.1.1(5)	>15% reduction in total TC	1	2	2	4	4	5	6	7	8
R408.2.1.1(6)	>20% reduction in total TC	2	4	4	5	6	7	8	9	11
R408.2.1.1(7)	>30% reduction in total TC	3	6	6	8	8	11	12	13	16
R408.2.1.2(2)	U-factor and SHGC for vertical fenestration per Table R408.2.1	1	1	1	2	1	1	1	1	

R408.2.1.3	Roof reflectance (roof is part of the *building thermal envelope* and directly above cooled, conditioned space)	1	1	0	0	0	0	0	0	0
R408.2.1.3	Roof reflectance (roof is above an unconditioned space that contains a duct system)	1	1	0	0	0	0	0	0	0
R408.2.1.4	Reduced air leakage	1	1	1	2	1	3	NA	NA	NA
R408.2.2(1)[b]	Ground source heat pump	4	8	12	19	14	25	32	35	46
R408.2.2(2)[b]	High Performance Cooling (Option 1)	5	4	3	2	1	1	1	1	1
R408.2.2(3)[b]	High Performance Cooling (Option 2)	6	4	3	2	1	1	1	1	1
R408.2.2(4)[b]	High Performance Gas furnace (Option 1)	NA	NA	NA	NA	NA	6	7	7	NA
R408.2.2(5)[b]	High Performance Gas furnace (Option 2)	0	1	2	4	3	NA	NA	NA	8
R408.2.2(6)[b]	High Performance Gas furnace (Option 3)	0	1	1	3	NA	NA	NA	NA	NA
R408.2.2(7)[b]	High Performance Gas furnace and cooling (Option 1)	5	5	4	5	NA	NA	NA	NA	NA
R408.2.2(8)[b]	High Performance	6	5	5	6	NA	NA	NA	NA	NA

	Gas furnace and cooling (Option 2)									
R408.2.2(9)[b]	High Performance Gas furnace and heat pump (Option 1)	~~13~~15	~~12~~13	~~9~~11	~~7~~NA[e]	NA	NA	NA	NA	NA
R408.2.2(10)[b]	HIgh Performance Heat pump with electric resistance backup (Option 1)	13	12	11	~~12~~NA	NA	NA	NA	NA	NA
R408.2.2(11)[b]	High Performance Gas furnace and cooling (Option 3)	NA	NA	NA	NA	4	6	7	7	9
R408.2.2(12) [b]	High Performance Gas furnace and cooling (Option 4)	NA	NA	NA	NA	5	7	8	8	10
R408.2.2(13)[b]	High Performance Gas furnace and heat pump (Option 2)	NA	NA	NA	NA	8	0	-1	-3	-7
R408.2.2(14)[b]	High Performance Heat pump with electric resistance backup (Option 2)	NA	NA	NA	NA	8	12	13	14	16
R408.2.3(1)(a)[d]	Gas-fired storage water heaters(option 1)	8	7	7	5	6	4	4	3	2
R408.2.3(1)(b)[d]	Gas Fired Storage Water Heater(option 2)	9	8	8	6	7	5	4	4	3

R408.2.3(2)(a)[d]	Gas-fired instantaneous water heaters (option 1)	10	9	9	6	7	5	5	4	3
R408.2.3(2)(b)[d]	Gas-fired instantaneous water heaters (option 2)	11	10	9	6	7	6	5	4	3
R408.2.3(3)(a)[d]	Electric water heaters (option 1)	12	11	11	8	8	5	4	4	3
R408.2.3(3)(b)[d]	Electric water heaters (option 2)	12	11	11	8	8	5	4	4	3
R408.2.3(4)[d]	Electric water heaters (option 3)	11	11	11	8	8	5	4	4	3
R408.2.3(5)(a)[d]	Electric water heaters (option 4)	8	10	11	8	11	7	5	5	
R408.2.3(5)(b)[d]	Electric water heaters (option 5)	9	11	12	8	11	7	6	5	4
R408.2.3(5)[d]	Electric water heaters (option 6)	12	11	11	8	8	5	4	4	3
R408.2.3(6)(a)[d]	Solar hot water heating system (option 1)	13	13	13	9	8	5	4	4	3
R408.2.3(6)(b)[d]	Solar hot water heating system (option 2)	10	9	9	6	7	6	5	4	3
R408.2.3.1[c]	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)[c]	More efficient distribution system	3	4	5	7	8	10	10	10	14
R408.2.4(2)[c]	100% of *duct systems* in conditioned space	2	3	4	6	7	9	9	9	13

R408.2.4(3)[c]	≥80% of ductwork inside *conditioned space*	2	3	3	5	6	7	7	7	9
R408.2.4(4)[c]	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	ERV or HRV installed	0	0	0	0	1	3	2	2	2
R408.2.5(2)[c]	≤2.0 ACH50 with ERV or HRV installed	0	0	0	4	4	8	5	5	5
R408.2.5(3)[c]	≤2.0 ACH50 with a *balanced ventilation system*	0	0	0	0	0	0	4	4	4
R408.2.5(4)[c]	≤1.5 ACH50 with ERV or HRV installed	0	0	0	6	5	10	9	9	9
R408.2.5(5)[c]	≤1.0 ACH50 with ERV or HRV installed	0	0	1	7	6	12	12	12	12
R408.2.6[a]	Energy efficient appliances	1	1	1	1	1	1	0	0	0
R408.2.7	On-site renewable energy measures	17	16		11	11	9	8	7	4
R408.2.8	Off-site renewable energy measures	71	65	62	55	46	41	43	41	39
R408.2.8b	Off-site renewable energy measure	1	1	1	1	1	1	1	1	1
R408.2.9[c]	Demand responsive thermostat	1	1	1	1	1	1	1	1	1
R408.2.11	Whole home lighting control	0	0	0	0	0	0	0	0	0
R408.2.12	Higher efficacy lighting	0	0	0	0	0	0	0	0	

a. Where the measure is selected, each dwelling unit, sleeping unit, and common areas where the measure is applicable must have the measure installed.

b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.

d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

e. 11 credits are available for climate zone 4 where the following measure is used: Gas Furnace and Heat Pump (Option 3): greater than or equal to 95% AFUE fuel gas furnace and 7.8 HSPF2, 15.2 SEER2 and 10.0 EER2 air source heat pump.
SEER2: Seasonal Energy Efficiency Ratio, HSPF2: Heating Season Performance Factor, EER2: Energy Efficiency Ratio, COP: Coefficient of Performance

Add new text as follows:

R408.2.2.1 More efficient HVAC equipment for Climate Zone 4.

For Climate Zone 4, the following HVAC options shall also apply:

1. Gas Furnace and Heat Pump (Option 3) - Greater than or equal to 95% AFUE fuel gas furnace and 7.8 HSPF2, 15.2 SEER2 and 10.0 EER2 air source heat pump
2. Heat Pump (Option 1)–Greater than or equal to 7.8 HSPF2, 15.2 SEER2, and 11.7 EER2 air source heat pump.

Reason:

At the last consensus committee there was substantial support for expanding equipment compliance options in R408. This proposal replaces N/A for several equipment options with credit values from the PNNL analysis. In addition, N/A in some cases appear to indicate that zero credit is allowed if a more efficient practice used than a similar practice with a credit (e.g., 5 credits for a 90 AFUE furnace and 0 credits for a 95 AFUE for climate zone 4). If the committee does not want to give additional credit as will be for a 97 AFUE compared to a 90 AFUE, then the credit should be listed as 5 for 97 AFUE (not zero). Some N/A are left as such intentionally (e.g., a cold climate heat pump in a warm climates).

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This proposal adds compliance options.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

This change expands high-performance heating and cooling compliance options for CZ 4.

RE2D-67-23

IECC RE: TABLE R408.2 (New)

Proponents:

Gayathri Vijayakumar, representing Steven Winter Associates (gayathri@swinter.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Credit Value								
		Climate Zone 0 & 1	Climate Zone 2	Climate Zone 3	Climate Zone 4 except Marine	Climate Zone 4 Marine	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total TC	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total TC	0	1	1	2	1	2	2	2	2
R408.2.1.1(3)	>7.5% reduction in total TC	0	1	2	2	2	2	3	3	3
R408.2.1.1(4)	>10% reduction in total TC	1	1	2	3	3	4	4	5	5
R408.2.1.1(5)	>15% reduction in total TC	1	2	2	4	4	5	6	7	8
R408.2.1.1(6)	>20% reduction in total TC	2	4	4	5	6	7	8	9	11
R408.2.1.1(7)	>30% reduction in total TC	3	6	6	8	8	11	12	13	16
R408.2.1.2(2)	U-factor and SHGC for vertical fenestration per Table R408.2.1	1	1	1	2	1	1	1	1	

R408.2.1.3	Roof reflectance (roof is part of the *building thermal envelope* and directly above cooled, conditioned space)	1	1	0	0	0	0	0	0	0
R408.2.1.3	Roof reflectance (roof is above an unconditioned space that contains a duct system)	1	1	0	0	0	0	0	0	0
R408.2.1.4	Reduced air leakage	1	1	1	2	1	3	NA	NA	NA
R408.2.2(1)[b]	Ground source heat pump	~~4~~14	~~8~~14	~~12~~14	~~19~~15	~~14~~10	~~25~~15	~~32~~17	~~35~~18	~~46~~21
R408.2.2(2)[b]	High Performance Cooling (Option 1)	5	4	3	2	1	1	1	1	1
R408.2.2(3)[b]	High Performance Cooling (Option 2)	6	4	3	2	1	1	1	1	1
R408.2.2(4)[b]	High Performance Gas furnace (Option 1)	NA	NA	NA	NA	NA	6	7	7	NA
R408.2.2(5)[b]	High Performance Gas furnace (Option 2)	0	1	2	4	3	NA	NA	NA	8
R408.2.2(6)[b]	High Performance Gas furnace (Option 3)	0	1	1	3	NA	NA	NA	NA	NA
R408.2.2(7)[b]	High Performance Gas furnace and cooling (Option 1)	5	5	4	5	NA	NA	NA	NA	NA
R408.2.2(8)[b]	High Performance	6	5	5	6	NA	NA	NA	NA	NA

	Gas furnace and cooling (Option 2)									
R408.2.2(9)[b]	High Performance Gas furnace and heat pump (Option 1)	13	12	9	7	NA	NA	NA	NA	NA
R408.2.2(10)[b]	HIgh Performance Heat pump with electric resistance backup (Option 1)	13	12	11	12	NA	NA	NA	NA	NA
R408.2.2(11)[b]	High Performance Gas furnace and cooling (Option 3)	NA	NA	NA	NA	4	6	7	7	9
R408.2.2(12) [b]	High Performance Gas furnace and cooling (Option 4)	NA	NA	NA	NA	5	7	8	8	10
R408.2.2(13)[b]	High Performance Gas furnace and heat pump (Option 2)	NA	NA	NA	NA	8	0	-1	-3	-7
R408.2.2(14)[b]	High Performance Heat pump with electric resistance backup (Option 2)	NA	NA	NA	NA	8	12	13	14	16
R408.2.3(1)(a)[d]	Gas-fired storage water heaters(option 1)	8	7	7	5	6	4	4	3	2
R408.2.3(1)(b)[d]	Gas Fired Storage Water Heater(option 2)	9	8	8	6	7	5	4	4	3

R408.2.3(2)(a)[d]	Gas-fired instantaneous water heaters (option 1)	10	9	9	6	7	5	5	4	3
R408.2.3(2)(b)[d]	Gas-fired instantaneous water heaters (option 2)	11	10	9	6	7	6	5	4	3
R408.2.3(3)(a)[d]	Electric water heaters (option 1)	12	11	11	8	8	5	4	4	3
R408.2.3(3)(b)[d]	Electric water heaters (option 2)	12	11	11	8	8	5	4	4	3
R408.2.3(4)[d]	Electric water heaters (option 3)	11	11	11	8	8	5	4	4	3
R408.2.3(5)(a)[d]	Electric water heaters (option 4)	8	10	11	8	11	7	5	5	
R408.2.3(5)(b)[d]	Electric water heaters (option 5)	9	11	12	8	11	7	6	5	4
R408.2.3(5)[d]	Electric water heaters (option 6)	12	11	11	8	8	5	4	4	3
R408.2.3(6)(a)[d]	Solar hot water heating system (option 1)	13	13	13	9	8	5	4	4	3
R408.2.3(6)(b)[d]	Solar hot water heating system (option 2)	10	9	9	6	7	6	5	4	3
R408.2.3.1[c]	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)[c]	More efficient distribution system	3	4	5	7	8	10	10	10	14
R408.2.4(2)[c]	100% of *duct systems* in conditioned space	2	3	4	6	7	9	9	~~9~~9	13

R408.2.4(3)[c]	≥80% of ductwork inside *conditioned space*	2	3	3	5	6	7	7	7	9
R408.2.4(4)[c]	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	ERV or HRV installed	0	0	0	0	1	3	2	2	2
R408.2.5(2)[c]	≤2.0 ACH50 with ERV or HRV installed	0	0	0	4	4	8	5	5	5
R408.2.5(3)[c]	≤2.0 ACH50 with a *balanced ventilation system*	0	0	0	0	0	0	4	4	4
R408.2.5(4)[c]	≤1.5 ACH50 with ERV or HRV installed	0	0	0	6	5	10	9	9	9
R408.2.5(5)[c]	≤1.0 ACH50 with ERV or HRV installed	0	0	1	7	6	12	12	12	12
R408.2.6[a]	Energy efficient appliances	1	1	1	1	1	1	0	0	0
R408.2.7	On-site renewable energy measures	17	16		11	11	9	8	7	4
R408.2.8	Off-site renewable energy measures	71	65	62	55	46	41	43	41	39
R408.2.8b	Off-site renewable energy measure	1	1	1	1	1	1	1	1	1
R408.2.9[c]	Demand responsive thermostat	1	1	1	1	1	1	1	1	1
R408.2.11	Whole home lighting control	0	0	0	0	0	0	0	0	0
R408.2.12	Higher efficacy lighting	0	0	0	0	0	0	0	0	

a. Where the measure is selected, each dwelling unit, sleeping unit, and common areas where the measure is applicable must have the measure installed.

b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.

d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

SEER2: Seasonal Energy Efficiency Ratio, HSPF2: Heating Season Performance Factor, EER2: Energy Efficiency Ratio, COP: Coefficient of Performance

Reason:

The points proposed for the GSHP measure seemed higher than I expected. It was explained that the savings & points were calculated outside the software used to simulate the other HVAC measures. In consultation with PNNL and Dandelion Energy, I reviewed their savings calculations and worked with them to modify inputs in their tool to provide different values, while maintaining the inherent savings potential of GSHP beyond traditional ASHP.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Change will neither increase or decrease the cost of construction

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Workgroup Recommendation

Residential Energy Committee Action: As Submitted

Residential Energy Committee Reason:

The Committee agreed that the revised points that resulted from revising the GSHP calculations were an improvement. This is because they now use the same ASHP Baseline HSPF/SEER values as other ASHP measures and also now use the 3.1 COP/16.1 EER that is required per the measure description.

REC2D-1-23

IECC RE: TABLE R402.1.2, R402.1.3, R402.2.10.2, R402.2.11.2, RF105, RF105.1 (New), TABLE RF105.1 (New), RF106, RF107, RF106.1 (New), TABLE RF106.1 (New)

Proponents:

Jay Crandell, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

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

Portions of table not shown remain unchanged.

	0	1	2	3	4 except Marine		6	7 and 8
VERTICAL FENESTRATION U-FACTOR	0.50	0.50	0.40	0.30	0.30	0.28 [d]	0.28 [d]	0.27 [d]
SKYLIGHT *U*-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED VERTICAL FENESTRATION SHGC	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
SKYLIGHT SHGC	0.28	0.28	0.28	0.28	0.40	NR	NR	NR
CEILING *U*-FACTOR	0.035	0.035	0.030	0.030	0.026	0.026	0.026	0.026
INSULATION ENTIRELY ABOVE ROOF DECK	0.039	0.039	0.039	0.039	0.032	0.032	0.032	0.028
WOOD FRAME WALL *U*-FACTOR	0.084	0.084	0.084	0.060	0.045	0.045	0.045	0.045
MASS WALL U-FACTOR[b]	0.197	0.197	0.165	0.098	0.098	0.082	0.060	0.057
FLOOR *U*-FACTOR	0.064	0.064	0.064	0.047	0.047	0.033	0.033	0.028
BASEMENT WALL *U*-FACTOR	0.360	0.360	0.360	0.091[c]	0.059	0.050	0.050	0.050
UNHEATED SLAB F-FACTOR [e]	0.73	0.73	0.73	0.54	0.51	0.51	0.48	0.48
HEATED SLAB F-FACTOR [e]	0.74	0.74	0.74	0.66	0.66	0.66	0.66	0.66
CRAWL SPACE *U*-FACTOR	0.477	0.477	0.477	0.136	0.065	0.055	0.055	0.055

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors and *F*-factors shall be obtained from measurement, calculation, ~~or~~ an approved source, or Appendix RF of this code where such appendix is adopted or approved.
b. Mass walls shall be in accordance with Section R402.2.6. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate

Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

e. F-factors for slabs correspond to the R-values of Table R402.1.3 and the installation conditions of Section R402.2.10.1.

R402.1.3 R-value alternative.

Assemblies with *R*-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the *U*-factor or *F*-factor in Table R402.1.2. ~~*R*-values of insulation materials for the assemblies specified in Appendix RF that have a *U*-factor less than or equal to the *U*-factor required by Table R402.1.2 shall be permitted~~

R402.2.10.2 Alternative slab-on-grade insulation configurations.

For buildings complying with Sections R405 or R406, slab-on-grade insulation shall be installed in accordance with the proposed design or rated design . ~~The proposed or rated design shall use an alternative insulation configuration and associated F-factor complying with Appendix A of ANSI/ASHRAE/IES 90.1 or, where adopted, Section RF105 of Appendix RF of this code. Where used to comply with Table R402.1.2 Section R401.2.1, the proposed F-factor shall be equal to or less than the F-factor required by Table R402.1.2 for a heated or unheated slab, as applicable. Where used to comply with Section R402.1.5 or Section R408.2.1, F-factors for the slab-on-grade reference and proposed design shall be applied in accordance with Section R402.1.5.~~

R402.2.11.2 Alternative crawl space wall insulation configurations.

For buildings complying with Sections R405 or R406 crawl space wall insulation shall be installed in accordance with the proposed design or rated design . ~~The proposed or rated design shall use an alternative insulation configuration and associated U-factor or C-factor complying with Appendix A of ANSI/ASHRAE/IES 90.1 or, where adopted, Appendix RF of this code. Where used to comply with Section R401.2.1, the U-factor or C-factor shall be equal to or less than the U-factor required by Table R402.1.2 for crawl space walls. Where used to comply with Section R402.1.5 or Section R408.2.1, effective U-factors for the crawlspace wall reference and proposed designs shall be applied in accordance with Section R402.1.5.~~

RF105 — BASEMENT <u>AND CRAWLSPACE</u> WALLS ~~RESERVED~~

Add new text as follows:

<u>RF105.1 Basement and crawlspace walls.</u>.

<u>U-factors for basement and crawlspace walls shall</u> ~~comply with insulation R-values and configurations~~ <u>be as specified in accordance with Table RF105.1.</u> ~~Where used to substitute alternative basement and crawlspace wall insulation R-values and configurations for compliance with Table 401.1.2, the applicable wall U-factor of~~

~~Table RF105.1 shall be used. Where used with Section R402.1.5 to determine overall building thermal envelope conductance (TC), the applicable effective~~ Effective U-factors ~~from Table RF105.1 shall be used for basement and crawlspace walls~~ for the proposed and reference foundation wall design must be used to demonstrate compliance with Section R402.1.5. ~~reference and proposed design. Basement slabs and crawlspace slabs or gravel floor shall be separately addressed in accordance with Section RF106, including adjustment for the floor depth below exterior finish grade.~~ Effective U-factors shall not be used for other compliance methods referenced in Section R401.2.1 of the code.~~with Sections R405 and R406.~~

TABLE RF105.1 BASEMENT AND CRAWLSPACE WALLS

Insulation Configurations[b]	Wall U-factor[c] (Btu/hr-ft^2-F)	Wall Effective U-factor[d] by Percentage of Wall Height Projecting Above Grade (Btu/hr-ft^2-F)for Use Only with Section R402.1.5	-	-	-
-	-	50%	35%	20%	5%
BASEMENT WALLS	-	-	-	-	-
Uninsulated & unfinished basement wall	0.360	0.324	0.288	0.252	0.216
Continuous Insulation	-	-	-	-	-
R-5ci	0.122	0.109	0.097	0.085	0.073
R-7.5ci	0.093	0.084	0.075	0.065	0.056
R-10ci	0.076	0.068	0.060	0.053	0.045
R-15ci	0.055	0.049	0.044	0.038	0.033
R-20ci	0.043	0.039	0.034	0.030	0.026
R-25ci	0.035	0.032	0.028	0.025	0.021
Cavity Insulation	-	-	-	-	-
R-11	0.076	0.068	0.060	0.053	0.045

R-13	0.067	0.060	0.054	0.047	0.040
R-15	0.060	0.054	0.048	0.042	0.036
R-19	0.050	0.045	0.040	0.035	0.030
R-21	0.045	0.041	0.036	0.032	0.027
Cavity + Continuous Insulation	-	-	-	-	-
R-13 + R-5ci	0.050	0.045	0.040	0.035	0.030
R-13 + R-7.5ci	0.045	0.040	0.036	0.031	0.027
R-13 + R-10ci	0.040	0.036	0.032	0.028	0.024
R-19 + R-5ci	0.040	0.036	0.032	0.028	0.024
R19 + R-7.5ci	0.036	0.033	0.029	0.025	0.022
R19 + R-10ci	0.033	0.030	0.027	0.023	0.020
CRAWLSPACE WALLS	-	-	-	-	-
Unisulated crawlspace wall	0.477	0.429	0.382	0.334	n/a
Continuous Insulation	-	-	-	-	-
R-5ci	0.141	0.127	0.113	0.099	n/a
R-7.5ci	0.104	0.094	0.083	0.073	n/a

R-10ci	0.083	0.074	0.066	0.058	n/a
R-15ci	0.058	0.053	0.047	0.041	n/a
R-20ci	0.045	0.041	0.036	0.032	n/a
R-25ci	0.037	0.033	0.030	0.026	n/a
Cavity Insulation	-	-	-	-	-
R-11	0.083	0.074	0.066	0.058	n/a
R-13	0.072	0.065	0.058	0.051	n/a
R-15	0.065	0.058	0.052	0.045	n/a
R-19	0.054	0.049	0.043	0.038	n/a
R-21	0.048	0.043	0.038	0.033	n/a
Cavity + Continuous Insulation	-	-	-	-	-
R-13 + R-5ci	0.053	0.048	0.043	0.037	n/a
R-13 + R-7.5ci	0.047	0.042	0.038	0.033	n/a
R-13 + R-10ci	0.042	0.038	0.034	0.029	n/a
R19 + R-5ci	0.043	0.038	0.034	0.030	n/a
R19 + R-7.5ci	0.039	0.035	0.031	0.027	n/a

R19 + R-10ci	0.035	0.032	0.028	0.025	n/a

n/a = not applicable

a. The wall U-factor excludes exterior air-film R-value and, for insulated assemblies, includes the following: 0.68 R for interior air film, 0.45 R for ½" gypsum panel finish (insulated basement walls only), and 2.1 R for 12" block basement wall or 1.4 R for 8" block crawlspace wall, both with empty cells. Where cavity insulation is included between 2x4 or 2x6 framing on the interior side of a foundation wall, wood stud material with thermal resistivity of R-1.25/in is assumed to be spaced at not less than 16-inches on center with an assumed framing factor of not greater than 0.15.

b. All insulation configurations extend from top of foundation wall to floor of basement or crawlspace. Extrapolation to partial height insulation shall not be permitted; U-factors for such insulation configurations shall be determined by accepted engineering practice for modeling of thermal bridging and ground-coupled assemblies.

c. All insulation configurations extend from top of foundation wall to floor of basement or crawlspace. Extrapolation to partial height insulation shall not be permitted; U-factors for such insulation configurations shall be determined by accepted engineering practice for modeling of thermal bridging and ground-coupled assemblies with results converted to an equivalent air-to-air annual heat transfer basis to determine effective U-factors.

d. Applicable to Sections R402.1.2, R405 and R406.

e. Effective U-factors are adjusted to account for ground-coupling effects to provide equivalency to U-factors used for above-grade building thermal envelope assemblies. The effective U-factors are provided for use with Section R402.1.5 for evaluation of trade-offs with above-grade assemblies and components of the *building thermal envelope*. The effective U-factor shall apply to the foundation wall area from interior floor or ground surface to top of wall. Interpolation between R-values and percentage of wall height projecting above grade within a given insulation configuration type is permitted.

Revise as follows:

~~RF106 — CRAWLSPACE WALLS RESERVED~~

RF106 ~~RF107~~ — SLABS-ON-GRADE

Add new text as follows:

RF106.1 Slabs-on-grade..

F-factors for unheated and heated slabs-on-grade shall be as specified in Table RF106.1. All applicable adjustment factors in the table footnotes shall apply. F-factors for basement floor slabs and crawl space ground surface located below exterior grade shall be adjusted in accordance footnote 'f' as applicable.

TABLE RF106.1 F-FACTORS FOR SLABS-ON-GRADE[a,b,c,d,e,f]

Unheated Slabs-on-Grade -- Insulation Configurations	F-factor (Btu/hr-ft-F)
Uninsulated Slab	0.73

Horizontal Insulation Under Slab at Slab Perimeter -- Slab Edge Not Insulated	-
>= R-5 for 2ft	0.70
R-5 for 4ft	0.67
>= R-10 for 4ft	0.64
Vertical Insulation on Exterior Face[g] -- Slab Edge Insulated[h]	-
R-2.5 for 2ft	0.66
R-5 for 2ft	0.58
R-7.5 for 2ft	0.56
R-10 for 2ft	0.54
R-15 for 2ft	0.52
R-5 for 3 ft	0.56
R-7.5 for 3ft	0.54
R-10 for 3ft	0.51
R-15 for 3ft	0.49
R-5 for 4ft	0.54
R-7.5 for 4ft	0.51

R-10 for 4ft	0.48
R-15 for 4ft	0.45
Fully Insulated Slab - Full Slab Area and Slab Edge Continuously Insulated	-
R-5 entire slab area and R-3.5 edge	0.48
R-5 entire slab area and edge	0.46
R-7.5 entire slab area and R-3.5 edge	0.45
R-7.5 entire slab area and edge	0.41
R-10 entire slab area and R-5 edge	0.40
R-10 entire slab area and edge	0.36
R-15 entire slab area and R-5 edge	0.35
R-15 entire slab area and edge	0.30
R10 slab edge and under slab perimeter inward 4ft; R-5 remaining slab area	0.42
R-15 slab edge and under slab perimeter inward 4ft; R-5 remaining slab area	0.40
R-15 slabe edge and under slab perimeter inward 4ft; R-10 remaining slab area	0.34
Heated Slabs-on-Grade -- Insulation Configurations	F-factor (Btu/hr-ft-F)
Uninsulated	1.35
Fully Insulated Slab -- Full Slab Area and Slab Edge Continuously Insulated	-

R-5 entire slab area and R-3.5 edge	0.77
R-5 entire slab area and edge	0.74
R-7.5 entire slab area and R-3.5 edge	0.71
R-7.5 entire slab area and edge	0.64
R-10 entire slab area and R-5 edge	0.62
R-10 entire slab area and edge	0.55
R-15 entire slab area and R-5 edge	0.54
R-15 entire slab area and edge	0.44
R-20 entire slab area and R-7.5 edge	0.44
R-20 entire slab area and edge	0.37
R-5 entire slab area and R-10 slab edge extending downward for min. 3ft	0.66
R-10 slab edge and under slab perimeter inward 4ft; R-5 remaining slab area	0.66
R-15 slab edge and under slab perimeter inward 4ft; R-5 remaining slab area	0.62
R-15 slab edge and under slab perimeter inward 4ft; R-10 remaining slab area	0.51

a. For alternative slab-on-grade insulation configurations, F-factors shall be determined in accordance with accepted engineering practice for modeling three dimensional ground-coupled building assemblies using project-specific building and site conditions to estimate annual energy use attributed to foundation heat transfer and converting the result to an equivalent air-to-air F-factor basis.

b. Interpolation between R-values for a given insulation configuration type is permitted.

c. Tabulated F-factors are based on a typical soil thermal conductivity of 0.75 Btu/hr-ft-F and shall be multiplied by one of the following adjustment factors as applicable to site soil conditions: (1) rock or any soil on sites with poor drainage or high water table – 1.2; (2) sandy soils – 1.1; (3) loam or clay soils on well-drained sites in dry climate regions – 0.85; and (3) for all other soil or site conditions – 1.00. Where soil conditions are unknown, use of 1.00 shall be permitted.

d. Tabulated F-factors are based on a slab area to perimeter length ratio of 9:1 and shall be multiplied by one of the following adjustment factors as applicable to a slab's area to perimeter length ratio: 5:1 – 0.7; 6:1 – 0.8; 7:1 – 0.9; 8:1 – 0.95; 9:1 – 1.0; 10:1 – 1.05; 15:1 – 1.2; 20:1 – 1.35; 30:1 – 1.5; and for ≥ 40:1 – 1.7,

e. Tabulated F-factors are based on a slab perimeter edge projection above exterior finish grade of 6 inches. For portions of slab perimeter projecting 12 inches or more above grade, multiply the tabulated F-factors by one of the following adjustment factors as applicable: 12 inches – 1.05; 18 inches – 1.1; 24 inches – 1.15; and 30 inches – 1.2.

f. For basement floor slabs and crawlspaces slabs or gravel floors, the tabulated F-factors shall be multiplied by one of the following adjustment factors based on the depth of the floor surface below exterior finish grade: 1 ft – 0.95; 3 ft – 0.9; and 6 ft or more – 0.8.

g. Vertical insulation on the exterior shall extend for the indicated depth below finish grade and above grade to the top of slab or stem wall. Where insulation is placed on the interior side of a foundation stem wall, it shall extend from the top of slab to the indicated depth below the exterior finish grade and the applicable tabulated F-factor shall be multiplied by 1.05.

h. The R-value of the vertical insulation located on the interior side of a stem wall shall be permitted to be reduced to R-2.5 at the slab edge, not exceeding 6 inches thick, provided the applicable F-factor is multiplied by 1.15 where R-5 vertical insulation is specified, 1.2 where R-10 vertical insulation is specified, or 1.25 where R-15 vertical insulation is specified.

Reason:

The main purpose of this proposal is to coordinate with changes to R402.2.10.2 (slabs-on-grade) and R402.2.11.2 (crawlspace walls) which added a reference to Appendix RF in the legislative draft, but the appendix did not include solutions for these assemblies (only placeholders). This proposal provides the solutions and data in Appendix RF as anticipated as a follow-up to these changes made during the recently completed Draft 1 development. It also adds a consistent reference to Appendix RF for alternative assemblies used in the simulated performance compliance path (Section R405). The tabulated F-factors align with those used for R-value and F-factor requirements in Tables R402.1.2 and R402.1.3 of the code. The values are based on the same research used for the code and also referenced in ASHRAE 90.1 Appendix A (see bibliography).

More importantly, tabulated U-factors (and effective U-factors) for below-grade walls (enclosing conditioned basements or crawlspaces) are also provided based on the same research. The effective U-factors for below grade walls are derived in the same manner as F-factors where ground coupling effects are considered and then used to convert the U-factor (or C-factor as used in the commercial code) to an effective value based on air-to-air (instead of air-to-ground) heat exchange such that they have the same basis as U-factors used for above grade assemblies in terms of impacts on annual energy use. This also ensures that equivalent "apples-to-apples" trade-offs are made between above- and below-grade assemblies when using Section R402.1.5 (see revisions to R402.1.5 to coordinate). It also ensures consistent additional UA credits are achieved in accordance with Section R408 for above- and below-grade assemblies. Without these effective U-factors for basement and

crawlspace walls, the trade-off value of adding insulation to a typical basement or crawlspace could be over-estimated by as much as 60%. This degree of non-conservative error or bias should not be tolerable.

Alternatively, one could use REScheck (which relies on actual building energy modeling and includes ground-coupling effects) instead of Section R402.1.5 and the proposed effective U-factors. Therefore, an exception is provided for alternative methods based on whole-building energy modeling principles (which is consistent with the REScheck software approach) as laid out in Appendix C of ASHRAE 90.1. With other changes made in this proposal, results should be similar and significant conflicting results avoided.

NOTE TO STAFF: I have attached a Word file of the submitted proposal should the formatting not come through cdpACCESS correctly. It looked correct when submitted, but I had issues inputting the proposal.

Bibliography:

Kennedy, M. (1991). Super Good Cents Heat Loss Reference, Volume IV, Earth Contact: Assumptions, Calculations, and Coefficient Tables. Prepared by Ecotope, Seattle, WA for Bonneville Power Administration (Contract No. DE-AP79-91BP15338).

Baylon, D. and Kennedy, M. (2007). Calculating the Impact of Ground Contact on Residential Heat Loss. Buildings X, ASHRAE.

Cleaveland, J.P. and Akridge, J.M. (198?). Slab-on-Grade Thermal Loss in Hot Climates. Georgia Institute of Technology for ASHRAE.

Bahnfleth, W.P. and Amber, J. (1990). Algorithms for Slab-on-Grade Heat Transfer Calculations. U.S. Army Corps of Engineers, USACERL Technical Report E-90/15, September 1990.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

The added supporting information in Appendix RF should provide for greater flexibility in evaluating TC trade-offs per R402.2 and R402.1.5, and also TC credit options for additional efficiency credits in R408. This is presumed to provide potential reduced costs. In some cases, depending on conditions the technical improvements could cut both ways, but this would come with the benefit of having a more accurate design where cost vs. benefits are more realistically assessed when considering how much insulation to put where on a building and where to get the lowest-cost credits or trade-offs for a particular building envelope design.

Workgroup Recommendation

Residential Energy Committee Action: As Modified

Residential Energy Committee Reason:

This proposal adds necessary language and tables that coordinate the proper calculation of F-factors for slabs and ground coupling for crawl space walls and basement walls

REC2D-3-23

IECC RE: ACCA (New)

Proponents:

John Hensley, representing IECC RE HVACR & Water heating subcommittee

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

ACCA 1330 Braddock Place, Suite 350, Alexandria, VA 22314.

ANSI/ACCA 1 Manual D—2023: Residential Duct Systems

Reason:

Provide chapter 6 reference for ANSI/ACCA Manual D that was brought in under RED1-285-22 for R403.3.1 Duct system design.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Editorial

Workgroup Recommendation
Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
Provide chapter 6 reference for ANSI/ACCA Manual D that was brought in under RED1-285-22 for R403.3.1 Duct system design.

REC2D-4-23

IECC RE: TABLE R405.4.2(1)

Proponents:

Jay Crandell, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

TABLE R405.4.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS
Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass where the proposed wall is a mass wall; otherwise wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
	Solar reflectance = 0.25.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2 , with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar reflectance = 0.25.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft^2 per 300 ft^2 of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	Foundation wall ~~or slab~~ extenstion above and below grade: same as proposed ~~+ foot (30 cm)~~ ~~Foundation wall or slab extension below grade: same as proposed~~ Foundation wall or slab perimeter length: same as proposed Soil characteristics: same as proposed.	As proposed
	Foundation wall *U*-factor and slab-on-grade *F*-factor: as specified in Table R402.1.2	
Opaque doors	Area: 40 ft^2.	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified in Table R402.1.2 .	As proposed
Vertical fenestration other than opaque doors	Total area[h] = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area. (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
	SHGC: as specified in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92 – (0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92 – (0.21 × SHGC as proposed)
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air leakage rate	For detached one-family dwellings, the air leakage rate at a pressure of 0.2 inch water gauge (50 Pa) shall be Climate Zones 0 through 2: 4.0 air changes per hour. Climate Zones 3 , 4, and 5: 3.0 air changes per hour. Climate Zones 6 through 8: 2.5 air changes per hour. For detached one-family dwellings that are 1,500 ft2 (139.4 m^2) or smaller and attached *dwelling units*, the *air leakage* rate at a pressure of 0.2 inch water gauge (50 Pa) shall be 0.27 cfm/ft^2 of the *dwelling unit enclosure area*.	The measured air leakage rate.[a]
Mechanical ventilation rate	-	

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than B x M where: B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air leakage rate is > = 3.0 air changes per hour at 50 Pascals, and otherwise, M = minimum (1.7, Q/B) Q = the proposed mechanical ventilation rate, cfm. CFA = conditioned floor area, ft2. Nbr = number of bedrooms.	The measured mechanical ventilation rate[b], Q, shall be in addition to the measured air leakage rate .
Mechanical ventilation fan energy	The mechanical ventilation system type shall be the same as in the *proposed design*. Heat recovery or energy recovery shall be modeled for mechanical ventilation where required by Section R403.6.1. Heat recovery or energy recovery shall not be modeled for mechanical ventilation where not required by Section R403.6.1.Where mechanical ventilation is not specified in the *proposed design*: None Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal (8.76 × B × M)/ef where: B and M are determined in accordance with the Mechanical Ventilation Rate row of this table. e_f = the minimum fan efficacy, as specified in Table 403.6.2, corresponding to the system type at a flow rate of B × M. *CFA* = conditioned floor area, ft^2. N_{br} = number of bedrooms.	As proposed
Internal gains	IGain, in units of Btu/day per dwelling unit, shall equal 17,900 + 23.8 ×*CFA* + 4,104 × N_{br} where: *CFA* = conditioned floor area, ft^2. N_{br} = number of bedrooms.	Same as *standard reference design*.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as *standard reference design*, plus any additional mass specifically designed as a thermal storage element[c] but not integral to the *building thermal envelope* or structure.
Structural mass	For masonry floor slabs: 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls: as proposed, but with insulation as specified in Table R402.1.3, located on the interior side of the walls.	As proposed

<table>
<tr><th>BUILDING COMPONENT</th><th>STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td></td><td>For other walls, ceilings, floors, and interior walls: wood frame construction.</td><td>As proposed</td></tr>
<tr><td rowspan="6">Heating systems[d, e, j, k]</td><td>Fuel Type/Capacity: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Product class: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Efficiencies:</td><td>As proposed</td></tr>
<tr><td>Heat pump: Complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td>Fuel gas and liquid fuel furnaces: Complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td>Fuel gas and liquid fuel boilers: Complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td rowspan="2">Cooling systems[d, f, k]</td><td>Fuel Type: Electric
Capacity: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Efficiencies: Complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td rowspan="11">Service water heating[d, g, k]</td><td rowspan="6">Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td>Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 − HWDS)
where:
N_{br} = number of bedrooms.
HWDS = factor for the compactness of the hot water distribution system.
<table>
<tr><th colspan="2">Compactness ratio[i]</th><th>HWDS factor</th></tr>
<tr><td>1 story</td><td>2 or more stories</td><td></td></tr>
<tr><td>> 60%</td><td>> 30%</td><td>0</td></tr>
<tr><td>> 30% to ≤ 60%</td><td>> 15% to ≤ 30%</td><td>0.05</td></tr>
<tr><td>> 15% to ≤ 30%</td><td>> 7.5% to ≤ 15%</td><td>0.10</td></tr>
<tr><td>< 15%</td><td>< 7.5%</td><td>0.15</td></tr>
</table></td></tr>
<tr><td>Fuel Type: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Rated Storage Volume: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Draw Pattern: Same as proposed design</td><td>As proposed</td></tr>
<tr><td>Efficiencies: Uniform Energy Factor complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><th>BUILDING COMPONENT</th><th colspan="4">STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td></td><td colspan="4">Tank Temperature: 120° F (48.9° C)</td><td>Same as standard reference design</td></tr>
<tr><td rowspan="4">Thermal distribution systems</td><td colspan="4">Duct location:</td><td rowspan="3">Duct location: as proposed[l] .</td></tr>
<tr><td>Foundation Type</td><td>Slab on grade</td><td>Unconditioned crawl space</td><td>Basement or conditioned crawl space</td></tr>
<tr><td>Duct location (supply and return)</td><td>One-story building: 100% in unconditioned attic

All other: 75% in unconditioned attic and 25% inside conditioned space</td><td>One-story building: 100% in unconditioned crawlspace

All other: 75% in unconditioned crawlspace and 25% inside conditioned space</td><td>75 % inside conditioned space

25 % unconditioned attic</td></tr>
<tr><td colspan="4">Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed[m] .</td></tr>
</table>

<table>
<tr><th>BUILDING COMPONENT</th><th>STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td></td><td>Duct system leakage to outside:
For duct systems serving > 1,000ft^2 (92.9 m^2) of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area.
For duct systems serving ≤ 1,000ft^2 (92.9 m^2) of conditioned floor area, the duct leakage to outside rate shall be 40 cfm (1132.7 L/min).</td><td>Duct System Leakage to Outside: The measured total duct system leakage rate shall be entered into the software as the duct system leakage to outside rate.
Exceptions:
<table><tr><td>1.</td><td>Where duct system leakage to outside is tested in accordance ANSI/ RESNET/ICC 380 or ASTM E1554, the measured value shall be permitted to be entered.</td></tr><tr><td>2.</td><td>Where total duct system leakage is measured without the space conditioning equipment installed, the simulation value shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area.</td></tr></table></td></tr>
<tr><td></td><td>Distribution System Efficiency (DSE): For hydronic systems and ductless systems a thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies.</td><td>Distribution System Efficiency (DSE): For hydronic systems and ductless systems, DSE shall be as specified in Table R405.4.2(2).</td></tr>
<tr><td>Thermostat</td><td>Type: Manual, cooling temperature setpoint = 75°F;
Heating temperature setpoint = 72°F.</td><td>Same as standard reference design.</td></tr>
<tr><td>Dehumidistat</td><td>Where a mechanical ventilation system with latent heat recovery is not specified in the proposed design: None. Where the proposed design utilizes a mechanical ventilation system with latent heat recovery:
Dehumidistat type: manual, setpoint = 60% relative humidity.
Dehumidifier: whole-dwelling with integrated energy factor = 1.77 liters/kWh.</td><td>Same as standard reference design.</td></tr>
</table>

For SI: 1 square foot = 0.93 m^2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m^2, 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

a.	Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals,* or the equivalent, shall be used to determine the energy loads resulting from infiltration.
b.	The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals,* page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals,* page 26.19 for intermittent mechanical ventilation.
c.	Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
d.	For a *proposed design* with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
e.	For a *proposed design* without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the *standard reference design* and *proposed design*.
f.	For a *proposed design* without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the *standard reference design* and the *proposed design*.
g.	For a *proposed design* without a proposed water heater, the following assumptions shall be made for both the proposed design and *standard reference design*. <u>For a proposed design with a heat pump water heater, the following assumptions shall be made for the *standard reference design*, except the fuel type shall be electric.</u> Fuel Type: Same as the predominant heating fuel type Rated Storage Volume: 40 Gallons Draw Pattern: Medium Efficiency: Uniform Energy Factor complying with 10 CFR § <u>430.32</u>

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouse units, the following formula shall be used to determine glazing area:

AF	$= A_s \times FA \times F$
where:	
AF	= Total glazing area.
A_s	= *Standard reference design* total glazing area.
FA	= (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).
F	= (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.
and where:	
-	Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.
-	Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.
-	Below-grade boundary wall is any thermal boundary wall in soil contact.
-	Common wall area is the area of walls shared with an adjoining dwelling unit.

<table>
<tr><td>i.</td><td>The factor for the compactness of the hot water distribution system is the ratio of the area of the rectangle that bounds the source of hot water and the fixtures that it serves (the “hot water rectangle”) divided by the floor area of the dwelling.

<table><tr><td>1.</td><td>Sources of hot water include water heaters, or in multiple-family buildings with central water heating systems, circulation loops or electric heat traced pipes.</td></tr><tr><td>2.</td><td>The hot water rectangle shall include the source of hot water and the points of termination of all hot water fixture supply piping.</td></tr><tr><td>3.</td><td>The hot water rectangle shall be shown on the floor plans and the area shall be computed to the nearest square foot.</td></tr><tr><td>4.</td><td>Where there is more than one water heater and each water heater serves different plumbing fixtures and appliances, it is permissible to establish a separate hot water rectangle for each hot water distribution system and add the area of these rectangles together to determine the compactness ratio.</td></tr><tr><td>5.</td><td>The basement or attic shall be counted as a story when it contains the water heater.</td></tr><tr><td>6.</td><td>Compliance shall be demonstrated by providing a drawing on the plans that shows the hot water distribution system rectangle(s), comparing the area of the rectangle(s) to the area of the dwelling and identifying the appropriate compactness ratio and HWDS factor.</td></tr></table></td></tr>
<tr><td>j.</td><td>For a proposed design with electric resistance heating, a split system heat pump complying with 10 CFR §430.32 (2021) shall be assumed modeled in the standard reference design.</td></tr>
<tr><td>k.</td><td>For heating systems, cooling systems, or water heating systems not included in Table R405.4.2(1), the standard reference design shall be the same as proposed design.</td></tr>
<tr><td>l.</td><td>Only sections of ductwork that are installed in accordance with Items 1 or 2 of Section R403.3.4, are assumed to be located completely inside conditioned space. All other sections of ductwork are not assumed to be located completely inside conditioned space.</td></tr>
<tr><td>m.</td><td>Sections of ductwork installed in accordance with Section R403.3.5.1, are assumed to have an effective duct insulation R-value of R-25.</td></tr>
</table>

Reason:

It was discovered recently that the reference design requirement (added by a prior proposal action) to have the foundation wall or slab extension above grade set at 1 foot (while leaving the extension below grade “same as proposed”) can create some odd or wrong configurations of the reference design foundation. For example, consider an 8’ basement wall that is proposed to be 3 ft above grade and 5 ft below grade. The current reference design requirements would then result in a basement wall that is 1 foot above grade and only 5 ft below grade (for a total wall height of 6 ft). Attempting to fix this by setting a below grade depth for the reference design would then require different values to be established for basement walls vs. conditioned crawlspace walls in a somewhat arbitrary fashion without a clear basis to establish these geometry conditions for a standard reference design.

Given the above, it was decided the best way to fix this for the 2024 code would be to return to the language used in the 2021 code as

shown by the changes made in this proposal. Please note that while the term “slab” is used in describing the nature of foundation elements in the table, the term “slab-on-grade” is purposefully used when referencing the F-factors in Table R402.1.2. This is because F-factors are only applicable to slabs-on-grade, not slabs below grade (such as a conditioned basement slab or condition crawlspace ground area). In fact, the F-factors for slabs-on-grade are specifically based on a 6” slab edge extension above grade. Slabs that are some distance below grade are addressed in various rating and modeling software, but are not specifically addressed within the minimum criteria in Table R402.1.2. Consequently, if greater specificity in a standard reference design is to be addressed for a slab or foundation wall geometry relative to exterior grade, more work will be needed to properly coordinate this with the prescriptive requirements as well as how these foundation elements are modeled in various software.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

The code change will neither increase nor decrease the cost of construction

The proposal corrects an error by restoring the reference design foundation wall description related to extension above or below grade to the approach currently in the 2021 IECC. Therefore, there is no cost increase or decrease. Although, this could have soft cost benefits by avoiding confusion in modeling and code compliance.

Workgroup Recommendation
Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
Corrects an error in the reference design foundation geometry condition and restores to the 2021 code language.

REC2D-6-23

IECC RE: R402.2.1 (New)

Proponents:

Vladimir Kochkin, representing NAHB (vkochkin@nahb.org)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R402.2.1 Ceilings with attics..

Where Section R402.1.3 requires R-38 insulation in the ceiling or attic, installing R-30 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-38 insulation wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.3 requires R-49 insulation in the ceiling or attic, installing R-38 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. ~~Where Section R402.1.3 requires R-60 insulation in the ceiling or attic, installing R-49 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves.~~ This reduction shall not apply to the insulation and *fenestration* criteria in Section R402.1.2 and the component performance alternative in Section R402.1.5.

Reason:

Correlates with the changes made to Table R402.1.3.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

Correlation with changes made to Table R402.1.3

Workgroup Recommendation
Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
aligns Section R402.2.1 requirements with Table R402.1.3 requirements.

REC2D-7-23

IECC RE: R403.6.2, TABLE R403.6.2

Proponents:

Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy.

Fans used to provide whole-dwelling mechanical *ventilation* shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with the test procedure referenced by Table R403.6.2 and *listed*. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, ~~balanced~~*balanced ventilation systems*, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c. (49.85 Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c. (24.91 Pa).

TABLE R403.6.2 WHOLE-DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY[a]

SYSTEM TYPE	AIRFLOW RATE (CFM)	MINIMUM EFFICACY (CFM/WATT)	TEST PROCEDURE
HRV or ERV	Any	1.2[a]	CAN/CSA C439
Balanced ventilation system without heat or energy recovery	Any	1.2[a]	ASHRAE 51 (ANSI/AMCA Standard 210)
Range hood	Any	2.8	
In-line supply or exhaust fan	Any	3.8	
Other exhaust fan	< 90	2.8	
	≥ 90 and < 200	3.5	
	≥ 200	4.0	
Air-handling unit that is integrated to tested and *listed* HVAC equipment	Any	1.2	Outdoor airflow as specified. *Air-handling unit* fan power determined in accordance with the applicable US Department of Energy Code of Federal Regulations DOE10 CFR 430, or other approved test method .

For SI: 1 cubic foot per minute = 0.47 L/s.

a. For ~~balanced systems~~*balanced ventilation systems*, HRVs, and ERVs, determine the efficacy as the outdoor airflow divided by the total fan power.

Reason:

PCD2 introduces a new term and definition for “balanced ventilation system”. This term was introduced in the newly expanded R408 Additional Efficiency Requirements section. In other sections, in the 2021 IECC, the term was undefined and just called “balanced” (R403.6.2). In PCD2, there still remains two instances where “balanced” or “balanced system” is used and should be reviewed to determine whether the defined term is more appropriate.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

None

Workgroup Recommendation
Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
appropriate use of defined term.

REC2D-8-23

IECC RE: SECTION 202 (New), R402.5.1.2, R402.5.1.2.1, R402.5.1.3, R403.3.1, R403.3.9, R403.6.4, TABLE R405.4.2(1)

Proponents: Emma Gonzalez-Laders, representing New York State Dept of State (emma.gonzalez-laders@dos.ny.gov)

2024 International Energy Code [RE] [RE Project] R3

Add new definition as follows:

SLEEPING UNIT. A single unit that provides rooms or spaces for one or more persons, includes permanent provisions for sleeping and can include 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 *sleeping units*.

Revise as follows:

~~**DWELLING**~~ **TESTING UNIT ENCLOSURE AREA.** The sum of the area of ceiling, floors, and walls separating a dwelling unit or *sleeping unit's* conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the *dwelling unit* or *sleeping unit* to the underside of the floor above.

R402.5.1.2 Air leakage testing. The *building* or each *dwelling unit* or *sleeping unit* in the building shall be tested for air leakage. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779, ASTM E1827 or ASTM E3158 and reported at a pressure differential of 0.2 inch water gauge (50 Pa). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope* have been sealed.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.

2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.

3. Interior doors, where installed at the time of the test, shall be open.

4. Exterior or interior terminations for continuous ventilation systems shall be sealed.

5. Heating and cooling systems, where installed at the time of the test, shall be turned off.

6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exceptions:

1. For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above grade plane in height, building thermal envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.5.1.1, applicable to the method of

construction, are field verified. Where required by the code official, an approved third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, conditioned spaces in accordance with Sections R402.2.13 and R402.4.5, as applicable.

2. Where tested in accordance with Section R402.5.1.2.1, testing of each dwelling unit or sleeping unit is not required.

R402.5.1.2.1 ~~Dwelling unit~~ Unit sampling. For buildings with eight or more *dwelling units* or *sleeping units*, seven or 20 percent of the *dwelling units* or *sleeping units*, whichever is greater, shall be tested. Tested units shall include a top floor unit, a ground floor unit, a middle floor unit, and the *dwelling unit* or *sleeping unit* with the largest ~~*dwelling unit*~~ *testing unit enclosure area*. Where the air leakage rate of a tested unit is greater than the maximum permitted rate, corrective actions shall be taken and the unit re-tested until it passes. For each tested *dwelling unit* or *sleeping unit* with an air leakage rate greater than the maximum permitted rate, three additional units, including the corrected unit, shall be tested. Where buildings have fewer than eight *dwelling units* or *sleeping units*, each ~~*dwelling unit*~~ unit shall be tested.

R402.5.1.3 Maximum air leakage rate. Where tested in accordance with Section R402.5.1.2, the air leakage rate for *buildings*, ~~or~~ *dwelling units*, or *sleeping units* shall be as follows:

1. Where complying with Section R401.2.1, the building, or the dwelling units or sleeping units in the building shall have an air leakage rate not greater than 4.0 air changes per hour in Climate Zones 0, 1 and 2~~;~~, 3.0 air changes per hour in Climate Zones 3 through 5~~;~~, and 2.5 air changes per hour in Climate Zones 6 through 8.
2. Where complying with Section R401.2.2 or R401.2.3, the building or the dwelling units or sleeping units in the building shall have an air leakage rate not greater than 4.0 air changes per hour, or 0.22 cfm/ft2 (1.1 L/s x m2) of the building thermal envelope area or the dwelling ~~unit~~ *testing unit enclosure area,* as applicable.

Exceptions:

1. Where dwelling units or *sleeping units* are attached or located in an R-2 occupancy, and are tested without simultaneously testing adjacent dwelling units or *sleeping units*, the air leakage rate is permitted to be not greater than 0.27 cfm/ft2 (1.35 L/s x m2) of the ~~*dwelling*~~ *testing unit* enclosure area. Where adjacent dwelling units are simultaneously tested in accordance with ASTM E779, the air leakage rate is permitted to be not greater than 0.27 cfm/ft2 (1.35 L/s x m2) of the ~~*dwelling unit*~~ *testing uni*t enclosure area that separates conditioned space from the exterior.
2. Where buildings have 1,500 square feet (139.4 m2) or less of conditioned floor area, the air leakage rate is permitted to be not greater than 0.27 cfm/ft2 (1.35 L/s x m2).

R403.3.1 Duct system design. *Duct systems* serving one or two *dwelling units* or *sleeping units* shall be designed and sized in accordance with ANSI/ACCA Manual D. *Duct systems* serving more than two *dwelling units* or *sleeping units* shall be sized in accordance with the ASHRAE Handbook of Fundamentals, ANSI/ACCA Manual D, or other equivalent computation procedure.
R403.3.9 ~~Dwelling unit~~ Unit sampling.

For *buildings* with eight or more *dwelling units* or *sleeping units* the *duct* systems in the greater of seven, or 20 percent of the *dwelling units* or *sleeping units* in the *building* shall be tested, including a top floor unit, a ground floor unit, a middle floor unit, and the unit with the largest *conditioned floor area*. Where buildings have fewer than eight dwelling units or *sleeping units*, the *duct* systems in each unit shall be tested. Where the leakage of a *duct* system is greater than the maximum permitted *duct system* leakage ,

corrective actions shall be made to the *duct system* and the *duct system* shall be system re-tested until it passes. For each tested *dwelling unit* or *sleeping unit* that has a greater total *duct system* leakage than the maximum permitted *duct system* leakage , an additional three *dwelling units* or *sleeping units*, including the corrected unit, shall be tested.

R403.6.4 ~~Dwelling unit~~ Unit sampling. For *buildings* with eight or more *dwelling units* or *sleeping units* the mechanical *ventilation* systems in seven, or 20 percent of the *dwelling units* or *sleeping units*, whichever is greater shall be tested.~~,~~ Tested systems shall include ~~a~~ systems in a top floor unit, systems in a ground floor unit, systems in a middle floor unit, and the systems in the *dwelling unit* or *sleeping unit* with the largest *conditioned floor area*. Where *buildings* have fewer than eight *dwelling units* or *sleeping units*, the mechanical *ventilation* systems in each unit shall be tested. Where the *ventilation* flow rate of a mechanical *ventilation* system is less than the minimum permitted rate, corrective actions shall be taken and the system retested until it passes. For each tested *dwelling unit* or *sleeping unit* system with a *ventilation* flow rate lower than the minimum permitted three additional systems, including the corrected system, shall be tested.

TABLE R405.4.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass where the proposed wall is a mass wall; otherwise wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
	Solar reflectance = 0.25.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2 , with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar reflectance = 0.25.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft^2 per 300 ft^2 of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed
	Foundation wall or slab extenstion above grade: 1 foot (30 cm) Foundation wall or slab extension below grade: same as proposed	As proposed

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	Foundation wall or slab perimeter length: same as proposed Soil characteristics: same as proposed.	
	Foundation wall *U*-factor and slab-on-grade *F*-factor: as specified in Table R402.1.2	
Opaque doors	Area: 40 ft^2.	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified in Table R402.1.2 .	As proposed
Vertical fenestration other than opaque doors	Total area[h] = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area. (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
	SHGC: as specified in Table R402.1.2 except for climate zones without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92 – (0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92 – (0.21 × SHGC as proposed)
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air leakage rate	For detached one-family dwellings, the air leakage rate at a pressure of 0.2 inch water gauge (50 Pa) shall be as follows: Climate Zones 0 through 2: 4.0 air changes per hour. Climate Zones 3 , 4, and 5: 3.0 air changes per hour. Climate Zones 6 through 8: 2.5 air changes per hour. For detached one-family dwellings that are 1,500 ft2 (139.4 m^2) or smaller and attached *dwelling units* or *sleeping units*, theair leakagerate at a pressure of 0.2 inch water gauge (50 Pa) shall be 0.27 cfm/ft^2 of the ~~*dwelling*~~ *testing unit enclosure area*.	The measured air leakage rate.[a]
Mechanical ventilation rate	-	
	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than B x M where: B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air leakage rate is > = 3.0 air changes per hour at 50 Pascals, and otherwise, M = minimum (1.7, Q/B) Q = the proposed mechanical ventilation rate, cfm. CFA = conditioned floor area, ft2. Nbr = number of bedrooms.	The measured mechanical ventilation rate[b], Q, shall be in addition to the measured air leakage rate .
Mechanical ventilation fan energy	The mechanical ventilation system type shall be the same as in the *proposed design*. Heat recovery or energy recovery shall be modeled for mechanical ventilation where required by Section R403.6.1. Heat recovery or energy recovery shall not be modeled for mechanical ventilation where not required by Section	As proposed

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	R403.6.1.Where mechanical ventilation is not specified in the *proposed design*: None Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal (8.76 × B × M)/ef where: B and M are determined in accordance with the Mechanical Ventilation Rate row of this table. e_f = the minimum fan efficacy, as specified in Table 403.6.2, corresponding to the system type at a flow rate of B × M. *CFA* = conditioned floor area, ft^2. N_{br} = number of bedrooms.	
Internal gains	IGain, in units of Btu/day per dwelling unit, shall equal 17,900 + 23.8 ×*CFA* + 4,104 × N_{br} where: *CFA* = conditioned floor area, ft^2. N_{br} = number of bedrooms.	Same as *standard reference design*.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as *standard reference design*, plus any additional mass specifically designed as a thermal storage element[c] but not integral to the *building thermal envelope* or structure.
Structural mass	For masonry floor slabs: 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls: as proposed, but with insulation as specified in Table R402.1.3, located on the interior side of the walls.	As proposed
	For other walls, ceilings, floors, and interior walls: wood frame construction.	As proposed
Heating systems[d, e, j, k]		
	Fuel Type/Capacity: Same as proposed design	As proposed
	Product class: Same as proposed design	As proposed
	Efficiencies:	As proposed
	Heat pump: Complying with 10 CFR §430.32	As proposed
	Fuel gas and *liquid fuel* furnaces: Complying with 10 CFR §430.32	As proposed
	Fuel gas and *liquid fuel* boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]		
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
Service water heating[d, g, k]	Use, in units of gal/day = 25.5 + (8.5 × N_{br}) where: N_{br} = number of bedrooms.	Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 – *HWDS*) where: N_{br} = number of bedrooms. *HWDS* = factor for the

<table>
<tr><th>BUILDING COMPONENT</th><th>STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td></td><td></td><td>compactness of the hot water distribution system.
<table><tr><td colspan="2">Compactness ratio[i] factor</td><td>HWDS</td></tr><tr><td>1 story</td><td>2 or more stories</td><td></td></tr><tr><td>> 60%</td><td>> 30%</td><td>0</td></tr><tr><td>> 30% to ≤ 60%</td><td>> 15% to ≤ 30%</td><td>0.05</td></tr><tr><td>> 15% to ≤ 30%</td><td>> 7.5% to ≤ 15%</td><td>0.10</td></tr><tr><td>< 15%</td><td>< 7.5%</td><td>0.15</td></tr></table></td></tr>
<tr><td></td><td>Fuel Type: Same as proposed design</td><td>As proposed</td></tr>
<tr><td></td><td>Rated Storage Volume: Same as proposed design</td><td>As proposed</td></tr>
<tr><td></td><td>Draw Pattern: Same as proposed design</td><td>As proposed</td></tr>
<tr><td></td><td>Efficiencies: Uniform Energy Factor complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td></td><td>Tank Temperature: 120° F (48.9° C)</td><td>Same as standard reference design</td></tr>
<tr><td>Thermal distribution systems</td><td>Duct location:
<table><tr><td>Foundation Type</td><td>Slab on grade</td><td>Unconditioned crawl space</td><td>Basement or conditioned crawl space</td></tr><tr><td>Duct location (supply and return)</td><td>One-story building: 100% in unconditioned attic

All other: 75% in unconditioned attic and 25% inside conditioned space</td><td>One-story building: 100% in unconditioned crawlspace

All other: 75% in unconditioned crawlspace and 25% inside conditioned space</td><td>75 % inside conditioned space

25 % unconditioned attic</td></tr></table></td><td>Duct location: as proposed[l].</td></tr>
<tr><td></td><td>Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed[m].</td></tr>
<tr><td></td><td>Duct system leakage to outside:
For duct systems serving > 1,000ft^2 (92.9 m^2) of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area.
For duct systems serving ≤ 1,000ft^2 (92.9 m^2) of conditioned floor area, the duct leakage to outside rate shall be 40 cfm (1132.7 L/min).</td><td>Duct System Leakage to Outside: The measured total duct system leakage rate shall be entered into the software as the duct system leakage to outside rate.

Exceptions:</td></tr>
</table>

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
		1. Where *duct system* leakage to outside is tested in accordance ANSI/ RESNET/ICC 380 or ASTM E1554, the measured value shall be permitted to be entered. 2. Where total *duct system* leakage is measured without the *space conditioning equipment* installed, the simulation value shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area.
	Distribution System Efficiency (DSE): For hydronic systems and ductless systems a thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies.	Distribution System Efficiency (DSE): For hydronic systems and ductless systems, DSE shall be as specified in Table R405.4.2(2).
Thermostat	Type: Manual, cooling temperature setpoint = 75°F; Heating temperature setpoint = 72°F.	Same as *standard reference design*.
Dehumidistat	Where a mechanical ventilation system with latent heat recovery is not specified in the proposed design: None. Where the proposed design utilizes a mechanical ventilation system with latent heat recovery: Dehumidistat type: manual, setpoint = 60% relative humidity. Dehumidifier: whole-dwelling with integrated energy factor = 1.77 liters/kWh.	Same as *standard reference design*.

For SI: 1 square foot = 0.93 m2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m2, 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

a. Hourly calculations as specified in the ASHRAE Handbook of Fundamentals, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE Handbook of Fundamentals, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE Handbook of Fundamentals, page 26.19 for intermittent mechanical ventilation.

c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.

d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

f. For a proposed design without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

g. For a proposed design without a proposed water heater, the following assumptions shall be made for both the proposed design and standard reference design. For a proposed design with a heat pump water heater, the following assumptions shall be made for the standard reference design, except the fuel type shall be electric.

Fuel Type: Same as the predominant heating fuel type

Rated Storage Volume: 40 Gallons

Draw Pattern: Medium

Efficiency: Uniform Energy Factor complying with 10 CFR § 430.32

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouse units, the following formula shall be used to determine glazing area:

$AF = As \times FA \times F$

where:

AF = Total glazing area.

As = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

- Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

- Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

- Below-grade boundary wall is any thermal boundary wall in soil contact.

- Common wall area is the area of walls shared with an adjoining dwelling unit.

i. The factor for the compactness of the hot water distribution system is the ratio of the area of the rectangle that bounds the source of hot water and the fixtures that it serves (the “hot water rectangle”) divided by the floor area of the dwelling.

    1. Sources of hot water include water heaters, or in multiple-family buildings with central water heating systems, circulation loops or electric heat traced pipes.

    2. The hot water rectangle shall include the source of hot water and the points of termination of all hot water fixture supply piping.

    3. The hot water rectangle shall be shown on the floor plans and the area shall be computed to the nearest square foot.

    4. Where there is more than one water heater and each water heater serves different plumbing fixtures and appliances, it is permissible to establish a separate hot water rectangle for each hot water distribution system and add the area of these rectangles together to determine the compactness ratio.

    5. The basement or attic shall be counted as a story when it contains the water heater.

    6. Compliance shall be demonstrated by providing a drawing on the plans that shows the hot water distribution system rectangle(s), comparing the area of the rectangle(s) to the area of the dwelling and identifying the appropriate compactness ratio and HWDS factor.

j. For a proposed design with electric resistance heating, a split system heat pump complying with 10 CFR §430.32 (2021) shall be assumed modeled in the standard reference design.

k. For heating systems, cooling systems, or water heating systems not included in Table R405.4.2(1), the standard reference design shall be the same as proposed design.

l. Only sections of ductwork that are installed in accordance with Items 1 or 2 of Section R403.3.4, are assumed to be located completely inside conditioned space. All other sections of ductwork are not assumed to be located completely inside conditioned space.

m. Sections of ductwork installed in accordance with Section R403.3.5.1, are assumed to have an effective duct insulation R-value of R-25.

Reason: A problem was created when the term “sleeping unit” was introduced in the Residential provisions of the Energy Code. By mentioning “sleeping units” in some code sections but not others, an ambiguity was created regarding whether certain provisions that only mention “dwelling units” should also apply to “sleeping units.”
This is intended to be an editorial proposal offered as a clarification consistent with the intent of existing code provisions. It adds a definition for the term “sleeping unit” but it neither adds new sections nor deletes existing sections. For simplicity and to avoid unnecessarily repetitive language, we’ve modified the term “~~dwelling~~ unit enclosure area” to read “testing unit enclosure area” in Chapter 2 and wherever it’s mentioned. We also corrected some punctuation mistakes.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.This proposal is editorial.

Workgroup Recommendation

Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
removes ambiguity created regarding whether certain provisions that only mention “dwelling units” should also apply to “sleeping units.”

REC2D-10-23

IECC RE: R402.5.1.3, R408.2.1.4, R403.3.7, R503.1.2.3, R403.6.2

Proponents:

Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com)

2024 International Energy Code [RE] [RE Project] R3

Revise as follows:

R402.5.1.3 Maximum air leakage rate.

Where tested in accordance with Section R402.5.1.2, the air leakage rate for *buildings* or *dwelling units* shall be as follows:

1. *building* or *dwelling units* in the *building* shall have an air leakage rate not greater than 4.0 air changes per hour in Climate Zones 0, 1 and 2, 3.0 air changes per hour in Climate Zones 3 through 5, and 2.5 air changes per hour in Climate Zones 6 through 8.

2. Where complying with Section R401.2.1, the *building* or dwelling units in the *building* shall have an air leakage rate not greater than 4.0 air changes per hour, or 0.22 cfm/ft^2~~(1.1 L/s x m^2)~~ [1.1 L/(s x m^2)]of the *building thermal envelope* area or *dwelling unit enclosure area*, as applicable.

Exceptions:

1. Where complying with Section R401.2.2 or R401.2.3, the *dwelling units* are attached or located in an R-2 occupancy, and are tested without simultaneously testing adjacent *dwelling units*, the air leakage rate is permitted to be not greater than 0.27 cfm/ft^2~~(1.35 L/s x m^2)~~ [1.4 L/(s x m^2)]of the *dwelling unit enclosure area*. Where adjacent dwelling units are simultaneously tested in accordance with ASTM E779, the air leakage rate is permitted to be not greater than 0.27 cfm/ft^2~~(1.35 L/s x m^2)~~[1.4 L/(s x m^2)] of the *dwelling unit enclosure area* that separates *conditioned space* from the exterior.Where

2. *buildings* have 1,500 square feet (139.4 m^2) or less of *conditioned floor area*, the air leakage rate is permitted to be not greater than 0.27 cfm/ft^2~~(1.35 L/s x m^2)~~[1.4 L/(s x m^2)].Where

R408.2.1.4 Reduced air leakage.

For the reduced air leakage credit, the *building*shall have a measured air leakage rate no less than 2.0 ACH50 and no greater than 2.5 ACH50 or the *dwelling units* in the *building*shall have an average measured *air leakage* rate no greater than 0.24 cfm~~50~~/ft^2[1.2 L/(s x m^2)].

R403.3.7 Duct system testing.

Each *duct system* shall be tested for air leakage in accordance with ANSI/RESNET/ICC 380 or ASTM E1554. Total leakage shall be measured with a pressure differential of 0.1 inch water gauge (25 Pa) across the *duct system* and shall include the measured leakage from the supply and return *ductwork*. A written report of the test results shall be signed by the party conducting the test and provided to the *code official*. *Duct system* leakage testing at either rough-in or post-construction shall be permitted with or without the installation of registers or grilles. Where installed, registers and grilles shall be sealed during the test. Where registers and grilles are not installed, the face of the register boots shall be sealed during the test.

Exceptions:

1. Testing shall not be required for *duct systems* serving *ventilation* systems that are not integrated with *duct systems* serving heating or cooling systems.

2. Testing shall not be required where there is not more than 10 feet (3.03 m) of total *ductwork* external to the *space conditioning equipment* and both the following are met:

2.1. The *duct system* is located entirely within *conditioned space*.

2.2. The *ductwork* does not include *plenums* constructed of building cavities or gypsum board.

3. Where the *space conditioning equipment* is not installed, testing shall be permitted. The total measured leakage of the supply and return *ductwork* shall be less than or equal to 3.0 ~~cubic feet per minute~~cfm (85 L/min) per 100 ft^2 ~~square feet~~ (9.29 m) of *conditioned floor area*.

4. Where tested in accordance with Section R403.3.9, testing of each *duct system* is not required.

R503.1.2.3 Duct system leakage.

Where an *alteration* includes any of the following, *duct systems* shall be tested in accordance with Section R403.3.5 and shall have a total leakage less than or equal to 12.0 ~~cubic feet per minute~~cfm (339.9 L/min) per 100 ft^2~~square feet~~ (9.29 m^2) of *conditioned floor area*:

1. Where 25 percent or more of the registers that are part of the *duct system* are relo2.
2. Where 25 percent or more of the total length of all *ductwork* in the *duct* system are relocated.
3. Where the total length of all *ductwork* in the *duct system* is increased by 25 percent or more.

Exception: *Duct systems* located entirely inside a *conditioned space* in accordance with Section R403.3.2.

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy.

Fans used to provide whole-dwelling mechanical *ventilation* shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with the test procedure referenced by Table R403.6.2 and *listed*. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch water gauge ~~w.c.~~ (~~49.85~~50 Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch water gauge~~w.c.~~ (~~24.91~~25 Pa).

Reason:

Clean-up Units for Air-Leakage and Duct Leakage metrics

Proponents: Gayathri Vijayakumar, gvijayakumar@swinter.com

Reason Statement: Since we don't have a style guide to strictly follow, we now have some incorrect and also inconsistent use of units that cannot be corrected by staff without a proposal. This proposal corrects some but not all.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.

Inconsistent Units:

1. The 2024 IECC-R uses both "cfm/ft²" and "cubic feet per minute per square foot". It also uses "L/s x m²" and "L/(s × m²)" which are not technically the same conversion.

Recommendation 1:

Consistently use "cfm/ft²" and "[L/(s × m²)]" and check conversions (seem to be different in R303 than R402)

R303.1.5 Air-impermeable insulation

. Insulation having an air permeability not greater than

0.004 ~~cubic feet per minute per square foot~~ cfm/ft² [0.0~~0~~2 L/(s × m²)] under pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall be determined air-impermeable insulation.

R402.5.1.3 Maximum air leakage rate.

1…

2. Where complying with Section R401.2.2 or R401.2.3, the building or dwelling units in the building shall have an air leakage rate not greater than 4.0 air changes per hour, or 0.22 cfm/ft²~~(1.1 L/s x m²)~~ [1.1 L/(s × m²)] of the building thermal envelope area or dwelling unit enclosure area, as applicable.

Exceptions:

1. Where dwelling units are attached or located in an R-2 occupancy, and are tested without simultaneously testing adjacent dwelling units, the air leakage rate is permitted to be not greater than 0.27 cfm/ft²~~(1.35 L/s x m²)~~ [1.4 L/(s × m²)] of the dwelling unit enclosure area. Where adjacent dwelling units are simultaneously tested in accordance with ASTM E779, the air leakage rate is permitted to be not greater than 0.27 cfm/ft²~~(1.35 L/s x m²)~~ [1.4 L/(s × m²)] of the dwelling unit enclosure area that separates conditioned space from the exterior.

2. Where buildings have 1,500 square feet (139.4 m²) or less of conditioned floor area, the air leakage rate is permitted to be not greater than 0.27 cfm/ft²~~(1.35 L/s x m²)~~ [1.4 L/(s × m²)][GV(1] [GV2]].

R408.2.1.4 Reduced air leakage

. For the reduced air leakage credit, the building shall have a measured air leakage rate no less than 2.0 ACH50 and no greater than 2.5ACH50 or the dwelling units in the building shall have an average measured air leakage rate no greater than 0.24 cfm~~50~~/ft² [1.2 L/(s × m²)].

2. The 2024 IECC-R is inconsistent in duct leakage metrics.

Recommendation 2: Consistently use “cfm (## L/min) per 100 ft²”

R403.3.7 Duct system testing.

Exceptions:

1.

2.

3. Where the space conditioning equipment is not installed, testing shall be permitted. The total measured leakage of the supply and return ductwork shall be less than or equal to 3.0 cfm ~~cubic feet per minute~~ (85 L/min) per 100 ft² ~~square feet~~ (9.29 m²) of conditioned floor area.

TABLE R403.3.8

MAXIMUM TOTAL DUCT SYSTEM LEAKAGE

cfm/100 ft² (LPM/9.29 m²)

R503.1.2.3 Duct system leakage.

Where an alteration includes any of the following, duct systems shall be tested in accordance with Section R403.3.5 and shall have a total leakage less than or equal to 12.0 cfm ~~cubic feet per minute~~ (339.9 L/min) per 100 ft² ~~square feet~~ (9.29 m²) of conditioned floor area:

TABLE R405.4.2 (1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

4 cfm (113.3 L/min) per 100 ft² (9.29 m²)

3.

In air leakage and duct leakage tests, we say “0.2 inch water gauge (50 Pa)” and “0.1 inch water gauge (25 Pa)” respectively. R403.6.2 shows 49.85 and 24.91 Pa respectively.

Recommendation 3: Round to 25 and 50 Pa. Consider whether “w.c.” could be “water gauge”[GV3]

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy. Fans used to provide whole-dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with the test procedure referenced by Table R403.6.2and listed. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch water gauge~~w.c.~~ (50~~49.85~~ Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 water gauge~~w.c.~~ (25~~24.91~~ Pa).

4. Where using “percent” sometimes it is preceded by a dash (sometimes not). It is spelled out most everywhere except R408.2.2.

Recommendation 4: Don’t use the dash between the number and the “percent”

5.

Climate Zone is a defined term. Sometimes is it is capitalized when referencing a specific climate zone, sometimes it is in italics when not referencing a specific zone.

Recommendation 5: Replace “*Climate Zone*” in R408.2 & RG101.3 with “*climate zone*”. Remove italics from “Climate Zone 8” in R408.2.5 and Appendix RI where they reference specific zones.

Also, when a range of climate zones are referenced, it should always be stated “Climate Zones 4 through 8”, not “Climate Zones 4 to 8” nor “Climate Zones 4 – 8.”

[GV(1]2024 IECC-C is using (1.4 L/s x m2)

[GV2]90.-2022 uses "cfm/ft2"

[GV3]Confirmed with Mike Moore.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

editorial changes

Workgroup Recommendation

Residential Energy Committee Action: As Modified
Residential Energy Committee Reason:
Editorial consistency in units and terminology