International Energy Conservation Code
Consensus Committee-Residential

Draft Meeting Agenda (9/13/23 posting-update)

Webex Meeting Link

September 14, 2023
2:00 PM Eastern until agenda complete

Committee Chair: JC Hudgison, CBO, Assoc. AIA
Committee Vice Chair: Bridget Herring

1. Call to order.

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

3. Roll Call.

4. Approve Agenda

5. Approve Minutes-September 7, 2023 meeting

6. Administrative issues-staff

7. Action Items-

RE2D-49-23(Stretch code appendix)	Modeling heard comment with no action
RE2D-69-23(Table R408.2 edit)	
RE2D-78-23(Table R408.2 edit)	
RE2D-62-23(HRV/ERV Table R408.2 edit)	HVACR disapprove 5-1-1
RE2D-63-23(HRV/ERV Table R408.2 edit)	HVACR approve 4-0-2
RE2D-64-23(HRV/ERV Table R408.2 edit)	HVACR disapprove 4-3
RE2D-65-23(HRV/ERV Table R408.2 edit)	HVACR disapprove 7-0
REC2D-7-23(Balanced ventilation)	HVACR approve 7-0
REC2D-5-23(Occupied space definition)	
REC2D-6-23(Update R402.2.1 with Table R402.1.3)	
REC2D-8-23(Sleeping units)	

REC2D-9-23(Table R405.2 and Table R406.2 edits)
Proposal for cleanup of air leakage and duct leakage metrics

8. Other business.

9. Upcoming meetings. TBD

10. Adjourn.

FOR FURTHER IECC Residential INFORMATION BE SURE TO VISIT THE ICC WEBSITE: IECC Residential Website

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
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Join by meeting number

Meeting number (access code): 2597 702 0320

Meeting password: uGvZqpTd984

Tap to join from a mobile device (attendees only)

1-844-740-1264,,25977020320## USA Toll Free

+1-415-655-0003,,25977020320## US Toll

RE2D-69-23 Mod 2

Notes This modification includes all changes approved for RE2D-59 and proposes to:

1. Change credits for Option (9) as shown highlighted in yellow.
2. Move the row for Option (9) to just below Option (5) to match up with climate zones
3. Move the language for “HVAC options applicable to all climate zones” for Option (9) to just below Option (5).
4. Modify previously approved RE2D-66, Mod 2 by striking the row for Option (9) and replacing it with the Option (9) credits per this proposal (RE2D-66 mods highlighted in green).
5. Keep the RE2D-66 changes for Option (10) as previously approved.
6. Strike the new footnote e per the previously approved RE2D-66.

IECC RE: TABLE R408.2

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
R408.2.2(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)	0	1	2	5	3	6	7	7	9
R408.2.2(5)[b]	High Performance Gas furnace (Option 2)	0	1	2	4	3	5	6	7	8
R408.2.2(9)[b]	High Performance Gas furnace and heat	15	13	11	~~7~~ ~~NA~~ 11	~~NA~~ 9	~~NA~~ 10	~~NA~~ 10	~~NA~~ 10	~~NA~~ 10

	pump (Option 1)									
R408.2.2(6)[b]	High Performance Gas furnace (Option 3)	0	1	1	NA	NA	NA	NA	NA	NA
R408.2.2(7)[b]	High Performance Gas furnace and cooling (Option 1)	5	5	4	NA	NA	NA	NA	NA	NA
R408.2.2(8)[b]	High Performance Gas furnace and cooling (Option 2)	6	5	5	NA	NA	NA	NA	NA	NA
~~R408.2.2(9)[b]~~	~~High Performance Gas furnace and heat pump (Option 1)~~	~~15~~	~~13~~	~~11~~	~~7 NA[c]~~	~~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	5	4	6	7	7	9
R408.2.2(12)[b]	High Performance Gas furnace and cooling (Option 4)	NA	NA	NA	6	5	7	8	8	10
R408.2.2(13)[b]	High Performance Gas furnace and heat pump (Option 2)	NA	NA	NA	12	8	11	11	12	12
R408.2.2(14)[b]	High Performance Heat pump with electric resistance backup (Option 2)	NA	NA	NA	12	8	12	13	14	16

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

R408.2.2 More efficient HVAC equipment performance option. Heating and cooling equipment shall meet one of the following efficiencies as applicable for the climate zone . Where multiple heating or 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. Centrally Ducted Systems:

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.

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

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.

Reason Statement: Hybrid systems using a heat pump with gas furnace back-up will become more popular, especially in cold climates, as programs, incentives, policies and codes continue to promote or require the installation of heat pumps. A more affordable option, not requiring a more expensive cold climate heat pump and 95% furnace, should also be available in cold climate zones and will still offer significant energy savings.

RE2D-78-23 Mod (replaces original proposal)

IECC RE: TABLE R408.2

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

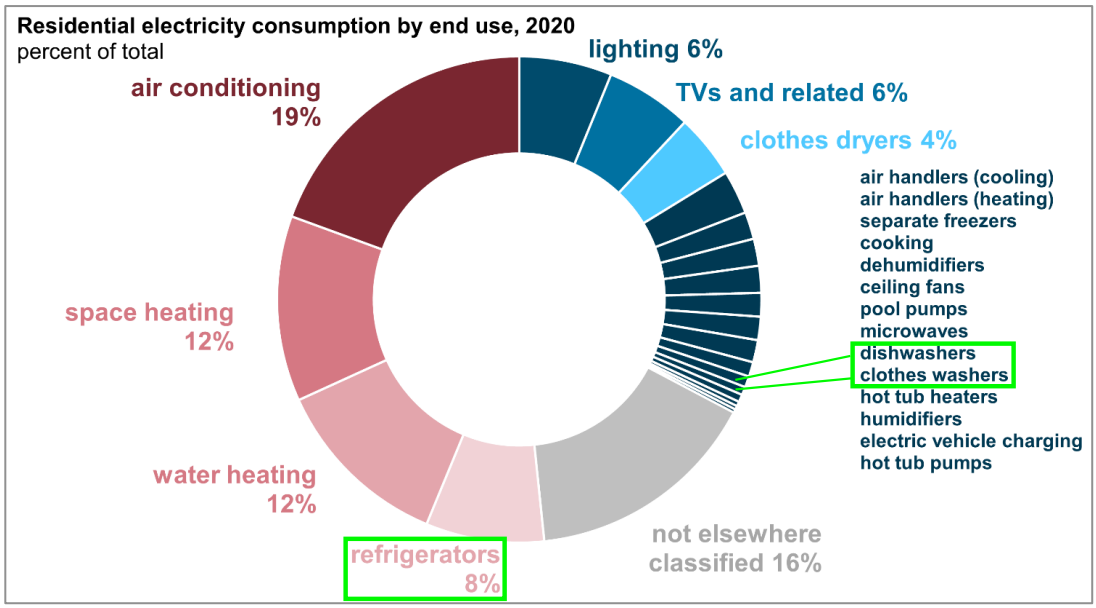
Revise as follows:

TABLE R408.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY
Portions of table not shown remain unchanged.

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
R408.2.6[a]	Energy efficient appliances	~~1~~ 0	~~1~~ 0	~~1~~ 0	~~1~~ 0	~~1~~ 0	~~1~~ 0	0	0	0

Reason Statement

At 8%, refrigerators consume far and away more electricity than dishwashers and clothes washers. Therefore, refrigerators are the most consequential part of R408.2.6.



Source: U.S. Energy Information Administration, 2020 *Residential Energy Consumption Survey*

There are two problems with the refrigerator portion of the measure: the baseline and the requirement.

In the past few days, the U.S. Energy Information Administration (EIA) within the U.S. Department of Energy has provided data from the 2020 Residential Energy Consumption Survey (2020 RECS) relevant to

R408.2.6. 2020 RECS data is compiled from household surveys, energy supplier billing data for those households, weather data, standards, and other sources. The collection and analysis process is quite robust and this is exactly the type of data we need to inform the R408.2.6 baseline and requirement.

Baseline

The measure was modeled with a single baseline for all refrigerator types: **669** kWh/yr. Per 2020 RECS, the average electricity consumption of new refrigerators of all types is **550** kWh/yr.[1]

Obviously, a baseline should not be higher than real-world annual energy consumption (AEC). Yet PNNL's current baseline is **higher** for all types combined and every type individually:

Comparison of Current Refrigerator Baseline to Average Energy Consumption
by Refrigerator Type for Most-Used Refrigerators[2] Less Than 2 Years Old
kWh per Household per Year

Refrigerator Types	Current Baseline	2020 RECS AEC	Δ %
All Types	669	550	22 % higher
All Types Except Compacts	669	553	21 % higher
All Types Except Compacts and One Door	669	568	18 % higher
Types:			
Compacts	669	339	97 % higher
1 door	669	410	63 % higher
2 doors, top freezer	669	395	69 % higher
2 doors, bottom freezer	669	642	4 % higher
2 doors, side-by-side	669	618	8 % higher
3 or more doors[3]	669	667	0 %

Note that top freezers are the most common refrigerator type in US homes (all housing unit types). (Source: 2020 RECS Table HC 3.1)

Requirement

Currently, the measure contains a single refrigerator requirement: 620 kWh/year (maximum). Where did 620 come from? A survey of Home Depot's website. 620 represents an average of the annual energy use of 4 side-by-side and 8 French door models on Home Depot's website in November 2022.

[1] In 2020 RECS, refrigerator age categories range from "less than 2 years old" to "20 or more years old." "Less than 2 years old" is the most relevant category for new refrigerators in new construction. (Although the data is already three years old, the 2020 survey is the most recent RECS survey; the data was released this year.)

[2] 2020 RECS collected information regarding the most-used (primary) refrigerator as well as additional (secondary) refrigerators.

[3] Includes French Door bottom freezer configurations.

To earn R408 credit, the requirement should be significantly **lower** than real-world annual energy consumption. Yet the current requirement is **higher** for all types combined and some types individually. It is not lower by a sufficient amount for any type:

Comparison of Current Refrigerator Requirement to Average Energy Consumption
by Refrigerator Type for Most-Used Refrigerators Less Than 2 Years Old
kWh per Household per Year

Refrigerator Types	Current Requirement	2020 RECS AEC	Δ %
All Types	620	550	13 % higher
All Types Except Compacts	620	553	12 % higher
All Types Except Compacts and One Door	620	568	9 % higher
Types:			
Compacts	620	339	83 % higher
1 door	620	410	51 % higher
2 doors, top freezer	620	395	57 % higher
2 doors, bottom freezer	620	642	3 % lower
2 doors, side-by-side	620	618	0 %
3 or more doors	620	667	7 % lower

Because there is wide variation in energy consumption between compact, top freezer, bottom freezer and side-by-side configurations, R408.2.6 should have four different baselines and four corresponding requirements that produce similar energy savings (and earn the same credit value).

RECS Data by Housing Unit Type

The U.S. Energy Information Administration also filtered the data by housing unit type. In all instances, the current baseline and current requirement are **higher** than 2020 annual energy consumption:

Comparison of Current Refrigerator Baseline to Average Energy Consumption
by Housing Unit Type for Most-Used Refrigerators Less Than 2 Years Old
kWh per Household per Year

Housing Unit Type	Current Baseline	2020 RECS AEC	Δ	Δ %
All Types	669	550	119	22 % higher
Single-family detached	669	611	58	9 % higher
Single-family attached	669	542	127	23 % higher
Apartments in buildings with 2-4 units	669	399	270	68 % higher
Apartments in buildings with 5 or more units	669	428	241	56 % higher

Comparison of Current Refrigerator Requirement to Average Energy Consumption
by Housing Unit Type for Most-Used Refrigerators Less Than 2 Years Old
kWh per Household per Year

Housing Unit Type	Current Requirement	2020 RECS AEC	Δ	Δ %
All Types	620	550	70	13 % higher
Single-family detached	620	611	9	1 % higher
Single-family attached	620	542	78	14 % higher
Apartments in buildings with 2-4 units	620	399	221	55 % higher
Apartments in buildings with 5 or more units	620	428	192	45 % higher

Even looking solely at single-family detached, the current baseline and current requirement are both higher than 2020 annual energy consumption. Given that the baseline should represent actual energy consumption and the requirement should be a substantial improvement over actual energy consumption, this is unacceptable. For multi-family housing types, the baseline and requirement are even further off the mark.

Federal Minimum Standards and Energy Star

Annual Energy Use Ranges (in kWh/yr)			
Type	U.S. Federal Standard	Energy Star	Energy Star Most Efficient
Top Freezer standard size	331 to 536	263 to 489	263 to 489
Bottom Freezer standard size[4]	439 to 844	286 to 807	286 to 595
Side-by-side standard size	646 to 885	560 to 805	N/A
Compact	228 to 580	106 to 470	106 to 255

Source: https://www.energystar.gov/productfinder/product/certified-residential-refrigerators/results

There are several configurations within each type listed in the table above. Every configuration has a maximum allowed annual energy consumption known as the U.S. Federal Standard. At 620, the current requirement is higher than the Federal Standard for many configurations. Thus, the 2024 code would give R408 credit for refrigerators that merely meet the applicable minimum Federal Standard.

The annual energy use of Energy Star models is at least 10% lower than the applicable Federal Standard, and Energy Star Most Efficient models consume the least amount of energy.

R408.2.6 Deficiencies

The refrigerator requirement in measure number R408.2.6 does not provide energy savings relative to U.S. Federal Standards, actual energy consumption (2020 RECS), or Energy Star. In addition, a single baseline and a single requirement fail to account for the large energy use differences between types.

[4] Includes French Door bottom freezer configurations.

The measure should not confer points until the refrigerator requirement produces true energy savings.

Under this proposal, the credit values for R408.2.6 would be zero and no credits would be earned. However, the measure would still qualify as a measure under Section R408.2.

Cost Impact

Comment will neither increase or decrease the cost of construction. This is an optional measure that presumably will not be chosen unless it is cost effective.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	RE2D-62-23 Modify Table R408.2
CDP ID #	1917
Code	IECC RE
Code Section(s)	Table R408.2
Location	SC rev
Proponent	Vladimir Kochkin
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Vladamir Kochkin opened and then turned over the floor to Armin Rudd to present. David Bixby made a motion to approve to open discussion with a second by Dean Potter. Initial support from some subcommittee members until Rob Salcido with PNNL said there is no time left for calculations to be completed. With this information David Bixby removed his motion to approve and the second agree. New motion to disapprove by Mark Lyles with a second from Jennifer Amann. Without PNNL calculations it is too late for this proposal to move forward.
Recommendation	Subcommittee voted to disapprove
Vote	5/1/1
Recommendation Date	9/5/2023
Next Step	To Subcommittee To Advisory Group_____ To Consensus Committee____x_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	RE2D-63-23 Modify Table R408.2
CDP ID #	1927
Code	IECC RE
Code Section(s)	Table R408.2
Location	SC rev
Proponent	Alisa McMahon
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Alisa McMahon presenting This proposal allows the ERV/ HRV to be installed inside or outside the conditioned boundary as long as points are appropriately applied. Motion to approve with a second opened the floor to discussion. Rob Salcido with PNNL stated calculating the cost this late in the process may not be possible. This proposal best aligned with manufactures that do not require installation inside the envelope yet allows for installation inside the envelope that some manufacturer require. Motion to approve carried. 4/0/0 Additional information On Wednesday the 6th of September Rob Salcido wrote (summary) from his team. The zonal HRV object in Energy Plus does not have a metric for input. The unit is indeed inside the envelope and there is no way to show it outside the envelope. “The problem is, we cannot have this competed in short time – so we are not able to analyze this proposal in the timeframe necessary as it will be a big lift. Alisa did respond and can better explain her positon to Consensus.
Recommendation	Subcommittee having voted to approve
Vote	4/0/2
Recommendation Date	9/5/2023
Next Step	To Subcommittee To Advisory Group_____ To Consensus Committee_____
Consensus Committee	
Committee Response	

Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	RE2D-64-23 Modify Table R408.2
CDP ID #	1928
Code	IECC RE
Code Section(s)	Table R408.2
Location	SC rev
Proponent	Alisa McMahon
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Alisa McMahon presented this proposal to the subcommittee as her preferred version of 3 proposals. The proposal requires ERV or HRV be installed within the conditioned boundary. Motion and a second to approve. After much discussion the mood of the subcommittee changed. A vote was taken and the motion to approve failed to pass. 3/4/0- The reason for the motion failing is the subcommittee did not support the requirement for all ERV and HRV being required to be installed inside the envelope conditioned boundary. Some manufacturers do not require their ERV or HRV to be installed interior thus conflicting with some manufacturers.
Recommendation	Vote to approve failed 3/4/0 subcommittee motion is to disapprove
Vote	Disapprove
Recommendation Date	9/5/2023
Next Step	To Subcommittee To Advisory Group_____ To Consensus Committee_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	RE2D-65-23 Modify Table R408.2
CDP ID #	1929
Code	IECC RE
Code Section(s)	Table R408.2
Location	SC rev
Proponent	Alisa McMahon
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Alisa McMahon presenting opened with this is the least preferred by the proponent. The proposal will conflict with some manufacturer installation requirements. Back and forth proposals and discussion. Vote to disapprove 7/0/0
Recommendation	Subcommttee vote is to disapprove
Vote	7/0/0 disapprove
Recommendation Date	9/5/2023
Next Step	To Subcommittee To Advisory Group_____ To Consensus Committee____x_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REC2D-7-23 Balanced ventilation
CDP ID #	1928
Code	IECC RE
Code Section(s)	Table R408.2
Location	SC rev
Proponent	Gayathri Vijayakumar
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Gayathri presented the new term and definition "balanced ventilation system" With a motion to approve and second. No discussion. Table 403.6.2
Recommendation	Motion to approve carried with a unanimous vote yes
Vote	7/0/0
Recommendation Date	9/5/2023
Next Step	To Subcommittee To Advisory Group_____ To Consensus Committee__x _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

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

REC2D-5-23

IECC RE: SECTION 202

Proponents:

Richard Potts, representing IECC R Consistency and Administration subcommittee

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

Revise as follows:

~~OCCUPIABLE~~ OCCUPIED SPACE. An enclosed space intended for human activities, excluding those spaces intended primarily for other purposes, such asstorage rooms and equipment rooms, that are only intended to be occupied occasionally and for short periods of time.

PLENUM. An enclosed portion of the *building* structure, other than an ~~*occupiable*~~ *occupied space* being conditioned, that is designed to allow air movement,and thereby serve as part of the supply or return *ductwork*.

Reason:

The term “Occupiable Space” as written in Public Draft #2 is only used in the body of the definition of the term “Plenum” and not found elsewhere within the body of the proposed draft. However, the use of occupied space is found twice within Section N1107.2(R407.2). For the purpose of consistency and to prevent an instance where a defined term is not utilized elsewhere in the body of the code I am respectively submitting the following modifications for consideration.

Cost Impact:

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

editorial change to definition

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

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, R403.8, 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 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/ft^2 (1.1 L/s x m^2) of the *building thermal envelope* area or the *dwelling* ~~*unit*~~ *testing 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/ft^2 (1.35 L/s x m^2) 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/ft^2 (1.35 L/s x m^2) of the ~~*dwelling unit*~~*testing enclosure area* that separates *conditioned space* from the exterior.
2. Where *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).

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.

R403.8 Systems serving multiple ~~dwelling~~ units.

Except for systems complying with Section R403.9, systems serving multiple *dwelling units* or *sleeping units* shall comply with Sections C403 and C404 of the *International Energy Conservation Code*—Commercial Provisions instead of Section R403.

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 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	

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
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*, 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*~~ *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 .

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
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
	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		

<table>
<tr><td>systems[d, f, k]</td><td></td><td></td></tr>
<tr><td>BUILDING COMPONENT</td><td>STANDARD REFERENCE DESIGN</td><td>PROPOSED DESIGN</td></tr>
<tr><td></td><td>Fuel Type: Electric
Capacity: Same as proposed design</td><td>As proposed</td></tr>
<tr><td></td><td>Efficiencies: Complying with 10 CFR §430.32</td><td>As proposed</td></tr>
<tr><td>Service water heating[d, g, k]</td><td>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><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>
</table></td><td>Duct location: as proposed[l] .</td></tr>
</table>

<table>
<tr><th>BUILDING COMPONENT</th><th colspan="4">STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td rowspan="4"></td><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><td></td></tr>
<tr><td colspan="4">Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed[m] .</td></tr>
<tr><td colspan="4">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 colspan="4">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 colspan="4">Type: Manual, cooling temperature setpoint = 75°F;
Heating temperature setpoint = 72°F.</td><td>Same as standard reference design.</td></tr>
</table>

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED 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 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*. 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 = $A_s \times FA \times F$

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.

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.

REC2D-9-23

IECC RE: R402.2.9, R402.2.9.1, TABLE R405.2, TABLE R406.2

Proponents:

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

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

Revise as follows:

R402.2.9 Basement walls.

Basement walls shall be insulated in accordance with Table R402.1.3.

Exception: Basement walls associated with unconditioned basements where the following requirements are met:

1. The floor overhead, including the underside stairway stringer leading to the basement, is insulated in accordance with Section R402.1.3 and applicable provisions of Sections R402.2 and R402.2.8.
2. There are no uninsulated *ductwork*, domestic hot water piping, or hydronic heating surfaces exposed to the basement.
3. There are no HVAC supply or return diffusers serving the basement.
4. The walls surrounding the stairway and adjacent to *conditioned space* are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2.
5. The door(s) leading to the basement from conditioned spaces are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2, and weatherstripped in accordance with Section R402.5.
6. The *building thermal envelope* separating the basement from adjacent conditioned spaces complies with Section R402.5.

R402.2.9.1 Basement wall insulation installation.

Where *basement walls* are insulated, the insulation shall be installed from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less, or in accordance with the *proposed design* or the *rated design*, as applicable.

TABLE R405.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.1.6	Rooms containing fuel burning appliances
R402.2.3	Attic knee wall
R402.2.4	Eave baffle

R402.2.5.1	Access hatches and door insulation installation and retention
R402.2.9.1	Basement wall insulation installation
R402.2.10	Slab-on-grade floors
R402.2.11	Crawl space ~~wall insulation~~walls
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing
R402.5.1.3	Maximum air leakage rate
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Recessed lighting
R402.5.5	Air-sealed electrical and communication outlet boxes
R402.6	Maximum fenestration *U*-factor and SHGC
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5	Service hot water systems
R403.6	Mechanical ventilation
R403.7, except Section R403.7.1	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9.2	Snow melt and ice system controls
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
R403.13	Gas fireplaces
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.5	Electric readiness

R404.6	Renewable energy infrastructure
R404.7	Electric Vehicle power transfer infrastructure

a. Reference to a code section includes all the relative subsections except as indicated in the table.

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	**TITLE**
General	
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.1.6	Rooms containing fuel burning appliances
R402.2.3	Attic knee wall
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and door insulation installation and retention
R402.2.9.1	Basement wall insulation installation
R402.2.10	Slab-on-grade floors
R402.2.11	Crawl space ~~wall insulation~~walls
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing
R402.5.1.3	Maximum air leakage rate
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Recessed lighting
R402.5.5	Air-sealed electrical and communication outlet boxes
R406.3	*Building thermal envelope*
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation

R403.5	Service hot water systems
R403.6	Mechanical ventilation
R403.7, except Section R403.7.1	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9.2	Snow melt and ice system controls
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
R403.13	Gas fireplaces
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.5	Electric readiness
R404.6	Renewable energy infrastructure
R404.7	Electric Vehicle power transfer infrastructure

a. Reference to a code section includes all of the relative subsections except as indicated in the table.

Reason:

R402.2.9.1 was modified in the last round of voting (RED1-217). The reason statement said: “The proposal clarifies the relationship between the prescriptive path and both performance paths. The performance paths are intended to provide design flexibility in achieving target energy performance. Only installation provisions should be listed in this table because the amount of insulation should be tradable. The insulation height on basement walls should be tradable as well.”However, this sub-section is no longer listed in Table R405.2 or Table R406.2. This member proposal corrects that mistake. In addition, the section header for ‘crawl space walls’ is updated and for consistency with Table R405.2, ‘Attic knee walls’ is added to Table R406.2.

Cost Impact:

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

None

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

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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/ft^2" and "cubic feet per minute per square foot". It also uses "L/s x m^2" and "L/(s × m^2)" which are not technically the same conversion.**

Recommendation 1: Consistently use "cfm/ft^2" and "[L/(s × m^2)]" 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/ft^2 [0.002 L/(s × m^2)] 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/ft^2 ~~(1.1 L/s x m^2)~~ [1.1 L/(s × m^2)] 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/ft^2 ~~(1.35 L/s x m^2)~~ [1.4 L/(s × 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 × m^2)] of the dwelling unit enclosure area that separates conditioned space from the exterior.
2. Where 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 × m^2)].

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~~/ft^2 [1.2 L/(s × m^2)].

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

Recommendation 2: Consistently use "cfm (## L/min) per 100 ft^2"

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 ft^2 ~~square feet~~ (9.29 m^2) of conditioned floor area.

TABLE R403.3.8
MAXIMUM TOTAL DUCT SYSTEM LEAKAGE

cfm/100 ft^2 (LPM/9.29 m^2)

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 ft^2 ~~square feet~~ (9.29 m^2) 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 ft^2 (9.29 m^2)

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"

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 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 inch 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.