IECC RESIDENTIAL COMMITTEE ACTION REPORT ON THE RESULTS ON THE 2022 PUBLIC COMMENTS/CODE CHANGES TO PUBLIC COMMENT DRAFT 1 TO THE INTERNATIONAL ENERGY CONSERVATION CODE-RESIDENTIAL (5/1/23)

Introduction

On July 19, 2021, Energy.cdpACCESScom was opened for 2021 Public Input Proposed Code Change submittals for consideration in the update to the 2024 International Energy Conservation Code and Chapter 11 of the International Residential Code. The submittal deadline was October 12, 2021. A total of 450 proposals were received (256 Commercial; 194 Residential). In addition, 17 committee proposals were submitted (7 Commercial; 10 Residential).

On September 6, 2022, energy.cdpaccess.com was opened for public comment on the IECC Commercial Public Comment Draft #1. The submittal deadline was October 21, 2022. On October 24, 2022, energy.cdpaccess.com was opened for public comment on the IECC Residential and Chapter 11 of the IRC Public Comment Draft #2. The submittal deadline was December 15, 2023. A total of 246 Commercial and 434 Residential proposals were received. In addition, 40 committee proposals were submitted (28 Commercial; 12 Residential)
Proposals are identified as follows:

- Commercial Energy Public Comment Draft 1 proposed code changes (CED1)
- Commercial Energy Committee Public Comment Draft 1 (CECD1) (committee proposal)
- Commercial Energy Public Comment Draft 1 public comments (CEPCD1)
- Residential Energy Public Comment Draft 1 proposed code changes (RED1)
- Residential Energy Committee Public Comment Draft 1(RECD1) (committee proposal)
- Residential Energy Public Comment Draft 1 public comments (REPCD1)
- Residential Energy IRC Public Comment Draft 1 proposed code changes (IRCED1)
- 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.

The process for consideration of the proposals included:

- Posting of the proposals on November 7, 2022 for Commercial, and December 23, 2022 for Residential.
- 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 November/2022 – April/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 development of Public Comment Draft #2.

In an effort to expedite the schedule, Public Comment Draft #2 will be posted for comment during the balloting process by the Consensus Committee. Public Comment Draft #2 (PCD #2) will incorporate 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). In the event that the balloting process results in a change to PCD #2, an addendum will be posted with the change clearly indicated in order to facilitate comments.

Public Comment Draft #2 will be posted and open for code change submittals via Energy.cdpACCESS. IIn accordance with Section 9.7 of the procedures, public comments will be limited to only "substantive changes". As such, the full PCD #2 is not open for comment. 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.

<u>Ballot #1</u>
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.

<u>Ballot #2</u>
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 **Tuesday, May 30 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 #1 Process November 2022-April 2023

Proposal Number	CC action	vote yes	vote no	abstain	%
IRCED1-01-22	disapproved	30	0	1	100%
IRCED1-02-22	disapproved	33	5	1	87%
IRCED1-03-22	disapproved	28	1	1	97%
IRCED1-04-22	disapproved	27	3	1	90%
IRCED1-05-22	disapproved	32	1	0	97%
IRCED1-06-22	disapproved	31	0	0	100%
IRCED1-07-22	approve	29	0	0	100%
IRCED1-08-22	approve	30	0	0	100%
IRCED1-09-22	disapproved	33	0	0	100%
IRCED1-10-22	approve	29	0	1	100%
IRCED1-11-22	disapproved	30	0	2	100%
RECD1-01-22	approved as modified	29	2	1	94%
RECD1-02-22	approve	31	0	0	100%
RECD1-03-22	approved as modified	24	5	2	83%
RECD1-04-22	approved as modified	29	0	0	100%
RECD1-05-22	disapproved	19	16	0	54%
RECD1-06-22	approved as modified	27	3	1	90%
RECD1-07-22	approved as modified	29	1	2	97%
RECD1-08-22	approve	33	0	0	100%
RECD1-09-22	disapproved	25	7	3	78%
RECD1-10-22	approve	32	0	0	100%
RECD1-11-22	approved as modified	28	1	1	97%
RECD1-12-22	approved as modified	30	2	0	94%
RED1-001-22	approved as modified	30	0	0	100%
RED1-002-22	disapproved	34	0	0	100%
RED1-003-22	approve	36	0	0	100%
RED1-004-22 PI	disapproved	37	0	0	100%
RED1-004-22 PII	disapproved	37	0	0	100%
RED1-005-22	disapproved	36	1	0	97%
RED1-006-22	approve	30	0	0	100%
RED1-007-22	approve	28	1	1	97%
RED1-008-22	approve	30	0	0	100%
RED1-009-22	approve	32	1	0	97%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-010-22	approve	31	0	1	100%
RED1-011-22	approved as modified	35	1	0	97%
RED1-012-22	approved as modified	33	3	2	92%
RED1-013-22	approve	34	0	0	100%
RED1-014-22	approved as modified	38	0	1	100%
RED1-015-22	disapproved	31	0	0	100%
RED1-016-22	approved as modified	31	1	1	97%
RED1-017-22	approve	30	0	1	100%
RED1-018-22	disapproved	28	2	2	93%
RED1-019-22	disapproved	35	3	0	92%
RED1-020-22 PI	disapproved	33	1	0	97%
RED1-020-22 PII	disapproved	33	1	0	97%
RED1-021-22 PI	disapproved	28	9	2	76%
RED1-021-22 PII	disapproved	28	9	2	76%
RED1-022-22	withdrawn				
RED1-023-22	disapproved	29	1	1	97%
RED1-024-22 PI	disapproved	20	12	2	63%
RED1-024-22 PII	disapproved	20	12	2	63%
RED1-025-22	withdrawn				
RED1-026-22	withdrawn				
RED1-027-22	approved as modified	29	2	3	94%
RED1-028-22	approved as modified	28	7	2	80%
RED1-029-22	disapproved	35	2	1	95%
RED1-030-22	disapproved	26	8	0	76%
RED1-031-22	approve	33	0	1	100%
RED1-032-22	approve	25	4	1	86%
RED1-033-22	withdrawn				
RED1-034-22	withdrawn				
RED1-035-22	approved as modified	28	1	0	97%
RED1-036-22	disapproved	18	12	3	60%
RED1-037-22	disapproved	29	1	0	97%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-038-22	disapproved	26	3	1	90%
RED1-039-22	disapproved	30	1	2	97%
RED1-040-22	disapproved	16	13	3	55%
RED1-041-22	disapproved	29	2	1	94%
RED1-042-22	disapproved	20	13	2	61%
RED1-043-22	approved as modified	32	0	1	100%
RED1-044-22	disapproved	30	2	2	94%
RED1-045-22	disapproved	29	1	1	97%
RED1-046-22	disapproved	28	10	1	74%
RED1-047-22 PI	disapproved	32	0	1	100%
RED1-047-22 PII	disapproved	32	0	1	100%
RED1-048-22	disapproved	29	2	0	94%
RED1-049-22 PI	withdrawn				
RED1-049-22 PII	withdrawn				
RED1-050-22	disapproved	27	2	1	93%
RED1-051-22	disapproved	26	1	1	96%
RED1-052-22	disapproved	30	2	1	94%
RED1-053-22	disapproved	27	2	1	93%
RED1-054-22	approve	40	0	1	100%
RED1-055-22	disapproved	34	4	2	89%
RED1-056-22	approve	32	0	0	100%
RED1-057-22	withdrawn				
RED1-058-22	withdrawn				
RED1-059-22	disapproved	33	2	0	94%
RED1-060-22	disapproved	24	5	3	83%
RED1-061-22	withdrawn				
RED1-062-22	withdrawn				
RED1-063-22	disapproved	30	0	0	100%
RED1-064-22	disapproved	32	0	0	100%
RED1-065-22	approved as modified	33	0	0	100%
RED1-066-22	withdrawn				
RED1-067-22	approve	28	0	0	100%
RED1-068-22 PI	disapproved	29	0	1	100%
RED1-068-22 PII	disapproved	29	0	1	100%
RED1-069-22	disapproved	24	7	1	77%
RED1-070-22	disapproved	28	0	0	100%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-071-22	approved as modified	30	2	0	94%
RED1-072-22	withdrawn				
RED1-073-22	approved as modified	31	1	2	97%
RED1-074-22	withdrawn				
RED1-075-22	disapproved	21	10	1	68%
RED1-076-22	approve	24	10	0	71%
RED1-077-22	disapproved	28	9	1	76%
RED1-078-22	disapproved	17	11	4	61%
RED1-079-22	approved as modified	29	1	1	97%
RED1-080-22	disapproved	28	1	0	97%
RED1-081-22	withdrawn				
RED1-082-22	withdrawn				
RED1-083-22	withdrawn				
RED1-084-22	disapproved	26	2	2	93%
RED1-085-22	disapproved	33	0	0	100%
RED1-086-22	disapproved	21	11	4	66%
RED1-087-22 PI	disapproved	33	1	2	97%
RED1-087-22 PII	disapproved	33	1	2	97%
RED1-088-22	disapproved	22	8	3	73%
RED1-089-22	approved as modified	22	9	3	71%
RED1-090-22	disapproved	36	4	1	90%
RED1-091-22	approved as modified	30	1	0	97%
RED1-092-22	disapproved	28	2	0	93%
RED1-093-22	disapproved	30	2	0	94%
RED1-094-22	approved as modified	33	0	1	100%
RED1-095-22	disapproved	35	0	0	100%
RED1-096-22	disapproved	27	7	2	79%
RED1-097-22 PI	disapproved	31	0	1	100%
RED1-097-22 PII	disapproved	31	0	1	100%
RED1-098-22	disapproved	26	8	1	76%
RED1-099-22	disapproved	32	1	1	97%
RED1-100-22	disapproved	31	2	1	94%
RED1-101-22	disapproved	29	3	1	91%
RED1-102-22	disapproved	30	3	1	91%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-103-22	disapproved	26	4	1	87%
RED1-104-22	disapproved	29	8	0	78%
RED1-105-22	disapproved	28	2	1	93%
RED1-106-22	disapproved	30	9	1	77%
RED1-107-22	approved as modified	28	1	0	97%
RED1-108-22	withdrawn				
RED1-109-22	withdrawn				
RED1-110-22	approve	24	7	1	77%
RED1-111-22	approved as modified	26	1	2	96%
RED1-112-22	approved as modified	23	7	0	77%
RED1-113-22	disapproved	29	1	0	97%
RED1-114-22	disapproved	19	14	0	58%
RED1-115-22 PI	disapproved	31	5	1	86%
RED1-115-22 PII	disapproved	31	5	1	86%
RED1-116-22	approved as modified	32	0	0	100%
RED1-117-22	disapproved	31	9	1	78%
RED1-118-22	disapproved	30	9	1	77%
RED1-119-22	disapproved	33	9	1	79%
RED1-120-22 PI	disapproved	30	9	1	77%
RED1-120-22 PII	disapproved	30	9	1	77%
RED1-121-22	disapproved	31	9	1	78%
RED1-122-22	disapproved	30	9	1	77%
RED1-123-22	disapproved	30	7	1	81%
RED1-124-22	disapproved	30	9	1	77%
RED1-125-22	disapproved	29	9	1	76%
RED1-126-22 PI	disapproved	32	8	1	80%
RED1-126-22 PII	disapproved	32	8	1	80%
RED1-127-22	disapproved	18	16	2	53%
RED1-128-22	approved as modified	22	8	1	73%
RED1-129-22	disapproved	25	9	2	74%
RED1-131-22	approve	32	0	0	100%
RED1-132-22	disapproved	29	2	0	94%
RED1-133-22	disapproved	25	9	1	74%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-134-22 PI	disapproved	29	9	1	76%
RED1-134-22 PII	disapproved	29	9	1	76%
RED1-135-22 PI	disapproved	29	9	1	76%
RED1-135-22 PII	disapproved	29	9	1	76%
RED1-136-22	disapproved	26	4	2	87%
RED1-137-22	approve	25	6	2	81%
RED1-138-22	approve	26	4	0	87%
RED1-139-22	withdrawn				
RED1-140-22	disapproved	33	1	0	97%
RED1-141-22	disapproved	34	0	0	100%
RED1-142-22	disapproved	32	3	1	91%
RED1-143-22	disapproved	31	3	1	91%
RED1-144-22	disapproved	30	6	2	83%
RED1-145-22	approve	30	3	3	91%
RED1-146-22 PI	disapproved	32	6	1	84%
RED1-146-22 PII	disapproved	32	6	1	84%
RED1-147-22	disapproved	33	6	1	85%
RED1-148-22	disapproved	30	8	1	79%
RED1-150-22	disapproved	33	5	1	87%
RED1-151-22	disapproved	32	6	1	84%
RED1-152-22	disapproved	31	2	3	94%
RED1-153-22	disapproved	29	2	1	94%
RED1-154-22	approve	27	4	5	87%
RED1-155-22	disapproved	27	6	2	82%
RED1-156-22	disapproved	24	4	5	86%
RED1-157-22	approve	27	3	1	90%
RED1-158-22	disapproved	18	11	1	62%
RED1-159-22	disapproved	36	6	0	86%
RED1-160-22 PI	disapproved	35	7	1	83%
RED1-160-22 PII	disapproved	35	7	1	83%
RED1-161-22	disapproved	35	4	2	90%
RED1-162-22	disapproved	35	4	2	90%
RED1-163-22 PI	disapproved	36	4	2	90%
RED1-163-22 PII	disapproved	36	4	2	90%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-164-22	disapproved	34	4	1	89%
RED1-165-22 PI	disapproved	31	2	2	94%
RED1-165-22 PII	disapproved	31	2	2	94%
RED1-166-22	approved as modified	21	9	1	70%
RED1-167-22	withdrawn				
RED1-168-22 PI	disapproved	26	2	0	93%
RED1-168-22 PII	disapproved	26	2	0	93%
RED1-169-22	disapproved	32	0	0	100%
RED1-170-22	disapproved	28	2	2	93%
RED1-171-22 PI	disapproved	28	1	0	97%
RED1-171-22 PII	disapproved	28	1	0	97%
RED1-172-22 PI	disapproved	29	1	0	97%
RED1-172-22 PII	disapproved	29	1	0	97%
RED1-173-22	disapproved	34	3	1	92%
RED1-174-22	disapproved	35	4	1	90%
RED1-175-22 PI	disapproved	34	5	1	87%
RED1-175-22 PII	disapproved	34	5	1	87%
RED1-176-22	disapproved	34	4	1	89%
RED1-177-22	disapproved	35	2	1	95%
RED1-178-22 PI	disapproved	35	3	1	92%
RED1-178-22 PII	disapproved	35	3	1	92%
RED1-179-22	disapproved	26	3	1	90%
RED1-180-22	withdrawn				
RED1-181-22 PI	disapproved	35	1	1	97%
RED1-181-22 PII	disapproved	35	1	1	97%
RED1-182-22	approve	34	0	0	100%
RED1-183-22	withdrawn				
RED1-184-22 PI	approve	29	0	0	100%
RED1-184-22 PII	approve	29	0	0	100%
RED1-185-22	approve	35	0	0	100%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-186-22	approved as modified	28	0	0	100%
RED1-187-22 PI	disapproved	23	16	1	59%
RED1-187-22 PII	disapproved	23	16	1	59%
RED1-188-22	disapproved	20	16	1	56%
RED1-189-22	approved as modified	28	0	4	100%
RED1-190-22	withdrawn				
RED1-191-22 PI	approved as modified	34	2	0	94%
RED1-191-22 PII	approved as modified	34	2	0	94%
RED1-192-22	disapproved	22	12	1	65%
RED1-193-22	disapproved	37	2	0	95%
RED1-194-22	approved as modified	37	0	1	100%
RED1-195-22	withdrawn				
RED1-196-22	approve	34	0	2	100%
RED1-197-22	disapproved	25	13	1	66%
RED1-198-22	disapproved	25	11	0	69%
RED1-199-22	approve	36	0	0	100%
RED1-200-22	withdrawn				
RED1-201-22	disapproved	18	12	3	60%
RED1-202-22	disapproved	32	3	2	91%
RED1-203-22	disapproved	19	18	3	51%
RED1-204-22	approved as modified	31	0	0	100%
RED1-205-22	withdrawn				
RED1-206-22	disapproved	29	5	2	85%
RED1-207-22	disapproved	28	5	3	85%
RED1-208-22	approved as modified	27	1	1	96%
RED1-209-22	disapproved	18	12	1	60%
RED1-210-22	approve	35	0	1	100%
RED1-211-22	approve	35	0	0	100%
RED1-212-22	approve	35	0	0	100%
RED1-213-22	disapproved	19	15	3	56%
RED1-214-22	disapproved	27	0	0	100%
RED1-215-22	disapproved	27	3	1	90%
RED1-216-22	disapproved	19	13	0	59%
RED1-217-22	approved as modified	31	0	1	100%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-218-22	approve	35	0	0	100%
RED1-219-22	disapproved	17	14	1	55%
RED1-220-22	disapproved	28	0	0	100%
RED1-221-22	disapproved	29	0	0	100%
RED1-222-22	approved as modified	29	0	1	100%
RED1-223-22 PI	disapproved	26	6	3	81%
RED1-223-22 PII	disapproved	26	6	3	81%
RED1-224-22 PI	approved as modified	29	1	0	97%
RED1-224-22 PII	approved as modified	29	1	0	97%
RED1-225-22	disapproved	16	14	2	53%
RED1-226-22	approve	32	0	0	100%
RED1-227-22	withdrawn				
RED1-228-22	disapproved	24	7	0	77%
RED1-229-22	approved as modified	31	0	0	100%
RED1-230-22	approved as modified	21	10	1	68%
RED1-231-22	approve	32	0	0	100%
RED1-232-22	withdrawn				
RED1-233-22	approve	31	0	0	100%
RED1-234-22	withdrawn				
RED1-235-22	approved as modified	34	1	0	97%
RED1-236-22	withdrawn				
RED1-237-22	approve	30	0	0	100%
RED1-238-22	disapproved	25	4	1	86%
RED1-239-22	disapproved	33	1	0	97%
RED1-240-22	disapproved	32	1	0	97%
RED1-241-22	disapproved	31	2	1	94%
RED1-242-22	disapproved	19	10	5	66%
RED1-243-22 PI	approve	32	0	0	100%
RED1-243-22 PII	approve	32	0	0	100%
RED1-244-22	disapproved	24	7	1	77%
RED1-245-22	disapproved	18	13	2	58%
RED1-246-22	disapproved	29	1	2	97%
RED1-247-22	disapproved	29	3	2	91%
RED1-248-22	disapproved	29	3	1	91%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-249-22	approved as modified	34	0	1	100%
RED1-250-22	approved as modified	29	1	0	97%
RED1-251-22	approved as modified	28	0	1	100%
RED1-252-22	approve	31	0	0	100%
RED1-253-22	approved as modified	25	3	0	89%
RED1-254-22	approved as modified	32	0	0	100%
RED1-255-22	approved as modified	31	1	1	97%
RED1-256-22	approve	32	0	0	100%
RED1-257-22	approve	32	0	0	100%
RED1-258-22	disapproved	29	3	0	91%
RED1-259-22	disapproved	21	11	4	66%
RED1-260-22	approve	35	0	0	100%
RED1-261-22	approve	33	0	1	100%
RED1-262-22	disapproved	38	0	2	100%
RED1-263-22	approved as modified	31	4	1	89%
RED1-264-22	approved as modified	29	0	1	100%
RED1-265-22	disapproved	28	5	1	85%
RED1-266-22	disapproved	25	13	0	66%
RED1-267-22	disapproved	30	0	0	100%
RED1-268-22	approved as modified	24	5	4	83%
RED1-269-22	withdrawn				
RED1-270-22	disapproved	36	0	3	100%
RED1-271-22	approve	31	0	0	100%
RED1-272-22	disapproved	20	14	1	59%
RED1-273-22	approved as modified	35	3	0	92%
RED1-274-22	disapproved	29	2	2	94%
RED1-275-22	disapproved	31	0	2	100%
RED1-276-22	withdrawn				
RED1-277-22	approve	31	0	0	100%
RED1-278-22	withdrawn				
RED1-279-22 PI	disapproved	29	0	2	100%
RED1-279-22 PII	disapproved	29	0	2	100%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-280-22 PI	approve	29	0	0	100%
RED1-280-22 PII	approve	29	0	0	100%
RED1-281-22	approve	29	0	0	100%
RED1-282-22 PI	disapproved	33	3	0	92%
RED1-282-22 PII	disapproved	33	3	0	92%
RED1-283-22	approve	30	0	1	100%
RED1-284-22 PI	withdrawn				
RED1-284-22 PII	withdrawn				
RED1-285-22	approved as modified	32	1	1	97%
RED1-286-22	approved as modified	28	1	2	97%
RED1-287-22	approved as modified	31	1	2	97%
RED1-288-22 PI	disapproved	27	0	3	100%
RED1-288-22 PII	disapproved	27	0	3	100%
RED1-289-22	disapproved	27	5	2	84%
RED1-290-22	approve	37	1	0	97%
RED1-291-22 PI	disapproved	30	2	2	94%
RED1-291-22 PII	disapproved	30	2	2	94%
RED1-292-22	approve	27	1	2	96%
RED1-293-22	disapproved	32	2	1	94%
RED1-294-22	disapproved	30	1	0	97%
RED1-295-22	disapproved	33	0	0	100%
RED1-296-22	approved as modified	31	1	1	97%
RED1-297-22	withdrawn				
RED1-298-22	approve	28	0	2	100%
RED1-299-22	approve	31	0	0	100%
RED1-300-22 PI	withdrawn				
RED1-300-22 PII	withdrawn				
RED1-301-22	withdrawn				
RED1-302-22	approve	29	3	0	91%
RED1-303-22	withdrawn				

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-304-22	disapproved	30	1	1	97%
RED1-305-22	approve	30	6	1	83%
RED1-306-22	withdrawn				
RED1-307-22	disapproved	33	1	0	97%
RED1-308-22	withdrawn				
RED1-309-22	approved as modified	31	0	1	100%
RED1-310-22	approved as modified	36	0	1	100%
RED1-311-22	disapproved	34	0	0	100%
RED1-312-22	withdrawn				
RED1-313-22	approved as modified	31	0	0	100%
RED1-314-22	withdrawn				
RED1-315-22	approved as modified	32	0	0	100%
RED1-316-22	disapproved	26	10	0	72%
RED1-317-22	withdrawn				
RED1-318-22	approve	34	0	1	100%
RED1-319-22	disapproved	20	11	2	65%
RED1-320-22	disapproved	30	1	2	97%
RED1-321-22	approve	36	0	0	100%
RED1-322-22	approved as modified	34	3	0	92%
RED1-324-22	approved as modified	34	4	1	89%
RED1-325-22	approved as modified	35	0	0	100%
RED1-326-22	withdrawn				
RED1-327-22	withdrawn				
RED1-328-22	disapproved	36	0	0	100%
RED1-329-22	approved as modified	30	2	3	94%
RED1-330-22	approved as modified	30	1	0	97%
RED1-331-22	disapproved	27	0	2	100%
RED1-332-22	disapproved	24	7	1	77%
RED1-333-22	disapproved	18	8	4	69%
RED1-334-22	withdrawn				
RED1-335-22	approve	26	3	2	90%
RED1-336-22	approve	29	4	1	88%
RED1-337-22	approve	35	0	0	100%
RED1-338-22	disapproved	19	9	5	68%

Proposal Number	CC action	vote yes	vote no	abstain	%
RED1-339-22	approved as modified	29	1	1	97%
RED1-340-22	approved as modified	27	1	2	96%
RED1-341-22	disapproved	21	10	2	68%
RED1-342-22	disapproved	21	16	0	57%
RED1-343-22	approved as modified	38	0	0	100%
RED1-344-22	disapproved	33	1	2	97%
RED1-345-22	withdrawn				
RED1-346-22	withdrawn				
RED1-347-22	withdrawn				
RED1-348-22	withdrawn				
RED1-349-22 PI	withdrawn				
RED1-349-22 PII	withdrawn				
RED1-350-22	withdrawn				
RED1-351-22	approved as modified	35	0	0	100%
RED1-352-22	withdrawn				
RED1-353-22	disapproved	24	6	3	80%
RED1-354-22	disapproved	32	0	0	100%
RED1-355-22	disapproved	33	1	1	97%
RED1-356-22	disapproved	32	1	1	97%
RED1-357-22	disapproved	33	0	0	100%
RED1-358-22	approved as modified	32	1	0	97%
RED1-359-22	withdrawn				
RED1-360-22	approved as modified	29	4	1	88%
RED1-361-22	disapproved	27	4	0	87%
RED1-362-22	withdrawn				
RED1-363-22	disapproved	27	2	2	93%
RED1-364-22	disapproved	29	2	1	94%
RED1-365-22	approved as modified	24	9	2	73%
REIPC1-1-22 PI	withdrawn				
REIPC1-1-22 PII	withdrawn				

Proposal Number	CC action	vote yes	vote no	abstain	%
REPCD1-10-22	heard by committee				
REPCD1-11-22	heard by committee				
REPCD1-1-22	heard by committee				
REPCD1-12-22	heard by committee				
REPCD1-13-22	heard by committee				
REPCD1-14-22	heard by committee				
REPCD1-15-22	heard by committee				
REPCD1-16-22	heard by committee				
REPCD1-17-22	heard by committee				
REPCD1-18-22	heard by committee				
REPCD1-19-22	heard by committee				
REPCD1-20-22	heard by committee				
REPCD1-21-22	heard by committee				
REPCD1-2-22	heard by committee				
REPCD1-22-22	heard by committee				
REPCD1-23-22	heard by committee				
REPCD1-3-22	heard by committee				
REPCD1-4-22	heard by committee				
REPCD1-5-22	heard by committee				
REPCD1-6-22	heard by committee				
REPCD1-7-22	heard by committee				
REPCD1-8-22	heard by committee				
REPCD1-9-22	heard by committee				

IRCED1-7-22

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 ENERGY Chapter11

Revise as follows:

N1102.5.1.2 Testing and maximum air leakage rate. The *building* or each *dwelling unit* in the building shall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2 (1.1 L/s x m^2) of building or dwelling unit enclosure area. 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.

Exceptions:

1. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in all climate zones for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.

2. 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 envelope tightness and insulation installation shall be considered acceptable where the items in Table N1102.5.1.1, 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 conditioned spaces in accordance with Sections N1102.2.13 and N1102.4.5, as applicable.
3. ~~Where tested in accordance with N1102.5.1.2, testing of each dwelling unit is not required.~~

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.

Mechanical *ventilation* shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*.

Reason: This proposal removes the 3rd exception which is confusing and has a circular logic. This exception is applies when following the the section to which it is an exception. It is removed to improve the clarity of the section.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal removes confusing and circular language and will not effect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This proposal removes left over language from another proposal that does not makes sense.

IRCED1-8-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

C1549-~~20~~16 (2022)	Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
E903-20~~2012~~	Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres~~ (Withdrawn 2005)~~
E1918-21~~06(2016)~~	Standard Test Method for Measuring Solar Reflectance of Horizontal or Low-sloped Surfaces in the Field
E1980-11(2019)	Standard Practice for Calculating Solar Reflectance of Horizontal and Low-sloped Opaque Surfaces

2024 ENERGY Chapter11

Revise as follows:

TABLE N1108.2.1.3 MINIMUM ROOF REFLECTANCE[a]

ROOF SLOPE	THREE-YEAR AGED SOLAR REFLECTANCE INDEX[b]
Low-slope	75[b,c]
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 N1108.2.1.3.1.

b. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.

c. 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. ~~Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.~~

Reason: This comment is primarily intended to update radiative property referenced standards C1549, E903, E1918, and E1980 to active editions and correct titles for the IECC residential provisions and the IRC. However, while preparing this comment, it became apparent that an error may have occurred while creating the 1st Public Comment Drafts for the IECC residential and IRC Chapter 11, because the third footnote of Table N1108.2.1.3 does not match Table R408.2.1.3. Therefore, the third footnote of Table N1108.2.1.3 is modified to match Table R408.2.1.3, which brings in ASTM E1980 as a required reference standard for the IRC.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Update of referenced standards editions and correction of a discrepancy between the IECC and IRC Chapter 11 should have no impact on cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This proposal updates and corrects references and footnotes.

Proposal # 953

IRCED1-10-22

Proponents: Robert OBrien, representing NORA (robrien@noraweb.org)

2024 ENERGY Chapter11

Revise as follows:

N1103.2 Hot water boiler outdoor temperature reset. The manufacturer shall equip each gas, liquid fuel ~~oil~~, and electric boiler (other than a boiler equipped with a tankless domestic water heating coil) with automatic means of adjusting the water temperature supplied by the boiler to ensure incremental change of the inferred heat load will cause an incremental change in the temperature of the water supplied by the boiler. This can be accomplished with outdoor reset, indoor reset or water temperature sensing.

Reason: This change more accurately reflects the liquid fuels in common use for heating and domestic hot water production. Most heating oil already contains 5% renewable liquid fuel (B5) and to comply with state mandates as well as industry goals, liquid fuel equipment manufacturers have rated their products for use with B20 (20% renewable) and are working rapidly to obtain listings for operation with B100. This will provide a pathway to rapid decarbonization
The Inflation Reduction Act of 2022 (IRA) provides a tax credit for Energy Star rated liquid fuel appliances that are rated for B20 in 2023-2026 transitioning to a minimum of 90% AFUE and B50 compatible in 2027-2032

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change will have no impact on the cost of construction

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: per proponents reason statement

Proposal # 960

RECD1-1-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org); John Hensley, representing ICC RE HVACR subcommittee (ieccrehvacr@iccsafe.org)

2024 ENERGY Chapter11

Add new text as follows:

N1103.6.4(R403.6.4) Intermittent exhaust control for bathrooms and toilet rooms.. Where an exhaust system serving a bathroom or toilet room is designed for intermittent operation, the exhaust system controls shall include one or more of the following:

1. A timer control with one or more delay setpoints that automatically turns off exhaust fans when the selected setpoint is reached. Not fewer than one delay-off setpoint shall be 30 minutes or less.
2. An occupant sensor control with one or more delay setpoints that automatically turns off exhaust fans in accordance with the selected delay setpoint after all occupants have vacated the space. Not fewer than one delay-off setpoint shall be 30 minutes or less.
3. A humidity control with an adjustable setpoint ranging between 50 percent or more and 80 percent or less relative humidity that automatically turns off exhaust fans when the selected setpoint is reached.
4. A contaminant control that responds to a particle or gaseous concentration and automatically turns off exhaust fans when a design setpoint is reached.

Manual-off functionality shall not be used in lieu of the minimum setpoint functionality required by this section.

> **Exception:** Bathroom and toilet room exhaust systems serving as an integral component of an outdoor air ventilation system or a whole-house mechanical ventilation system.

Reason: This proposal will coordinate the IECC-R with Section C403.8.6.2 of IECC-C PC#1. Following is the PC#1 text of that Section with

strikethrough and underline shown for minor modifications that adapt it to the residential chapter.
C403.8.6.2 Intermittent exhaust control for bathrooms and toilet rooms.

Where an exhaust system serving a bathroom or toilet room is designed for intermittent operation, the exhaust system shall be provided with manual-on capability and one or more of the following controls:

1. A timer control that has a minimum setpoint not greater than 30 minutes.

2. An occupant sensor control that automatically turns off exhaust fans within 30 minutes after all occupants have left the space.

3. A humidity control capable of manual or automatic adjustment from a minimum setpoint not greater than 50 percent to a maximum setpoint not greater than 80 percent relative humidity.

4. A contaminant control that responds to a particle or gaseous concentration.

An off setpoint shall not be used to comply with a minimum setpoint requirement.

Exception: Bathroom and toilet room exhaust systems serving as an integral component of an outdoor air ventilation system or a whole-house

mechanical ventilation system ~~in Group R-2, R-3, and R-4 occupancies~~ shall not be required to provide controls other than manual on capability.

~~An off setpoint shall not be used to comply with a minimum setpoint requirement.~~

Rationale for modifications for the IECC-R version versus the IECC-C PC1 version:

1. Move the sentence beginning with, “an off setpoint shall not…” ahead of the exception to align with the ICC convention of placing all

requirements prior to the exception.

2. Remove the reference to R-2, R-3, and R-4 occupancies because the requirement should apply to dwelling units in all occupancies within the scope of the IECC-R.

3. Add “whole-house mechanical ventilation system” because this is the defined term that is used in the IRC. “Outdoor air ventilation system” is the term used in the IMC.

Cost Impact: The code change proposal will increase the cost of construction.
The code change proposal will increase the cost of construction
The timers are approximately $ 20 retail (see links below for costs) with a $ 1 credit for the light switch, the installation is the same as a light switch during new construction. Payback is generally between 3 months and 3 years.
https://www.lowes.com/pd/TORK-Digital-Countdown-Lighting-Timer/1000341275
https://www.homedepot.com/p/GE-In-Wall-Digital-Countdown-Timer-15318/202788262

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: This proposal will coordinate the IECC-R with Section C403.8.6.2 of IECC-C PC#1. Following is the PC#1 text of that Section with strikethrough and underline shown for minor modifications that adapt it to the residential chapter.

Proposal # 1504

RECD1-2-22

Proponents: Kristopher Stenger, representing ICC

2024 International Energy Conservation Code [CE Project]

Delete and substitute as follows:

~~AAMA~~

~~American Architectural Manufacturers Association~~
~~1827 Walden Office Square Suite 550~~
~~Schaumburg, IL 60173-4268~~

FGIA

Fenestration & Glazing Industry Alliance (formerly AAMA)
1900 E. Golf Road, Suite 250
Schaumburg, IL 60173

Revise as follows:

AAMA

American Architectural Manufacturers Association
1827 Walden Office Square Suite 550
Schaumburg, IL 60173-4268

AAMA/WDMA/CSA 101/I.S.2/A440 —~~17~~ 22:	North American Fenestration Standard/Specification for ~~Windows, Doors, and Skylights~~ windows, doors, and skylights

CSA

CSA Group
8501 East Pleasant Valley Road
Cleveland, OH 44131-5516

AAMA/WDMA/CSA 101/I.S.2/A440 —~~17~~ 22:	North American Fenestration Standard/Specification for ~~Windows, Doors and Unit Skylights~~ windows, doors, and skylights

WDMA

Window and Door Manufacturers Association
~~2025 M Street NW, Suite 800~~ 2001 K Street NW, Suite 300
Washington, DC ~~20036-3309~~ 20006

WDMA

Window and Door Manufacturers Association
2025 M Street NW, Suite 800
Washington, DC 20036-3309

AAMA/WDMA/CSA 101/I.S.2/A440 —~~17~~ 22:	North American Fenestration Standard/Specification for ~~Windows, Doors and Skylights~~ windows, doors, and skylights

Reason: This proposal provides corrections to the listing of the *North American Fenestration Standard/Specification for windows, doors, and skylights* which is a referenced standard in Chapter 4 the IECC. There have been recent changes to the names and/or locations of the promulgating organizations. In addition, the title was slightly incorrect and the standard has also been updated.
The American Architectural Manufacturers Association (AAMA) has changed its name to the Fenestration & Glazing Industry Alliance (FGIA) and also changed its office address.

The Window & Door Manufacturers Association relocated its office.

Also, the title of *AAMA/WDMA/CSA 101/I.S.2/A440: North American Fenestration Standard/Specification for windows, doors, and skylights* has been inconsistently referenced in the code.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No change in cost

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: update reference standards and promulgators information.

Proposal # 1508

RECD1-3-22

Proponents: Kristopher Stenger, representing ICC

2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	A sealed air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be air sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with Section R402.2.4 Eave Baffles shall be installed in accordance with Section R402.2.3
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The ~~space~~ rough opening gap between framing and the frames of skylights, ~~and the jambs of~~ windows and doors, shall be sealed in accordance with fenestration manufacturer's instructions.	Insulation shall not be required in the rough opening gap except as required by the fenestration manufacturer's instructions. ~~Framing cavities around windows, skylights, and doors shall be completely filled with insulation or insulated per window manufacturer's instructions.~~
Rim joists	Rim joists shall include an air barrier.[b] The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement crawl space and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.11. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the *International Residential Code*.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.9.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.11.
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required *R*-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.8.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.5.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required *R*-value can be met by installing insulation and air barrier systems completely to the exterior side of

obstructions	sealed.	installing insulation and air barrier systems completely to the exterior side of the obstructions.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: Reconciles the differences between RED1-232, RED1-227, RED1-234 and RED1-183.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal will not increase the cost of construction. It will remove conflict with installation instructions and will prevent consumers, builders, and manufacturers from incurring costs related to repairs caused by code requirements that contradict the manufacturer’s instructions.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The previous language had some unintended consequences and possibly voiding the manufacturer's warranty. Multiple members expressed the need to modify the language of the insulation criteria. Proposed language provides clarity and resolves issues related to unintended consequences and is preferred to the language currently in draft 1

Proposal # 1512

RECD1-4-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.6.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses shall comply with Sections R404.6.1.1 through R404.6.1.4.

Exceptions:

1. A dwelling unit with a permanently installed, on-site renewable energy system.
2. A dwelling unit with a solar-ready zone area that is less than 500 square feet (46 m^2) of roof area oriented between 110 degrees and 270 degrees of true north.
3. A dwelling unit with less than 500 square feet (46m2) of roof area oriented between 110 degrees and 270 degrees of true north.
4. Dwelling units where 50 percent of the solar-ready zone area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.
5. A dwelling unit that complies with Appendix RC.
6. A dwelling unit with a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated *dwelling unit* ~~whole-building~~ electric use on an annual basis.
7. A dwelling unit with less than or equal to 1,500 square feet (139 m^2) of living space ~~floor area~~ located above grade plane.

R404.6.2 Group R occupancies. Residential buildings other than one- and two-family dwellings and townhouses ~~Buildings in Group R-2, R-3 and R-4~~ shall comply with ~~the requirements of~~ Sections R404.6.2.1 through R404.6.2.8~~Appendix CB~~.

Add new text as follows:

R404.6.2.1 General.. A *solar-ready zone* shall be located on the roof of residential buildings that are oriented between 110 degrees and 270 degrees of true north or have low-slope roofs. *Solar-ready zones* shall comply with Sections R404.6.2.2 through R404.6.2.8.

Exceptions:

1. A building with a permanently installed on-site renewable energy system.
2. A building with a *solar-ready zone* area that is shaded for more than 70 percent of daylight hours annually.
3. A building where an *approved* party certifies that the incident solar radiation available to the building is not suitable for a *solar-ready zone*.
4. A building where an *approved party* certifies that the *solar-ready zone* area required by Section R404.6.2.3 cannot be met because of rooftop equipment, skylights, vegetative roof areas or other obstructions.
5. A building that complies with Appendix RC.
6. A building with a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated electric use of the residential occupancy portion of the building on an annual basis.

R404.6.2.2 Construction document requirements for a solar-ready zone. Construction documents shall indicate the solar-ready zone.

R404.6.2.3 Solar-ready zone area. The total *solar-ready zone* area shall be not less than 40 percent of the roof area calculated as the horizontally projected gross roof area less the area covered by penthouses, mechanical equipment, rooftop structures, skylights, occupied roof decks, vegetative roof areas and mandatory access or set back areas as required by the *International Fire Code*. The *solar-ready zone* shall be a single area or smaller, separated sub-zone areas. Each sub-zone shall be not less than 5 feet (1524 mm) in width in the narrowest dimension.

R404.6.2.4 Obstructions. *Solar-ready zones* shall be free from obstructions, including pipes, vents, ducts, HVAC equipment, skylights and roof-mounted equipment.

R404.6.2.5 Roof loads and documentation. A collateral dead load of not less than 5 pounds per square foot (5 psf) (24.41 kg/m^2) shall be included in the gravity and lateral design calculations for the *solar-ready zone*. The structural design loads for roof dead load and roof live load shall be indicated on the construction documents.

R404.6.2.6 Interconnection pathway. *Construction documents* shall indicate pathways for routing of conduit or plumbing from the *solar-ready zone* to the electrical service panel or service hot water system.

R404.6.2.7 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a dual-pole circuit breaker for future solar electric and shall be labeled “For Future Renewable Electric.” The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

R404.6.2.8 Construction documentation certificate. A permanent certificate, indicating the *solar-ready zone* and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location.

Reason: We cannot point to an Appendix for requirements; the requirements have to be stated in the section itself. This proposal takes the requirements from the referenced Appendix CB and copies it into the R404.6.2 section. There are some edits to consider, given that the R404.6.1 section that applies to other residential buildings does not contain some of these sub-sections, as they are covered in R103 and R401.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
None. Rather than pointing to an Appendix for a requirement, it brings the requirement text into the actual section.

Bibliography: Appendix CB from 2024 IECC-C, 1st public comment draft [https://www.iccsafe.org/wp-content/uploads/IECC2024P1CE_2022-09-07-clean-gray-red2.pdf]

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The committee discussed changes proposed in RED1-140 and RED1-169 before voting on RECD1-4-22 to remove references to the commercial code. The committee felt that this proposal successfully combined the elements of past committee work and brought clarity to the section.

Proposal # 1517

RECD1-6-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1. the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be:

(Equation #)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}}$$
$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15 \times UA_{\text{Prescriptive reference design}}$$

3. An annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for electricity shall be 2.51. The source energy multiplier for fuels other than electricity shall be 1.09. ~~multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the code official.~~
   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~~ for an all electric building with on-site renewable energy installed~~.

Reason: Based on discussion during the 2-28 SC meeting on numerous Panel 1 proposals that sought to remove, add, or delete the reference to Appendix K Tables from ASHRAE Standard 105, the Sub-Committee questioned whether the complexity of adding this Standard was worth it. While the Main Committee supported the inclusion of this Standard in the 1st round of comment, upon closer examination, the Table references offer 6 different site-to-source multipliers for electricity which could lead to unnecessary complexity for the code official and software implementers. Additionally, the need for the site-based Exception was called into question given that it yields the same result as the energy cost calculation.
This proposal is similar to RED1-47, which removes the Exception 2 and restores a more simple approach for source energy savings calculation, when it is selected as an alternative to energy cost savings. It also recognizes that the multipliers have decreased, as evidenced by the values in ASHRAE Std 105. This simplifies the code without negatively affecting energy performance.

For reference, how this Section is stated in PCD1 of 2024 IECC-C:

C407.2 Mandatory requirements. Compliance based on total building performance requires that a proposed design meet all of the following:

1. The requirements of the sections indicated within **Table C407.2(1)**.
2. An annual energy cost that is less than or equal to ~~80~~ the percent of the annual energy cost (PAEC) of the *standard reference design* calculated in Equation 4-32. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Data System Prices and Expenditures* reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Exceptions:

1. Jurisdictions that require site energy (1 kWh = 3413 Btu) rather than energy cost as the metric of comparison.
2. Where energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area is substituted for the energy cost, the energy use shall be calculated using source energy factors from Table C407.2(2) For electricity, U.S. locations shall use values eGRID subregions. Locations outside the United States shall use the value for "All other electricity" or locally derived values.

$$PAEC = 100 \times (0.85 + 0.025 - ECr/1000)$$

(Equation 4-32)

PAEC = Percentage of annual energy cost applied to standard reference design
EC_r= Energy efficiency credits required for the building in accordance with Section C406.1 (do not include load management and renewable credits)

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No cost impact

See cost effectiveness calculator https://www.iccsafe.org/wp-content/uploads/Copy-of-Source-Multipliers.xlsx

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The term fossil fuel is misleading, and the net result will not improve energy efficiency.

Proposal # 1521

RECD1-7-22

Proponents: Kristopher Stenger, representing ICC

2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX WITH OPP
0-1	51	~~40~~ 35
2	51	~~40~~ 34
3	50	~~40~~ 33
4	53	40
5	54	~~40~~ 43
6	53	~~40~~ 43
7	52	~~40~~ 46
8	52	~~40~~ 46

Reason:

Climate Zone	Developed Using PNNL SF Prototypes	Building Type	R406 Target ERI without OPP *	1 kW PV Target ERI with OPP	2 kW PV Target ERI with OPP	3 kW PV Target ERI with OPP	4 kW PV Target ERI with OPP
CZ 1	R406 ERI Home - 51	Single Family	51	43	35	27	19
CZ 2	R406 ERI Home - 51	Single Family	51	42	34	26	18
CZ 3	R406 ERI Home - 50	Single Family	50	42	33	24	15
CZ 4	R406 ERI Home - 53	Single Family	53	47	40	32	25
CZ 5	R406 ERI Home - 54	Single Family	54	49	43	37	32
CZ 6	R406 ERI Home - 53	Single Family	53	48	43	39	35
CZ 7 & 8	R406 ERI Home - 52	Single Family	52	49	46	43	40

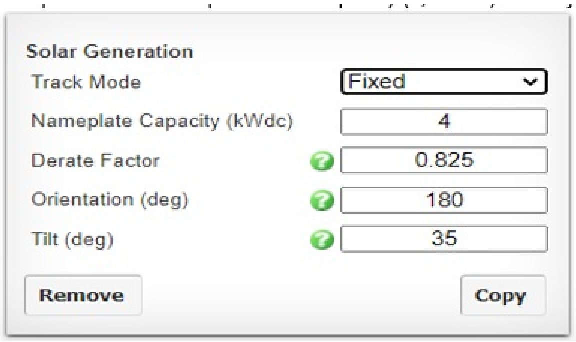
* R406 ERI "not including OPP" targets in IECC 2024 Public Comment Draft #1

The ERI with OPP targets in Public Comment Draft #1 (40 in every climate zone) were placeholders and not based on any form of analysis. The purpose of this proposal is to update the ERI with OPP targets based on simulation analysis via Residential Energy Services Network (RESNET) Accredited Rating Software (Ekotrope). PNNL analyzed the single-family prototypes (2376 sq ft) in the Ekotrope Rating software across all system types, foundation types and 19 representative cities based on a national scale analysis. According to NAHB, 2021 fourth quarter Census Quarterly Starts show a median single-family home is 2,338 square feet. Using prototype models that meet the ERI without OPP targets in Public Comment Draft #1 as the baseline, PNNL modeled onsite PV systems (1 kW, 2 kW and 4 kW) to calculate ERI with OPP potential targets based on system size. The modeled PV systems were oriented due south and tilted equal to the site latitude. The results are summarized in the table above.

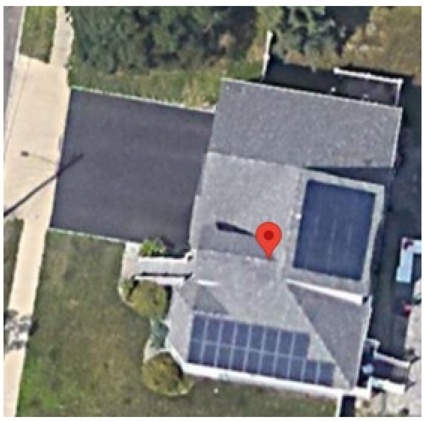
The decision to propose 2 kW ERI with OPP scores for Table R406.5 was based in part on the fact that a 2 kW size system fits almost any rooftop. However, based on LBNL and PNNL research, the median size residential PV system in the U.S. in 2021 was 7 kW, with most systems – those within the 20th to 80th percentile – between 4 and 10 kW.

The proposed ERI with OPP targets represent an easy score for a home to meet utilizing onsite PV.

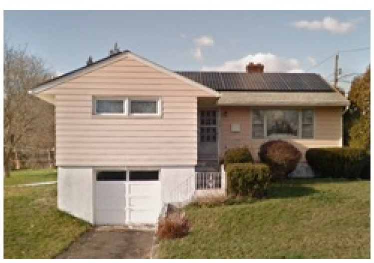
PV specs from Ekotrope - varied capacity (1, 2 or 4) and adjusted tilt to match latitude:



Real Examples for context: CZ5 house with 1500 ft^2 footprint, and around 2,700 ft^2 of CFA. 30 panels, 7.14 kW, produces ~9,400 kWh/yr (Net-zero for electric, still uses gas for heat/DHW)



Another CZ5 home, with 1384 ft^2 CFA...24 panels, ~5 kW.



Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Because the ERI with OPP targets in Public Comment Draft #1 are only placeholders, there is no basis for comparing cost between this proposal and Public Comment Draft #1. Compared to the placeholder targets, the proposed targets are less stringent in four climate zones, more stringent in three climate zones, and the same in one climate zone.

Bibliography: PV System Sizes - Lawrence Berkeley National Laboratory
https://emp.lbl.gov/sites/default/files/2_tracking_the_sun_2022_report.pdf

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Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: support the revised ERI maximum values based on analysis provided by PNNL which estimated the ERI with 2 kW of OPP

RECD1-8-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R405.3 Compliance Documentation. ~~Documentation of the software used for the proposed design and the parameters for the baseline *building* shall be in accordance with Sections R405.3.1 through R405.3.2.2.~~ The following compliance reports, which document that the performance of the *proposed design* 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 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.

Delete without substitution:

~~**R405.3.1 Compliance software tools.** Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the *code official.*~~

~~**R405.3.2 Compliance report.** Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a confirmed compliance report based on the confirmed condition of the building shall be submitted to the *c ode official* before a certificate of occupancy is issued.~~
~~Compliance reports shall include information in accordance with Sections R405.3.2.1 and R405.3.2.2.~~

~~**R405.3.2.1 Compliance report for permit application.** A compliance report submitted with the application for building permit shall include the following:~~

1. ~~Building street address, or other *building site* identification.~~
2. ~~The name of the individual performing the analysis and generating the compliance report.~~
3. ~~The name and version of the compliance software tool.~~
4. ~~Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.~~
5. ~~A certificate indicating that the proposed design complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation *R*-values or *U*-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.~~
6. ~~Where a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.~~

~~**R405.3.2.2 Compliance report for certificate of occupancy.** A compliance report submitted for obtaining the certificate of occupancy shall include the following:~~

1. ~~Building street address, or other building site identification.~~
2. ~~Declaration of the simulated building performance path on the title page of the energy report and the title page of the building plans.~~
3. ~~A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section R405.3.~~
4. ~~The name and version of the compliance software tool.~~
5. ~~A site-specific energy analysis report that is in compliance with Section R405.3.~~
6. ~~A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405.3. The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation *R*-values or *U*-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.~~
7. ~~When on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.~~

Revise as follows:

R405.4 Calculation procedure. ~~Calculations~~ Performance calculations of the *proposed design* shall be in accordance with Sections R405.4.1 , ~~and~~ R405.4.2 , R405.4.3. Except as specified by this section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

R405.4.1 General. ~~Except as specified by this section, the *standard reference design* and *proposed design* shall be configured and analyzed using identical methods and techniques.~~ Calculation procedures used to comply with Section R405 shall use an approved software tool, in accordance with R405.5, capable of calculating the annual energy consumption of all building elements that differ between the standard reference design and the proposed design.

R405.4.2 Residence specifications. The *standard reference design* and *proposed design* 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 R402.1.3.

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

R405.4.3 Input values. When calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from an *approved* source.

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R405.5 Calculation software tools. ~~Calculation software, where used, shall be in accordance with Sections R405.5.1 through R405.5.3.~~ Performance analysis tools meeting the applicable provisions of Sections R405.5.1 through R405.5.4 shall be permitted to be approved. Tools are permitted to be *approved* based on meeting a specified threshold for a jurisdiction. The code official shall be permitted to *approve* such tools for a specified application or limited scope.

R405.5.1 Minimum capabilities. ~~Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the *standard reference design* and the *proposed design* and~~ *Approved* software tools shall include the following capabilities:

1. Computer generation of the *standard reference design* using only the input for the *proposed design.* The calculation procedure shall not allow the user to directly modify the building component characteristics of the *standard reference design*.
2. Calculation of whole-building (as a single *zone*) sizing for the heating and cooling equipment in the *standard reference design* residence in accordance with Section R403.7.
3. Hourly calculations of building operation for a full calendar year (8760 hours).
4. ~~3.~~ 4. Calculations that account for ~~the effects~~ hourly variations of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.
5. ~~4.~~ 5. Printed *code official* inspection checklist listing each of the *proposed design* component characteristics from Table R405.4.2(1) determined by the analysis to provide compliance, along with their respective performance ratings such as *R*-value, *U*-factor, SHGC, HSPF, AFUE, SEER and EF.

Delete without substitution:

~~**R405.5.2 Specific approval.** Performance analysis tools meeting the applicable provisions of Section R405 shall be permitted to be *approved.* Tools are permitted to be *approved* based on meeting a specified threshold for a jurisdiction. The *code official* shall be permitted to approve such tools for a specified application or limited scope.~~

~~**R405.5.3 Input values.** When calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from an *approved* source.~~

2024 International Energy Conservation Code [RE Project]

Add new text 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 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.

R405.5.3 **Algorithms not tested.** Algorithms not tested in accordance with R405.5.2 shall be permitted in accordance with ANSI/RESNET/ICC 301.. Numerical settings not tested, such as timestep duration and tolerances shall be permitted when they represent a higher resolution than the numerical settings used for testing.

R405.5.4 **Compliance reports.** *Approved* software tools shall generate compliance reports in accordance with R405.5.4.1 and R405.5.4.2.

R405.5.4.1 **Compliance report for permit appliction.** A compliance report generated for submission with the application for building permit shall include the following:

1. Building street address, or other *building site* identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the *proposed design* complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation R-values or U-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
6. Where a site-specific report is not generated, the *proposed design* shall be based on the worst-case orientation and configuration of the rated home.

R405.5.4.2 **Compliance report for certificate of occupancy.** A compliance report generated for submission prior to obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.
2. Declaration of the simulated building performance path on the title page of the energy report and the title page of the building plans.
3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with the requirements of Section R405.
4. The name and version of the compliance software tool.
5. A site-specific energy analysis report that is in compliance with the requirements of Section R405.
6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405. The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation R-values or U-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.
7. When on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

Reason: This proposal adds language to align the software requirements for R405 with the requirements in R406. The changes are a joint effort in collaboration with members of ASHRAE Standard 140. The new language being proposed is in R405.5.2 and R405.5.3 and a new item #3 in R405.5.1. The rest of the changes are editorial to the existing language in R405.3, R405.4 and R405.454 to cleanup and reorganize the existing requirements.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Provides consistent testing requirements for software compliance tools based on ASHRAE Standard 140.

Proposal # 1525

RECD1-10-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R503.1.2 Heating and cooling systems. New heating and cooling and duct systems installed as part of an *alteration* shall comply with Section R403. Alterations to heating, cooling and duct systems shall comply with this section.

Exception: Where ducts from an existing heating and cooling system are extended~~ to an *addition*~~.

R503.1.2.1 Ducts. HVAC ducts newly installed as part of an alteration shall comply with Section R403.
Exception: Where ducts from an existing heating and cooling system are extended~~ to an *addition*~~.

Reason: Having the term addition tends to be confusing when in the alterations section.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This will not increase the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Deletes “To an addition” in both sections. Having “addition” in the alteration section adds confusion. Removing provides clarity to the code.

Proposal # 1536

RECD1-11-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R402.2.8 Floors. Floor insulation shall ~~comply with one~~ be installed in accordance with all of the following:

1. Table R402.1.2 or Table R402.1.3 and manufacturer's instructions.
2. Floor framing members that are part of the *building thermal envelope* shall be air sealed to maintain a *continuous air barrier*.
3. One of the following methods:

3.1. ~~Installation~~ *Cavity insulation* shall be installed to maintain permanent contact with the underside of the subfloor decking ~~in accordance with manufacturer instructions to maintain required *R*-value or readily fill the available cavity space~~.

3.2. ~~Floor framing cavity~~ *Cavity insulation* shall be ~~permitted~~ installed to ~~be in~~ maintain contact with the top side of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members ~~and the framing members shall be air sealed~~.

3.3. A combination of *cavity insulation* and *continuous insulation* shall be installed ~~so~~ such that the *cavity insulation* ~~is in~~ maintains contact with the top side of the *continuous insulation* ~~that is installed on~~ and the *continuous insulation* maintains contact with the underside of the ~~floor framing~~ structural floor system ~~separating the cavity and the unconditioned space below. The *R*-values of the cavity and continuous insulation components or the R-value of continuous insulation only shall equal the required insulation component *R*-values for floors. Cavity insulation~~ . Insulation shall extend from the bottom to the top of all perimeter floor framing members ~~and the framing members shall be air sealed~~.

3.4 *Continuous insulation* shall be installed to maintain contact with the underside of the structural floor system. Insulation shall extend from the bottom to the top of all perimeter floor framing members.

Reason: This proposal responds to the clarifications requested in REPCD1-18-22. (A separate proposal, RED1-230-22 Modification, addresses the request regarding Table R402.5.1.1.) These editorial changes delineate the four possible scenarios and provide parallel language to clarify the similarities and differences between them.

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

Editorial clarification only; no change in code requirements; no impact on cost.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: this proposal responds to the clarifications requested in REPCD1-18-22. (A separate proposal, RED1-230-22 Modification, addresses the request regarding Table R402.5.1.1.) These editorial changes delineate the four possible scenarios and provide parallel language to clarify the similarities and differences between them.

Proposal # 1538

RECD1-12-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Add new definition as follows:

BIODIESEL BLEND. A homogeneous mixture of hydrocarbon oils and mono alkyl esters of long chain fatty acids.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

LIQUID FUEL. A *fuel oil* or biodiesel blend.

Revise as follows:

R403.1.2 Heat pump supplementary heat. Heat pumps having supplementary electric-resistance, *fuel gas*, or *liquid fuel* ~~fuel oil heat~~ ~~system~~ heating systems shall have controls that are configured to prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load. ~~Limit supplemental~~ Supplemental heat operation shall be limited to only ~~those times when~~ where one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The thermostat malfunctions.

R403.2 Hot water boiler temperature reset. Other than where equipped with tankless domestic water heating coils, the ~~The~~ manufacturer shall equip each gas, *liquid fuel* ~~oil~~ and electric boiler ~~(other than a boiler equipped with a tankless domestic water heating coil)~~ with automatic means of adjusting the water temperature supplied by the boiler ~~to ensure~~ so that incremental change of the inferred heat load will cause an incremental change in the temperature of the water supplied by the boiler. This can be accomplished with outdoor reset, indoor reset or water temperature sensing.

R404.5 Electric Readiness. Water heaters, household clothes dryers and cooking appliances that use *fuel gas* or *liquid fuel* ~~conventional tops and conventional oven fossil fuelSystems using fossil fuel: water heaters, household clothes dryers, conventional cooking tops or conventional ovens~~ shall comply with ~~the requirements of~~ Sections R404.5.1 through R404.5.4.

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 absorptance = 0.75.	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 absorptance = 0.75.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 air changes per hour. Climate Zones 3 through 8: 3.0 air changes per hour.	The measured air exchange rate.[a]
	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be	

<table>
<tr><td>Air exchange rate</td><td>the same as in the proposed design, but not greater than 0.01 × CFA + 7.5 × (N_{br} + 1)
where:
CFA = conditioned floor area, ft^2.
N_{br} = number of bedrooms.
The mechanical ventilation system type shall be the same as in the proposed design.
Energy recovery shall not be assumed for mechanical ventilation.</td><td colspan="3">The mechanical ventilation rate[b] shall be in addition to the air leakage rate and shall be as proposed.</td></tr>
<tr><td>Mechanical ventilation</td><td>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 (1/e_f) ×[0.0876 × CFA + 65.7 × (N_{br} + 1)]
where:
e_f = the minimum fan efficacy, as specified in Table 403.6.2, corresponding to the system type at a flow rate of 0.01 × CFA + 7.5 × (N_{br} + 1)
CFA = conditioned floor area, ft^2.
N_{br} = number of bedrooms.</td><td colspan="3">As proposed</td></tr>
<tr><td>Internal gains</td><td>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.</td><td colspan="3">Same as standard reference design.</td></tr>
<tr><td>Internal mass</td><td>Internal mass for furniture and contents: 8 pounds per square foot of floor area.</td><td colspan="3">Same as standard reference design, plus any additional mass specifically designed as a thermal storage element[c] but not integral to the building envelope or structure.</td></tr>
<tr><td rowspan="3">Structural mass</td><td>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.</td><td colspan="3">As proposed</td></tr>
<tr><td>For masonry basement walls: as proposed, but with insulation as specified in Table R402.1.3, located on the interior side of the walls.</td><td colspan="3">As proposed</td></tr>
<tr><td>For other walls, ceilings, floors, and interior walls: wood frame construction.</td><td colspan="3">As proposed</td></tr>
<tr><td>Heating systems[d, e]</td><td>For other than electric heating without a heat pump: as proposed.
Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions.
Capacity: sized in accordance with Section R403.7.</td><td colspan="3">As proposed</td></tr>
<tr><td></td><td>~~Non-electric Natural gas, propane~~ *Fuel gas* and *liquid fuel* ~~fuel oil~~ furnaces: Complying with 10 CFR §430.32</td><td colspan="3">As proposed</td></tr>
<tr><td></td><td>~~Non-electric Natural gas, propane~~ *Fuel gas* and *liquid fuel* ~~fuel oil~~ boilers: Complying with 10 CFR §430.32</td><td colspan="3">As proposed</td></tr>
<tr><td>Cooling systems[d, f]</td><td>As proposed.
Capacity: sized in accordance with Section R403.7.</td><td colspan="3">As proposed</td></tr>
<tr><td rowspan="7">Service water heating[d, g]</td><td rowspan="7">As proposed.
Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td colspan="3">As proposed
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.</td></tr>
<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>
<tr><td>Thermal distribution</td><td>Duct insulation: in accordance with Section R403.3.1.
A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems.
Duct location: same as proposed design.</td><td colspan="3">Duct location: as proposed.
Duct insulation: as proposed.</td></tr>
</table>

distribution systems	**Exception:** For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).	As tested or, where not tested, 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 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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, 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.

APPENDIX RE
ALL-ELECTRIC RESIDENTIAL BUILDINGS

SECTION RE102
GENERAL DEFINITIONS

COMBUSTION EQUIPMENT. Any equipment or appliance used for space heating, service water heating, cooking, clothes drying and/or lighting that uses *fuel gas* or *liquid fuel* ~~fuel gas or fuel oil~~.

~~**FUEL GAS.** A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.~~

Add new definition as follows:

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

Reason: Based on multiple approved RED1’s and IRCED1’s in this round (IRCED1-10, 340, 292, 116, 335) and the prior round, there are inconsistencies in how we reference ‘fuels’ that need to be resolved. This proposal resolves those inconsistencies by creating a new term “liquid fuel” that is inclusive of traditional heating oils but also expanded to clearly also include biodiesel blends.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
NONE

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Based on multiple approved RED1’s and IRCED1’s in this round (IRCED1-10, 340, 292, 116, 335) and the prior round, there are inconsistencies in how we reference ‘fuels’ that need to be resolved. This proposal resolves those inconsistencies by creating a new term “liquid fuel” that is inclusive of traditional heating oils but also expanded to clearly also include biodiesel blends.

Proposal # 1540

RED1-1-22

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

2024 International Energy Conservation Code [RE Project]

APPENDIX RC
ZERO NET ENERGY RESIDENTIAL BUILDING PROVISIONS

SECTION RC101
GENERAL

Revise as follows:

RC101.1 ~~General~~ Scope. This appendix applies to new ~~residential~~ *residential buildings*.

~~**RC101.2 Scope.** [no change, same as R406.1]~~

RC101.~~3~~ 2 Application. *Residential buildings* ~~Residential buildings~~ shall comply with Section R406.

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

RC101.~~4~~ 3 Certificate. [no change, same as R401.3]

Add new text as follows:

SECTION RC 102
GENERAL DEFINITIONS

Revise as follows:

~~**RC102 GENERAL DEFINITIONS.**~~ COMMUNITY RENEWABLE ENERGY FACILITY (CREF). A facility that produces energy from ~~renewable energy resources~~ *renewable energy resources* and that is qualified as a community energy facility under applicable jurisdictional statutes and rules.

FINANCIAL RENEWABLE ENERGY POWER PURCHASE AGREEMENT (FPPA) . A financial arrangement between a renewable electricity generator and a purchaser wherein the purchaser pays or guarantees a price to the generator for the project's renewable generation. Also known as a ~~"~~financial power purchase agreement~~"~~ and ~~"~~virtual power purchase agree~~-~~ment.~~"~~

PHYSICAL RENEWABLE ENERGY POWER PURCHASE AGREEMENT (PPPA). A contract for the purchase of re~~-~~newable electricity from a specific renewable electricity generator by a purchaser of renewable electricity.

SECTION RC103
ZERO NET ENERGY RESIDENTIAL BUILDINGS

Add new text as follows:

RC103.1 Scope. . [no change, same as R406.1]

Revise as follows:

RC103.~~1~~ 2 ERI compliance (Replace R406.2). Compliance based on the ERI requires that the rated design meets one of the following:

1. The requirements of the sections indicated within Table R406.2 and Sections R406.3 through R406.7, or
2. The requirements of ASHRAE/IES Standard 90.2, including:
   - 2.1 The ERI requirements of ASHRAE/IES 90.2 Table 6-1 without the use of on-site power production (OPP),
   - 2.2 The requirements of Sections R402.4.1.1, R402.4.1.2, R406.3, R404.5 (Electric Readiness), R404.7 (Electric Vehicle Power Transfer Infrastructure), and
   - 2.3 The maximum ERI including adjusted OPP of Table RC103.~~3~~ 5 determined in accordance with RC103. 4~~3~~.

RC103.3~~2~~ Building thermal envelope. [no change, same as R406.3]

RC103.~~3~~ 4 Energy Rating Index ~~zero net energy score~~. The Energy Rating Index (ERI) not including renewable energy resources shall be determined in accordance with RESNET/ICC 301.The Energy Rating Index (ERI) including renewable energy resources shall be determined in accordance with ANSI/RESNET/ICC 301, except where electrical energy is provided from a community renewable energy facility (CREF) or contracted from a physical or financial renewable energy power purchase agreement that meets requirements of RC406.4.1, on-site power production (OPP) shall be adjusted in accordance with Equation RC-1.

$$\text{Adjusted OPP} = \text{OPP}_{\text{kWh}} + \text{CREF}_{\text{kWh}} + \text{PPPA}_{\text{kWh}} + \text{FPPA}_{\text{kWh}}$$ **(Equation RC-1)**

OPP_{kWh} = Annual electrical energy from on-site renewable energy, in units of kilowatt-hours (kWh).
CREF_{kwh} = Annual electrical energy from a community renewable energy facility (CREF), in units of kilowatt-hours (kWh).
PPPA_{kwh} = Where not included as OPP, the annual electrical energy contracted from a physical renewable energy power purchase agreement, in units of kilowatt-hours (kWh).
FPPA_{kwh} = Where not included as OPP, the annual electrical energy contracted from a financial renewable energy power purchase agreement (FPPA), in units of kilowatt-hours (kWh).

RC103.4~~3~~.1 Power purchase agreement contract. The renewable energy shall be delivered or credited to the building site under an energy contract with a duration of not less than 10 years. The contract shall be structured to survive a partial or full transfer of ownership of the building property.

RC103.5~~4~~ ERI-based compliance. Compliance based on an ERI analysis requires that the *rated design* and confirmed built dwelling be shown to have an ERI less than or equal to both values indicated in Table RC103. 5~~3~~ when compared to the *ERI reference design*.

TABLE RC103.5~~3~~ MAXIMUM ENERGY RATING INDEX[a]

RC103.6~~5~~ Verification by approved agency. [no change, same as R406.6]

RC103.7~~6~~ Documentation. [no change, same as R406.7]

Reason: This Public Comment is intended as a clean-up (errata) to ensure Appendix RC is the same version as approved (RECPI-11).
RC101 was intended to only have 3 sections, with the same exact headings as R401 (Scope, Application, Certificate).

RC102 has some missing italicized words and some quotes and hyphens that need to be removed.

RC103 was intended to have the same 7 sub-sections as R406, so a Scope section is added as RC103.1 and other section numbers updated accordingly. Also "zero energy score" was intended to be struck from the Energy Rating Index sub-heading. Defined words were intended to be italicized, so those are corrected here.

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

Bibliography: None, however RECPI-11 from the CAR supports the changes in this PC.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: approve to align with prior Main Committee action on RECPI-11

Proposal # 1380

RED1-3-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

GRADE PLANE. A reference plane representing the average of the finished ground level adjoining the building at all exterior walls. Where the finished ground level slopes away from the exterior wall, the reference plane ~~shall be~~ is established by the lowest points within the area between the building and the lot line or, where the lot line is more than 6 feet (1829 mm) from the building between the structure and a point 6 feet (1829 mm) from the building.

Reason: Requirements do not belong in definitions; definitions are intended to be explanatory.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No effect on construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Committee supported. Questioned whether this has been submitted for commercial. Proponent submit if necessary

Proposal # 1082

RED1-6-22

Proponents: Jonathan Humble, representing American Iron and Steel Institute (jhumble@steel.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

AISI

American Iron and Steel Institute
25 Massachusetts Avenue, NW, Suite 800
Washington, DC 20001

AISI S250-~~21~~ 22	North American Standard for Thermal Transmittance of Building Envelopes with Cold-Formed Steel Framing, with Supplement 1, dated 2022

Reason: Supplement #1 - 2022 modified Section B4.2 Standard Truss Framing equations by removing the parenthesis in the denominator, which was not intended to be included, in order to correctly illustrate the equation. No other modifications were made to Standard S250.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This modification to Standard S250 corrected an error tot he 2021 edition.

Bibliography: AISI S250-21w/S1-22 North American Standard for Thermal Transmittance of Building Envelopes with Cold-Formed Steel Framing, American Iron and Steel Institute, Washington, DC 2022.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Necessary change to update the standard

Proposal # 962

RED1-7-22

Proponents: Ryan Meres, representing RESNET (ryan.meres@gmail.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

RESNET

Residential Energy Services Network, Inc.
P.O. Box 4561
Oceanside, CA 92052-4561

ANSI/RESNET/ICC 301—2022:	Standard for the Calculation and Labeling of the Energy Performance of Dwelling and Sleeping Units using an Energy Rating Index--includes Addendum A Approved July 28, 2022; Addendum B Approved October 12, 2022 and Addendum C

Reason: Since the publication of ANSI/RESNET/ICC 301-2022, RESNET's SDC 300 has approved new addenda.
Addendum A- provides language regarding the ownership of renewable energy certificates.

Addendum B- provides updated calculations for estimating carbon emissions of homes and creates a new CO2e index.

Addendum C- provides several improvements to the following: Ceiling Area, Interior Shade, Multi-systems, Onsite Battery. It also provides updates to incorporate the new federal equipment equipment testing/labeling requirements for SEER2/HSPF2.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
These new addenda to Standard 301 will not increase the cost of construction. Standard 301 is referenced in R406 which is an optional compliance pathway in the IECC.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: SC feels this proposal provides the most up-to-date RESNET language in the IECC

Proposal # 979

RED1-8-22

Proponents: Mike Nugent, representing BCAC (bcac@iccsafe.org)

2024 International Energy Conservation Code [RE Project]

SECTION R101
SCOPE AND GENERAL REQUIREMENTS

R101.1 Title. This code shall be known as the Energy Conservation Code of [NAME OF JURISDICTION] and shall be cited as such. It is referred to herein as "this code."

R101.2 Scope (Not subject to public input). This code applies to the design and construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

Add new text as follows:

<u>**101.2.1** **Appendices.** Provisions in the appendices shall not apply unless specifically adopted.</u>

Reason: Appendices are in all of the codes except for IZC. The intent is to put information about their adoption for inclusion in the same location in all of the codes immediately following the section on scope. This is already the case in the IBC, IFC, IMC, IPSDC and IWUIC. ADM7-22 has added this section to ICCPC, IGCC, IPMC, and ISPSC. This section was relocated in the IEBC, IFGC, IPC and IRC.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is an editorial coordination item.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal provide consistency with the other International Codes regarding appendices

Proposal # 1048

RED1-9-22

Proponents: Mike Nugent, representing BCAC (bcac@iccsafe.org)

2024 International Energy Conservation Code [RE Project]

SECTION R101
SCOPE AND GENERAL REQUIREMENTS

R101.1 Title. This code shall be known as the Energy Conservation Code of [NAME OF JURISDICTION] and shall be cited as such. It is referred to herein as "this code."

R101.2 Scope (Not subject to public input). This code applies to the design and construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

R101.3 Intent (Not subject to public input). The International Energy Conservation Code - Residential Provisions provide market-driven, enforceable requirements for the design and construction of residential buildings, providing minimum efficiency requirements for buildings that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment. Additionally, the code provides jurisdictions with optional supplemental requirements, including requirements that lead to achievement of zero energy buildings, presently, and, through glidepaths that achieve zeroenergy buildings by 2030 and on additional timelines sought by governments, and achievement of additional policy goals as identified by the Energy and Carbon Advisory Council and approved by the Board of Directors. The code may include non-mandatory appendices incorporating additional energy efficiency and greenhouse gas reduction resources developed by the Code Council and others. Requirements contained in the code will include, but not be limited to, prescriptive- and performance-based pathways. The code will aim to simplify code requirements to facilitate the code's use and compliance rate. The code is updated on a three-year cycle with each subsequent edition providing increased energy savings over the prior edition. The IECC residential provisions shall include an update to Chapter 11 of the International Residential Code. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this intent. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Revise as follows:

~~R101.5~~ R101.4 Compliance. *Residential buildings* shall meet the provisions of IECC—Residential Provisions. *Commercial buildings* shall meet the provisions of IECC—Commercial Provisions.

~~R101.5.1~~ R101.4.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

Add new text as follows:

SECTION R102
APPLICABILITY

Revise as follows:

~~R101.4~~ R102.1 Applicability. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

~~R101.4.1~~ R102.1.1 Mixed residential and commercial buildings. Where a *building* includes both *residential* building and *commercial building* portions, each portion shall be separately considered and meet the applicable provisions of the IECC—Commercial Provisions or IECC—Residential Provisions.

~~R108.3~~ R102.2 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

~~R108.2~~ R102.3 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

~~R108.1~~ R102.4 Referenced codes and standards. The codes and standards referenced in this code shall be those indicated in Chapter 6, and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections ~~R108.1.1~~ R102.4.1 and ~~R108.1.2~~ R102.4.1.

~~R108.1.1~~ R102.4.1 Conflicts. Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

~~R108.1.2~~ R102.4.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

~~R107.1~~ R102.5 ~~General~~ Partial invalidity. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

Delete without substitution:

~~SECTION R107~~
~~VALIDITY~~

~~SECTION R108~~
~~REFERENCED STANDARDS~~

Reason: Right now many jurisdictions delete Chapter 1 of the codes and write their own unified Administrative provisions. Part of the reason for this is that it is not easy to see where the administrative provisions are similar or different. Chapter 1 of the I-codes should be different where applicable. However, if the administrative provisions are the same, it is important for the authority having jurisdiction to be able to identify that quickly. As we work on this throughout the codes, it is hoped that jurisdictions will use the Chapter 1's in the relative code.
The intent of this change is to have the provision in Section 101, Scope and General Requirements, and Section 102, Applicability, to contain the same basic points for all the codes. This will make compliance easier. For the IECC, this would involve some reorganization, including movement of the sections dealing with references standards (R108) and validity (R107). There are no changes to requirements. A similar proposal was submitted for IECC Commercial and was accepted.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is a reorganization of administrative provisions with no change to technical requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal aligns with the other I-codes

Proposal # 1049

RED1-10-22

Proponents: Mike Nugent, representing BCAC (bcac@iccsafe.org)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

SECTION 103
CODE COMPLIANCE AGENCY

103.1 Creation of enforcement agency. The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the authority having jurisdiction (AHJ). The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

103.2 Appointment. The authority having jurisdiction (AHJ) shall be appointed by the chief appointing authority of the jurisdiction.

103.3 Deputies. In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the authority having jurisdiction (AHJ) shall have the authority to appoint a deputy authority having jurisdiction (AHJ) , other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the authority having jurisdiction (AHJ).

Reason: This section include provisions for the creation of the code compliance agency. Similar language is in the IBC, IFC, IPC, IMC, IFGC, IEBC, IPMC, IPSDC, IWUIC, IRC and IGCC.
The department's responsibilities are more than just 'enforcement' of the code. The fill in the blank for the name allows for the agency to develop a name appropriate to their jurisdiction and responsibilities. This also allows for the code official to appoint staff where needed.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is an editorial change with no change to construction requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal aligns with the other I-codes.

Proposal # 1051

RED1-11-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R103.2.2 Solar-ready system. Where a *solar-ready zone* is provided, the ~~The~~ construction documents shall provide details for dedicated roof area, structural design for roof dead and live load, and routing of conduit or pre-wiring from solar-ready zone to electrical service panel or plumbing from solar-ready zone to service water heating system.

Reason: New section 404.6 contains requirements for renewable energy infrastructure. However, it also contains 7 exceptions where new residential buildings will not have to install infrastructure:
"Exceptions:

1. A dwelling unit with a permanently installed on-site renewable energy system.

2. A dwelling unit with a solar-ready zone area that is less than 500 square feet (46 m2) of roof area oriented between 110 degrees and 270 degrees of true north.

3. A dwelling unit with less than 500 square feet (46m2) of roof area oriented between 110 degrees and 270 degrees of true north.

4. Dwelling units where 50 percent of the solar-ready area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.

5. A dwelling unit that complies with Appendix RC.

6. A dwelling unit with a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated whole-building electric use on an annual basis.

7. A dwelling unit less than or equal to 1,500 square feet (139 m2) of living space floor area located above grade plane."

Since there will be there are cases where a solar-ready system will not be installed, there needs to be language in R103.2.2 to account for the exceptions.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal only deals with the content of construction documents.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Solar ready zone is a defined term. This section should apply whether the solar ready zone is required by R404.6 or provided voluntarily.

Proposal # 980

RED1-12-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R105.2.2 Framing and air barrier rough-in inspection. Air barrier inspections at framing and rough-in shall be made before application of air permeable insulation and shall verify compliance with the code ~~as to: fenestration properties such as *U*-factor and SHGC and proper installation; air leakage controls as required by the code;~~ and *approved* plans and specifications. Exterior air barriers ~~may~~ shall be permitted to be inspected after insulation is installed.

R105.2.3 Insulation and fenestration rough-in inspection. Inspections at insulation and fenestration rough-in shall be made before application of interior finish and shall verify compliance with the code as to: types of insulation and corresponding R-values and their correct location and proper installation; fenestration properties such as U-factor and SHGC and proper installation.

Reason: This proposed change removes duplicative requirements. The language in R105.2.2 to "fenestration properties such as U-factor and SHGC and proper installation" is very similar to the language in R105.2.3 that states "types of insulation and corresponding R-values and their correct location and proper installation; fenestration properties such as U-factor and SHGC and proper installation." Duplicative requirements can lead to issues in the field with interpreting the intent of the code.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The change is editorial and will not change the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: agree with proponent reason statement to remove duplicative requirements. Leaving the term “and” provides flexibility.

Proposal # 973

RED1-13-22

Proponents: Christopher McWhite, representing Region VI (cmcwhite@me.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

~~**R105.2.3**~~ **R105.2.6 Insulation and fenestration rough-in inspection.** Inspections at insulation and fenestration rough-in shall be made before application of interior finish and shall verify compliance with the code as to: types of insulation and corresponding R-values and their correct location and proper in-stallation; fenestration properties such as U-factor and SHGC and proper installation.

~~**R105.2.4**~~ **R105.2.3 Plumbing rough-in inspection.** Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications as to types of insulation and corresponding *R*-values and protection, and required controls. Where required, inspections shall verify pathways for routing of plumbing from solar-ready zone to service water heating system.

~~**R105.2.5**~~ **R105.2.4 Mechanical rough-in inspection.** Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding *R*-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation, and minimum fan efficiency.

Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C105.2.4.

~~**R105.2.6**~~ **R105.2.5 Electrical rough-in inspection.** Inspections at electrical rough-in shall verify compliance as required by the code and the approved plans and specifications as to the locations, distribution, and capacity of the electrical system. Where the solar-ready zone is installed for electricity generation, inspections shall verify conduit or pre-wiring from solar-ready zone to electrical panel.

Reason: Renumbering the sections is not really a problem. Also, the Committee got it right by adding the electrical inspection language so the local inspector has guidance on what to inspect. The issue is that many inspectors view section 105 as the intended inspections order. By locating the insulation and fenestration ahead of the MEP rough inspections reverses the logical order and can have the unintended effect of obscuring in-wall systems with insulation. The intent of this change is to reorder the inspections so as to remain consistent with the logical order of inspections currently being done by inspectors.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is a simple reordering of code sections and will not have an effect on the cost of construction.

Bibliography: I am a career, 22 year Building Code Official who has served communities in five states from the Midwest, to the South, and now in New England. Through The Rhode Island Building Code Standards Committee, I am accepted as a certified Building Official; *R.I.G.L. Ch. 23-27.3 §107.5*. Through The International Code Council, I am exam certified as a Certified Building Official, Housing Code Official, Combination Residential Building Inspector, and a Residential and Commercial Plans Examiner. Through the State of Massachusetts I am a certified/licensed Inspector of Buildings/Building Commissioner. Currently I am working as the Department Head Building and Zoning Official in the Town of Smithfield Rhode Island. Here we are committed to our communities' development through partnerships with local and statewide organizations, institutions, and people who are dedicated and/or focused on the process of maintaining existing buildings and constructing new edifices with the goal of making an ever safer built community. I am committed to pursuing improved life safety in residential and commercial structures and the judicious enforcement of current building code and its referenced standards through effective leadership both within the builders and design community and with the professional staff I have the honor to lead. My personal goal is the building of a team of amicable, fair, ethical, and consistently equitable Officials utilizing State and Local building regulations while also judiciously incorporating relevant 28 CFR, ADA requirements. My role is also to communicate these goals with political bodies, large stakeholder investors in high profile projects, local community projects, and simple renovations with homeowners, without parity. I am also a decades-long member of the International Code Council, the non-profit agency that develops and publishes the building Codes. I've twice served as a selected committee member for code development on the national level and I am currently serving as an elected, Governing Board Member with one ICC Membership Council while chairing a subcommittee in another.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: agree with logical order this provides

Proposal # 1208

RED1-14-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R105.2.4 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications as to types of insulation and corresponding *R*-values and protection, and required controls. Where solar-ready zone is provided for a solar thermal system ~~required~~, inspections shall verify pathways for routing of plumbing from solar-ready zone to service water heating system.

Reason: This proposal adds clarity by coordinating requirements of the section with applicable definition. Solar-ready zone is defined as "A section or sections of the roof or building overhang designated and reserved for the future installation of solar photovoltaic or solar thermal system." Therefore, plumbing rough-in inspection applies only where the solar-ready zone is designated for a solar thermal system.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal is only providing clarification and would not change the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: the proposal with the modification clarifies that the plumbing rough-in inspection is required where a solar thermal system is provided

Proposal # 985

RED1-16-22

Proponents: Robert Schwarz, representing BUILDTank, Inc. (robby@btankinc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R105.4 Approved Third Party inspection agencies. The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the *building* design or construction, provided that such agencies are *approved* as to qualifications and reliability relevant to the *building* components and systems that they are inspecting or testing, and approval is granted prior to issuance of the building permit.

Add new text as follows:

R105.4.1 Authorization of approved third- party inspection agency. . An *approved* third-party inspection agency shall provide all requested information for the code official to determine that the agency meets the applicable requirements specified in Sections R105.4.1.1 through R105.4.1.3 and to authorize its work in the jurisdiction.

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

R105.4.1.1 Independence. An *approved* third-party inspection agency shall be an independent business identity. The agency shall perform its duties in accordance with the scope of delegated responsibilities established by the *code official*. The agency shall disclose to the *code official* any conflicts of interest including where fees for service are derived. The agency shall acknowledge in writing that it is only authorized to work within the scope of delegated responsibilities.

R105.4.1.2 Equipment. An *approved* third-party inspection agency shall have adequate equipment to perform inspections and tests required by the *code official* and this code. All testing equipment shall be periodically calibrated as required by the manufacturer, testing standards used in this code, or certifications held by the approved third-party inspection agency.

R105.4.1.3 Personnel. Personnel assigned by an *approved* third-party inspection agency to perform inspections and testing shall be trained or credentialed and documentation of training or credentials shall be available to *code official* upon request.

R105.4.1.4 Delegated authority. Where *approved*, a third-party inspection agency shall have the authority to perform delegated inspections and determine compliance or noncompliance of work with *approved construction documents*.

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

R105.4.2 Approved third-party inspection agency reporting. An *approved* third-party inspection agency shall keep records of delegated inspections, tests, and compliance documentation required by this code. The agency shall submit reports of delegated inspections and tests to the *code official* and to the owner or owner's representative. Reports shall indicate the compliance determination for the inspected or tested work based on *approved construction document*. A final report documenting required delegated inspections and tests, and correction of any discrepancies noted in the inspections or tests, shall be submitted, with other required compliance documentation, at a time required by the *code official*.

Reason: Reason Statements:
In relation to the International Energy Conservation Code, third-party inspection agencies and building officials currently have a variety of ideas regarding what should constitute the work of the agency. For the ERI path, for example, many Raters understand that they must develop an ERI score, but do not fully understand their relationship to inspection of other requirements in the IECC. Jurisdictions having authority, are often either abdicating inspections or believe that Rater's are looking at mandatory inspection items. In addition, the creation of a HERS Index score is different from the creation of an ERI score. A HERS Index score is an asset rating which allows for the derating of the R-value of poorly installed insulation in the energy model, as the objective is to benchmark the energy performance of the home on the HERS Index scale. An IECC ERI evaluation of the installation of Insulation does not allow for the deration of poorly installed insulation. If insulation is not installed in accordance with the manufactures instruction and the guidance given in Table R402.4.1.1, then the installation should fail inspection and be reinstalled until it meets the mandatory requirement of the code. This disconnect in understanding is the genesis of this code change proposal.

There are three aspects of the relationship that are specifically troublesome within the context of IECC enforcement and which this proposal addresses.

1. That the Approved third party works at the discretion of the Authority having jurisdiction. If the AHJ does not like the work that is being done the have the complete ability to refuse to accept compliance inspections and reports from a third Party. Clarifying this working relationship should also make it understood that regardless of who is paying the third party they are working at the pleasure of the AHJ and no one else. In addition,

clarification of this relationship will enable better energy code enforcement and allow jurisdictions to meaningfully address the workforce shortage within their jurisdictions.

2. Assurance that a transfer of authority is established so that a third-party inspection agency is authorized to fail or pass the inspections they perform and that the party being inspected clearly understands that authority.

3. The code official must clearly establish what is needed from the third-party inspection agency.

4. Lastly, anything inspected by a third-party agency must be reported to the code official and the owner's representative

The clarity gained in the relationship between the authority having jurisdiction and the approved third-party inspection agency is crucial as we progress into more complicated and meaningful energy codes. Nationally, jurisdictions are losing experienced professionals to retirement. Consequently, more third-party inspection agencies are stepping in to fill the gap. These third-party inspection agencies tend to be solely focused on energy and are capable, and eager to work in the energy code compliance niche. They are filling a need for jurisdictions that are either under staffed or lack a desire to fully enforce the energy components of the code. This proposal clearly defines a path forward to meet the need by defining scope and responsibilities to better ensure compliance and thus achieve expected energy savings.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal does not increase cost but better allocates dollars currently being spent to ensure that the job being undertaken by approved third party inspection agencies truly meets the needs of the authority having jurisdiction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Provides better guidance to utilize 3rd party inspection agencies to comply with the code. There were concerns raised by some in attendance that will likely address during the PC2 period.

Proposal # 1004

RED1-17-22

Proponents: Mike Nugent, representing BCAC (bcac@iccsafe.org)

2024 International Energy Conservation Code [RE Project]

SECTION R110
MEANS OF APPEALS

R110.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

Revise as follows:

R110.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code ~~or interpret the administration of this code~~.

R110.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training <u>on matters pertaining to the provisions of this code</u> and are not employees of the jurisdiction.

R110.4 Administration. The code official shall take ~~immediate~~ action <u>without delay</u> in accordance with the decision of the board.

Reason: The intent of this proposal is coordination for the means of appeals within the family of codes. Most of this was accomplished through ADM40-19 during the last cycle. Comments during the testimony, from the code development committees and subsequent discussions have suggested some improvements.

Limitation on authority. The deletion of 'or interpret the administration of this code' is proposed to be deleted so that the board could consider appeals on any part of the codes.

Qualifications: The phrase for experience and training is slightly different in each code. Adding this idea to all codes would provide consistency.

Administration: This modification is to revise Section R110.4 to so that the term 'immediate' is replaces with 'without delay' as a reasonable compromise for a building official to react promptly to a board of appeals decision, without having to respond immediately following the meeting.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
These are administration requirements, so there will be no change in construction requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal coordinates the language in this section with the family of codes

Proposal # 1052

RED1-27-22

Proponents: Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com); Mark Lyles, representing California IOUs (markl@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

APPENDIX RG
2024 IECC Stretch Code

RG101
COMPLIANCE

RG405.2 Simulated building performance compliance. Compliance based on simulated building performance requires that a *building* comply with of 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.

   For Climate Zones 0-2: $TC_{Proposed\ design} \leq 1.08 \times TC_{Prescriptive\ reference\ design}$ **(Equation 4-2)**

   For Climate Zones 3-8: $TC_{Proposed\ design} \leq 1.15 \times TC_{Prescriptive\ reference\ design}$

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 70 percent of the annual energy cost of the *standard reference design*. For all other *dwelling units*, the annual energy cost of the *dwelling unit* shall be less than or equal to 75 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 multipliers for electricity shall be 2.51. The source energy multiplier for fuels other than electricity shall be 1.09.
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.

RG406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the *rated design* and each confirmed as-built *dwelling unit* be shown to have an ERI less than or equal to the applicable value indicated in Table R406.5 where compared to the *ERI reference design* as follows:

1. Where on-site renewables are not installed, the maximum ENERGY RATING INDEX NOT INCLUDING OPP applies.
2. Where on-site renewables are installed, the maximum ENERGY RATING INDEX INCLUDING OPP applies.

Exceptions:

1. Where the ERI analysis excludes OPP, the maximum ENERGY RATING INDEX NOT INCLUDING OPP shall be permitted.
2. For *buildings* with twenty or more *dwelling units*, where approved by the *code official*, compliance shall be permitted using the Average Dwelling Unit Energy Rating Index, as calculated in accordance with ANSI/RESNET/ICC 301.

R406.5 MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX WITH OPP
0-1	46	27
2	46	26
3	45	24
4	48	32
5	49	37
6	48	39
7	47	43
8	47	43

RG408.2 Additional energy efficiency credit requirements. *Residential buildings* shall earn not less than twenty credits from not less than two measures specified in Table R408.2. Five additional credits shall be earned for dwelling units with more than 5,000 square feet (465 m2) of *living space* located above *grade plane*. To earn credit as specified in Table R408.2 for the applicable *Climate Zone*, each measure selected for compliance shall comply with the applicable subsections of Section R408. Each *dwelling unit* or *sleeping unit* shall comply with the selected measure to earn credit. Interpolation of credits between measures shall not be permitted.

Reason: This glide path appendix is being offered as a simple option for jurisdictions to adopt to exceed the energy performance 2024 IECC on their "glide path" to net zero energy. To attain that additional performance, this Appendix has three sections that would replace the corresponding sections in the main body of the code: one section from each Compliance option (Prescriptive, Simulated Performance, and ERI).
Where changes are made throughout the public comment period to these three copied sections, those changes would be intended to be updated here as well.

Cost Impact: The code change proposal will increase the cost of construction.
For jurisdictions that adopt this code, local building construction costs at the time of adoption should be considered to determine cost-effectiveness.

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: support a Glide Path Appendix as an optional pathway for AHJ’s to adopt in order to achieve higher energy conservation without yet requiring net-zero performance or renewable installations. Compared to the version in the monograph, the Proponent had modified the ERI Max values to reflect 10% reduction below 2024 IECC ERI values without OPP and to revise the ERI Max values with OPP, based on recent PNNL analysis.

Proposal # 1119

RED1-28-22

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

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

APPENDIX RH
Operational Carbon Rating and Energy Reporting

RH101
GENERAL DEFINITIONS

Add new definition as follows:

$CO2_e$ INDEX. A numerical integer value, calculated in accordance with ANSI / RESNET / ICC 301 that represents the relative Carbon Dioxide equivalence (CO_2e) emissions of a *rated design* as compared with the CO_2e emissions of the CO_2e reference design and where an Index value of 100 represents the CO_2e performance of the CO_2e reference design and an Index value of 0 (zero) represents a home that emits zero net CO_2e annually.

Add new text as follows:

RH102
COMPLIANCE

RH401.2 Application. Residential buildings shall comply with Section R406.

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

RH401.3 Certificate. A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building.* Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory *label*, service disconnect *label* or other required labels. The certificate shall indicate the following:

1. The predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls, crawl space walls* and floors and ducts outside *conditioned spaces.*
2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the *building thermal envelope*, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and *building thermal envelope* air leakage testing performed on the *building.*
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
5. Where on-site *photovoltaic* panel systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score and CO_2e Index, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted.
8. Where a *solar-ready zone* is provided, the certificate shall indicate the location, and dimensions.

RH406.2 ERI and CO2e Index compliance. Compliance based on the ERI and *CO_{2e} Index* requires that the *rated design* and as-built *dwelling unit* meet all of the following:

1. The requirements of the sections indicated within Table R406.2.
2. Maximum ERI values indicated in Table R406.5.
3. For all-electric dwelling units, maximum $CO2_e$ Index of 65, not including OPP, determined in accordance with ANSI/RESNET/ICC 301. For mixed-fuel *dwelling units*, a maximum $CO2_e$ Index established at the time of adoption of this Appendix by the authority having jurisdiction based on the $CO2_e$ emissions data specific to the jurisdiction.

RH406.7.2.2 Confirmed compliance report for a certificate of occupancy. . A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other *building site* identification.
2. Declaration of ERI and CO_2e Index on title page and on building plans.
3. The name of the individual performing the analysis and generating the report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the *ERI* reference design and the as-built *dwelling unit*.
6. A final confirmed certificate indicating that the as-built building has been verified to comply with Sections R406.2, R406.4, and R406.5. The certificate shall report the energy features that were confirmed to be in the building, including: component-level insulation R-values or *U*-factors; results from any required duct system and *building thermal envelope* air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water-heating equipment installed. The certificate shall report the estimated dwelling unit energy use by fuel type, inclusive of all end-uses. Where on-site renewable energy systems have been installed on or in the building, the certificate shall report the type and production size of the installed system.

Reason: As stated in the Executive Summary of the "Path Forward on Energy and Sustainability to Confront a Changing Climate," reduction of greenhouse gas emissions is part of our mission on this Committee. This proposal is a step toward that goal, by reporting an index, similar to ERI, that helps a builder/homeowner understand the performance of their home with respect to GHG. The calculation of this CO2e index has no added cost and requires no additional effort by the builder or rater. The same software that calculates an ERI in 2024 IECC R406 path will be done so in accordance with ANSI 301-2022. That Standard requires software to list this CO2e Index on labels & certificates. It will be published in time for reference within the 2024 IECC to include an update to GHG emission factors (Addendum B).
This proposal also provides an achievable but maximum CO2e Index and adds the reporting of energy use such that GHG emissions could be calculated separately, if other metrics are being used by the jurisdiction to document GHG performance.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The code change proposal will neither increase nor decrease the cost of construction since the reporting of this value is already part of compliance with the referenced Standard.

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: support the Carbon Rating Appendix as an optional pathway for AHJ's to adopt in order to demonstrate reductions in operational carbon. Based on discussion, a motion to modify the max CO2e Index was made, increasing it to 65 from 55.alues without OPP and to revise the ERI Max values with OPP, based on recent PNNL analysis.

Proposal # 1170

RED1-31-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

SIMULATED BUILDING PERFORMANCE. A process in which the proposed building design is compared to a *standard reference design* for the purposes of estimating relative energy use ~~against a baseline~~ to determine code compliance.

Reason: This proposal clarifies the definition. The *standard refence design* is the baseline.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is a clarification of intent.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The deleted words are redundant, because the standard reference design is the baseline.

Proposal # 1017

RED1-32-22

Proponents: Robert Schwarz, representing BUILDTank, Inc. (robby@btankinc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

Table R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION a.

COMPONENT	AIR BARRIER AND AIR SEALING CRITERIA	INSULATION INSTALLATION CRITERIA
HVAC Register boots	HVAC supply and return register boots ~~that penetrate the *building thermal envelope*~~ shall be sealed to the subfloor, wall covering, or ceiling penetrated by the boot.	HVAC supply and return register boots located in the *building's thermal envelope* shall be buried in or surrounded by insulation. ~~Insulation shall be fitted tightly aroundHVAC supply and return register boots located in the *buildings thermal envelope to maintain its required assembly R-value per section R401.2*~~

Reason: This proposal was approved as modified by the committee. However, only the approved changes to the Insulation installation criteria were listed in the released draft of the IECC for public comment. There were also approved changes to the Air Barrier side of the table that were not reflected in the released draft of the IECC for public comment. This Public ensures that there is a record of everything that was approved by the committee as an errata to the released draft of the IECC for public comment.
In addition the Public comment addes “and air Sealing” to the table header so it now would read, “Air Barrier And Air Sealing Criteria” to better reflect the purpose of the table.

The proposal as originally written and approved requires that all supply and return registers be sealed to the surface they are penetrating. The origin of this air sealing requirement comes from ENERGY STAR, who has demonstrated that energy loss is associated with duct boot installation in three ways: 1) if the boot directly penetrates the thermal envelope, such as a duct boot coming from a ventilated attic into the house; 2) when air that should be delivered to the conditioned space is redirected into building cavities when it hits the register cover; 3) when Venturi pressure, sometimes called the Coanda effect, is created and pulls air into the building cavity as it is being delivered into the room. See Bibliography for more)

Read more here, **https://www.achrnews.com/articles/128615-why-dirt-streaking-occurs-around-vents**

By not being able to deliver the HVAC designed volume of air to the rooms of the house, the occupant is often left with no other choice than to raise the thermostat set point temperature in the winter and to lower it in the summer. This causes energy inefficiencies while not correcting their comfort issue. In addition, building cavities are often connected to unconditioned space which increases duct leakage to the outside, as well as other inefficiencies. Therefore, I believe that it is an important energy and building durability issue. This needs to be addressed at this time because many builders and contractors have experience implementing this in part, if not in whole, and this proposal finished what the code has been intending when it barrowed this requirement from the Energy Star program.

There have not been insulation requirements associated with duct boots in the past which continues to make this a significant code change proposal. Ensuring that our building cavities are insulated properly is imperative when duct boots are placed in them, and this proposal directly addresses that issue at the termination of the duct boot and the substrate it passes through.

Lastly, this proposal aligns with ENERGY STAR requirements that are the basis of the creation of this table that has been adopted by the IECC.

6. Duct Quality Installation: See Bibliography from more information

6.4.1 In addition, all duct boots sealed to the finished surface, Rater-verified at final. 39

Cost Statement:

§ As the committee noted this proposal changes the scope of the requirement and therefore should slightly increase the cost of execution. However, the proposed in reality offers better clarity and expansion of existing requirements.

Cost Impact: The code change proposal will increase the cost of construction.
The proposed language may possibly increase the cost of construction a small amount due to the application of additional caulk but the benefits to the energy performance of the system far out way the small incremental cost. For Energy Star builders there would be no increase in cost.

Bibliography: Read more here, **https://www.achrnews.com/articles/128615-why-dirt-streaking-occurs-around-vents**

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: based on committee action on REPI-50-21.

Proposal # 1012

RED1-35-22

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

2024 International Energy Conservation Code [RE Project]

R405.1 Scope. This section establishes criteria for compliance using simulated building performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water-heating energy only.

Revise as follows:

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-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. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-2)

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

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

3. For buildings without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design. Energy prices shall be taken from ~~a~~ an *approved* source ~~*approved* by the *code official*~~, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
   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 for an all-electric building with on-site renewable energy installed.

Reason: R404.6.2 is an inappropriate reference; it violates intent of the IECC-R as specified in Section 105 by mandating compliance with voluntary adoption appendix of the IECC- commercial code. This is inconsistent with commitments made by the ICC to industry and does not accommodate locations where the IECC-C is not adopted.
It is a sloppy code structure with no regard for the people who use the code for design, building, or regulation. We need to do better work.

R401.3(5) already requires detailed information about onsite solar energy systems; redundant documentation is not needed.

Cost Impact: The code change proposal will decrease the cost of construction.
Some redundant documentation is eliminated which should save some $.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Modified proposal removed technical changes and resolved editorial concerns to clarify "simulated building performance" and "approved" source.

RED1-43-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-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. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-2)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$
$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

3. For buildings without a fuel burning appliance for either space heating or water heating, the annual energy cost of the proposed design ~~that is~~ shall be less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design ~~that is~~ shall be less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
   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 for an all-electric building with on-site renewable energy installed.

Reason: The PCD #1 language creates a nonsensical situation where if one appliance is fuel burning and one is not, both sentences and both conditions apply: 85% and 80%. For the provision to make sense, the first sentence must make clear that no fuel burning appliances are present.

It doesn't work to say: "the annual energy cost that is . . ." The first two sentences have been changed to match the structure of the third sentence: "the annual energy cost shall be . . ."

There may be another proposal that addresses "buildings" versus "dwelling units" in this section.

Alternative Options (first two sentences only):

3. For buildings without a fuel burning appliance for space heating and without a fuel burning appliance for water heating, 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 buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design shall be less than or equal to 80 percent of the

annual energy cost of the standard reference design.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: This proposal resolves the ambiguity and the grammar problem.

Proposal # 1342

RED1-54-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R405.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
~~R401.2.5~~	~~Additional energy efficiency~~
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Attic knee or pony wall
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and doors
R402.2.9	Basement walls
R402.2.9.1	Basement wall insulation installation
R402.2.10.1	Slab-on-grade floor insulation installation
R402.2.11.1	Crawl space wall insulation installations
R402.5.1.1	Installation
R402.5.1.2	Testing
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Room containing fuel burning applicances
R402.5.5	Recessed lighting
R402.5.6	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 except Section R403.5.2 (staff note: this needs to be fixed with hot water pipe insulation)	Service hot water system
R403.5.2	Hot water pipe insulation
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
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.

R408.1 Scope. This section establishes additional efficiency credits to achieve additional energy efficiency ~~in accordance with Section R401.2.5~~.

RE103.1 Application. Residential buildings shall be *all-electric buildings* and comply with ~~Section R401.2.5 and~~ either Sections R401.2.1, R401.2.2, R401.2.3 or R401.2.4.

Reason: Section R401.2.5 has been deleted in the current code change proposal draft and therefore is a ghost reference.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change proposal will neither increase nor decrease the cost of construction as it appears to be editorial.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Clean up to remove redundant language.

Proposal # 1422

RED1-56-22

Proponents: Gary Klein, representing Self (gary@garykleinassociates.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R405.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5 ~~except Section R403.5.2 (staff note: this needs to be fixed with hot water pipe insulation)~~	Service hot water system
~~R403.5.2~~	~~Hot water pipe insulation~~
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas

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

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
General	
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5 ~~except Section R403.5.2 (staff note: this needs to be fixed with hot water pipe insulation)~~	Service hot water systems
~~R403.5.2~~	~~Hot water pipe insulation~~
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
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: Due to two REPI's affecting the same text in Table R405.2 and Table R406.2, staff noted a conflict that would need to be addressed via Public Comment. This Public Comment proposes to remove the dedicated row for HW pipe insulation and also remove the text "except Section R403.5.2 (staff note: this needs to be fixed with hot water pipe insulation)"
This would be consistent with the approved REPI which added the row for HW pipe insulation, such that the insulation requirement is met even when using a modeling pathway.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Since this is clarifying a previously approved REPI, this public comment has no additional cost impact.

Bibliography: None.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The purpose of this proposal is to resolve the Staff Note shown in the Public Comment draft in Table R405.2 and Table R406.2, which points out a conflict between the rows for service hot water system requirements and hot water pipe insulation requirements.

RED1-65-22

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

2024 International Energy Conservation Code [RE Project]

CHAPTER 2 [RE]
DEFINITIONS

SECTION R202
GENERAL DEFINITIONS

Revise as follows:

ENERGY RATING INDEX (ERI). A numerical integer value that represents the relative energy performance of a *rated design* ~~Rated Home~~ or constructed *dwelling unit* as compared with the energy performance of the *ERI Reference Design*, where an ERI value of 100 represents the energy performance of the *ERI Reference Design* and an ERI value of 0 represents a *rated design* or constructed *dwelling unit* ~~home~~ with zero net energy performance.

ERI REFERENCE DESIGN. A version of the *rated design* that meets the minimum requirements of the 2006 *International Energy Conservation Code*.

Revise as follows:

RATED DESIGN. A description of the proposed ~~*building*~~ *dwelling unit* used to determine the energy rating index.

CHAPTER 4 [RE]
RESIDENTIAL ENERGY EFFICIENCY

SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise as follows:

R406.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis. Such analysis shall be limited to *dwelling units*. Spaces other than *dwelling units* in Group R-2, R-3, or R-4 buildings shall comply with Sections R402 through R404.

R406.2 ERI compliance. Compliance based on the ERI requires that the *rated design* and as-built *dwelling unit* meets~~s~~ all of the following:

1. The requirements of the sections indicated within Table R406.2.
2. Maximum ERI values indicated in Table R406.5.

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

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

R406.3 Building thermal envelope. The proposed total building thermal envelope UA, which is sum of *U*-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive *U*-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, and 2, and by 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-3. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-3)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

R406.4 Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with ANSI/RESNET/ICC 301. The mechanical ventilation rates used for the purpose of determining the ERI shall not be construed to establish minimum ventilation requirements for compliance with this code.
Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

Revise as follows:

R406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the *rated* ~~*proposed*~~ *design* and each confirmed as-built *dwelling unit* be shown to have an ERI less than or equal to the appropriate value indicated in Table R406.5 when compared to the *ERI reference design* as follows:

1. Where on-site renewables are not installed, the maximum ENERGY RATING INDEX NOT INCLUDING OPP applies.
2. Where on-site renewables are installed, the maximum ENERGY RATING INDEX INCLUDING OPP applies.

Exceptions:

1. Where the ERI analysis excludes OPP, the maximum ENERGY RATING INDEX NOT INCLUDING OPP shall be permitted.

2. For buildings with twenty or more *dwelling units*, where *approved* by the code official, compliance shall be permitted using the Average Dwelling Unit Energy Rating Index, as calculated in accordance with ANSI/RESNET/ICC 301.

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

Revise as follows:

R406.6 Verification by approved agency. Verification of compliance with Section R406 as outlined in Sections R406.4 and R406.5~~6~~ shall be completed by an *approved* third party. Verification of compliance with Section R406.2 shall be completed by the authority having jurisdiction or an *approved* third-party inspection agency in accordance with Section R105.4.

R406.7 Documentation. Documentation of the software used to determine the ~~ERI~~ *ERI* and the parameters for the *ERI Reference Design* ~~*residential building*~~ shall be in accordance with Sections R406.7.1 through R406.7.4.

R406.7.1 Compliance software tools. Software tools used for determining *ERI* ~~ERI~~ shall be ~~*Approved* Software Rating Tools~~ *approved* software rating tools as defined by ~~in accordance with~~ ANSI/RESNET/ICC 301. Software vendors shall publish, on a publicly available website, documentation that the software tool has been validated using the Class II, Tier 1 test procedure in ANSI/ASHRAE Standard 140.

R406.7.2 Compliance report. Compliance software tools shall generate a report that documents that the ~~home and the ERI score~~ *ERI* of the *rated design* and as-built *dwelling unit* complies with Sections R406.2, R406.3, R406.4 and R406.5~~4~~. Compliance documentation shall be created for the proposed design and shall be submitted with the application for the building permit. Confirmed compliance documents of the as-built *dwelling unit* shall be created and submitted to the code official for review before a certificate of occupancy is issued. Compliance reports shall include information in accordance with Sections R406.7.2.1 and R406.7.2.2.

R406.7.2.1 Proposed compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building street address, or other *building site* identification.
2. Declare ERI on title page and building plans.
3. The name of the individual performing the analysis and generating the compliance report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the *ERI reference design* and~~/or~~ the *rated design* ~~home~~.
6. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate score indicated in Table R406.5 when compared to the *ERI reference design*. The certificate shall document the building component energy specifications that are included in the calculation, including: component level insulation *R*-values or *U*-factors; assumed duct system and building envelope air leakage testing results; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
7. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated *dwelling unit* ~~home~~.

R406.7.2.2 Confirmed compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other *building site* identification.
2. Declaration of ERI on title page and on building plans.
3. The name of the individual performing the analysis and generating the report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the *ERI reference design* and~~/or~~ the as-built *dwelling unit*~~rated home~~.
6. A final confirmed certificate indicating that the as-built building ~~confirmed rated design of the built home~~ complies with Sections R406.2, R406.4 and R406.5~~4~~. The certificate shall report the energy features that were confirmed to be in the building~~home~~, including: component-level insulation *R*-values or *U*-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water-heating equipment installed. Where on-site renewable energy systems have been installed on or in the building ~~home~~, the certificate shall report the type and production size of the installed system.

R406.7.3 Renewable energy certificate (REC) documentation. Where renewable energy power production is included in the calculation of an ERI, documentation shall comply with Section R404.4.

R406.7.4 Additional documentation. The *code official* shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the *ERI reference design*.
2. A certification signed by the builder providing the building component characteristics of the *rated design.*

3. Documentation of the actual values used in the software calculations for the *rated design*.

R406.7.5 Specific approval. Performance analysis tools meeting the applicable subsections of Section R406 shall be *approved*. Documentation demonstrating the approval of performance analysis tools in accordance with Section R406.7.1 shall be provided.

Revise as follows:

R406.7.6 Input values. Where calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from ANSI/RESNET/ICC 301.

CHAPTER 6 [RE]
REFERENCED STANDARDS

ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036

Add new standard(s) as follows:

ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036

R406.7.1	ANSI/ASHRAE 140-2017 2020 **Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs**

Reason: Similar to a clean-up proposal for R405, R406 needs to be clear for multifamily that an ERI is only performed on a dwelling unit and that common spaces are still subject to the other code requirements in R402 through R404.
In addition, for large MF, the average ERI of all dwelling units in the building should be permitted to be used to demonstrate compliance with the maximum ERI (rather than each indvidual dwelling unit being required to meet the max ERI).

Finally, some edits are made to maintain consistency, use defined terms, and underscore that the as-built dwelling unit is also required to be compliant, not just the 'rated design' ERI.

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

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: support the clarifying edits and the modification to require common spaces comply with R402 through R404. Consistent with action on RECD1-8, the sub-committee also supported the new requirement for software to document that the ASHRAE Standard 140 tests had been performed.

Proposal # 1400

RED1-67-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the *rated proposed design* and confirmed built dwelling be shown to have an ERI less than or equal to the ~~appropriate~~ applicable value indicated in Table R406.5 ~~when~~ where compared to the *ERI reference design as follows:*

1. Where on-site renewables are not installed, the maximum ENERGY RATING INDEX NOT INCLUDING OPP applies.
2. Where on-site renewables are installed, the maximum ENERGY RATING INDEX INCLUDING OPP applies.

Exception: Where the ERI analysis excludes OPP, the maximum ENERGY RATING INDEX NOT INCLUDING OPP shall be permitted.

Reason: Editorial:
1."Appropriate" is not appropriate, it is subjective.
2. "When" is only time specific. "Where" is condition - including time - specific.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Editorial improvements

Proposal # 1431

RED1-71-22

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

2024 International Energy Conservation Code [RE Project]

SECTION R408
ADDITIONAL EFFICIENCY REQUIREMENTS

Revise as follows:

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

R408.2 Additional energy efficiency credit requirements . No less than t~~T~~wo ~~of the additional~~ measures shall be selected from Table R408.2 that meet or exceed a total of ten credits. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table R408.2 for the specific Climate Zone. For *dwelling units* in Group R-2 buildings, where applicable, the requirements shall be met in each dwelling unit in order to receive credit. Interpolation of credits between measures shall not be permitted.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.1(4)	>10% reduction in total UA									
R408.2.1.1(5)	>15% reduction in total UA									
R408.2.1.1(6)	>20% reduction in total UA									
R408.2.1.1(7)	>30% reduction in total UA									
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
R408.2.1.3	Cool Roof	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.1.4	Reduced air leakage	TBD	TBD	TBD	TBD	TBD	TBD	0	0	0

R408.2.1 Enhanced envelope options. For the enhanced envelope credits, t~~T~~he *building thermal envelope* shall ~~meet the requirements~~ 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 envelope performance ~~UA~~. The ~~proposed~~ total building thermal envelope thermal conductance TC~~UA~~shall be calculated 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.~~shall meet one of the following:~~

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

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

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

R408.2.1.3 Roof reflectance. Roofs shall comply with one or more of the options in Table R408.2.1.3.

Add new text as follows:

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 cfm50/ft^2. .

Reason: This public comment proposes credit for achieving airtightness below the prescriptive air leakage rates in CZ 0-5, as defined in Section R402.5.1.3. However, this credit is not being proposed for values less than 2.0 ACH50 given that another R408 section provides credit for that level airtightness when combined with balanced ventilation. In addition, this credit is not being proposed where sampling is used in Group R-2 buildings, but instead a whole building test could be used to earn this credit.

Other edits are editorial to provide better clarity of the original intent of this section.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Where selected as a measure, some additional labor cost associated with the greater attention to air-sealing practices would be applicable. Where not deemed cost-effective, this measure simply would not be selected.

Bibliography: None.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Clarifies language in R408.2.1.1 to align with prior action on RED1-79. Introduces reduced air leakage credit for achieving air tightness below the prescriptive air leakage rates and a comparable air leakage reduction credit for R-2 occupancies in R408 in CZ 0-5.

Proposal # 1120

RED1-73-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R408.1 Scope. This section ~~establishes~~ provides additional efficiency measures and credits ~~to achieve additional energy efficiency in accordance~~ required to comply with Section ~~R401.2.5~~ R401.2.1.

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R408.2 Additional energy efficiency credit requirements . ~~Two of the additional~~ *Residential buildings* shall earn not less than ten credits from not less than two measures ~~shall be selected from~~ specified in Table R408.2 ~~that meet or exceed a total of ten credits~~. Five additional credits shall be ~~selected~~ earned for *dwelling units* with ~~greater~~ more than 5,000 square feet (465 m^2) of *living space* ~~floor area~~ located above *grade plane*. To earn credit as specified in Table R408.2 for the applicable Climate Zone, each ~~Each~~ measure selected for compliance shall ~~meet~~ comply with the ~~relevant~~ applicable subsections of Section R408 ~~and receive credit as specified in Table R408.2 for the specific Climate Zone~~. Each dwelling unit or sleeping unit shall comply with the selected measure to earn credit. Interpolation of credits between measures shall not be permitted.

2024 International Energy Conservation Code [CE Project]

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
R408.2.2(1)[b]	High performance cooling system option 1	7	6	5	3	3	3	1	1	1
R408.2.2(2)[b]	High performance cooling system option 2	5	5	4	3	3	2	1	1	0
R408.2.2(3)[b]	High performance gas furnace option 1	0	2	3	5	5	7	8	8	10
R408.2.2(4)[b]	High performance gas furnace option 2	0	2	2	4	4	5	7	7	8
R408.2.2(5)[b]	High performance heat pump system option 1	8	7	6	6	6	6	5	5	4
R408.2.2(6)[b]	High performance gas furnace and heat pump system option 1	6	6	5	5	5	5	4	4	3
R408.2.2(7)[b]	High performance gas furnace option 2	0	2	4	6	6	8	7	6	5
R408.2.2(8)[b]	High performance heat pump system option 1									
R408.2.2(9)[b]	High performance heat pump system option 2									
R408.2.2(10)[b]	High performance heat pump system option 3									
R408.2.2(11)[b]	Ground source heat pump									
R408.2.2(12)[b]	Ductless-Single zone									
R408.2.2(13)[b]	Ductless-Multizone (Non-ducted indoor unit)									
R408.2.2(14)[b]	Ductless - Multizone (Ducted or Mixed)									
R408.2.3(1a)[d]	Gas-fired storage water heaters (option 1)									
R408.2.3(1b)[d]	Gas-fired storage water heaters (option 2)									
R408.2.3(2a)[d]	Gas-fired instantaneous water heaters (option 1)									
R408.2.3(2b)[d]	Gas-fired instantaneous water heaters (option 2)									
R408.2.3(3a)[d]	Electric water heaters (option 1)									
R408.2.3(3b)[d]	Electric water heaters (option 2)									
R408.2.3(4)[d]	Electric water heaters (option 3)									
R408.2.3(5a)[d]	Electric water heaters (option 4)									
R408.2.3(5b)[d]	Electric water heaters (option 5)									
R408.2.3(6)[d]	Electric water heaters (option 6)									
R408.2.3(1)	Fossil fuel service water heating system	7	6	5	3	3	2	2	3	1

	system									
R408.2.3(2)	High performance heat pump water heating system option 1	12	11	11	8	8	6	5	5	3
R408.2.3(3)	High performance heat pump water heating system option 2	12	12	11	8	8	6	5	5	3
R408.2.3(7a)[d]	Solar hot water heating system (option 1)	4	5	6	6	6	6	5	5	4
R408.2.3(7b)[d]	Solar hot water heating system (option 2)									
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	4	6	7	10	10	12	13	15	16
R408.2.4(2)[c]	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)[c]	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)[c]	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
R408.2.5(2)[c]	2 ACH50 air leakage rate with balanced ventilation	2	3	2	4	4	5	6	6	6
R408.2.5(3)[c]	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
R408.2.5(4)[c]	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
R408.2.6[a]	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
R408.2.9[c]	Demand responsive thermostat									

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.

R408.2.3 Reduced energy use in service water-heating option. For measure numbers R408.2.3 (1) through R408.2.3 (~~5~~ 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 (~~6~~ 8), the *dwelling unit* hot water distribution system shall comply with R408.2.3.1.

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

1. At plan review, referencing ounces of water per foot of tube on plans as per Table R403.5.4.
2. At rough in (plumbing), referencing ounces of water per foot of tube installed as per Table R403.5.4.
3. At final inspection. In accordance with Department of Energy's Zero Energy Ready Home National Specification (Rev. 07 or higher) footnote on Hot water delivery systems.

R408.2.3 Service water-heating efficiencies

Portions of table not shown remain unchanged.

Measure Number	Water Heater	Size and Draw Pattern	Type	Efficiency
R408.2.3(1)(b)	Gas-fired storage water heaters (option 2)	Rated input capacity > 75,000 Btu/h	UEF >= 0.86 or E_t >= 94%	
R408.2.3(6)	Electric water heaters (option 6)	Rated input capacity >12 kW	COP >= 3.00	

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

R408.2.6 ~~**Energy efficient appliances.** All appliances installed in a residential building dwelling unit shall meet the product energy efficiency specifications listed in Table R408.2.6, or equivalent energy efficiency specifications. Not less than three appliance types from Table R408.2.6 shall be installed for compliance with this section.~~

Reason: This change removes the words "of the." Those words are unnecessary.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change is editorial and will have no impact on construction costs.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: the modification further clarifies the language; provides additional direction for implementation in MF buildings; coordinates with other proposals that have been approved for this section.

Proposal # 1369

RED1-76-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

ON-SITE RENEWABLE ENERGY. Energy from renewable energy resources harvested at the building site.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7
R408.2.7	On-site renewable energy measures	17	16	17	11	11	9	8	7
R408.2.8	Off-site renewable energy measuress	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

R408.2.7 On-site renewable energy. Renewable energy resources shall be permanently installed that have the rated capacity to produce a minimum of 1.0 watt of on-site renewable energy per square foot of conditioned floor area. To qualify for this option, renewable energy certificate (REC) documentation shall meet the requirements of R404.4.

Add new text as follows:

R408.2.8 Off-site renewable energy. The building shall have a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated whole-building electric use on an annual basis.

Reason: This proposal adds off-site renewables to the list of options for compliance with Section R408. Off-site renewables have the potential to provide viable strategies for deploying renewable energy resources at-scale. On-site renewable energy measures are already acknowledged in Section R408. The proposed language was adopted from the existing Section R404.6.1 addressing off-site renewables via a renewable energy power purchase agreement with a duration of not less than 15 years from a utility or a community renewable energy facility and for not less than 80 percent of the estimated whole-building electric use on an annual basis.

Cost Impact: The code change proposal will increase the cost of construction.
This change is in Section R408 and would not have an effect on construction costs.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The proposal provides an option to recognize the many benefits of community solar and other offsite renewable energy generation choices.

Proposal # 1038

RED1-79-22

Proponents: Amy Boyce, representing Energy Efficient Codes Coalition (EECC) (amy.boyce@imt.org)

2024 International Energy Conservation Code [RE Project]

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	1	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.1(4)	>10% reduction in total UA	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1(5)	>15% reduction in total UA	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1(6)	>20% reduction in total UA	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.1(7)	>30% reducction in total UA	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
R408.2.1.3	Cool Roof	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.2(1)	High performance cooling system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2)	High performance cooling system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)	High performance gas furnace option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4)	High performance gas furnace option 2	0	0	0	0	0	TBD	TBD	TBD	0
R408.2.2(5)	High performance gas furnace and cooling system option 2	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
R408.2.2(6)	High performance gas furnace and heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(7)	High performance gas furnace option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(8)	High performance heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(9)	High performance heat pump system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(10)	High performance heat pump system option 3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(11)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(12)	Ductless - Single zone	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(13)	Ductless - Multizone (Non-ducted indoor unit)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)	Ductless – Multizone (Ducted or Mixed)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(1)	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
R408.2.3(2)	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(3)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(4)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(5)	Solar hot water heating system	4	5	6	6	6	6	5	5	4
R408.2.3(6)	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)	More efficient distribution system	4	6	7	10	10	12	13	15	16
R408.2.4(2)	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2

R408.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
R408.2.5(2)	2 ACH50 air leakage rate with balanced ventilation	2	3	2	4	4	5	6	6	6
R408.2.5(3)	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
R408.2.5(4)	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
R408.2.6	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
R408.2.9	Demand responsive thermostat	1	1	1	1	1	1	1	1	1

R408.2.1.1 Enhanced envelope performance ~~UA~~. The proposed total building thermal envelope thermal conductance~~UA~~ 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.~~shall meet one of the following:~~

1. ~~Not less than 2.5 percent of the total UA of the *building thermal envelope*.~~
2. ~~Not less than 15 percent of the total UA of the *building thermal envelope*.~~
3. ~~Not less than 30 7.5 percent of the total UA of the *building thermal envelope*.~~

Reason: This proposal encourages code users to further improve the efficiency of the permanent thermal envelope by awarding credit for UA improvements of 15% and 30% as compared to the prescriptive baseline. We do not oppose the current UA improvement options (2.5%, 5%, 7.5%), but we are concerned that the current options are not differentiated enough from each other and do not capture enough of the potential envelope UA improvements possible. We recommend either adding these additional levels of credit or replacing two of the smaller increments with larger credits (as proposed above). A 15-30% improvement in Total UA is feasible and should be recognized in the code. Credit values are based on an analysis provided by Pacific Northwest National Laboratories.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal neither increases nor decreases the cost of construction. Because the Total UA improvements are among several optional improvements in Section R408, they will not impact the overall cost of construction. We trust that code users will select the optimal combination of options under R408 for code compliance and cost-effectiveness.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Proposal expands the availability of credits for additional improvements in total UA

RED1-89-22

Proponents: Diana Burk, representing New Buildings Institute (diana@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

RC103.3 Energy Rating Index zero net energy score. The Energy Rating Index (ERI) not including renewable energy resources shall be determined in accordance with RESNET/ICC 301.The Energy Rating Index (ERI) including renewable energy resources shall be determined in accordance with ANSI/RESNET/ICC 301, except where electrical energy is provided from a community renewable energy facility (CREF) or contracted from a physical or financial renewable energy power purchase agreement that meets requirements of RC406.4.1, on-site power production (OPP) shall be adjusted in accordance with Equation RC-1.

(Equation RC-1)

$$\text{Adjusted OPP} = OPP_{kWh} + CREF_{kWh} + \cancel{\frac{CL_{yrs}}{15}}\ \cancel{(}PPPA_{kWh} + FPPA_{kWh}\cancel{)}$$

where:

OPP_{kWh} = Annual electrical energy from on-site renewable energy, in units of kilowatt-hours (kWh).

$CREF_{kwh}$ = Annual electrical energy from a community renewable energy facility (CREF), in units of kilowatt-hours (kWh).

$PPPA_{kwh}$ = Where not included as OPP, the annual electrical energy contracted from a physical renewable energy power purchase agreement, in units of kilowatt-hours (kWh).

$FPPA_{kwh}$ = Where not included as OPP, the annual electrical energy contracted from a financial renewable energy power purchase agreement (FPPA), in units of kilowatt-hours (kWh).

RC103.3.1 ~~Power purchase agreement~~ Renewable energy contract. The renewable energy shall be delivered or credited to the building site under an energy contract with a duration of not less than 10 years. The contract shall be structured to survive a partial or full transfer of ownership of the building property.

Reason: This amendment creates greater equivalence between the amount of power procured by an off-site renewable energy contract and that provided throughout the life of an on-site renewable energy system, which can operate for up to 25-30 years. It requires buildings with contract lengths shorter than 15 years to purchase the same amount of power over the shorter contract length as would be purchased in a 15-year contract or produced in 15 years by an onsite system. This approach parallels the draft commercial 2024 IECC which requires building owners with contract lengths between 10 and 15 years to procure an equivalent total amount of renewable energy as building owners with a 15-year contract. Finally, this amendment amends the section title to be consistent with a similar section title in the commercial IECC.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Consistent with duration of purchased power in other parts of code and simplify requirement to avoid equation of original proposal.

Proposal # 1072

RED1-91-22

Proponents: Michael Tillou, representing Pacific Northwest National Lab (michael.tillou@pnnl.gov)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

RP
On-Site Renewable Energy

RP101 **SCOPE.** These provisions shall be applicable for new construction where on-site renewable energy is required.

RP102 **GENERAL DEFINITION**. **POTENTIAL SOLAR ZONE AREA.** The combined area of any steep-sloped roofs oriented between 90 degrees and 300 degrees of true north and any low-sloped roofs where the *annual solar access* is 70 percent or greater.
ANNUAL SOLAR ACCESS. The ratio of annual solar insolation with shade to the annual solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of *annual solar access*. Shading from existing permanent natural or person-made obstructions that are external to the building, including but not limited to trees, hills, and adjacent structures, shall be considered for *annual solar access* calculations.

RP103
ON-SITE RENEWABLE ENERGY

RP103.1 **General.** New buildings shall shall comply with the requirements of RP103.1 through RP103.6

RP103.2 **One and two family dwellings and townhouses and other R3 Occupancies.** Install an on-site renewable energy system with a nameplate DC power rating measured under standard test conditions, of not less than 2kW.

Exceptions:

1. A building with a permanently installed domestic solar water heating system with a solar savings fraction of not less than 0.5.
2. A building in climate zone 4C, 5C or 8
3. A building where the *potential solar zone area* is less than 300 square feet (28 m^2)

RP103.3 **Group R2 and R4 Occupancies.** Buildings containing Group R-2 or R-4 shall install an on-site renewable energy system with a peak rated capacity calculated to be of not less than 0.75 W/ft2 multiplied by the gross conditioned floor area.

Exceptions:

1. A building with a permanently installed domestic solar water heating system with a solar savings fraction of not less than 0.5.
2. A building in climate zone 8.
3. A building where the *potential solar zone area* is less than 300 square feet(28 m^2).

RP103.4 **Renewable energy certificate (REC) documentation.** Where *RECs* are associated with *renewable energy* power production required by Section RP103.2 or RP103.3, documentation shall comply with Section R404.4 Renewable energy certificate (REC) documentation.

RP103.5 **Total Building Performance.** Where new buildings demonstrate compliance using Section R405 Total Building Performance, the applicable requirements of RP103.2, RP103.3 and RP103.4 shall be met.

RP103.6 **Energy Rating Index.** Where new buildings demonstrate compliance using Section R406 Energy Rating Index, the applicable requirements of RP103.2, RP103.3 and RP103.4 shall be met.

Reason: On-site electricity generation using photovoltaics is a key technology for reducing greenhouse gas emissions associated with Commercial and Residential buildings. According to the most recent assessment by the National Renewable Energy Lab (NREL) the cost of installed photovoltaics in 2020 was 3% lower than in 2019 and 65-70% lower than the cost of similar sized systems in 2010. With the continued drop in cost of installing on-site PV the cost per kilowatt hour of PV generated electricity is at parity with grid purchased electricity in many States throughout the country. This proposal describes requirements for prescriptive solar PV that must be installed at the time of construction. Analysis by PNNL shows that on-site renewable electricity generation is cost effective across all low-rise multifamily buildings and most single family and one or two unit townhouses. The analysis was done using each of the Residential prototypes in each ASHRAE climate zone. The capacity requirements were established by calculating the highest on-site solar PV capacity that limited electricity export back to the grid. The threshold used for determining these capacities was a grid export limit of less than 0.5% of total annual building electricity consumption. A review of the hourly results showed it was unrealistic to set a hard limit of zero overproduction. When calculating cost effectiveness no credit was taken for electricity that was exported back to the grid. The calculation of grid exports was done on an hourly basis. The proposed requirements reduce purchased energy from the electrical grid which will help reduce green house gas emissions and energy costs for building owners.

PVs provide substantial benefits to the consumer and society by helping to reduce GHG emissions associated with electricity generation. PV market growth combined with a cleaner grid will support goals of reduced GHG emissions established across the U.S. and others by federal agencies, as well as many states and local governments.

This public comment is in direct response to the feedback provided by the full Residential Committee that REPI-114 be brought back as an optional Appendix.

Cost Impact: The code change proposal will increase the cost of construction.
PNNL prepared a cost effectiveness analysis of the proposed changes as part of the original REPI-114 submission in October 2021. This original analysis of residential building solar PV cost effectiveness was calculated using the Life Cycle Cost methodology established by Pacific Northwest National Lab for determining National and State cost effectiveness of the 2021 International Energy Conservation Code. The DOE methodology accounts for the benefits of energy-efficient home construction over the life of a typical mortgage, balancing initial costs against longer term energy savings. The Life-Cycle Cost methodology provides a full accounting over a 30-year period of the cost savings, considering energy savings, the initial investment financed through increased mortgage costs, tax impacts, and residual values of energy efficiency measures. The installed cost of solar PV was based on costs reported in the U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020 published by NREL in 2021. Installed costs were scaled based on solar PV capacity from 2kW up to 200kW and applied based on the calculated capacity required for each prototype in each climate zone. The proposed solar PV capacities were shown to be cost effective for R occupancies in each ASHRAE climate zone except for climate zone 8 and for single family residences in all climate zones except 4C, 5C and 8.An updated analysis was provided to the full committee in May 2022 using the IECC Residential cost effectiveness methodology. The results of that analysis by climate zone are provided below. The analysis has not been updated to reflect any change in the national average cost of small-scale renewables or to capture the impact of the Inflation Reduction Act passed in November 2022 that included renewable tax credits through 2032.

Single Family Dwellings	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
PV Capacity (kW)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PV Generation (kWh)	3,189	3,082	3,480	3,000	3,651	3,458	2,669	3,593	2,304	2,510	3,154	2,355	2,611	2,775	2,444	1,885
PV Cost @ 3.55	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100	$ 7,100
IECC Cost effectiveness @ $3.55 per Watt																
3.84% Real w/o SCC	$2,956	$2,617	$3,881	$2,356	$4,424	$3,811	$1,305	$4,239	$146	$800	$2,845	$308	$1,121	$1,642	$591	($1,185)
3% Real w/o SCC	$2,164	$1,884	$2,927	$1,669	$3,374	$2,869	$802	$3,223	($154)	$386	$2,073	($20)	$650	$1,080	$213	($1,251)
7% Real w/o SCC	$871	$692	$1,358	$555	$1,645	$1,321	$0.30	$1,547	($611)	($266)	$812	($525)	($97)	$178	($376)	($1,312)
3.84% Real w/ SCC	$4,542	$4,149	$5,611	$3,848	$6,239	$5,531	$2,632	$6,026	$1,292	$2,048	$4,414	$1,479	$2,419	$3,022	$1,806	($247)
3% Real w/ SCC	$3,750	$3,417	$4,657	$3,161	$5,190	$4,589	$2,130	$5,009	$992	$1,634	$3,641	$1,151	$1,949	$2,460	$1,428	($314)
7% Real w/ SCC	$2,457	$2,225	$3,089	$2,047	$3,460	$3,041	$1,328	$3,334	$535	$982	$2,381	$646	$1,202	$1,558	$839	($375)

Low-Rise Multifamily	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
PV Capacity (kW)	16.22	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
PV Generation (kWh)	25,921	25,050	28,286	24,388	29,675	28,108	21,699	29,208	18,728	20,403	25,634	19,145	21,221	22,554	19,863	15,322
PV Cost @ 2.26/W	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673	$ 36,673
IECC Cost effectiveness @ $2.26 per Watt																
3.84% Real w/o SCC	$45,279	$42,513	$52,789	$40,410	$57,201	$52,224	$31,871	$55,717	$22,436	$27,755	$44,367	$23,760	$30,353	$34,586	$26,040	$11,619
3% Real w/o SCC	$35,929	$33,648	$42,124	$31,914	$45,762	$41,658	$24,871	$44,539	$17,089	$21,476	$35,177	$18,181	$23,619	$27,110	$20,062	$8,167
7% Real w/o SCC	$20,320	$18,862	$24,280	$17,753	$26,606	$23,982	$13,251	$25,824	$8,276	$11,081	$19,840	$8,975	$12,451	$14,683	$10,177	$2,574
3.84% Real w/ SCC	$58,170	$54,971	$66,857	$52,539	$71,959	$66,203	$42,663	$70,244	$31,750	$37,902	$57,116	$33,281	$40,907	$45,803	$35,919	$19,239
3% Real w/ SCC	$48,821	$46,106	$56,192	$44,043	$60,521	$55,637	$35,662	$59,065	$26,403	$31,623	$47,926	$27,702	$34,173	$38,327	$29,940	$15,788
7% Real w/ SCC	$33,212	$31,320	$38,348	$29,883	$41,364	$37,961	$24,043	$40,350	$17,591	$21,228	$32,589	$18,496	$23,005	$25,900	$20,056	$10,194

The installed cost of photovoltaic systems was based on published NREL cost data that was furhter adjusted to account for streamlined permitting under the NREL SolarApp+ program and to account for differences between retrofit and new construction costs. A cost of $3.55 per installed watt was used for 2kW array capacity and $2.26 per installed watt was used for a 16kW array capacity.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The committee worked together to come to consensus on the placement of renewable energy prescriptive requirements in an appendix while allowing options for improved efficiency to offset, some or all, of the renewable energy requirement. This proposal is consistent with requests from the Consensus Committee last spring.

RED1-94-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R103.2.2 Solar-ready system. The construction documents shall ~~provide details for~~ indicate dedicated roof area for a solar-ready zone, ~~structural design for~~ roof dead load, ~~and~~ roof live load , ground snow load, and routing of conduit or pre-wiring from solar-ready zone to electrical service panel or plumbing from solar-ready zone to service water heating system.

Reason: This proposal clarifies the provisions and aligns structural load documentation requirements with other ICC codes.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal will have no change on construction cost.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Primarily editorial. Coordinates structural language with IRC.

Proposal # 972

RED1-107-22

Proponents: Nick Thompson, representing Colorado Chapter ICC (nick.thompson@cityofaspen.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.10 Roof and gutter deicing controls. Roof and gutter deicing systems, including but not limited to self-regulating cable, shall include automatic controls that are configured to shut off the system when the outdoor temperature is above 40°F (4.4°C) ~~maximum~~ and shall include one of the following:

1. A moisture sensor configured to shut off the system in the absence of moisture, or
2. ~~A programmable timer configured to shut off the system for 8 hours minimum at night.~~ A daylight sensor or other means configured to shut off the system between sunset and sunrise.

Reason: Aligns with the commercial section C403.14.3 which has improved grammar and sets the control option #2 to better meet the intent- which is to have the system off when the sun isn't shining.
The intent of roof and gutter deicing is to prevent ice dams from causing water damage to the building. Ice dams occur when roof eaves, valleys, and gutters get ice buildup from a combination of flowing water and freezing conditions. Ice on a roof or gutter is not a problem in and of itself. The problem is when liquid water flow occurs and is blocked from draining properly by ice. Water flow during freezing conditions occurs chiefly from the sun, thus the provision for controls to shut off the system at night. A moisture sensor is provided as an option for the designer if there is concern for free water flow during nighttime hours. If there is no water flow (moisture), there is no need to keep drainage pathways clear as there is no water to drain. To clarify the original reason statement, ice damming can occur even on new buildings built to current code provisions, such as warm roofs that are unvented.

Cost Impact: The code change proposal will increase the cost of construction.
The options provided are cost effective. There are many variables in judging payoff, including temperature, energy cost, and system size. Assuming $0.14 kWh electricity cost and $250 conservative install cost (including $75 in parts), in climate zone 7 a 200W system pays off in one year compared to one without controls left on all summer. If turned off all summer, a 390W system pays off in 1 year. 390W is about 50 LF of heat tape, which is a very small system. Many building management systems (BMS) are currently capable of time of day based control.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: the changes to the charging language were not needed. However, the edit to item #2 provided better clarity without reducing options.

Proposal # 1044

RED1-110-22

Proponents: Glenn Heinmiller, representing International Association of Lighting Designers (glenn@lampartners.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.1.2 Exterior lighting power requirements. The total exterior connected lighting power shall be not greater than the exterior lighting power allowance calculated in accordance with Section R404.1.3. The total exterior connected lighting power shall be the total maximum rated wattage of all lighting that is powered through the energy service for the building.
Exceptions: Lighting used for the following applications shall not be included.

1. Lighting *approved* ~~because of~~ for safety reasons ~~considerations~~.
2. Emergency lighting that is automatically off during normal operations
~~2.~~ 3. Exit signs.
~~3.~~ 4. Specialized signal, directional and marker lighting associated with transportation.
5. Lighting for athletic playing areas
~~4.~~ 6. Temporary lighting.
7. Lighting used to highlight features of art, public monuments and the national flag
~~5.~~ 8. Lighting for water features and swimming pools.
~~6.~~ 9. Lighting controlled from within *sleeping units* and *dwelling units*.
10. Lighting of the exterior means of egress as required by the *International Building Code.*

R404.1.3 Exterior lighting power allowance. The total area or length of each area type multiplied by the value for the area type in Table R404.1 shall be the lighting power (watts) allowed for each area type. For area types not listed, the area type that most closely represents the proposed use of the area shall be selected. The total exterior lighting power allowance (watts) shall be the sum of the base site allowance plus the watts from each area type.

R404.1.4 Additional exterior lighting power. Additional exterior lighting power allowance shall be available for the building facades at 0.075 W/ft^2 (0.807 w/m^2) of gross above-grade wall area. This additional power allowances shall be used only for the luminaires serving the facade and shall not be used to increase any other lighting power allowance.

Revise as follows:

TABLE R404.1 LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

Base site allowance	~~400~~ 280 watts
Uncovered parking areas and drives	~~0.4~~ 0.026 W/ft^2
Building Grounds	
Walkways and ramps ~~less than 10 feet wide~~	0.50 W/linear foot
~~Walkways and ramps 10 feet wide or greater,~~ plaza areas~~, special feature areas~~	~~0.10~~ 0.049 W/ft^2
Dining areas	~~0.65~~ 0.273 W/ft^2
Stairways	~~0.70 W/ft^2~~ Exempt
Pedestrian tunnels	~~0.12~~ 0.110 W/ft^2
Landscaping	~~0.04~~ 0.025 W/ft^2
Building Entrances and Exits	
Pedestrian and vehicular entrances and exits	~~14~~ 9.8 W/linear foot of opening
Entry canopies	~~0.25~~ 0.126 W/ft^2

For SI: 1 watt per square foot = 10.76 w/m^2, 1 foot = 304.8 mm.

Reason: This proposal revises these sections and the table to match the equivalent requirements in IECC-C Public Comment Draft #1. Additional exceptions from IECC-C were added that could apply to these Group R occupancies

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
These changes do not affect the cost of lighting equipment required to meet code

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: add applicable provisions from IECC-C to IECC-R

Proposal # 1013

RED1-111-22

Proponents: Glenn Heinmiller, representing International Association of Lighting Designers (glenn@lampartners.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.2 Interior lighting controls. All permanently installed luminaires shall be controlled as required in Sections R404.2.1 and R404.2.2. **Exception:** Lighting controls shall not be required for safety or security lighting ~~fixtures~~:

R404.2.1 Habitable spaces. All permanently installed luminaires in habitable spaces shall be controlled with a *manual* *dimmer* or with an *automatic shut-off control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.

R404.2.2 Specific locations. All permanently installed luminaires in garages, unfinished basements, laundry rooms, and utility rooms shall be controlled by an *automatic shut-off control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.

Reason: Editorial changes have been made to improve clarity and use the correct the defined terms

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is only an editorial change.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: this proposal was mostly editorial but that the addition of language in 404.2.1 provided additional clarity.

Proposal # 1101

RED1-112-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.3 Exterior lighting controls. Exterior lighting controlled from within individual dwelling units shall comply with Section R404.3.1. ~~Controls for all other exterior lighting shall comply with Sections C405.2.7 of the International Energy Conservation Code – Commercial Provisions instead of Section R404.3.1.~~

Reason: Section R101.5 clearly requires that residential buildings comply with the IECC-R rather than the IECC- commercial provisions.
The original proponent of this section should do the work of incorporating the actual requirements for the benefit of the code user instead of referencing a code that may not be adopted.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
There will be no impact if the original proponent actually brings the requirements into the body of the code.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The committee felt that the requirements in R404 were appropriate for multi-family under the residential code. Modifications to the charging language were approved to provide additional clarity.

Proposal # 1096

RED1-116-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.5 Electric readiness. Water heaters, household clothes dryers, conventional cooking tops and conventional ovens that use fossil fuel ~~Systems using fossil fuel: water heaters, household clothes dryers, conventional cooking tops or conventional ovens~~ shall comply with ~~the requirements of~~ Sections R404.5.1 through R404.5.4

Reason: Performed a colonectomy and otherwise edited for clarity.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Edited for clarity. The word “of” was deleted before “…Sections R404.5.1…”.

Proposal # 1388

RED1-128-22

Proponents: Shane Hoeper, representing myself (shoeper@cityofdubuque.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.5.1 Cooking ~~products~~ appliances. A~~n individual~~ dedicated branch circuit ~~outlet~~ with a rating not less than 2~~5~~ 40-volts, 40-amperes shall be installed~~,~~ and terminate within three feet of conventional cooking tops, conventional ovens or cooking ~~products~~ appliances combining both.

Exception: Cooking ~~products~~ appliances not installed in an individual dwelling unit.

Reason: This edit is intended to clean-up the language used and does not change the intent of the section.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This editorial change does not change the cost impact of the code section.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The committee felt that the changes accurately described the type of appliances used for cooking and the technical changes better reflected the electrical requirements.

Proposal # 1141

RED1-131-22

Proponents: Shane Hoeper, representing myself (shoeper@cityofdubuque.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.5.2 Household Clothes Dryers. ~~An individual~~ dedicated branch circuit~~ outlet~~ with a rating not less than 240-volts, 30-amperes shall be installed~~,~~ and terminate within three feet (304 mm) of each household clothes dryer.

> **Exception:** Clothes dryers ~~that serve more than one dwelling unit and are located outside of a dwelling unit~~ not installed in an individual dwelling unit.

Reason: Editorial changes to be consistent with R404.5.1. Not intended to change the intent of the section.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The committee felt that the changes accurately described the type of appliances used for cooking and the technical changes better reflected the electrical requirements.

Proposal # 1186

RED1-137-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.6.1.3 Electrical service reserved space. The main electrical service panel shall have a reserved space for a dual pole circuit breaker and shall be labeled “For Future ~~Solar~~ Renewable Electric.” The reserved space shall be at the opposite (load) end of the busbar from the primary energy source.

Reason: There are other renewable energy systems than solar, even on rooftops.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: language open to all types of renewables.

Proposal # 1097

RED1-138-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.6.1.4 Electrical interconnection. An electrical junction box shall be installed within 24 inches (610 mm) of the main electrical service panel and shall be connected to a capped roof penetration sleeve or a location in the attic that is within 3 feet (914 mm) of the solar-ready zone by a ~~minimum~~ not less than 1 inch (25 mm) nonflexible metallic conduit or permanently installed wire as *approved* ~~by the code official~~. Where the interconnection terminates in the attic, the location shall be no t less than 12 inches (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled “For Future ~~Solar~~ Renewable Electric”.

Reason: There are other renewable energy systems than solar and some fit on roofs. Edited for preferable code language.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This proposal clarifies the requirements for location and labeling of the electrical interconnection for future renewable energy installations. Similar to RED1-137-22, it changes the wording “Solar” to “Renewable”.

Proposal # 1098

RED1-145-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org); Patricia Chawla, representing Austin Energy (patricia.chawla@austinenergy.com); Michael Stone, representing NEMA (mike.stone@nema.org); Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com); Robert Raymer, representing Leading Builders of America (rraymer@cbia.org); Emily Kelly, representing ChargePoint (emily.kelly@chargepoint.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.7 Electric Vehicle Power Transfer Infrastructure. ~~New automobile parking spaces for one- and two-family dwellings and townhouses shall be provided in accordance with Sections R404.7.1 through R404.7.5.~~ New residential automobile parking spaces for ~~R-2 occupancies~~ residential buildings shall be provided with electric vehicle power transfer infrastructure in accordance with Sections R404.7.1 through R404.7.5.

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 ~~installed~~ 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 space for 40 percent of each dwelling units or automobile parking spaces, whichever is less.

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 ~~3~~ 6 feet (~~914~~ 1828 mm) of the EV capable space and a suitable panelboard or other onsite electrical distribution equipment.
2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with R404.7.~~4~~ 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)."

R404.7.3 EV Ready Spaces. Each branch circuit serving EV ready spaces shall comply with all of the following:

1. Terminate at an outlet or enclosure, located within ~~3~~ 6 feet (~~914~~ 1828 mm) of each EV ready space it serves and marked "For electric vehicle supply equipment (EVSE)".
2. ~~Have~~ Be served by an ~~a minimum~~ electrical distribution system and circuit capacity in accordance with ~~R404.7.4~~ Section R404.7.5.
3. Be designated on ~~T~~ the panelboard or other electrical distribution equipment directory ~~shall designate the branch circuit~~ as "For electric vehicle supply equipment (EVSE)." ~~and the outlet or enclosure shall be marked "For electric vehicle supply equipment (EVSE)."~~

~~R404.7.4.1~~ R404.7.4 ~~Circuit capacity management~~ EVSE Spaces. ~~The capacity of each branch circuit serving multiple EVSE spaces, EV ready space or EV capable spaces designed to be controlled by an energy management system providing load management in accordance with NFPA 70, shall have a capacity of not less than 2.7 kVA per space.~~
An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE serving either a single EVSE space or multiple EVSE spaces shall comply with the following:

1. Be served by an electrical distribution system in accordance with Section R404.7.5
2. Have a nameplate charging capacity of not less than 6.2 kVA (or 30A at 208/240V) per EVSE space served. Where an EVSE serves three or more EVSE spaces and is controlled by an energy management system in accordance with Section R404.7.5, the nameplate charging capacity shall be not less than 2.1 kVA per EVSE space served.
3. Be located within ~~3~~ 6 feet (914 1828 mm) of each EVSE space it serves.
4. Be installed in accordance with NFPA 70 and be listed and labeled in accordance with UL 2202 or UL 2594.

~~R404.7.4~~ R404.7.5 ~~Circuit Capacity~~ Electrical distribution system capacity. ~~For one- and two-family dwellings and townhouses, the capacity of electrical infrastructure~~ 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 ~~have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70. For R-2 occupancies, the capacity of electrical infrastructure serving each EV capable space, EV ready space and EVSE space shall~~ comply with one of the following:

1. ~~A branch circuit shall have a rated capacity not less than 8.3kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves.~~ 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 requirements of R404.7.4.1.~~ 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.

Exceptions:

1. Where the local electric distribution entity has certified 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. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.
2. Where substantiation has been approved that meeting the requirements of Section R404.7.5~~4.1~~ 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 $400.00 per dwelling unit.

~~**R404.7.5.1 EVSE minimum charging rate.** Each installed EVSE shall comply with one of the following:~~

1. ~~Be capable of charging at a rate of not less than 6.2 kVA (or 30A at 208/240V).~~
2. ~~Where serving EVSE spaces allowed to have a circuit capacity of not less than 2.7 kVA in accordance with R404.7.4.1 and controlled by an energy management system providing load management, be capable of simultaneously charging each EVSE space at a rate of not less than 2.1 kVA.~~

Reason: The intent of this public comment is not to make substantive changes to the essential requirements for EV charging, but is intended to improve the clarity, usability and enforceability of the EV charging section of the code. The only change to the requirements loosens the location requirement. This public comment was developed as a consensus proposal with input from several stakeholders as part of discussions by a working group. The edits do several things:

- Since the section was created by two separate proposals for single-family and multifamily, the code ended up with redundant language. The proposal removes and consolidates the redundant langue for better clarity.
- There are several editorial changes to make the language more internally consistent and more understandable.
- The language has been clarified that capacity requirements are not just for branch circuits, but for the whole electrical distribution system. This is particularly important for clarity and enforceability of the load managed capacity section.
- Section R404.7.4 Circuit Capacity. has been renamed and renumbered R404.7.5 Electrical distribution system capacity. The new location is more logical. The new name reflects the reality that capacity requirements apply to the whole electrical distribution system and not just individual branch circuits. This section has been modified for greater clarity and technical soundness. The existing language creates confusion because it sets requirements for the capacity of the distribution system that take into account the safety factors in the electrical code. This creates confusion because it is not always clear that those safety factors have already been applied and users might think that they need to still apply those factors. It is also problematic because the electrical code could change the safety and sizing requirements for distribution systems serving EV loads, introducing inconsistencies. The edit changes the focus to the minimum functional requirements of the EV charging infrastructure: the amount of power available. It changes to the requirement to the minimum EV charging load that the distribution system needs to be sized for. It leaves all of the sizing calculations and safety factors up to the electrical designer and electrical code. This has the additional benefit of aligning the numbers in the capacity section with the functional requirements for EVSE.
- The existing Section R404.7.4.1 has been simplified and incorporated into R404.7.5.
- The content of R404.7.5.1 EVSE minimum charging rate has been moved to a more logical location (section R404.7.4) it has also been modified for greater clarity. The "capable of charging at a minimum rate" (in kW), consistently caused confusion. The PC replaces that with a requirement for minimum nameplate charging capacity. This is better aligned with the way that electric equipment capacities are denoted. It also allows the unit to be kVA, which is the appropriate unit for capacity (as opposed to kW) and aligns better with modifications made to how capacity requirements have been modified below. The section is also clear about what the minimum nameplate rating needs to be for load managed EVSE with multiple connections.
- The working group considered 3 feet to be overly restrictive and inconsistent with the requirements used by some jurisdictions. Therefore, the location requirement for all EV space types has been changed to 6 feet.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change will not change the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: the efficiency gains from level 2 charging equipment and the avoided costs of future retrofit were sufficient to place these requirements within the body of the code, per the guidance given to the subcommittee.

RED1-154-22

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

2024 International Energy Conservation Code [RE Project]

CHAPTER 4 [RE]
RESIDENTIAL ENERGY EFFICIENCY

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 installed 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 space for 40 percent of each dwelling units or automobile parking spaces, whichever is less.
Exceptions:

1. Where the local electric distribution entity has certified 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. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.
2. Where substantiation has been approved that meeting the requirements of Section R404.7.4.1 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 $400.00 per dwelling unit.

R404.7.4 Circuit Capacity. For one- and two-family dwellings and townhouses, the capacity of electrical infrastructure serving each EV capable space, EV ready space and EVSE space shall have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70. For R-2 occupancies, the capacity of electrical infrastructure serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. A branch circuit shall have a rated capacity not less than 8.3kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70.
2. The requirements of R404.7.4.1.

~~**Exceptions:**~~

1. ~~Where the local electric distribution entity has certified 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. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.~~
2. ~~Where substantiation has been approved that meeting the requirements of Section R404.7.4.1 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 $400.00 per dwelling unit.~~

Reason: The exceptions for the local electrical utility's lack of capacity are misplaced in the circuit capacity section. They instead should be located in the quantity section.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: the language change to capacity is more appropriate and the exceptions are well placed in this section.

Proposal # 1080

RED1-157-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.7.4 Circuit Capacity. For one- and two-family dwellings and townhouses, the capacity of electrical infrastructure serving each EV capable space, EV ready space and EVSE space shall have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70. For R-2 occupancies, the capacity of electrical infrastructure serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. A branch circuit shall have a rated capacity not less than 8.3kVA (or 40A at 208/240V) for each EV capable space, EV ready space or EVSE space it serves. Where a circuit is shared or managed it shall be in accordance with NFPA 70.
2. The requirements of R404.7.4.1.

Exceptions:

1. Where the local electric distribution entity has certified 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. The required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.
2. Where substantiation has been approved that meeting the requirements of Section R404.7.4.1 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 ~~$400.00~~ $450.00 per dwelling unit.

Reason: This proposed change is suggested to adjust the nominal value in Exception 2 to account for current (2022) inflation and to account for projected inflation in 2023 and 2024. Using data and projections from the following web sites:

https://www.usinflationcalculator.com/inflation/current-inflation-rates/
https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20221214.htm
https://www.bls.gov/cpi/

Inflation in the US (as of November 2022) was 7.1% over the 12 month period from November 2021 to November 2022. The December Federal Reserve projection for personal consumption expenditures (PCE) inflation is 3.1% for 2023 and 2.5% in 2024.

Using these values for inflation and projected inflation yields the following results:

$400.00 * 1.071 (7.1% inflation in 2022) = $428.40

$428.40 * 1.031 (3.1% inflation in 2023) = $441.68

$441.68 * 1.025 (2.5% inflation in 2024) = $452.72

This proposal rounds down the value to $450 for ease of use in the code.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposed change only adjusts a value in an exception to account for inflation.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The committee felt that the change is in line with inflation measures and provides a fair value for the future.

Proposal # 1373

RED1-166-22

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

2024 International Energy Conservation Code [RE Project]

SECTION R408
ADDITIONAL EFFICIENCY REQUIREMENTS

R408.1 Scope. This section establishes additional efficiency credits to achieve additional energy efficiency in accordance with Section R401.2.5.

R408.2 Additional energy efficiency credit requirements . Two of the additional measures shall be selected from Table R408.2 that meet or exceed a total of ten credits. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table R408.2 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.10	Whole home lighting control	1	1	1	1	1	1	1	1	1

Add new text as follows:

R408.2.10 Whole Home Lighting Control. The dwelling unit shall have a switch 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% of the total lighting power may remain uncontrolled.

2. Spaces where lighting is controlled by a count-down timer or *occupant sensor control*.

Reason: This proposal is similar to one that was submitted as a mandatory requirement for the base energy code but was rejected by the consensus committee even though it was approved and recommended by the PLR subcommittee. I believe this provision makes sense as an optional energy credit. This would provide a lighting option in the energy credit section. Currently there are no lighting options in the energy credit section.

This proposal is similar to what is mandatory in ASHRAE 90.2-2018 and similar to what has been approved so far for dwelling units in the energy credits section of the IECC 2024 commercial energy code. The intent to require lighting to have a control system or smart light fixtures such that the lighting can be shut-off from the exit or remote locations (e.g., using a phone app). This control strategy will save energy by allowing occupants to shutoff the lighting as they leave (or while they are away) so that unneeded lighting is not left on when no one is home. In the U.K. this feature is called "the last man out button". Note that the intent is for lighting to have the capability to be shutoff, not mandate lighting be shutoff.

Cost Impact: The code change proposal will increase the cost of construction.

Energy savings is 11% and cost $150 per the Bonnaville power study (see bibliography). I calculated scalar ratio on this and got 9.5 with scalar ratio limit of 14.6 so it is cost effective. See attachment. Keep in mind this is one of many optional provisions in the energy credit section and the only lighting one.

Bibliography: ASHRAE 90.2 section 7.5.3. http://ashrae.iwrapper.com/ASHRAE_PREVIEW_ONLY_STANDARDS/STD_90.2_2018

FutureResLightingPaper FINAL DRAFT docx - 2018-08-15.pdf (bpa.gov) http://legacy.bpa.gov/EE/Technology/EE-emerging-technologies/Projects-Reports-Archives/Documents/FutureResLightingPaper%20FINAL%20DRAFT%20docx%20-%202018-08-15.pdf [11% lighting savings from energy management system, cost is $150 at high end. See page 37]

Attached Files

- **Cost Effectiveness Tool (large home control system).pdf**
  https://energy.cdpaccess.com/proposal/1378/3025/files/download/489/

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: approved the changes with edits to the table to ensure that some values were added.

RED1-182-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

LOW SLOPE~~LOW-SLOPED ROOF~~. A roof slope less than 2 units vertical in 12 units horizontal (17 percent slope).

STEEP SLOPE~~STEEP-SLOPED ROOF~~. A roof slope 2 units vertical in 12 units horizontal (17 percent slope) or greater.

TABLE R408.2.1.3 MINIMUM ROOF REFLECTANCE[a]

ROOF SLOPE	THREE-YEAR AGED SOLAR REFLECTANCE INDEX[b]
Low slope ~~Low-slope~~	75[b, c]
Steep slope ~~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. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.

c. 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.

2024 ENERGY Chapter11

Revise as follows:

LOW SLOPE~~LOW-SLOPED ROOF~~. A roof slope less than 2 units vertical in 12 units horizontal (17 percent slope).

STEEP SLOPE~~STEEP-SLOPED ROOF~~. A roof slope 2 units vertical in 12 units horizontal (17 percent slope) or greater.

TABLE N1108.2.1.3 MINIMUM ROOF REFLECTANCE[a]

ROOF SLOPE	THREE-YEAR AGED SOLAR REFLECTANCE INDEX[b]
Low slope ~~Low-slope~~	75[b,c]
Steep slope ~~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 N1108.2.1.3.1.

b. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.

c. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.

Reason: This comment changes the new defined terms "low-sloped roof" and "steep-sloped roof" to "low slope" and "steep slope." Doing so aligns these new IECC residential/IRC Chapter 11 terms with the existing IBC definition of "steep slope" [i.e., A roof slope 2 units vertical in 12 units horizontal (17-percent slope) or greater]. The phrase "sloped roof" is not present in the Residential 1st Public Comment Draft (except as the defined terms), so there are no uses of the new terms "low-sloped roof" and "steep-sloped roof" within the 1st Public Comment Draft. "Slope" is used in conjunction with "roof" in three sections (R407.2/N1107.2, Table R408.2.1.3/N1108.2.1.3, and RB103.6/AT103.6), and the changes proposed do not affect interpretation of the provisions of those sections. The change in terms (e.g., "low-sloped roof" to "low slope") also matches the terms and associated definitions appropriately. Finally, this comment changes the hyphenated terms "low-slope" and "steep-slope" to the proposed defined terms "low slope" and "steep slope" in Tables R408.2.1.3. and N1108.2.1.3 to clarify that the defined terms apply.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This comment makes editorial changes to defined terms without any technical effect, so there is no change in cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Provides consistency across codes.

Proposal # 951

RED1-184-22 Part I

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 ENERGY Chapter11

Revise as follows:

N1102.5.1.2 Testing and maximum air leakage rate. The *building* or each *dwelling unit* in the building shall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2 (1.1 L/s x m^2) of building or dwelling unit enclosure area. 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. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in all climate zones for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.
2. 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 envelope tightness and insulation installation shall be considered acceptable where the items in Table N1102.5.1.1, 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 conditioned spaces in accordance with Sections N1102.2.13 and N1102.4.5, as applicable.
3. Where tested in accordance with N1102.5.1.2, testing of each dwelling unit is not required.

~~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.~~

Mechanical *ventilation* shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*.

Reason: This proposal is editorial. It moves the details of testing conditions which should be a part of the section to the end of the section (before the exception list). No technical changes are made.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is an editorial change and does not change any code requirements, and therefore does not change the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Helpful re-organization placing requirements above the exception.

Proposal # 1318

RED1-184-22 Part II

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.5.1.2 Testing. The *building* or each *dwelling unit* in the buildingshall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2(1.1 L/s x m^2) of building or dwelling unit enclosure area. 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. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.

2. 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 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.

3. Where tested in accordance with R402.5.1.4, testing of each dwelling unit is not required.

~~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.~~

Mechanical ventilation shall be provided in accordance with Section M1505 of the *International Residential Code* or Section 403.3.2 of the

International Mechanical Code, as applicable, or with other *approved* means of ventilation.

Reason: This proposal is editorial. It moves the details of testing conditions which should be a part of the section to the end of the section (before the exception list). No technical changes are made.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is an editorial change and does not change any code requirements, and therefore does not change the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Helpful re-organization placing requirements above the exception.

Proposal # 1260

RED1-185-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code where such buildings also meet the requirements identified in Table R405.2 and the proposed total *building thermal envelope* UA, which is the sum of U-factor times assembly area, shall be less than or equal to the *building thermal envelope*~~building thermal envelope~~ UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, 2, and by 1.15 in Climate Zones 3 through 8, in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

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

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

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the *building thermal envelope*~~envelope~~.

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

1. The predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, *crawl space walls* and floors and ducts outside *conditioned spaces*.
2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the *building thermal envelope*~~building envelope~~, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted, the compliance path used, and where applicable, the additional efficiency measures selected for compliance with R408.
8. Where a solar-ready zone is provided, the certificate shall indicate the location, and dimensions.

R402.1.5 Component performance alternative. Where the proposed total *building thermal envelope thermal conductance* is less than or equal to the required total *building thermal envelope* ~~building thermal envelope~~ conductance using factors in Table R402.1.2 the *building* shall be considered to be in compliance with Table R402.1.2. The total thermal conductance shall be determined in accordance with Equation 4-1. Proposed *U*-factors and slab-on-grade *F*-factors shall be taken from 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. In addition to total thermal conductance compliance, the SHGC requirements of Table R402.1.2 and the maximum fenestration *U*-factors of Section R402.6 shall be met.

Equation 4-1

$$(\text{Up A} + \text{Fp P}) \leq (\text{Ur A} + \text{Fr P})$$

Up A = the sum of proposed *U*-factors times the assembly areas in the proposed building.

Fp P = the sum of proposed *F*-factors times the slab-on-grade perimeter lengths in the proposed building.
Ur A = the sum of *U*-factors in Table R402.1.2 times the same assembly areas as in the proposed building.
Fr P = the sum of *F*-factors in Table R402.1.2 times the same slab-on-grade perimeter lengths as in the proposed building.

R402.2.7 Steel-frame ceilings, walls and floors. Steel-frame ceilings, walls, and floors shall comply with the *U*-factor requirements of Table R402.1.2. The calculation of the *U*-factor for a steel-framed ceilings and walls in a~~n~~ *building thermal envelope*~~envelope~~ assembly shall be determined in accordance with AISI S250 as modified herein.

1. Where the steel-framed wall contains no cavity insulation, and uses continuous insulation to satisfy the U-factor maximum, the steel-framed wall member spacing is permitted to be installed at any on center spacing.
2. Where the steel-framed wall contains framing spaced at 24 inches (610 mm) on center with a 23 percent framing factor or framing spaced at 16 inches (400 mm) on center with a 25 percent framing factor, the next lower framing member spacing input values shall be used when calculating using AISI S250.
3. Where the steel-framed wall contains less than 23 percent framing factors the AISI S250 shall be used without any modifications.
4. Where the steel-framed wall contains other than standard C-shape framing members the AISI S250 calculation option for other than standard C-shape framing is permitted to be used.

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 all of 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 duct, domestic hot water, 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*~~building thermal envelope~~ separating the basement from adjacent conditioned spaces complies with Section R402.5.

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the *building thermal envelope*~~building envelope~~. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	A sealed air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be air sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with Section R402.2.5 Eave Baffles shall be installed in accordance with Section R402.2.4
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior *building thermal envelope*~~thermal envelope~~ insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	Framing cavities around windows, skylights and doors shall be completely filled with insulation or insulated per window manufacturer's instructions.
Rim joists	Rim joists shall include an air barrier. The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement, crawl space, and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.11. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the *International Residential Code*.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.9.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.11.
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the *building thermal envelope*~~building thermal envelope~~ to maintain required *R*-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.8.
Recessed lighting	Recessed light fixtures installed in the *building thermal envelope*~~building thermal envelope~~ shall be air sealed in accordance with Section R402.5.5.	Recessed light fixtures installed in the *building thermal envelope*~~building thermal envelope~~ shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be [illegible]	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required *R*-value can be met by installing insulation and air barrier systems completely

	air sealed.	to the exterior side of the obstructions.
Showers, tubs, and fireplaces adjacent to the *building thermal envelope*~~building thermal envelope~~	An air barrier shall separate insulation in the *building thermal envelope* from the shower, tub, and fireplace assemblies.	Exterior framed walls adjacent to showers, tubs and fireplaces shall be insulated.
Electrical,communication, and other equipment boxes, housings, and enclosures	Boxes, housing, and enclosures that penetrate the air barrier shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing, or enclosure shall be sealed. The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier. Alternatively, air-sealed boxes shall be installed in accordance with R402.5.6.	Boxes, housing, and enclosures shall be burried in or surrounded by insulation.
HVAC register boots	HVAC supply and return register boots that penetrate *building thermal envelope*~~building thermal envelope~~ shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	HVAC supply and return register boots located in the *building thermal envelope*~~building's thermal envelope~~ shall be buried and surrounded by insulation.
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—
Common walls or double walls	Air sealing materials recognized in a listed fire-resistance rated common wall or double wall design and installed in accordance with the listing, or air sealing materials recognized in an approved design, shall be used. Common walls or double walls shall be considered an exterior wall for the purposes of air barrier and air sealing application of this Table.	Insulation materials recognized in the listed common wall or double-wall design and installed in accordance with the listing, or insulation materials recognized in the approved design, shall be used.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

R402.5.1.2 Testing. The *building* or each *dwelling unit* in the buildingshall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2(1.1 L/s x m^2) of building or dwelling unit enclosure area. 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.

Exceptions:

1. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.

2. 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*~~building 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.
3. Where tested in accordance with R402.5.1.4, testing of each dwelling unit is not required.

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.

Mechanical ventilation shall be provided in accordance with Section M1505 of the *International Residential Code* or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of ventilation.

R402.5.4 Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room that is isolated from inside the *building thermal envelope*~~thermal envelope~~. Such rooms shall be sealed and insulated in accordance with the *building thermal envelope*~~envelope~~ requirements of Table R402.1.3, where the walls, floors and ceilings shall meet a minimum of the *basement wall R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through *conditioned space* to an *R*-value of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.5.2 and Section R1006 of the International Residential Code.

R402.5.6 Air-Sealed electrical and communication outlet boxes. Air-sealed electrical and communication outlet boxes that penetrate the air barrier of the *building thermal envelope*~~building thermal envelope~~ shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. Air sealed boxes shall be buried in or surrounded by insulation. Air-sealed boxes shall be tested and marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer's instructions .

R403.3.2 Ducts located in conditioned space. For ductwork to be considered inside a *conditioned space,* it shall comply with one of the following:

1. The duct system shall be located completely within the *continuous air barrier* and within the *building thermal envelope*~~building thermal envelope~~.

2. Ductwork in ventilated attic spaces or unvented attic with vapor diffusion port shall be buried within ceiling insulation in accordance with Section R403.3.3 and all of the following conditions shall exist:

   2.1. The air handler is located completely within the *continuous air barrier* and within the *building thermal envelope*.

   2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the *building thermal envelope* in accordance with Section R403.3.6, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m^2) of *conditioned floor area* served by the duct system.

   2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.

3. Ductwork located in wall or floor building assemblies separating unconditioned from conditioned space shall comply with the following:

   3.1. A *continuous air barrier* shall be installed as part of the building assembly between the duct and the unconditioned space.

   3.2. Ducts shall be installed in accordance with Section R403.3.1.

   Exception: Where the building assembly cavities containing ducts have been air sealed in accordance with Section R402.5.1, duct insulation is not required.

   3.3. Not less than R-10 insulation, and not less than 50 percent of the required R-value specified in Table R402.1.3, shall be located between the duct and the unconditioned space.

   3.4 For ducts in these building assemblies to be considered within conditioned space, the air handling equipment shall be installed within conditioned space.

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total <u>*building thermal envelope*</u>~~building thermal envelope~~ UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the <u>*building thermal envelope*</u>~~building thermal envelope~~ UA using the prescriptive U-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. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-2)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$
$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

3. For buildings without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
   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 for an all-electric building with on-site renewable energy installed.

R405.3.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other *building site* identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation *R*-values or *U*-factors; duct system and *building thermal envelope*~~building envelope~~ air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
6. Where a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R405.3.2.2 Compliance report for certificate of occupancy. A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.
2. Declaration of the simulated building performance path on the title page of the energy report and the title page of the building plans.
3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section R405.3.
4. The name and version of the compliance software tool.
5. A site-specific energy analysis report that is in compliance with Section R405.3.
6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405.3. The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation *R*-values or *U*-factors; results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.
7. When on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

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

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 absorptance = 0.75.	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 absorptance = 0.75.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 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.	The measured air exchange rate.[a]
	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 × M	

Air exchange rate	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 exchange 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 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.	The mechanical ventilation rate[b], Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 Air Exchange 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*~~building 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.	
	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
	Non-electric furnaces: Complying with 10 CFR §430.32	As proposed
	Non-electric boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section R403.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
		As proposed Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1

<table>
<tr><td rowspan="6">Service water heating[d, g, k]</td><td>As proposed.
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>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>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>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>50% inside conditioned space

50% unconditioned attic</td></tr>
</table></td><td>Duct location: as proposed.</td></tr>
<tr><td>Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed.</td></tr>
<tr><td>Duct system leakage to outside:
For duct systems serving > 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area.
For duct systems serving ≤ 1,000ft2 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 measure 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>When 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>When total duct system leakage is measured without the air handler 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>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>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.</td><td>Same as standard reference design.</td></tr>
</table>

	Dehumidifier: whole-dwelling with integrated energy factor = 1.77 liters/kWh.	

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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

   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 §130.32

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.

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and doors
R402.2.9	Basement walls
R402.2.9.1	Basement wall insulation installation
R402.2.10.1	Slab-on-grade floor insulation installation
R402.2.11.1	Crawl space wall insulation installation
R402.5.1.1	Installation
R402.5.1.2	Testing
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Rooms containing fuel burning appliances
R402.5.5	Recessed lighting
R402.5.6	Air-sealed electrical and communication outlet boxes(air sealed boxes)
R406.3	*Building thermal envelope* ~~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 except Section R403.5.2(staff note: this needs to be fixed with hot water pipe insulation)	Service hot water systems
R403.5.2	Hot water pipe insulation
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
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.

R406.3 Building thermal envelope. The proposed total *building thermal envelope*~~building thermal envelope~~ UA, which is sum of *U*-factor times assembly area, shall be less than or equal to the *building thermal envelope*~~building thermal envelope~~ UA using the prescriptive *U*-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, and 2, and by 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-3. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-3)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

R406.7.2.1 Proposed compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building street address, or other *building site* identification.
2. Declare ERI on title page and building plans.
3. The name of the individual performing the analysis and generating the compliance report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate score indicated in Table R406.5 when compared to the ERI reference design. The certificate shall document the building component energy specifications that are included in the calculation, including: component level insulation *R*-values or *U*-factors; assumed duct system and *building thermal envelope*~~building envelope~~ air leakage testing results; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation, and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
7. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R406.7.2.2 Confirmed compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other *building site* identification.
2. Declaration of ERI on title page and on building plans.
3. The name of the individual performing the analysis and generating the report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A final confirmed certificate indicating that the confirmed rated design of the built home complies with Sections R406.2 and R406.4. The certificate shall report the energy features that were confirmed to be in the home, including: component-level insulation *R*-values or *U*-factors; results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water-heating equipment installed. Where on-site renewable energy systems have been installed on or in the home, the certificate shall report the type and production size of the installed system.

R408.2.1 Enhanced building thermal envelope options. The *building thermal envelope* shall meet the requirements of the following:

1. Section R408.2.1.1 or R408.2.1.2.
2. Section R408.2.1.3.

R408.2.1.1 Enhanced building thermal envelope performance UA. The proposed total *building thermal envelope*~~building thermal envelope~~ UA shall be calculated in accordance with Section R402.1.5 and shall meet one of the following:

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

R502.2.1 Building thermal envelope. New *building thermal envelope*~~envelope~~ assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.4.1 through R402.4.5, and R402.5.

Exception: New *building thermal envelope*~~envelope~~ assemblies are exempt from the requirements of Section R402.5.1.2.

R503.1.1 Building thermal envelope. Alterations of existing *building thermal envelope*~~building thermal envelope~~ assemblies shall comply with this section. New *building thermal envelope* ~~Building building thermal envelope~~ assemblies that are part of the *alteration* shall comply with Section R402. In no case shall the R-value of insulation be reduced or the U-factor of a *building thermal envelope*~~building thermal envelope~~ assembly be increased as part of a *building thermal envelope*~~building thermal envelope~~ alteration.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Roof recover.
3. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
4. An existing building undergoing alterations that is demonstrated to be in compliance with Section R405 or Section R406

R503.1.1.4 Floor alterations. Where an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied and the floor or floor overhang is part of the *building thermal envelope*~~building thermal envelope~~, the floor or floor overhang shall be brought into compliance with Section R402.1 or an approved design. This requirement shall apply to floor alterations where the floor cavities or surfaces are exposed and accessible prior to construction.

R503.1.1.6 Air barrier. *Building thermal envelope*~~Building thermal envelope~~ assemblies altered in accordance with Section R503.1.1 shall be provided with an air barrier in accordance with Section R402.5. The air barrier shall not be required to be made continuous with unaltered portions of the *building thermal envelope*~~building thermal envelope~~. Testing requirements of Section R402.5.1.2 shall not be required.Content

R503.1.5 Additional Efficiency Packages. Alterations shall comply with Section R506 where the alteration contains replacement of two or more of the following:

1. HVAC unitary systems or HVAC central heating or cooling equipment serving the *work area* of the *alteration*.
2. Water heating equipment serving the *work area* of the *alteration*.
3. 50 percent or more of the lighting fixtures in the *work area* of the *alteration*.
4. 50 percent or more of the area of interior surfaces of the *building thermal envelope*~~thermal envelope~~ in the *work area* of the *alteration*.
5. 50 percent or more the area of the building's *exterior wall envelope*.

Exceptions:

1. *Alterations* that are permitted with an *addition* complying with Section R502.3.5.
2. *Alterations* that comply with Section R405 or R406.

R506.1 General. Where required in Section R502 or R503, the building shall comply with one or more additional efficiency package options in accordance with the following:

1. Enhanced *building thermal envelope*~~envelope~~ performance in accordance with Section R408.2.1.
2. More efficient HVAC equipment performance in accordance with Section R408.2.2.
3. Reduced energy use in service water-heating in accordance with Section R408.2.3.
4. More efficient duct thermal distribution system in accordance with Section R408.2.4.
5. Improved air sealing and efficient ventilation system in accordance with Section R408.2.5.

2024 ENERGY Chapter11

Revise as follows:

N1101.4 Above code programs. The *code official* or other authority having *jurisdiction* shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code. The requirements identified in Table N1105.2andthe proposed total *building thermal envelope UA, which is the sum of U-factor times assembly area, shall be less* than or equal to the *building thermal envelope*~~building thermal envelope~~ UA using the prescriptive U-factors from Table N1102.1.2 multiplied by 1.15 in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

$$UA_{\text{Proposed design}} \leq 1.15 \text{ x } UA_{\text{Prescriptive reference design}}$$

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the *building thermal envelope*~~envelope~~.

N1101.14 Certificate. A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory *label*, service disconnect *label* or other required *labels*. The certificate shall indicate the following:

1. The predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, c*rawl space walls* and floors, and ducts outside *conditioned spaces*.
2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the *building thermal envelope*~~building envelope~~, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency is not required to be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section N1106, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted, the compliance path used, and where applicable, the additional efficiency measures selected for compliance with N1108.
8. Where a solar-ready zone is provided, the certificate shall indicate the location, and dimensions.

N1102.1.5 Component performance alternative. Where the proposed total *building thermal envelope* thermal conductance is less than or equal to the required total *building thermal envelope* ~~building thermal envelope~~ conductance using factors in Table N1102.1.2 the *building* shall be considered to be incompliance with Table N1102.1.2. The total thermal conductance shall be determined in accordance with Equation 11-5. Proposed U-factors and slab-on-grade F-factors shall be taken from 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. In addition to total thermal conductance compliance, the SHGC requirements of Table N1102.1.2 and the maximum fenestration *U*-factors of Section N1102.6 shall be met.

(Equation 11-5)

$$\underline{(\mathrm{Up\ A} + \mathrm{F\ P}) \leq (\mathrm{Ur\ A} + \mathrm{Fr\ P})}$$

Up A = the sum of proposed U-factors times the assembly areas in the proposed building.
Fp P = the sum of proposed F-factors times the slab-on-grade perimeter lengths in the proposed building.
Ur A = the sum of U-factors in Table N1102.1.2 times the same assembly areas as in the proposed building.
Fr P = the sum of F-factors in Table N1102.1.2 times the same slab-on-grade perimeter lengths as in the proposed building.

N1102.2.7 Steel-frame ceilings, walls, and floors. Steel-frame ceilings, walls, and floors shall comply with the *U*-factor requirements of Table N1102.1.2. The calculation of the *U*-factor for a steel- framed ceilings and walls in a~~n~~ *building thermal envelope*~~envelope~~ assembly shall be determined in accordance with AISI S250 as modified herein.

1. Where the steel-framed wall contains no cavity insulation, and uses continuous insulation to satisfy the U-factor maximum, the steel-framed wall member spacing is permitted to be installed at any on center spacing.
2. Where the steel-framed wall contains framing spaced at 24 inches (610 mm) on center with a 23 percent framing factor or framing spaced at 16 inches (400 mm) on center with a 25 percent framing factor, the next lower framing member spacing input values shall be used when calculating using AISI S250.
3. Where the steel-framed wall contains less than 23 percent framing factors the AISI S250 shall be used without any modifications.
4. Where the steel-framed wall contains other than standard C-shape framing members the AISI S250 calculation option for other than standard C-shape framing is permitted to be used.

N1102.2.9 Basement walls. *Basement walls* shall be insulated in accordance with Table N1102.1.3.

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

1. The floor overhead, including the underside stairway stringer leading to the basement, is insulated in accordance with Section N1102.1.3 and applicable provisions of Sections N1102.2 and N1102.2.8.
2. There are no uninsulated duct, domestic hot water 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 N1102.1.3 and applicable provisions of Section N1102.2.
5. The door(s) leading to the basement from conditioned spaces are insulated in accordance with Section N1102.1.3 and applicable provisions of Section N1102.2, and weatherstripped in accordance with Section N1102.5.
6. The *building thermal envelope*~~building thermal envelope~~ separating the basement from adjacent conditioned spaces complies with Section N1102.5.

N1102.4.5 Sunroom and heated garage fenestration. *Sunrooms* and heated garages enclosing *conditioned space* shall comply with the fenestration requirements of this code.

> **Exception:** In Climate Zones 2 through 8, for *sunroom s* and heated garages with *thermal isolation* and enclosing *conditioned spac e*, the fenestration *U*-factor shall not exceed 0.45 and the skylight *U*-factor shall not exceed 0.70.

New fenestration separating a sunroom or heated garages with thermal isolation from conditioned space shall comply with the *building thermal envelope* ~~building thermal envelope~~ requirements of this code.

TABLE N1102.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the *building thermal envelope*~~building envelope~~. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	A sealed air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space . Access openings, drop-down stairs or knee wall doors to unconditioned attic spaces shall be air sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with Section N1102.2.5 Eave Baffles shall be installed in accordance with Section N1102.2.4.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior *building thermal envelope*~~thermal envelope~~ insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	Framing cavities around windows, skylights and doors shall be completely filled with insulation or insulated per window manufacturer's instructions.
Rim joists	Rim joists shall include an air barrier. The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement, crawl space, and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section N1102.2.11. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section N1102.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section N1102.2.9.1. Slab-on-grade floor insulation shall be installed in accordance with Section N1102.2.11.
Shafts, penetrations	Duct and flue shafts and other similar penetrations to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the *building thermal envelope*~~building thermal envelope~~ to maintain required *R*-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections N1101.10–N1101.12 and N1102.2.8.
Recessed lighting	Recessed light fixtures installed in the *building thermal envelope*~~building thermal envelope~~ shall be air sealed in accordance with Section N1102.5.5.	Recessed light fixtures installed in the *building thermal envelope*~~building thermal envelope~~ shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required *R*-value can be met by installing insulation and air barrier systems completely

	air sealed.	to the exterior side of the obstructions.
Showers, tubs, and fireplaces adjacent to the *building thermal envelope*~~building thermal envelope~~	An air barrier shall separate insulation in the *building thermal envelope* from the shower, tub, and fireplace assemblies.	Exterior framed walls adjacent to showers, tubs and fireplaces shall be insulated.
Electrical,communication, and other equipment boxes, housings, and enclosures	Boxes, housing, and enclosures that penetrate the air barrier shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing, or enclosure shall be sealed. The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier. Alternatively, air-sealed boxes shall be installed in accordance with N1102.5.6.	Boxes, housing, and enclosures shall be burried in or surrounded by insulation.
HVAC register boots	HVAC supply and return register boots that penetrate *building thermal envelope*~~building thermal envelope~~ shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	HVAC supply and return register boots located in the *building thermal envelope*~~building's thermal envelope~~ shall be buried and surrounded by insulation.
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—
Common walls or double walls	Air sealing materials recognized in a listed fire-resistance rated common wall or double wall design and installed in accordance with the listing, or air sealing materials recognized in an approved design, shall be used. Common walls or double walls shall be considered an exterior wall for the purposes of air barrier and air sealing application of this Table.	Insulation materials recognized in the listed common wall or double-wall design and installed in accordance with the listing, or insulation materials recognized in the approved design, shall be used.

For SI: 1 inch = 25.4 mm.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

N1102.5.1.2 Testing and maximum air leakage rate. The *building* or each *dwelling unit* in the building shall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2 (1.1 L/s x m^2) of building or dwelling unit enclosure area. 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.

Exceptions:

1. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in all climate zones for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.

2. 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*~~building envelope~~ tightness and insulation installation shall be considered acceptable where the items in Table N1102.5.1.1, 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 conditioned spaces in accordance with Sections N1102.2.13 and N1102.4.5, as applicable.
3. Where tested in accordance with N1102.5.1.2, testing of each dwelling unit is not required.

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.

Mechanical *ventilation* shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*.

N1102.5.4 Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where opencombustion airducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room that is isolated from inside the *building thermal envelope*~~thermal envelope~~. Such rooms shall be sealed and insulated in accordance with the *building thermal envelope*~~envelope~~ requirements of Table N1102.1.3, where the walls, floors and ceilings shall meet a minimum of the *basement wall R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section N1103. The combustion air duct shall be insulated where it passes through *conditioned space* to an *R*-value of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections N1102.5.2 and R1006.

N1102.5.6 Air-sealed electrical and communication outlet boxes. Air-sealed electrical and communication outlet boxes that penetrate the air barrier of the *building thermal envelope*~~building thermal envelope~~ shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated . Air-sealed boxes shall buried in or surrounded by insulation. Air-sealed boxes shall be tested and marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer’s instructions .

N1105.2 Simulated performance based compliance. Compliance based on simulated building performance requires that a *proposed design* meets all of the following:

1. The requirements of the sections indicated within Table N1105.2.
2. The proposed total *building thermal envelope*~~building thermal envelope~~ UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the *building thermal envelope*~~building thermal envelope~~ UA using the prescriptive U-factors from Table N1102.1.2 multiplied by 1.08 in Climate Zones 0, 1 and 2, and 1.15 in Climates Zones 3 through 8, in accordance with Equation 11-6. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 11-6)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \times UA_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\times UA_{\text{Prescriptive reference design}}$$

3. For buildings without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design.

   Energy prices shall be taken from a source *approved*by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations.

   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 3.16. The source energy multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the code official.
   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 for an all-electric building with on-site renewable energy installed.

N1105.3.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other *building site* identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design complies with Section N1105.3. The certificate shall document the building components' energy specifications that are included in the calculation, including component-level insulation *R*-values or *U*-factors; duct system and *building thermal envelope*~~building envelope~~ air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
6. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

N1105.3.2.2 Compliance report for certificate of occupancy. A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.
2. Declaration of the simulated building performance path on the title page of the energy report and the title page of the building plans.
3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section N1105.3.
4. The name and version of the compliance software tool.
5. A site-specific energy analysis report that is in compliance with Section N1105.3.
6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section N1105.3. The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation *R*-values or *U*-factors; results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water heating equipment installed.
7. Where on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

TABLE N1105.4.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

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 N1102.1.2.	As proposed
	Solar absorptance = 0.75.	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 N1102.1.2, 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 N1102.1.2.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1102.1.2.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar absorptance = 0.75.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft^2.	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified in Table N1102.1.2.	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 N1102.1.2.	As proposed
	SHGC: as specified in Table N1102.1.2 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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 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.	The measured air exchange rate.[a]

Air exchange 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 thanB x M where:B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air exchange 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 mechanical ventilation system type shall be the same as in the proposed design. Heat recovery or energy recovery shall be modeled assumed for mechanical ventilation where required by Section N1103.6.1. Heat recovery or energy recovery shall not be modeled for mechanical ventilation where not required by Section N1103.6.1..	The mechanical ventilation rate[b] ,Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 x B x M)/ef where: e_f = the minimum fan efficacy, as specified in Table N1103.6.2, corresponding to the system type at a flow rate of B x 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*~~building 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 N1102.1.3, 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section N1103.7.	As proposed
	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
	Non-electric furnaces: Complying with 10 CFR §430.32	As proposed
	Non-electric boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section N1103.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed

<table>
<tr>
<td rowspan="6">Service water heating[d, g, k]</td>
<td>As proposed.
Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td>
<td>As proposed
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] factor</th><th>HWDS</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>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>Duct insulation: in accordance with Section N1103.3.2.</td>
<td>Duct insulation: as proposed</td>
</tr>
<tr>
<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 attic

All other:
75% in unconditioned attic and 25% inside conditioned space</td><td>50% inside conditioned space

50% unconditioned attic</td></tr>
</table>
</td>
<td>Duct location: as proposed</td>
</tr>
<tr>
<td>Duct system leakage to outside: For duct systems serving > 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area.
For duct systems serving ≤ 1,000ft2 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>When 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>When total duct system leakage is measured without the air handler 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>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>For hydronic systems and ductless systems, DSE shall be as specified in Table N1105.4.2(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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

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 §130.32

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 N1105.4.2(1), the standard reference design shall be the same as proposed design.

TABLE N1106.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
N1101.14	Certificate
Building Thermal Envelope	
N1102.1.1	Vapor retarder
N1102.2.4	Eave baffle
N1102.2.5.1	Access hatches and doors
N1102.2.9	Basement walls
N1102.2.9.1	Basement wall insulation installation
N1102.2.10.1	Slab-on-grade floor insulation installation
N1102.2.11.1	Crawl space wall insulation installation
N1102.5.1.1	Installation
N1102.5.1.2	Testing
N1102.5.2	Fireplaces
N1102.5.3	Fenestration air leakage
N1102.5.4	Rooms containing fuel burning appliances
N1102.5.5	Recessed lighting
N1102.5.6	Air sealed electrical and communication outlet boxes
N1106.3	*Building thermal envelope* ~~Building thermal envelope~~
Mechanical	
N1103.1	Controls
N1103.2	Hot Water boiler temperature reset
N1103.3 except	Duct systems
N1103.4	Mechanical system piping insulation
N1103.5 except Section N1103.5.2	Service hot water systems
N1103.5.2	Hot water pipe insulation
N1103.6	Mechanical ventilation
N1103.7, except Section N1103.7.1	Equipment sizing and efficiency rating
N1103.8	Systems serving multiple dwelling units
N1103.9	Snow melt and ice system controls
N1103.11	Energy consumption of pools and spas
N1103.12	Portable spas
N1103.13	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
N1104.1	Lighting equipment
N1104.2	Interior lighting controls
N1104.5	Electric readiness
N1104.6	Renewable energy infrastructure
N1104.7	Electric Vehicle power transfer infrastructure

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

N1106.3 Building thermal envelope. The proposed total *building thermal envelope*~~building thermal envelope~~ UA, which is sum of *U*-factor times assembly area, shall be less than or equal to the *building thermal envelope*~~building thermal envelope~~ UA using the prescriptive *U*-factors from Table N1102.1.2 multiplied by 1.08 in Climate Zones 0, 1, and 2, and by 1.15 in Climates Zones 3 through 8, in accordance with Equation 11-7 Equation 11-7. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 11-7)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

N1106.7.2.1 Proposed compliance report for permit application. Compliance reports submitted with the application for a building permit shall include the following:

1. Building street address, or other *building site* identification.
2. Declaration of ERI on the title page and on the building plans.
3. The name of the individual performing the analysis and generating the compliance report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A certificate indicating that the proposed design has an ERI less than or equal to the appropriate score indicated in Table N1106.5 when compared to the ERI reference design. The certificate shall document the building component energy specifications that are included in the calculation, including: component level insulation *R*-values or *U*-factors; assumed duct system and *building thermal envelope*~~building envelope~~ air leakage testing results; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
7. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

N1106.7.2.2 Confirmed compliance report for a certificate of occupancy. A confirmed compliance report submitted for obtaining the certificate of occupancy shall be made site and address specific and include the following:

1. Building street address or other *building site* identification.
2. Declaration of ERI on the title page and on the building plans.
3. The name of the individual performing the analysis and generating the report.
4. The name and version of the compliance software tool.
5. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
6. A final confirmed certificate indicating that the confirmed rated design of the built home complies with Sections N1106.2 and N1106.4. The certificate shall report the energy features that were confirmed to be in the home, including: component-level insulation *R*-values or *U*-factors; results from any required duct system and *building thermal envelope*~~building envelope~~ air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation, and service water-heating equipment installed. Where on-site renewable energy systems have been installed on or in the home, the certificate shall report the type and production size of the installed system.

N1108.2.1 Enhanced building thermal envelope options. The *building thermal envelope* shall meet the following:

1. Section N1108.2.1.1 or N1108.2.1.2
2. Section N1108.2.1.3

N1108.2.1.1 Enhanced building thermal envelope performance UA. The proposed total *building thermal envelope*~~building thermal envelope~~ UA shall be calculated in accordance with Section N1102.1.5 and shall meet one of the following:

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

N1108.2.4 More efficient duct thermal distribution system option. The thermal distribution system shall meet one of the following efficiencies:

1. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope* ~~building thermal envelope~~.

100 percent of duct thermal distribution system located in conditioned space as defined by Section N1103.3.3.

3. When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with N1103.3.5, shall be in accordance with one of the following:

3.1 Where air handler is installed at the time of testing, 2.0 cubic feet per minute (0.94 L/s) per 100 square feet (9.29 m^2) of conditioned floor area.

3.2 Where air handler is not installed at the time of testing, 1.75 cubic feet per minute (0.83 L/s) per 100 square feet (9.29 m^2) of conditioned floor area.

4. Duct systems designed so the individual room airflow shall be within ±20 percent of the design/application requirements for the supply and return ducts. This shall be demonstrated by using a duct airflow balancing procedure as specified by ANSI/ACCA 5 QI or by other approved methods.

N1110.2.1 Building thermal envelope. New *building thermal envelope*~~envelope~~ assemblies that are part of the *addition* shall comply with Sections N1102.1, N1102.2, N1102.4.1 through N1102.4.5, and N1102.5.

Exception: New *building thermal envelope*~~envelope~~ assemblies are exempt from the requirements of Section N1102.5.1.2.

N1111.1.1 Building thermal envelope. *Alterations* of existing *building thermal envelope* assemblies shall comply with this section. ~~*New*~~ New *building thermal envelope*~~building thermal envelope~~ assemblies that are part of the *alteration* shall comply with Section N1102. In no case shall the R-value of insulation be reduced or the U-factor of a *building thermal envelope*~~building thermal envelope~~ assembly be increased as part of a *building thermal envelope*~~building thermal envelope~~ alteration.

Exception: The following *alterations* shall not be required to comply with the requirements for new construction provided that the energy use of the *building* is not increased:

1. Storm windows installed over existing fenestration.
2. *Roof recover*.
3. Surface-applied window film installed on existing single-pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
4. In no case shall the R-value of insulation be reduced or the U-factor of a *building thermal envelope* ~~building thermal envelope~~ assembly be increased as part of a *building thermal envelope* ~~building thermal envelope~~ alteration.

N1111.1.1.4 Floor alterations. Where an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied and the floor or floor overhang is part of the *building thermal envelope*~~building thermal envelope~~, the floor or floor overhang shall be brought into compliance with Section N1102.1 or an approved design. This requirement shall apply to floor alterations where the floor cavities or surfaces are exposed and accessible prior to construction.

N1111.1.1.6 Air barrier. *Building thermal envelope*~~Building thermal envelope~~ assemblies altered in accordance with Section N1111.1.1 shall be provided with an air barrier in accordance with Section N1102.4. The air barrier shall not be required to be made continuous with unaltered portions of the *building thermal envelope*~~building thermal envelope~~. Testing requirements of Section N1102.4.1.2 shall not be required.

N1111.1.5 Additional Efficiency Packages. Alterations shall comply with Section N1114 where the alteration contains replacement of two or more of the following:

1. HVAC unitary systems or HVAC central heating or cooling equipment serving the work area of the alteration.
2. Water heating equipment serving the work area of the alteration.
3. 50 percent or more of the lighting fixtures in the work area of the alteration.
4. 50 percent or more of the area of interior surfaces of the *building thermal envelope*~~thermal envelope~~ in the work area of the alteration.
5. 50 percent or more the area of the building's exterior wall envelope.

Exceptions:

1. Alterations that are permitted with an addition complying with Section N1110.3.5.
2. Alterations that comply with Section N1105 or N1106.

N1114.1 General. Where required in Section N1110 or N1111, the building shall comply with one or more additional efficiency package options in accordance with the following:

1. Enhanced *building thermal envelope*~~envelope~~ performance in accordance with Section N1108.2.1.
2. More efficient HVAC equipment performance in accordance with Section N1108.2.2.
3. Reduced energy use in service water-heating in accordance with Section N1108.2.3.
4. More efficient duct thermal distribution system in accordance with Section N1108.2.4.
5. Improved air sealing and efficient ventilation system in accordance with Section N1108.2.5.

Reason: "Building thermal envelope" is a defined term in the IECC, but "building envelope" and "thermal envelope" are not defined. This comment attempts to standardize terminology throughout the residential provisions by replacing instances of "building envelope," "thermal envelope," and "envelope" with the defined term "building thermal envelope."
This replacement is made thirteen times for "building envelope," three times for "thermal envelope," and six times for "envelope" within both the IECC residential provisions and IRC Chapter 11 of the 1st Public Comment Draft. In addition, there are twenty-four cases in the IECC residential provisions and twenty-nine cases in IRC Chapter 11 where "building thermal envelope" is proposed to be italicized. It is understood that the decision to italicize rests with ICC staff, but identification of these instances is offered to assist staff and because they illustrate the potential for confusion that may arise on this topic when the defined term is not explicitly triggered via italicization.

If there are technically valid reasons to retain existing terminology in specific situations, please consider amending this comment for those sections, as necessary.

Companion comment CED1-92-22 offers similar changes for the commercial provisions to ensure consistency throughout the entire IECC.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This comment is intended solely to clarify terminology without any technical impact. There should be no impact on cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This proposal provides clarification and consistency in the use of defined terms.

Proposal # 964

RED1-186-22

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

2024 International Energy Conservation Code [RE Project]

SECTION R102
ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

Revise as follows:

R102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. *Buildings approved* in writing by such an energy-efficiency program shall be considered to be in compliance with this code where such buildings also meet the requirements identified in Table R405.2 and the proposed total *building thermal envelope* thermal conductance *TC*~~UA, which is the sum of U-factor times assembly area,~~ shall be less than or equal to the total *building thermal envelope* thermal conductance TC ~~UA~~ using the prescriptive U-factors and F-factors from Table R402.1.2 multiplied by 1.08 in Climate Zones 0, 1, 2, and by 1.15 in Climate Zones 3 through 8, in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

For Climate Zones 0-2: $TC\cancel{UA}_{\text{Proposed design}} \le 1.08 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-1)**

For Climate Zones 3-8: $TC\cancel{UA}_{\text{Proposed design}} \le 1.15 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-1)**

SECTION R402
BUILDING THERMAL ENVELOPE

Revise as follows:

R402.1.5 Component performance alternative. Where the proposed total *building thermal envelope* thermal conductance TC_p is less than or equal to the required total *building thermal envelope* thermal conductance TC_r using factors in Table R402.1.2 , the *building* shall be considered to be in compliance with Table R402.1.2. The total thermal conductance TC shall be determined in accordance with Equation 4-1. Proposed *U*-factors and slab-on-grade *F*-factors shall be taken from 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. In addition to total thermal conductance TC compliance, the SHGC requirements of Table R402.1.2 and the maximum fenestration *U*-factors of Section R402.6 shall be met.

Equation 4-1

$$(\text{Up A} + \text{Fp P}) \le (\text{Ur A} + \text{Fr P})$$

$TC_p \le TC_r$
where:
$TC_p = U_p A + F_p P$

$TC_r = U_r A + F_r P$
$U_p A$ = the sum of proposed *U*-factors times the assembly areas in the proposed building.

$F_p P$ = the sum of proposed *F*-factors times the slab-on-grade perimeter lengths in the proposed building.
$U_r A$ = the sum of *U*-factors in Table R402.1.2 times the same assembly areas as in the proposed building.
$F_r P$ = the sum of *F*-factors in Table R402.1.2 times the same slab-on-grade perimeter lengths as in the proposed building.

R402.2.1 Ceilings with attics. 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~~Total UA~~ alternative in Section R402.1.5.

R402.2.2 Ceilings without attics. Where Section R402.1.3 requires insulation *R*-values greater than R-30 in the interstitial space above a ceiling and below the structural roof deck, and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.3 shall be limited to 500 square feet (46 m^2) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the Component performance~~Total UA~~ alternative in Section R402.1.5.

R402.2.5 Access hatches and doors. Access hatches and doors from conditioned to unconditioned spaces such as attics and crawl spaces shall be insulated to the same *R*-value required by Table R402.1.3 for the wall or ceiling in which they are installed.

Exceptions:

1. Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.3 based on the applicable climate zone specified in Chapter 3.
2. Horizontal pull-down, stair-type access hatches in ceiling assemblies that provide access from conditioned to unconditioned spaces in Climate Zones 0 through 4 shall not be required to comply with the insulation level of the surrounding surfaces provided the hatch meets all of the following:

    2.1. The average *U*-factor of the hatch shall be less than or equal to U-0.10 or have an average insulation *R*-value of R-10 or greater.

    2.2. Not less than 75 percent of the panel area shall have an insulation *R*-value of R-13 or greater.

    2.3. The net area of the framed opening shall be less than or equal to 13.5 square feet (1.25 m^2).

    2.4. The perimeter of the hatch edge shall be weatherstripped.

The reduction shall not apply to the Component performance~~total UA~~ alternative in Section R402.1.5.

R402.4.3 Glazed fenestration exemption. Not greater than 15 square feet (1.4 m^2) of glazed fenestration per *dwelling unit* shall be exempt from the *U*-factor and SHGC requirements in Section R402.1.2. This exemption shall not apply to the Component performance~~Total UA~~ alternative in Section R402.1.5.

R402.4.4 Opaque door exemption. One side-hinged opaque door assembly not greater than 24 square feet (2.22 m^2) in area shall be exempt from the *U*-factor requirement in Section R402.1.2. This exemption shall not apply to the Component performance~~Total UA~~ alternative in Section R402.1.5.

SECTION R405
SIMULATED BUILDING PERFORMANCE

Revise as follows:

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total *building thermal envelope* thermal conductance TC ~~UA, which is the sum of the U-factor times assembly area,~~ shall be less than or equal to the *building thermal envelope* thermal conductance TC~~UA~~ 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 R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

    For Climate Zones 0-2: $TC\cancel{UA}_{\text{Proposed Design}} \leq 1.08 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-2)**

    For Climate Zones 3-8: $TC\cancel{UA}_{\text{Proposed Design}} \leq 1.15 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-2)**

3. For buildings without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

    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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
    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 for an all-electric building with on-site renewable energy installed.

SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise as follows:

R406.3 Building thermal envelope. The proposed total *building thermal envelope* thermal conductance TC~~UA, which is sum of *U*-factor times assembly area,~~ shall be less than or equal to the *building thermal envelope* thermal conductance TC ~~UA~~ 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 by 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-3 and R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

For Climate Zones 0-2: $TC\cancel{UA}_{\text{Proposed design}} \leq 1.08 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-3)**

For Climate Zones 3-8: $TC\cancel{UA}_{\text{Proposed design}} \leq 1.15 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-3)**

SECTION R408
ADDITIONAL EFFICIENCY REQUIREMENTS

R408.2 Additional energy efficiency credit requirements . Two of the additional measures shall be selected from Table R408.2 that meet or exceed a total of ten credits. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table R408.2 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total TC~~UA~~	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total TC~~UA~~	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total TC~~UA~~	0	1	2	2	2	3	3	4	4

R408.2.1.1 Enhanced envelope performance ~~UA~~. The proposed total *building thermal envelope* thermal conductance TC~~UA~~ shall be calculated in accordance with Section R402.1.5 and shall meet one of the following:

1. Not less than 2.5 percent of the total TC~~UA~~ of the *building thermal envelope*.
2. Not less than 5 percent of the total TC~~UA~~ of the *building thermal envelope*.
3. Not less than 7.5 percent of the total TC~~UA~~ of the *building thermal envelope*.

Reason: The Committee approved REPI-26, a DOE proposal, to replace 'total UA' alternative with 'Component performance' alternative but other sections still rely on and reference “UA”. This public comment updates uses of “UA” with “TC” for thermal conductance, the term being used in R402.1.5.
Other solutions to address this problem will likely be submitted and all these public comments should be assigned to an Envelope SC working group to identify the best solution.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
None

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Makes needed editorial changes capturing instances where the term UA should have been corrected without introducing unintended consequences.

Proposal # 1157

RED1-189-22

Proponents: Christopher McWhite, representing Region VI (cmcwhite@me.com)

2024 ENERGY Chapter11

Revise as follows:

EMITTANCE. The ratio of the radiant heat flux emitted by a specimen ~~to that emitted by a blackbody at the same temperature and under the same conditions~~ measured on a scale from 0 to 1, where a value of 1 indicates perfect emission.

Reason: Unless there is an industry term that supports this, the inclusion of the language “black body” is inherently tone deaf and completely out of place in any ICC published Code with respect to black humans.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
There is no cost associated with this proposed change

Bibliography: I am a career, 22 year Building Code Official who has served communities in five states from the Midwest, to the South, and now in New England. Through The Rhode Island Building Code Standards Committee, I am accepted as a certified Building Official; *R.I.G.L. Ch. 23-27.3 §107.5*. Through The International Code Council, I am exam certified as a Certified Building Official, Housing Code Official, Combination Residential Building Inspector, and a Residential and Commercial Plans Examiner. Through the State of Massachusetts I am a certified/licensed Inspector of Buildings/Building Commissioner. Currently I am working as the Department Head Building and Zoning Official in the Town of Smithfield Rhode Island. Here we are committed to our communities’ development through partnerships with local and statewide organizations, institutions, and people who are dedicated and/or focused on the process of maintaining existing buildings and constructing new edifices with the goal of making an ever safer built community. I am committed to pursuing improved life safety in residential and commercial structures and the judicious enforcement of current building code and its referenced standards through effective leadership both within the builders and design community and with the professional staff I have the honor to lead. My personal goal is the building of a team of amicable, fair, ethical, and consistently equitable Officials utilizing State and Local building regulations while also judiciously incorporating relevant 28 CFR, ADA requirements. My role is also to communicate these goals with political bodies, large stakeholder investors in high profile projects, local community projects, and simple renovations with homeowners, without parity. I am also a decades-long member of the International Code Council, the non-profit agency that develops and publishes the building Codes. I’ve twice served as a selected committee member for code development on the national level and I am currently serving as an elected, Governing Board Member with one ICC Membership Council while chairing a subcommittee in another.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Clarifies the term consistent with the ways in which it is used throughout the code and other standards.

Proposal # 1223

RED1-191-22 Part I

Proponents: Christopher McWhite, representing Region VI (cmcwhite@me.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

EXTERIOR WALL ENVELOPE. A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural or non-structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

Reason: The exclusion of non-structural exterior wall elements could unintentionally exclude such installations as curtain walls and other non-load bearing exterior building elements that are intended to provide a delineation from unconditioned versus conditioned space.

Cost Impact: The code change proposal will increase the cost of construction.
The cost will increase because the inclusion of non-structural building elements will require the installation of materials intended to provide thermal resistance or thermal transmittance.

Bibliography: I am a career, 22 year Building Code Official who has served communities in five states from the Midwest, to the South, and now in New England. Through The Rhode Island Building Code Standards Committee, I am accepted as a certified Building Official; *R.I.G.L. Ch. 23-27.3 §107.5*. Through The International Code Council, I am exam certified as a Certified Building Official, Housing Code Official, Combination Residential Building Inspector, and a Residential and Commercial Plans Examiner. Through the State of Massachusetts I am a certified/licensed Inspector of Buildings/Building Commissioner. Currently I am working as the Department Head Building and Zoning Official in the Town of Smithfield Rhode Island. Here we are committed to our communities' development through partnerships with local and statewide organizations, institutions, and people who are dedicated and/or focused on the process of maintaining existing buildings and constructing new edifices with the goal of making an ever safer built community. I am committed to pursuing improved life safety in residential and commercial structures and the judicious enforcement of current building code and its referenced standards through effective leadership both within the builders and design community and with the professional staff I have the honor to lead. My personal goal is the building of a team of amicable, fair, ethical, and consistently equitable Officials utilizing State and Local building regulations while also judiciously incorporating relevant 28 CFR, ADA requirements. My role is also to communicate these goals with political bodies, large stakeholder investors in high profile projects, local community projects, and simple renovations with homeowners, without parity. I am also a decades-long member of the International Code Council, the non-profit agency that develops and publishes the building Codes. I've twice served as a selected committee member for code development on the national level and I am currently serving as an elected, Governing Board Member with one ICC Membership Council while chairing a subcommittee in another.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The exterior wall envelope does protect non-structural elements.

Proposal # 1215

RED1-191-22 Part II

Proponents: Christopher McWhite, representing Region VI (cmcwhite@me.com)

2024 ENERGY Chapter11

Revise as follows:

EXTERIOR WALL ENVELOPE. A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural <u>or non-structural</u> members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

Reason: The exclusion of non-structural exterior wall elements could unintentionally exclude such installations as curtain walls and other non-load bearing exterior building elements that are intended to provide a delineation from unconditioned versus conditioned space.

Cost Impact: The code change proposal will increase the cost of construction.
There cost will increase because the inclusion of non-structural building elements will require the installation of materials intended to provide thermal resistance or thermal transmittance.

Bibliography: I am a career, 22 year Building Code Official who has served communities in five states from the Midwest, to the South, and now in New England. Through The Rhode Island Building Code Standards Committee, I am accepted as a certified Building Official; *R.I.G.L. Ch. 23-27.3 §107.5*. Through The International Code Council, I am exam certified as a Certified Building Official, Housing Code Official, Combination Residential Building Inspector, and a Residential and Commercial Plans Examiner. Through the State of Massachusetts I am a certified/licensed Inspector of Buildings/Building Commissioner. Currently I am working as the Department Head Building and Zoning Official in the Town of Smithfield Rhode Island. Here we are committed to our communities' development through partnerships with local and statewide organizations, institutions, and people who are dedicated and/or focused on the process of maintaining existing buildings and constructing new edifices with the goal of making an ever safer built community. I am committed to pursuing improved life safety in residential and commercial structures and the judicious enforcement of current building code and its referenced standards through effective leadership both within the builders and design community and with the professional staff I have the honor to lead. My personal goal is the building of a team of amicable, fair, ethical, and consistently equitable Officials utilizing State and Local building regulations while also judiciously incorporating relevant 28 CFR, ADA requirements. My role is also to communicate these goals with political bodies, large stakeholder investors in high profile projects, local community projects, and simple renovations with homeowners, without parity. I am also a decades-long member of the International Code Council, the non-profit agency that develops and publishes the building Codes. I've twice served as a selected committee member for code development on the national level and I am currently serving as an elected, Governing Board Member with one ICC Membership Council while chairing a subcommittee in another.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The exterior wall envelope does protect non-structural elements.

Proposal # 1224

RED1-194-22

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

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

R303.1.5 **Air spaces.**. Where the *R-value* of an *enclosed reflective air space* or enclosed non-reflective air space is used for compliance with this standard, the air space shall be enclosed in a cavity bounded on all sides by building components and constructed to minimize airflow into and out of the enclosed air space. Airflow shall be deemed minimized where one of the following conditions occur:

1. The enclosed air space is unventilated.
2. The enclosed air space is bounded on one or more sides by an anchored masonry veneer, constructed in accordance with Chapter 7 of the *International Residential Code*, and vented by veneer weep holes located only at the bottom portionof the air space and spaced not less than 15 inches (381 mm) on center with the top of the cavity air space closed.

Exception: For ventilated cavities, the effect of the ventilation of air spaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the air space at an air movement rate of not less than 70 mm/second.

Revise as follows:

R303.1.1 Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation that is 12 inches (305 mm) or greater in width. Alternatively, the insulation installers shall provide a certification that indicates the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown-in or sprayed fiberglass and cellulose insulation, the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be indicated on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and the *R*-value of the installed thickness shall be indicated on the certification. For reflective insulation, the number of reflective sheet(s), the number and thickness of the enclosed reflective air space(s) and the R-value for the installed assembly determined in accordance with Section R303.1.5, shall be listed on the certification. For insulated siding, the *R*-value shall be on a label on the product's package and shall be indicated on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

Exception: For roof insulation installed above the deck, the *R*-value shall be labeled as required by the material standards specified in Table 1508.2 of the International Building Code or Table R906.2 of the International Residential Code, as applicable.

R303.2.2 Radiant barrier. Where installed, *radiant barriers* shall comply with the requirements of ASTM C1313/C1313M and shall be installed in accordance with ASTM C1743.

Reason: Air space R-values can vary by as much as a factor of 8 depending on various conditions of use (see ASHRAE 90.1 Appendix A). This proposal provides needed requirements to ensure air space R-values are properly specified and applied for both reflective and non-reflective air spaces.
Foam sheathing products with foil facers, various types of structural sheathing products with reflective facers, batt insulation products with reflective facers, and reflective insulation sheet goods (including radiant barriers) rely on an air space to achieve an R-value or thermal performance benefits that can vary significantly based on installation conditions, climate, air-space orientation and heat flow direction at different seasons of the year, and other factors. The FSC membership is among manufacturers and code users that rely on appropriate characterization of air spaces to provide added thermal performance under appropriate conditions of use. It is important that the R-value performance of such air spaces are consistently and properly characterized for code compliance purposes, just as is the case for the variety of insulation materials that rely on material based R-values alone and do not rely on combination with a reflective or non-reflective air space. It is the intent of this proposal to address air space R-values in a manner that is consistent with the determination of R-values for other materials and in a way that transparently addresses the unique considerations that are important to air space R-values.The charging language of the first paragraph of the new proposed Section R303.1.5, including items 1 and 2, are consistent with provisions for air spaces found in Section C402.2.7 of the IECC commercial provisions. It also makes use of the newly added definition "enclosed reflective air space" to ensure that it as well as other air spaces that are not reflective are properly constructed to attain (or nearly attain) the idealized R-values that are typically assigned to such air spaces. The exception provided at the end of the proposed new Section R303.1.5 provides flexibility to address ventilated air spaces (not meeting the requirements for an enclosed, unventilated air space) and also is part of the IECC commercial provisions in Section C402.2.7.

The 2nd paragraph gives needed direction on how to determine R-values for compliant air spaces. The FTC R-value rule is referenced as it is for insulation products in Section R303.1.4 because it does address reflective insulation and associated enclosed air spaces. However, the FTC R-value rule does not address horizontal air spaces such as found in floor or roof systems which have R-values that vary seasonally based on direction of heat flow and the magnitude of this effect on air space R-value depends on the climate zone. Therefore, reference to ASHRAE 90.1 Appendix A is provided which does address proper climate-based seasonal weighting to arrive at a single R-value for a given climate that is necessary to determine compliance with the R-value or U-factor requirements of the IECC standard. It also addresses R-value determination for non-reflective air spaces which also are not addressed in the FTC R-value Rule but which are commonly used to support compliance with the

IECC. Finally, there is no means of assigning an R-value to radiant barrier applications unless they are installed together with and facing an enclosed reflective air space also meeting the air space construction requirements in R303.1.5.

To complement the above, Section R303.1.1 is revised to require that reflective insulation and associated enclosed reflective air spaces comply with the proposed new Section R303.1.5. Finally, Section R303.2.2 for radiant barriers is revised to a reference standard that addresses installation which is the purpose of Section R303.2. The currently referenced ASTM standard only addresses material properties, not installation.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal is a clarification that doesn't change appropriate methods for determining and applying air space R-values which the IECC-R provisions have been silent on. It relies on practices and references that are commonly used for this purpose. There may be a cost increase associated with air spaces that have been applied and characterized in a manner inconsistent with accepted practice.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Adds language to ensure air space R-values are properly specified and applied for both reflective and non-reflective air spaces.

Proposal # 1135

RED1-196-22

Proponents: Daniel Carroll, representing Division of Building Standards & Codes (daniel.carroll@dos.ny.gov); Hendrik Shank, representing New York State, Department of State (hendrikus.shank@dos.ny.gov)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.1 General. The *building thermal envelope* shall comply with the requirements of ~~Sections R402.1.1 through R402.1.5.~~ one of the following:

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

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: This modification clarifies that there are two options that can be used to demonstrate compliance with the Residential prescriptive building thermal envelope Provisions of the 2024 IECC. Essentially, the vapor retarder Provision identified in Section R402.1.1 is always applicable and the user may utilize the U-factor, f-factor, and R-value provisions identified in Sections R402.1.2 through R402.1.4 as one option, and the component performance alternative identified in Section R402.1.5 as another option.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change proposal is editorial so there is no cost impact associated with it.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Provides clarity to the intent and proper application of the section.

Proposal # 1199

RED1-199-22

Proponents: Jennifer Hatfield, representing Fenestration & Glazing Industry Alliance (formerly AAMA) (jen@jhatfieldandassociates.com)

2024 International Energy Conservation Code [RE Project]

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

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

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. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

e. 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*.

f. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R U-factors of Table C402.1.2.

g. F-factors for heated slabs correspond to the configuration described by footnote (d) of Table R402.1.3

Revise as follows:

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	0	1	2	3	4 except Marine	5 and Marine 4	6	7 and 8
FENESTRATION U-FACTOR[b, i]	0.50	0.50	0.40	0.30	0.30	0.28 [h]	0.28 [h]	0.27 [h]
SKYLIGHT[b] *U*-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED FENESTRATION SHGC[b, e]	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
CEILING *R*-VALUE[i]	30	30	38	38	49	49	49	49
WOOD FRAME WALL R-VALUE[g]	13 or 0&10ci	13 or 0&10ci	13 or 0&10ci	20 or 13&5ci or 0&15ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci
MASS WALL R-VALUE[h]	3/4	3/4	4/6	8/13	8/13	13/17	15/20	19/21
FLOOR *R*-VALUE[h, i]	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	19 or 13+5ci or 15ci	19 or 13+5ci or 15ci	30 or 19+7.5ci or 20ci	30 or 19+7.5ci or 20ci	38 or 19+10ci or 25ci
BASEMENT[c, g] WALL *R*-VALUE	0	0	0	5ci or 13[f]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13& 5ci
SLAB[d] R-VALUE & DEPTH	0	0	0	10ci, 2 ft	10ci, 4 ft	10ci, 4 ft	10ci, 4 ft	10ci, 4 ft
CRAWL SPACE[c, g] WALL R-VALUE	0	0	0	5ci or 13[f]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.
ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

f. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

g. Mass walls shall be in accordance with Section R402.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

h. A maximum *U*-factor of 0.30~~2~~ shall apply in Marine Climate Zone 4 and Climate Zones 5~~3~~ through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation, or
   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

i. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R R-values of Table C402.1.2.

j. "30 or 19+7.5ci or 20ci" means R30 cavity insulation alone or R19 cavity insulation with R7.5 continuous insulation or R20 continuous insulation alone.

2024 ENERGY Chapter11

TABLE N1102.1.2 MAXIMUM ASSEMBLY U-FACTORS[a] AND FENESTRATION REQUIREMENTS

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. 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. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

e. 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.

f. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R U-factors ofTable C402.1.2.

g. F-factors for heated slabs correspond to the configuration described by footnote (d) of Table R402.1.3.

Revise as follows:

TABLE N1102.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

    Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “10ci or 13” means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “15ci or 19 or 13&5ci” means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

f. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

g. Mass walls shall be in accordance with Section N1102.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

h. A maximum *U*-factor of 0.30~~2~~ shall apply in Marine Climate Zone 4 and Climate Zones 5~~3~~ through 8 to vertical fenestration products installed in buildings located either:

    1. Above 4,000 feet in elevation, or
    2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

i. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R R-values of Table C402.1.2.

j. "30 or 19+7.5ci or 20ci" means R30 cavity insulation alone or R19 cavity insulation with R7.5 continuous insulation or R20 continuous insulation alone.

Reason: This public comment is errata as it simply addresses what we believe was an error in Public Comment Draft #1. It simply aligns with the consensus proposal, REPI-28, that was adopted during the first round by making edits to the following footnotes:

- Table R402.1.3, footnote h – the consensus agreement that passed changed this from 0.32 to 0.30 and it should be for CZs Marine 4 and 5-8 (matching the same change to Table R402.1.2, footnote e).
- This same error is in Table N1102.1.3, footnote h of the IRC, Chapter 11 document and the fix aligns with Table N1102.1.2, footnote e.

The proposal includes both Tables to show how this errata provides for consistency between table footnotes.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Simply fixing what we believe to be a publishing error in PC Draft #1.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Correcting an errata in the code, just a matter of breaking out its own footnote.

RED1-204-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

Portions of table not shown remain unchanged.

CLIMATE ZONE	0	1	2	3	4 except Marine	5 and Marine 4	6	7 and 8
VERTICAL FENESTRATION U-FACTOR	0.50	0.50	0.40	0.30	0.30	0.28[e]	0.28[e]	0.27[e]
SKYLIGHT~~[d]~~ *U*-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED VERTICAL FENESTRATION SHGC~~[d]~~	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

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

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. The fenestration *U*-factor column row excludes skylights other than skylights in Climate Zones 0 through 3 that have a SHGC of 0.28 or less. The SHGC column row applies to all glazed fenestration.~~

> ~~**Exception:** In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.~~

e. 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*.

f. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R U-factors of Table C402.1.2.

g. F-factors for heated slabs correspond to the configuration described by footnote (d) of Table R402.1.3

2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]
Portions of table not shown remain unchanged.

CLIMATE ZONE	0	1	2	3	4 except Marine	5 and Marine 4	6	7 and 8
VERTICAL FENESTRATION U-FACTOR	0.50	0.50	0.40	0.30	0.30	0.28[e]	0.28[e]	0.27[e]
SKYLIGHT~~[b]~~ U-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED VERTICAL FENESTRATION SHGC~~[b]~~	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

For SI: 1 foot = 304.8 mm.

NR = Not Required.
ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

~~b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.~~

~~**Exception:** In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.~~

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section R402.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

Reason: Footnotes should not contain requirements, they should be explanatory. Since there should be no requirements in footnotes there should be no exceptions. There are no columns for fenestration u-factors or SHGC; there are rows.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No change in requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Editorial clarification of the requirements.

Proposal # 1083

RED1-208-22

Proponents: Maston Stafford, representing US-EcoLogic, Inc. (maston.stafford@texenergy.org); Aaron Gary, representing Tempo, Inc. (aaron.gary@texenergy.org); Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.1.5 Component performance alternative. Where the proposed total *building thermal envelope* thermal conductance TC is less than or equal to the required total *building thermal envelope* thermal conductance TC using factors in Table R402.1.2 the *building* shall be considered to be in compliance with Table R402.1.2. The total thermal conductance shall be determined in accordance with Equation 4-1. Proposed *U*-factors and slab-on-grade *F*-factors shall be taken from 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. In addition to total thermal conductance TC compliance, the SHGC requirements of Table R402.1.2 and the maximum fenestration *U*-factors of Section R402.6 shall be met.

Equation 4-1

$$(Up\ A + Fp\ P) \le (Ur\ A + Fr\ P)$$

Up A = the sum of proposed *U*-factors times the assembly areas in the proposed building.
Fp P = the sum of proposed *F*-factors times the slab-on-grade perimeter lengths in the proposed building.
Ur A = the sum of *U*-factors in Table R402.1.2 times the same assembly areas as in the proposed building.
Fr P = the sum of *F*-factors in Table R402.1.2 times the same slab-on-grade perimeter lengths as in the proposed building.

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

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total *building thermal envelope* thermal conductance TC~~UA, which is the sum of the U-factor times assembly area,~~ shall be less than or equal to the required total *building thermal envelope* thermal conductance TC~~UA~~ 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.

   For Climate Zones 0-2: $TC\cancel{UA}_{\text{Proposed Design}} \le 1.08 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$ **(Equation 4-2)**
   For Climate Zones 3-8: $TC\cancel{UA}_{\text{Proposed Design}} \le 1.15 \times TC\cancel{UA}_{\text{Prescriptive reference design}}$

3. For buildings without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For buildings with a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For dwelling units with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the proposed design shall be reduced by an additional 5 percent of annual energy cost of the standard reference design. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
   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 for an all-electric building with on-site renewable energy installed.

R405.4.2 Residence specifications. The *standard reference design* and *proposed design* 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.~~3~~ 2. Proposed *U*-factors and slab-on-grade *F*-factors shall be taken from 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.

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
Foundations	Type: same as proposed.	As proposed
	Foundation wall area above and below grade and soil characteristics and slab-on-grade exposed perimeter lengths: same as proposed.	As proposed
	Foundation wall *U*-factor and slab-on-grade *F*-factor: as specified in Table R402.1.2.~~1~~	As proposed

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.

~~1. A maximum *F*-factor of 0.73 shall apply in jurisdictions designated by the *code official* as having a very heavy termite infestation.~~

R406.3 Building thermal envelope. The proposed total *building thermal envelope* thermal conductance TC~~UA, which is sum of *U*-factor times assembly area,~~ shall be less than or equal to the required total *building thermal envelope* thermal conductance TC~~UA~~ 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 by 1.15 in Climates Zones 3 through 8, in accordance with Equation 4-3 and Section R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

For Climate Zones 0-2: $\text{TC}\cancel{\text{UA}}_{\text{Proposed design}} \leq 1.08 \times \text{TC}\cancel{\text{UA}}_{\text{Prescriptive reference design}}$ **(Equation 4-3)**
For Climate Zones 3-8: $\text{TC}\cancel{\text{UA}}_{\text{Proposed design}} \leq 1.15 \times \text{TC}\cancel{\text{UA}}_{\text{Prescriptive reference design}}$

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R402.2.10 Slab-on-grade floors. Slab-on-grade floors, in contact with the ground, with a floor surface within 24 inches (600 mm) above or below grade shall be insulated in accordance with Table R402.1.3.

> **Exception:** Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation probability.

Reason: Section R402.1.5 has changed from the UA alternative to a component performance alternative which includes the *F*-factor of a slab-on-grade foundation. This change to the prescriptive compliance path should also be included to sections R405 and R406 envelope requirements. With the inclusion of *F*-factors to slab-on-grade foundations in Table R402.1.2, then the foundation section of Table R405.4.2(1) needs to include these changes for the standard reference design. An interpretation could be made that because Table R405.4.2(1) does not specify slab-edge insulation for slab-on-grade foundation types, then the standard reference design will equal the proposed design slab-edge insulation or lack thereof. Hypothetically a building using the Simulated Building Performance compliance path in climate zones 3 through 8 built without slab-edge insulation would never have to compensate for the increased energy costs by lowering the U-factor of other assemblies because the simulation software would run both the proposed design and the standard reference design with no slab-edge insulation. Making this change to Table R405.4.2(1) and the changes we have made to Equation 4-2 of Section R405.2, this hypothetical becomes impossible.

A footnote was added to Table R405.4.2(1) to coordinate with existing Section R402.2.10 addressing slab-edge insulation in areas with very heavy termite infestation.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
These suggested changes only incorporate changes made in section R402.1.5 to other sections. There is no cost impact.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Clarifies R405 to be consistent with edits to R402.1.5 that were approved in the last round of comments.

Proposal # 1307

RED1-210-22

Proponents: Shane Hoeper, representing myself (shoeper@cityofdubuque.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.2.10 Slab-on-grade floors. Slab-on-grade floors~~, in contact with the ground,~~ with a floor surface within 24 inches (600 mm) above or below grade shall be insulated in accordance with Table R402.1.3.

Exception: Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

Reason: Slab on grade is by definition "in contact with the ground". The phrase is unnecessary.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Removes unnecessary language

Proposal # 1139

RED1-211-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.2.11.1 Crawl space wall insulation installation~~s~~. Where installed, c~~C~~rawl space wall insulation ~~shall comply with the following:~~

~~1.~~ ~~Where exterior crawl space wall insulation is installed, it~~ shall be secured ~~permanently attached~~ to the wall and extend downward from the sill plate to not less than the top ~~base~~ of the foundation wall footing.

~~2.~~ **Exception:** Where ~~interior~~ the crawl space wall insulation is installed on the interior side of the wall and the crawl space floor is more than 24 inches below the exterior grade, the crawl space wall insulation ~~it~~ shall be permitted to ~~permanently attached to the foundation wall and~~ extend downward from the sill plate at the top of the foundation wall to not less than the interior floor of the crawl space.

Exposed earth in crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or *International Residential Code*, as applicable. Joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up stem walls and shall be attached to the stem walls.

Reason: This proposal is a clean-up of formatting and clarification of crawl space wall insulation installation requirements. These revisions also align better with the basis of the R-value requirements for crawl space walls. It also removes the word "permanently attached" and replaces it with "secured" to avoid situations where insulation is installed to be removable, such as done in accordance with some local requirements to allow for termite inspections.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal is a clarification and does not change requirements in a way that should have any negative impact on construction cost. In fact, it may allow some flexibility through the clarifications that could reduce construction cost such as by the exception provided or by way of requiring insulation to be "secured" rather than "permanently attached".

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Since crawl space insulation can be traded, "where required" is a good addition and the language proposed is helpful for code officials. Also agreement that in some jurisdictions it may need to be removed for inspection

Proposal # 1335

RED1-212-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.2.3 Attic knee wall. Wood attic knee ~~Attic knee~~wall assemblies that separate conditioned space from unconditioned attic spaces shall comply with Table R402.1.3 for wood frame walls. ~~meet the same insulation requirements as above-grade walls.~~ Steel attic knee wall assemblies shall comply with Section R402.2.7. Such knee walls shall have an air barrier between conditioned an d unconditioned space.

R402.2.3.1 ~~Truss~~ Roof truss framing separating conditioned and unconditioned space. Where wood vertical roof truss framing members are used to separate conditioned space and unconditioned space, they shall ~~meet the same insulation requirements as the~~ comply with Table R402.1.3 for wood frame walls ~~above-grade walls~~. Steel frame vertical roof truss framing members used to separate conditioned space and unconditioned space shall comply with Section R402.2.7.

Reason: These sections are imprecise and do not differentiate between wood and steel framing. The title of R402.2.3.1 is changed to differentiate between roof trusses and floor trusses.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Appropriate and will add clarity.

Proposal # 1090

RED1-217-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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.

Reason: 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.

Cost Impact: The code change proposal will decrease the cost of construction.
The added design flexibility may lead to cost improved cost-effectiveness.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Clarifies the relationship between the prescriptive path and both performance paths regarding basement walls.
Reason for the modification:
- Reconciles with errata for Tables R405.2 and R406.2.
- It is proposed to italicize the term “proposed design” at the request of the subcommittee because it’s a defined term. However, the term “proposed design” is not always italicized throughout the code and a coordination effort may be needed in the future.
- The term “proposed design” is used in a similar manner in Section R402.2.10.1 Slab-on-grade.

Proposal # 1016

RED1-218-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.3 Radiant barriers. Where installed~~ to reduce thermal radiation~~, radiant barriers shall be installed in accordance with ASTM C1743.

Reason: The reason to install a radiant barrier is commentary and should not be in a requirement.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This is an editorial update to remove unnecessary language.

Proposal # 1091

RED1-222-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.5.1.2 Air leakage Testing. The *building* or each *dwelling unit* in the buildingshall be tested for air leakage. ~~The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2(1.1 L/s x m^2) of building or dwelling unit enclosure area.~~ 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. When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:~~

~~1.1 Attached single and multiple family building dwelling units.~~

~~1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.~~

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 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 R402.5.1.2.1~~4~~, testing of each *dwelling unit* is not required.

~~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.~~

~~Mechanical ventilation shall be provided in accordance with Section M1505 of the *International Residential Code* or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of ventilation.~~

~~R402.5.1.4~~ R402.5.1.2.1 Dwelling unit sampling. For buildings with eight or more dwelling units, ~~the greater of~~ seven or 20 percent of the dwelling units , whichever is greater, ~~in the building~~ shall be tested. Tested units shall include a top floor unit, a ground floor unit, a middle floor unit, and the dwelling unit with the largest dwelling unit enclosure area. Where the air leakage rate of a tested unit is greater than the maximum permitted ~~air leakage~~ rate, corrective actions shall be taken ~~made to the unit~~ and the unit re-tested until it passes. For each tested dwelling unit with an ~~that has a greater~~ air leakage rate greater than the maximum permitted ~~air leakage~~ rate, ~~an additional~~ three additional units, including the corrected unit, shall be tested. Where buildings have fewer than eight dwelling units, each dwelling unit shall be tested.

Reason: This Public Comment does the following:

- Improves the organization of Section R402.5.1.2 by separating testing procedures from testing thresholds and re-ordering the test steps and exceptions
- Clarifies the testing thresholds by compliance path
- Establishes a cfm/ft2 metric alternative to ACH50 when choosing the Prescriptive Compliance Option.
- Clarifies the whole-building test threshold vs the dwelling unit test threshold.
- Corrects the spelling of "appliances" in Table R405.2 and adds the reference to the new Performance air leakage rate section

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
None

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Most of the content of the proposal had already been approved by prior action. The modifications improve the language and add clarity.

Proposal # 1165

RED1-224-22 Part I

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.5.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.5.1.1 through R402.5.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.5.1.2 Air Leakage Testing. The *building* or each *dwelling unit* in the buildingshall be tested for air leakage. ~~The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2(1.1 L/s x m^2) of building or dwelling unit enclosure area.~~ 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.

Exceptions:

~~1.~~ ~~When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:~~

~~1.1 Attached single and multiple family building dwelling units.~~

~~1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.~~

~~2.~~ 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 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.

~~3.~~ 2. Where tested in accordance with R402.5.1.4, testing of each dwelling unit is not required.

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.

Mechanical ventilation shall be provided in accordance with Section M1505 of the *International Residential Code* or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of ventilation.

Delete without substitution:

~~**R402.5.1.3 Prescriptive air leakage rate.** When complying with Section R401.2.1, the building or each dwelling unit in the building shall have an air leakage rate not exceeding 5.0 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, when tested in accordance with Section R402.5.1.2.~~

Add new text as follows:

R402.5.1.4 Dwelling unit sampling. For buildings with eight or more dwelling units, the greater of seven or 20 percent of the dwelling units in the building shall be tested. Tested units shall include a top floor unit, a ground floor unit, a middle floor unit, and the dwelling unit with the largest dwelling unit enclosure area. Where the air leakage rate of a tested unit is greater than the maximum permitted air leakage rate, corrective actions shall be made to the unit and the unit re-tested. For each tested unit that has a greater air leakage rate than the maximum permitted air leakage rate, an additional three units, including the corrected unit, shall be tested. Where buildings have fewer than eight dwelling units, each dwelling 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* shall be as follows:

1. 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 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 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) 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) 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) 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).

2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
R401.2.5	Additional energy efficiency
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and doors
R402.2.11.1	Crawl space wall insulation installations
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing ~~Testing~~
R402.5.1.3	Maximum air leakage rate
R402.6	Maximum fenestration *U*-factor and SHGC
Mechanical	
R403.1	Controls
R403.3, including R403.3.1, except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2.1	Interior lighting controls

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	
R401.2.5	Additional efficiency packages
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and doors
R402.2.11.1	Crawl space wall insulation installation
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing ~~Testing~~
R402.5.1.3	Maximum air leakage rate
Mechanical	
R403.1	Controls
R403.3 except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water calculation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2.1	Interior lighting controls
R406.3	Building thermal envelope

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

Reason: This proposals seeks a more logical organization of the code. It only updates the organization of the code and does not change technical requirements. More specifically, it separates the mandatory maximum air leakage rate (required across all compliance pathways) from the test method section by moving the existing language into a separate section identified as mandatory. This is intended to improve the code readability and the ease of understanding the code.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal does not change requirements but only reorganizes the code for readability and clarity.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Improves the clarity of the code by clearly separating test protocols from maximum air leakage rate criteria.

RED1-224-22 Part II

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 ENERGY Chapter11

Revise as follows:

N1102.5.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.5.1.1 through N1102.5.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.5.1.2 <u>Air leakage</u>Testing ~~and maximum air leakage rate.~~ The *building* or each *dwelling unit* in the building shall be tested for air leakage. ~~The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2 (1.1 L/s x m^2) of building or dwelling unit enclosure area.~~ 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.

Exceptions:

~~1.~~ ~~When testing individual dwelling units, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in all climate zones for:~~

~~1.1 Attached single and multiple family building dwelling units.~~

~~1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.~~

~~2.~~ <u>1</u>. 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 envelope tightness and insulation installation shall be considered acceptable where the items in Table N1102.5.1.1, 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 conditioned spaces in accordance with Sections N1102.2.13 and N1102.4.5, as applicable.

~~3.~~ <u>2.</u> Where tested in accordance with N1102.5.1.2, testing of each dwelling unit is not required.

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.

Mechanical *ventilation* shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*.

Delete without substitution:

~~**N1102.5.1.3 Prescriptive air leakage rate.** Where complying with Section N1101.13.1, the building or each *dwelling unit* in the building shall have an air leakage rate not exceeding 5.0 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, when tested in accordance with Section N1102.5.1.2.~~

Add new text as follows:

<u>**N1102.5.1.4 Dwelling unit sampling.** For buildings with eight or more dwelling units, the greater of seven or 20 percent of the dwelling units in the building shall be tested. Tested units shall include a top floor unit, a ground floor unit, a middle floor unit, and the dwelling unit with the largest dwelling unit enclosure area. Where the air leakage rate of a tested unit is greater than the maximum permitted air leakage rate, corrective actions shall be</u>

made to the unit and the unit re-tested. For each tested unit that has a greater air leakage rate than the maximum permitted air leakage rate, an additional three units, including the corrected unit, shall be tested. Where buildings have fewer than eight dwelling units, each dwelling unit shall be tested.

N1102.5.1.3 Maximum air leakage rate. Where tested in accordance with Section N1102.5.1.2, the air leakage rate for *buildings* or *dwelling units* shall be as follows:

1. Where complying with Section N1101.2.1, the building or dwelling units in the building shall have an air leakage rate not greater than 4.0 air changes per hour 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 N1101.2.2 or N1101.2.3, 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) 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) 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) 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).

Revise as follows:

TABLE N1105.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
N1101.14	Certificate
Building Thermal Envelope	
N1102.1.1	Vapor retarder
N1102.2.3	Attic knee or pony wall
N1102.2.4	Eave baffle
N1102.2.5.1	Access hatches and doors
N1102.2.9	Basement walls
N1102.2.9.1	Basement wall insulation installation
N1102.2.10.1	Slab-on-grade floor insulation installation
N1102.2.11.1	Crawl space wall insulation installation
N1102.5.1.1	Installation
N1102.5.1.2	~~Testing~~ Air leakage testing
N1102.5.1.3	Maximum air leakage rate
N1102.5.2	Fireplaces
N1102.5.3	Fenestration air leakage
N1102.5.4	Rooms containing fuel burning appliances
N1102.5.5	Recessed lighting
N1102.5.6	Air Sealed electrical and communication outlet boxes
N1102.6	Maximum fenestration *U*-factor and SHGC
Mechanical	
N1103.1	Controls
N1103.2	Hot Water boiler temperature reset
N1103.3,	Duct systems
N1103.4	Mechanical system piping insulation
N1103.5 except Section N1103.5.2	Service hot water systems
N1103.5.2	Hot water pipe insulation
N1103.6	Mechanical ventilation
N1103.7, except Section N1103.7.1	Equipment sizing and efficiency rating
N1103.8	Systems serving multiple dwelling units
N1103.9	Snow melt and ice system controls
N1103.11	Energy consumption of pools and spas
N1103.12	Portable spas
N1103.13	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
N1104.1	Lighting equipment
N1104.2	Interior lighting controls
N1104.5	Electric readiness
N1104.6	Renewable energy infrastructure
N1104.7	Electric vehicle power transfer infrastructure

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

TABLE N1106.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
N1101.14	Certificate
Building Thermal Envelope	
N1102.1.1	Vapor retarder
N1102.2.4	Eave baffle
N1102.2.5.1	Access hatches and doors
N1102.2.9	Basement walls
N1102.2.9.1	Basement wall insulation installation
N1102.2.10.1	Slab-on-grade floor insulation installation
N1102.2.11.1	Crawl space wall insulation installation
N1102.5.1.1	Installation
N1102.5.1.2	~~Testing~~ Air leakage testing
N1102.5.1.3	Maximum air leakage rate
N1102.5.2	Fireplaces
N1102.5.3	Fenestration air leakage
N1102.5.4	Rooms containing fuel burning appliances
N1102.5.5	Recessed lighting
N1102.5.6	Air sealed electrical and communication outlet boxes
N1106.3	Building thermal envelope
Mechanical	
N1103.1	Controls
N1103.2	Hot Water boiler temperature reset
N1103.3 except	Duct systems
N1103.4	Mechanical system piping insulation
N1103.5 except Section N1103.5.2	Service hot water systems
N1103.5.2	Hot water pipe insulation
N1103.6	Mechanical ventilation
N1103.7, except Section N1103.7.1	Equipment sizing and efficiency rating
N1103.8	Systems serving multiple dwelling units
N1103.9	Snow melt and ice system controls
N1103.11	Energy consumption of pools and spas
N1103.12	Portable spas
N1103.13	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
N1104.1	Lighting equipment
N1104.2	Interior lighting controls
N1104.5	Electric readiness
N1104.6	Renewable energy infrastructure
N1104.7	Electric Vehicle power transfer infrastructure

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

Reason: This proposals seeks a more logical organization of the code. It only updates the organization of the code and does not change technical requirements. More specifically, it separates the mandatory maximum air leakage rate (required across all compliance pathways) from the test method section by moving the existing language into a separate section identified as mandatory. This is intended to improve the code readability and the ease of understanding the code.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal does not change requirements but only reorganizes the code for readability and clarity.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Improves the clarity of the code by clearly separating test protocols from maximum air leakage rate criteria.

Proposal # 1316

RED1-226-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA
Ceiling/attic	An ~~sealed~~ air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be air sealed with gasketing materials that allow for repeated entrance over time.

Reason: This proposal removes the redundant term "sealed." It is already required that breaks and joints in the air barrier are sealed. The term “sealed air barrier” can be interpreted as a new term different from “air barrier” with sealed joints. Therefore, it will lead to issues in the field with interpretation of the code. It’s not the air barrier that gets sealed, it’s the joints that get sealed.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change is editorial and will not effect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Helps clarify the code by reducing potential for misinterpretation.

Proposal # 1035

RED1-229-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Common walls or double walls separating attached single-family dwellings or townhouses	~~Air sealing materials recognized in a listed fire-resistance rated common wall or double wall design and installed in accordance with the listing, or air sealing materials recognized in an approved design, shall be used.~~ ~~Common walls or double walls shall be considered an exterior wall for the purposes of air barrier and air sealing application of this Table.~~ An interior air barrier shall be provided. Air sealing at the intersections with building thermal envelope shall be provided. Where installed in a fire-resistance rated wall assembly, air sealing materials shall comply with one of the following: 1. be in accordance with an *approved* design for the fire resistance-rated assembly. 2. be supported by *approved* data that shows the assembly as installed complies with the required fire-resistance rating	Insulation materials recognized in the *approved* ~~listed~~ common wall or double-wall design and installed in accordance with the ~~listing, or insulation materials recognized in the~~ *approved* design~~,~~ shall be permitted to be used.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: The proposal resolves several issues with the current language:
1. The revised language clearly identifies that the provisions are intended to apply to townhomes. The terms "double wall" and "common wall" were originally adopted from IRC Section R302.2 Townhomes. However, both terms can apply to other uses such exterior double walls.

2. The revised language requires that an air barrier be provided without limiting the designer's choice on the type of fire-rated assembly or imposing overly prescriptive provisions.

3. The revised language requires that the boundary of the fire rated assembly be sealed to the exterior wall (air barrier materials installed on the outside of the assembly do not impact the fire rating).

4. The revised language removes the highly problematic language that the common wall shall be considered an exterior wall. These walls are not exterior walls. The energy code cannot require that the shaft liner panels be sealed at the H-channel. There are no listed assemblies that allow that. In addition, Section R402.5 Air Leakage or Table R402.5.1.1 do not use the term "exterior wall" in this manner elsewhere. This language is replaced by the sentence requiring that the air barrier be provided at these wall assemblies.

5. The proposal also adds a compliance option for using are sealing materials that are approved for use in similar fire rated systems. The installation of air sealing is limited only to the perimeter of the assembly and intersections with other assemblies.

6. The revised language also clarifies that it is not a requirement to insulate common walls. These walls do not represent exterior building boundary. The current language may lead the code user to an interpretation that common walls must be insulated to the same level as exterior walls.

During testimony it was stated that these provisions can be met by installation of proprietary foam products in the gap between the liner panels and framing. However, the same gap can be filled with strips of the same liner panels and complemented with other air sealing strategies. In addition, the area separation wall system is not the only strategy for achieving the required fire rating. The current language limits other wall options.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposed language is intended to provide clarity and allow options for achieving air sealing of fire rated assemblies. It may or may not impact cost.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Resolves potential conflict in draft 1 language for fire-resistance rated wall assemblies and provides more clarity.

Proposal # 1041

RED1-230-22

Proponents: Robert Schwarz, representing BUILDTank, Inc. (robby@btankinc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a].

COMPONENT	AIR BARRIER AND AIR SEALING CRITERIA	INSULATION INSTALLATION CRITERIA
Floors, including cantilevered floors and floors above garages	~~The air barrier shall be installed, and air sealed to maintain its continuity at any exposed edge s of insulation the insulated floor cavity.~~ <u>Floor framing members that are part of the building thermal envelope shall be air sealed to maintain a continuous air barrier.</u> <u>Air permeable floor cavity insulation shall be enclosed</u>	Floor ~~framing cavity~~ insulation shall be installed <u>in accordance with the requirements of Section R402.2.8.</u> ~~to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.~~

Reason: Table R402.4.1.1 has continued to evolve to recognize other component installation requirements that have been defined in Sections R402.2.1 through R402.2.13. Floor insulation installation requirements specifically, in Section R402.2.7 of the 2021 IECC, have changed and the Component section of Floors in Table R402.4.1.1 has not changed in the same way causing inconsistency between the two sections of code. The proposal has been simplified in the public comment and uses now common language in the table to refer the user to Section R402.2.7 as a reference.

Component Criteria: No Changes proposed.

Air barrier and air sealing criteria section:

- Floor cavities are wall cavities laid down, therefore, air permeable insulation installed inside the cavity also needs to be enclosed by the air barrier assembly. As the IECC now allows three insulation techniques for insulating floors as seen in Section R402.2.7 it becomes more important to ensure that the rim joist of the insulated floor not only get insulated but is airtight because the insulation is no longer required to be installed adjacent to the subfloor decking. The proposed language brings this to light for builders and trades that are executing the code requirements.

Insulation Installation Criteria:

- The insulation installation criteria outlined in Section R402.2.7 clearly describes how insulation in floor systems must be installed. There is no need to further explain it in this table,

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposed language does not increase the cost of construction but rather offers clarity of existing requirements for inspection and installation of insulation.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Addressing previous comments made in RED1-18 and referring back to table we had approved in REDC1-11.

Proposal # 1010

RED1-231-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER CRITERIA
Electrical,communication, and other equipment boxes, housings, and enclosures	Boxes, housing, and enclosures that penetrate the air barrier shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing, or enclosure shall be sealed. ~~The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier.~~ Alternatively, air-sealed boxes shall be installed in accordance with R402.5.6.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: This proposal removes duplicative and unnecessary language. The requirements for air barrier around boxes, housings and enclosures is already addressed by the first sentence in this cell, which states that boxes, housing and enclosures shall be sealed to the air barrier. This requirement will ensure the continuity of the air barrier. The third sentence is recommended for deletion because it effectively re-states the same requirement and does not provide new information. Duplicative requirements can lead to issues in the field with interpreting the intent of the code and should be removed.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change is editorial and will have no effect on the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal removes redundant language.

Proposal # 1040

RED1-233-22

Proponents: Shannon Corcoran, representing American Gas Association

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	A sealed air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be air sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with Section R402.2.5 Eave Baffles shall be installed in accordance with Section R402.2.4
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	Framing cavities around windows, skylights and doors shall be completely filled with insulation or insulated per window manufacturer's instructions.
Rim joists	Rim joists shall include an air barrier. The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement, crawl space, and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.11. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the *International Residential Code*.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.9.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.11.
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required *R*-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.8.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.5.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required *R*-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.
Showers, tubs, and	An air barrier shall separate insulation in the	

Showers, tubs, and fireplaces adjacent to the building thermal envelope	An air barrier shall separate insulation in the *building thermal envelope* from the shower , tub , ~~and~~ or fireplace assemblies.	Exterior framed walls adjacent to showers , tubs and fireplaces shall be insulated.
Electrical,communication, and other equipment boxes, housings, and enclosures	Boxes, housing, and enclosures that penetrate the air barrier shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing, or enclosure shall be sealed. The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier. Alternatively, air-sealed boxes shall be installed in accordance with R402.5.6.	Boxes, housing, and enclosures shall be burried in or surrounded by insulation.
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	HVAC supply and return register boots located in the building's thermal envelope shall be buried and surrounded by insulation.
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—
Common walls or double walls	Air sealing materials recognized in a listed fire-resistance rated common wall or double wall design and installed in accordance with the listing, or air sealing materials recognized in an approved design, shall be used. Common walls or double walls shall be considered an exterior wall for the purposes of air barrier and air sealing application of this Table.	Insulation materials recognized in the listed common wall or double-wall design and installed in accordance with the listing, or insulation materials recognized in the approved design, shall be used.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Reason: As currently written, the tub and fireplace assemblies are one item. I believe the intent is to provide a barrier for any one of those installations.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This as an editorial change that should not affect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal removes redundant language.

Proposal # 1275

RED1-235-22

Proponents: Robert Schwarz, representing BUILDTank, Inc. (robby@btankinc.com)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a].

Component	Air Barrier, Air Sealing Criteria	Insulation Installation Criteria
Knee wall	Knee walls shall have an air barrier between conditioned and unconditioned space	Insulation installed in a knee wall assembly shall be installed in accordance with Section R402.2.3 Air-permeable insulation shall be enclosed inside an air barrier assembly.

Reason: Attic knee walls, in the field, are a unique assembly that have been overlooked by the IECC up until the 2024 IECC code development cycle when Section R402.2.3 Attic Knee Wall as well as a definition for knee wall, has been incorporated into the body of the code.
Now that knee walls are defined and Section R402.2.3 has been established it is important to incorporate Knee walls into Table R402.4.1.1 in the same way that other distinct assembly components have been incorporated.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Since Knee walls are now defined in the IECC and have been called out specifically and separately in Section R402.2.3 adding additional Air barrier, Air Sealing, and insulation installation requirements and clarification will not increase the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Conditioned spaces need air barriers on both sides of the wall

Proposal # 1009

RED1-237-22

Proponents: Hendrik Shank, representing New York State, Department of State (hendrikus.shank@dos.ny.gov); Daniel Carroll, representing Division of Building Standards & Codes (daniel.carroll@dos.ny.gov)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.5.1.2 Testing. The *building* or each *dwelling unit* in the buildingshall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 4.0 air changes per hour or 0.22 cfm/ft^2(1.1 L/s x m^2) of building or ~~dwelling unit enclosure area~~ *dwelling unit enclosure area*. 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.

Exceptions:

1. When testing individual ~~dwelling units~~ *dwelling units*, an air leakage rate not exceeding 0.27 cubic feet per minute per square foot [1.35 L/s x m^2)] of the ~~dwelling unit enclosure area~~ *dwelling unit enclosure area*, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch ~~w.g.~~ water gauge (50 Pa), shall be permitted in all ~~climate zones~~ *climate zones* for:

   1.1 Attached single and multiple family building dwelling units.

   1.2 Buildings or dwelling units that are 1,500 square feet (139.4 m^2) or smaller.

2. 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 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.
3. Where tested in accordance with R402.5.1.4, testing of each dwelling unit is not required.

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.

Mechanical ventilation shall be provided in accordance with Section M1505 of the *International Residential Code* or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of ventilation.

Reason: The intention of the editorial code change relating to water gauge is to keep the units consistent with other units in this code section and the units used in the fenestration air leakage provisions identified in Section R402.5.3 of the Draft 2024 IECC. The purpose of changing “dwelling unit enclosure area” to italic font is to inform the user that “dwelling unit enclosure area” is a defined term in Chapter 2.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change proposal is editorial so there is no cost impact associated with it.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Editorial modifications consistent with the intent of the applicable section and terminology.

Proposal # 1205

RED1-243-22 Part I

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

~~**R402.5.4**~~ **R402.1.6** **Rooms containing fuel-burning appliances.** In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room that is isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.3, where the walls, floors and ceilings shall meet a minimum of the *basement wall R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through *conditioned space* to an *R*-value of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.5.2 and Section R1006 of the International Residential Code.

Reason: This moves the section on "Rooms containing fuel-burning appliances" to a more appropriate place in the code. Currently, it is buried in the air leakage section, but contains more general requirements rather than only air leakage requirements.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal only reorganizes the code and makes no changes in requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal moves the fuel-burning appliance section to a more appropriate section.

Proposal # 1281

RED1-243-22 Part II

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 ENERGY Chapter11

Revise as follows:

~~**N1102.5.4**~~ **N1102.1.6** **Rooms containing fuel-burning appliances.** In Climate Zones 3 through 8, where opencombustion airducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room that is isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table N1102.1.3, where the walls, floors and ceilings shall meet a minimum of the *basement wall R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section N1103. The combustion air duct shall be insulated where it passes through *conditioned space* to an *R*-value of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections N1102.5.2 and R1006.

Reason: This moves the section on "Rooms containing fuel-burning appliances" to a more appropriate place in the code. Currently, it is buried in the air leakage section, but contains more general requirements rather than only air leakage requirements.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal only reorganizes the code and makes no changes in requirements.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Proposal moves the fuel-burning appliance section to a more appropriate section.

Proposal # 1310

RED1-249-22

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

2024 International Energy Conservation Code [RE Project]

SECTION R202
GENERAL DEFINITIONS

Revise as follows:

PROPOSED DESIGN. A description of the proposed *dwelling unit*~~*building*~~ used to estimate annual energy use for determining compliance based on simulated building performance.

SECTION R405
SIMULATED BUILDING PERFORMANCE

Revise as follows:

R405.1 Scope. This section establishes criteria for compliance using simulated building performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water-heating energy only. Such analysis shall be limited to *dwelling units*. Spaces other than *dwelling units* in Group R-2, R-3, or R-4 buildings shall comply with Sections R402 through R404.

R405.2 Simulated performance compliance. Compliance based on simulated~~total~~ building performance requires that a building~~*proposed design* meets all of~~ comply with the following:

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total building thermal envelope UA, which is the sum of the U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-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. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

(Equation 4-2)

$$\text{For Climate Zones 0-2: } UA_{\text{Proposed design}} \leq 1.08 \text{ x } UA_{\text{Prescriptive reference design}}$$

$$\text{For Climate Zones 3-8: } UA_{\text{Proposed design}} \leq 1.15\text{x } UA_{\text{Prescriptive reference design}}$$

3. For each dwelling unit~~buildings~~ without a fuel burning appliance for space heating or water heating, the annual energy cost of the proposed design that is less than or equal to 85 percent of the annual energy cost of the *standard reference design*. For each dwelling unit~~buildings~~ with a fuel burning appliance for space heating or water heating, the annual energy cost of the dwelling unit~~proposed design~~ that is less than or equal to 80 percent of the annual energy cost of the standard reference design. For each dwelling unit~~s~~ with greater than 5,000 square feet (465 m^2) of living space floor area located above grade plane, the annual energy cost of the dwelling unit~~proposed design~~ shall be reduced by an additional 5 percent of annual energy cost of the *standard reference design*. Energy prices shall be taken from a source *approved* by the *code official*, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

   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 multipliers for all energy sources shall be obtained from ASHRAE Standard 105 (Tables K2, K4, or K8) or from another data source approved by the *code official*.
   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 for an all-electric dwelling unit~~building~~ with on-site renewable energy installed.

R405.3 Documentation. Documentation of the software used for the proposed design, as-built dwelling unit, and the parameters for the *standard reference design*~~baseline *building*~~ shall be in accordance with Sections R405.3.1 through R405.3.2.2.

R405.3.1 Compliance software tools. Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the *code official.*

Revise as follows:

R405.3.2 Compliance report. Compliance software tools shall generate a report that documents that the *proposed design* and as-built *dwelling unit* complies with Section R405. 2~~3~~. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a confirmed compliance report based on the confirmed condition of the building shall be submitted to the *c ode official* before a certificate of occupancy is issued. Compliance reports shall include information in accordance with Sections R405.3.2.1 and R405.3.2.2.

R405.3.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other *building site* identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs entered into the software used to produce the results for the *standard reference design* and~~/or~~ the proposed design~~rated home~~.
5. A certificate indicating that the *proposed design* complies with Section R405. 2~~3~~. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation *R*-values or *U*-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. ~~If~~ Where on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
6. Where a site-specific report is not generated, the *proposed design* shall be based on the worst-case orientation and configuration of the rated dwelling unit~~home~~.

R405.3.2.2 Compliance report for certificate of occupancy. A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other *building site* identification.
2. Declaration of the simulated building performance path on the title page of the energy report and the title page of the building plans.
3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section R405.2~~3~~.
4. The name and version of the compliance software tool.
5. A site-specific energy analysis report that is in compliance with Section R405.4~~3~~ , where all inputs for the *proposed design* have been replaced in the simulation with confirmed energy features of the as-built *dwelling unit.*
6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the as-built building~~confirmed rated design of the built home~~ complies with Section R405. 2~~3~~. The certificate shall report the energy features that were confirmed to be in the building~~home~~, including component-level insulation *R*-values or *U*-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.
7. When on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

R405.4 Calculation procedure. Calculations ~~of the proposed design~~ shall be in accordance with Sections R405.4.1 and R405.4.2.

R405.4.1 General. Except as specified by this section, the *standard reference design*, ~~and~~ *proposed design*, and as-built *dwelling unit* shall be configured and analyzed using identical methods and techniques.

R405.4.2 Residence specifications. The *standard reference design*,~~and~~ *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 R402.1.3.

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
Air exchange rate	The air leakage rate at a pressure of 0.2 inch w.g. (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.	The measured air leakage ~~exchange~~ rate.[a]
	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 ~~exchange~~ 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 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.	The measured mechanical ventilation rate[b], Q, shall be in addition to the measured air leakage rate~~ and shall be as proposed~~.
Thermal distribution systems	Duct system leakage to outside: For duct systems serving > 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area. For duct systems serving ≤ 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 40 cfm (1132.7 L/min).	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:** 1. When 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. When total duct system leakage is measured without the air handler installed, the simulation value shall be 4 cfm (113.3 L/min) per 100 ft^2 (9.29 m^2) of conditioned floor area.

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. Where required by the code official, testing shall be conducted by an approved party. 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 ~~home~~ 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 the following assumptions shall be made for both the proposed design and standard reference design.

   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 §130.32

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.

R405.5.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the *standard reference design* and the *proposed design* and shall include the following capabilities:

1. Computer generation of the *standard reference design* using only the input for the *proposed design.* The calculation procedure shall not allow the user to directly modify the building component characteristics of the *standard reference design.*
2. Calculation of whole-dwelling unit~~building~~ (as a single *zone*) sizing for the heating and cooling equipment in the *standard reference design* residence in accordance with Section R403.7.
3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.

4. Printed *code official* inspection checklist listing each of the *proposed design* component characteristics from Table R405.4.2(1) determined by the analysis to provide compliance, along with their respective performance ratings such as *R*-value, *U*-factor, SHGC, HSPF 2, AFUE, SEER 2 and UEF.

Reason: This public comment is submitted to accomplish the following:

1. Clarify that for Group R-2 buildings, simulations are performed on the dwelling unit, not the whole building. Common spaces, such as lobbies, stairwells, corridors and amenity spaces shall follow requirements in R401 through R404.
2. For Group R-2, rather than require repetitive modeling of dwelling units with identical features, specifies a list of unit types that must be simulated.
3. Makes more explicit the process prior to CO (i.e., proposed design MUST be updated with as-built information) and creates a footnote to clarify that assumptions for tested results may be used at Proposed Design for the sake of the permit application.
4. Corrected some incorrect section references
5. Updates references to SEER, EF and HSPF to more current ratings

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

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: clarifying edits but could not reach consensus on the proposed edits related to sampling and a new footnote clarifying that measured values should replace assumed values in the simulations prior to CO. The motion was therefore modified to remove the text introducing sampling and the new footnote.

Proposal # 1143

RED1-250-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R405.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
Building Thermal Envelope	
~~R402.2.9~~	~~Basement walls~~
~~R402.2.9.1~~	~~Basement wall insulation installation~~
R402.2.10~~.1~~	Slab-on-grade floors ~~floor insulation installation~~
R402.2.11~~.1~~	Crawl space wall insulation ~~installations~~

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

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
Building Thermal Envelope	
~~R402.2.9~~	~~Basement walls~~
~~R402.2.9.1~~	~~Basement wall insulation installation~~
R402.2.10~~.1~~	Slab-on-grade floors ~~floor insulation installation~~
R402.2.11~~.1~~	Crawl space wall insulation~~ installation~~

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

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R402.2.10 Slab-on-grade floors. Slab-on-grade floors, in contact with the ground, with a floor surface within 24 inches (600 mm) above or below grade shall be insulated in accordance with one of the following:~~Table R402.1.3.~~

Exception: Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

R402.2.10.1 Slab-on-grade floor insulation installation. For buildings complying with Section R401.2.1,~~Where installed,~~ the slab edge continuous insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the vertical distance provided in Table R402.1.3 but need not exceed the footing depth in accordance with Section R403.1.4 of the *International Residential Code*. ~~Alternatively, a proposed design for slab insulation R-value and installation shall comply with Table R402.1.2, Section R402.1.5, or Section R405.~~ Where a proposed design includes insulation extending away from the building, it shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. ~~Where installed, full~~ Full slab insulation shall be continuous under the entire area of the slab-on-grade floor, except at structural column locations and service penetrations. Slab edge insulation required at the heated slab perimeter shall not be required to extend below the bottom of the heated slab and shall be continuous with the full slab insulation.

Add new text as follows:

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 ASHRAE 90.1 or, where adopted, Appendix RF of this code. Where used to comply with Section R401.2.1, the 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.

Revise as follows:

R402.2.11 Crawl space walls. Crawl space walls shall be insulated in accordance with one of the following: ~~Table R402.1.3.~~

Exception: Crawl space walls associated with a crawl space that is vented to the outdoors and the floor overhead is insulated in accordance with Table R402.1.3 and Section R402.2.8.

Add new text as follows:

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 ASHRAE 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 crawlspace walls.

Reason: Each of the sections proposed to be deleted from Tables R405.2 and R406.2 are prescriptive installation requirements that mandate a certain area of insulation be installed (under a full slab per footnote d to Table R402.1.3; top of the basement wall to 10 ft below grade or to the basement floor; crawlspace insulation from sill to base of foundation or to interior floor of crawlspace).
Mandating installation of specific areas - volumes - of insulation defeats the purpose of the performance paths, which are intended to permit the flexibility of trading some amount or area of insulation for other energy saving measures like additional insulation in some other area of the building.

There is no reason that an owner/designer/contractor should not be able to trade away 1/2 of the insulation on a basement wall. Ditto for underslab insulation and crawlspace wall insulation provided the any loss of energy efficiency is fully mitigated by other efficiency measures .

Cost Impact: The code change proposal will decrease the cost of construction.

The proposal protects trade-off flexibility which permits owners to find the most cost effective approach to energy code compliance.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The Committee supported the modified proposal because it clarifies application of performance path requirements for slab and crawl space insulation.

Proposal # 1076

RED1-251-22

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

2024 International Energy Conservation Code [RE Project]

SECTION R405
SIMULATED BUILDING PERFORMANCE

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
Air exchange rate	For detached one-family dwellings, t~~T~~he air leakage rate at a pressure of 0.2 inch water gauge ~~w.g.~~ (50 Pa) shall be Climate Zones 0 through 2: 4.0~~5.0~~ 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 ft^2 (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~~exchange~~ rate.[a]
	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~~exchange~~ 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 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.~~	The measured mechanical ventilation rate[b], Q, shall be in addition to the measured air leakage rate ~~and shall be as proposed~~.
Mechanical ventilation	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 Air Exchange 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

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. ~~Where required by the code official, testing shall be conducted by an approved party.~~ 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

   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 §130.32

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.

Reason: Based on another public comment to add a 0.25 cfm50/ft2 metric for the air leakage threshold for attached units and smaller homes when using the Prescriptive Compliance option, this public comment adds those same metrics/thresholds to the Standard Reference Design (SRD). Additionally, given that air “exchange” rate is the combination of air “leakage” and mechanical ventilation, some revisions are made to phrasing to maintain that intent.

Also, the text related the ERV and HRVs in the SRD is better placed in the row called “Mechanical Ventilation” rather than “Air exchange rate”, so this PC proposes to move it.

Also, footnote a contains text redundant to R402.5.1.2, so is struck in this PC.

Finally, an Errata was submitted clarifying that the Committee previously voted to approve REPI-63, therefore the 5.0 ACH50 is revised to 4.0 ACH50, as approved previously by the Committee.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
None

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: [The Committee voted in favor of the proposal which moves ventilation text into the mechanical ventilation row in Table R405.4.2(1) and adds the Prescriptive CFM50/ft2 air leakage values in the Standard Reference Design for the types of dwelling units that are permitted to use that metric. The modification at the Sub-Committee corrected the 0.25 to read 0.27, and the additional modification that was approved was editorial, to use air leakage phrasing consistent with action taken by the Consensus Committee on RED1-224.]

Proposal # 1164

RED1-252-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

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~~absorptance~~ = 0.25~~0.75~~.	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~~absorptance~~ = 0.25~~0.75~~.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 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.	The measured air exchange rate.[a]
	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:	

Air exchange rate	where: B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air exchange 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 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.	The mechanical ventilation rate[b] , Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 Air Exchange 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 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.	
	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
	Non-electric furnaces: Complying with 10 CFR §430.32	As proposed
	Non-electric boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section R403.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
		As proposed Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 − *HWDS*)

<table>
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<tr><td>Fuel Type: Same as proposed design</td><td>As proposed</td></tr>
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All other: 75% in unconditioned attic and 25% inside conditioned space</td><td>One-story building: 100% in unconditioned crawlspace

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<tr><td>Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed.</td></tr>
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For duct systems serving > 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area.
For duct systems serving ≤ 1,000ft2 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 measure total duct system leakage rate shall be entered into the software as the duct system leakage to outside rate.
Exceptions:
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<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>
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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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

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 §130.32

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.

2024 ENERGY Chapter11

Revise as follows:

TABLE N1105.4.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

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 N1102.1.2.	As proposed
	Solar reflectance~~absorptance~~ = 0.25~~0.75~~.	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 N1102.1.2, 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 N1102.1.2.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1102.1.2.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar reflectance~~absorptance~~ = 0.25~~0.75~~.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft^2.	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified in Table N1102.1.2.	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 N1102.1.2.	As proposed
	SHGC: as specified in Table N1102.1.2 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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 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.	The measured air exchange rate.[a]

Air exchange 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 thanB x M where:B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air exchange 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 mechanical ventilation system type shall be the same as in the proposed design. Heat recovery or energy recovery shall be modeled assumed for mechanical ventilation where required by Section N1103.6.1. Heat recovery or energy recovery shall not be modeled for mechanical ventilation where not required by Section N1103.6.1..	The mechanical ventilation rate[b] ,Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 x B x M)/ef where: e_f = the minimum fan efficacy, as specified in Table N1103.6.2, corresponding to the system type at a flow rate of B x 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 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 N1102.1.3, 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section N1103.7.	As proposed
	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
	Non-electric furnaces: Complying with 10 CFR §430.32	As proposed
	Non-electric boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section N1103.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
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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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

   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 §130.32

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.
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-	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 N1105.4.2(1), the standard reference design shall be the same as proposed design.

Reason: Within the IECC residential provisions and IRC Chapter 11 of the 1st Public Comment Draft, there are only two instances where "solar absorptance" is used. In contrast, there are multiple uses of "solar reflectance" in IECC Section R408.2.1.3 and IRC Section N1108.2.1.3. This comment changes those two instances of "solar absorptance," and the associated values, to make all uses consistent throughout the residential provisions. The intended result is less confusion in understanding roof radiative property requirements in different portions of the IECC and IRC. CED1-197-22 proposes the same changes in the commercial provisions.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The changes proposed in this comment align language across sections of the code without making technical modifications. Therefore, there is no impact on cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Aligns terms with those used in the body of the residential code; also consistent with action take for the commercial code

Proposal # 981

RED1-253-22

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

2024 International Energy Conservation Code [RE Project]

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 roof surface complies with one of the options in Table C402.3 of the *International Energy Conservation Code*—Commercial Provisions or the~~ exterior 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 (21-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.

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

TABLE R407.1 MINIMUM 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.

Reason: Section R101.5 clearly requires that residential buildings comply with the IECC-R rather than the IECC- commercial provisions.
The original proponent of this section should do the work of incorporating the actual requirements for the benefit of the code user instead of referencing a code that may not be adopted.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
There will be no cost impact if the original proponent does the work of incorporating the provisions they wish to see applied.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Removes the reference to the IECC-C and brings in the table.

Proposal # 1100

RED1-254-22

Proponents: Dynice Broadnax, representing SELF (cdpsadynice@iccsafe.org); Jennifer Hatfield, representing Fenestration & Glazing Industry Alliance (formerly AAMA) (jen@jhatfieldandassociates.com)

2024 International Energy Conservation Code [RE Project]

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 UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
~~R408.2.1.2(1)~~	~~0.22 U-factor windows~~	~~1~~	~~2~~	~~2~~	~~3~~	~~3~~	~~4~~	~~4~~	~~4~~	~~5~~
R408.2.1.2(2)	U-factor and SHGC for ~~windows~~ vertical fenestration per Table R408.2.1	1	1	1	~~0~~ 2	~~0~~ 1	~~0~~ 1	~~0~~ 1	1	2
R408.2.1.3	Cool Roof	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.2(1)	High performance cooling system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2)	High performance cooling system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)	High performance gas furnace option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4)	High performance gas furnace option 2	0	0	0	0	0	TBD	TBD	TBD	0
R408.2.2(5)	High performance gas furnace and cooling system option 2	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
R408.2.2(6)	High performance gas furnace and heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(7)	High performance gas furnace option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(8)	High performance heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(9)	High performance heat pump system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(10)	High performance heat pump system option 3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(11)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(12)	Ductless - Single zone	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(13)	Ductless - Multizone (Non-ducted indoor unit)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)	Ductless – Multizone (Ducted or Mixed)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(1)	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
R408.2.3(2)	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(3)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(4)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(5)	Solar hot water heating system	4	5	6	6	6	6	5	5	4
R408.2.3(6)	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)	More efficient distribution system	4	6	7	10	10	12	13	15	16
R408.2.4(2)	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
R408.2.5(2)	2 ACH50 air leakage rate with	2	3	2	4	4	5	6	6	6

[illegible]	balanced ventilation	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R408.2.5(3)	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
R408.2.5(4)	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
R408.2.6	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
R408.2.9	Demand responsive thermostat	1	1	1	1	1	1	1	1	1

R408.2.1.2 Improved fenestration. The area weighted average U-factor and SHGC of all vertical ~~Vertical~~ fenestration ~~shall meet one of the following:~~ shall be equal to or less than values specified in Table R408.2.1.2

~~1. U-factor equal to or less than 0.22~~

~~2. U-factor and SHGC shall be equal to or less than that values specified in Table R408.2.1.2~~

TABLE R408.2.1.2 IMPROVED FENESTRATION

Climate Zone	~~Fenestration~~ U-factor	~~Fenestration~~ SHGC
0	0.32	0.23
1	0.32	0.23
2	0.30	0.23
3	~~0.25~~ 0.28	~~0.25~~ 0.23
4 except 4 Marine	~~NA~~ 0.25	~~NA~~ 0.40
5 and 4 Marine	~~NA~~ 0.25	~~NA~~ NR
6	~~NA~~ 0.25	~~NA~~ NR
7 and 8	0.25	~~NA~~ NR

Reason: A number of changes are necessary in section R408 for fenestration in order to make the section more usable, improve the accuracy of credits allocated, and improve clarity and consistency.

- Climate Zone 4 has been modified to exclude Zone 4 Marine and Zone 4C changed to 4 Marine on order to make it consistent with the prescriptive tables.
- The 0.22 U-Factor measure has been removed. This is done because the associated points are only accurate with a 15% windows to floor area ratio that was used for the analysis. There are already multiple options to change the thermal performance of the building envelope which is a more accurate alternative that accounts for window area and better represents the savings associated with improving the building envelope.
- Section R408.2.1.2 has been rewritten for clarity and to insure that window U-factor and SHGC weighted averages are permitted to achieve the Improved Fenestration target values.
- Table R408.2.1.2 has been modified to include values for climate zones 4-6. It is believed that the overall energy savings is sufficient to earn 1 or 2 credits (needs to be verified by PNNL).
- NAs have been changed to NRs to be consistent with the terminology in the prescriptive tables.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No change in cost.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: A number of changes are necessary in section R408 for fenestration in order to make the section more usable, improve the accuracy of credits allocated, and improve clarity and consistency.

Proposal # 1408

RED1-255-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R408.2.1.3 Roof reflectance. Roofs 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:
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.

3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (74 kg/m2) or 23 psf (117 kg/m2) pavers.

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

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
R408.2.1.3	~~Cool Roof~~ 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	Roof reflectance (roof is above an unconditioned space that contains a duct system)	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.2(1)	High performance cooling system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2)	High performance cooling system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)	High performance gas furnace option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4)	High performance gas furnace option 2	0	0	0	0	0	TBD	TBD	TBD	0
R408.2.2(5)	High performance gas furnace and cooling system option 2	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
R408.2.2(6)	High performance gas furnace and heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(7)	High performance gas furnace option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(8)	High performance heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(9)	High performance heat pump system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(10)	High performance heat pump system option 3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(11)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(12)	Ductless - Single zone	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(13)	Ductless - Multizone (Non-ducted indoor unit)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)	Ductless – Multizone (Ducted or Mixed)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(1)	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
R408.2.3(2)	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(3)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(4)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(5)	Solar hot water heating system	4	5	6	6	6	6	5	5	4
R408.2.3(6)	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)	More efficient distribution system	4	6	7	10	10	12	13	15	16
R408.2.4(2)	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
R408.2.5(2)	2 ACH50 air leakage rate with balanced ventilation	2	3	2	4	4	5	6	6	6
R408.2.5(3)	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
R408.2.5(4)	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
R408.2.6	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
R408.2.9	Demand responsive thermostat	1	1	1	1	1	1	1	1	1

2024 ENERGY Chapter11

Revise as follows:

N1108.2.1.3 Roof reflectance. Roofs shall comply with one or more of the options in Table N1108.2.1.3. The following roofs and portions of roofs are excluded from the roof reflectance credit:

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.

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 of this section.

TABLE N1108.2 CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Credit Value								
Climate Zone 0 & 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8		
N1108.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
N1108.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
N1108.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
N1108.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
N1108.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
N1108.2.1.3	~~Cool Roof~~ 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
N1108.2.1.3	Roof reflectance (roof is above an unconditioned space that contains a duct system)	TBD	TBD	TBD	TBD	TBD	0	0	0	0
N1108.2.2(1)	High performance cooling system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(2)	High performance cooling system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(3)	High performance gas furnace option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(4)	High performance gas furnace and cooling system option 1	0	0	0	0	0	TBD	TBD	TBD	0
N1108.2.2(5)	High performance gas furnace and cooling system option 2	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
N1108.2.2(6)	High performance gas furnace and heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(7)	High performance gas furnace option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(8)	High performance heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(9)	High performance heat pump system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(10)	High performance heat pump system option 3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(11)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(12)	Ductless - Single zone	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(13)	Ductless - Multizone (Non-ducted indoor unit)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.2(14)	Ductless - Multizone (Ducted or Mixed)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.3(1)	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
N1108.2.3(2)	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.3(3)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.3(4)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
N1108.2.3(5)	Solar hot water heating system	4	5	6	6	6	6	5	5	4
N1108.2.3(6)	Compact hot water distribution	2	2	2	2	2	2	2	2	2
N1108.2.4(1)	More efficient distribution system	4	6	7	10	10	12	13	15	16
N1108.2.4(2)	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
N1108.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
N1108.2.5(1)	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
N1108.2.5(2)	2 ACH50 air leakage rate with balanced ventilation	2	3	2	4	4	5	6	6	6
N1108.2.5(3)	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
N1108.2.5(4)	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
N1108.2.6	Energy efficient appliances	9	8	8	7	7	5	5	5	4
N1108.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
N1108.2.9	Demand reponsive thermostat	1	1	1	1	1	1	1	1	1

Reason: Placing "cool roofs" in the additional efficiency requirements section permits design professionals to utilize reflective roofs to achieve an

energy efficiency improvement when appropriate based on project specifics. However, as presently configured, selection of the cool roof credit may allow fulfillment of credit requirements without the intended improvement in energy efficiency. This comment modifies this section to ensure that, when a cool roof is selected, it can be expected to improve energy efficiency.
R408.2.1.3 (N1108.2.1.3). Under certain circumstances, installation of a reflective roof will not yield an improvement in energy efficiency. These limitations are already present in the IECC commercial provisions (C402.4 of the 1st Public Comment Draft). This comment incorporates those existing limits into the residential provisions. Doing so will prevent someone from asserting energy efficiency improvement via installation of a reflective roof when, for example, the roof is located beneath a photovoltaic array.

Table R408.2 (N1108.2). Replace the existing "cool roof" row in the table with two rows that recognize that energy efficiency improvement from a reflective roof is contingent on other conditions. One row acknowledges that energy efficiency gains may be available in certain climate zones when a reflective roof is part of the *building thermal envelope* and is above cooled, conditioned space. The other row recognizes the potential energy efficiency benefit in certain climate zones when a reflective roof is installed above an unconditioned space that contains ducts that are insufficiently insulated. By establishing separate rows in the table that recognize the interdependency of reflective roofing and other building elements, this comment supports analysis that assigns appropriate credits based on building construction details.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This comment clarifies the situations in which a reflective roof may offer energy efficiency benefits. This comment is not expected to affect cost of construction because it only adds guidance to ensure selection of an additional energy efficiency credit that saves energy.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: improves the accuracy of this credit.

Proposal # 982

RED1-256-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R408.2.1.3 Roof reflectance. Roofs in Climate Zones 0-4 and 4C shall comply with one or more of the options in Table R408.2.1.3.

2024 ENERGY Chapter11

Revise as follows:

N1108.2.1.3 Roof reflectance. Roofs in Climate Zone 0-4 and 4C shall comply with one or more of the options in Table N1108.2.1.3.

Reason: This public comment code change proposal further clarifies that the roof reflectance criteria options are only required in these specific climate zones based upon the "TBD" credits in Table R408.2 (N1108.2).

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Clarified the application of the provision.

Proposal # 1430

RED1-257-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R408.2.1.3 MINIMUM ROOF REFLECTANCE[a]

ROOF SLOPE	THREE-YEAR AGED SOLAR REFLECTANCE INDEX[b]
Low-slope	75~~[b, c]~~
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. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.~~

b.~~c.~~ 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 aged solar reflectance ~~required by Section R402.6~~ is not available, it shall be determined in accordance with Equation 4-4

(Equation 4-4)

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

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

2024 ENERGY Chapter11

Revise as follows:

TABLE N1108.2.1.3 MINIMUM ROOF REFLECTANCE[a]

ROOF SLOPE	THREE-YEAR AGED SOLAR REFLECTANCE INDEX[b]
Low-slope	75~~[b,c]~~
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 N1108.2.1.3.1.

~~b. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-S100.~~

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

N1108.2.1.3.1 Aged solar reflectance. Where an aged solar reflectance~~ required by Section N1102.6~~ is not available, it shall be determined in accordance with Equation 11-8.

(Equation 11-8)

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

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

2024 International Energy Conservation Code [RE Project]

Add new standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

C1371-15(2022)	Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
E408-13(2019)	Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

Reason: This comment cleans up the roof reflectance provisions in Section R408 and Section N1108. Modifications are summarized as follows:

- Remove footnote b and place the necessary information into the final footnote, which is re-identified from "c" to "b".
- Delete footnote references "b" and "c" in the second row of Tables R408.2.1.3 and N1108.2.1.3.
- Add additional acceptable test methods C1371 and E408 for thermal emittance in the final footnote of Tables R408.2.1.3 and N1108.2.1.3. This coordinates with options present in the Commercial 1st Public Comment Draft.
- Align content of the final footnote of Table N1108.2.1.3 with the content of the Table R408.2.1.3 footnote. For some reason, these do not match in the 1st Public Comment Draft.
- Add alternative solar reflectance test methods in the "$R_{initial}$" term description to coordinate with options already offered in footnotes to the Tables.
- Remove from R408.2.1.3.1 the reference to section R402.6, which is no longer accurate.
- Remove from N1108.2.1.3.1 the reference to section N1102.6, which is no longer accurate.
- Add ASTM C1371 and ASTM E408 as new standards within Chapter 6 of the residential provisions. They are already present in Chapter 6 of the commercial provisions.
- To coordinate with this comment, add ASTM C1371, ASTM C1549, ASTM E408, ASTM E903, ASTM E1918, and ASTM E1980 to Chapter 44 of the IRC.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This comment primarily makes improvements for clarity, which should have no impact on cost of construction. The addition of more options for measuring radiative properties provides greater flexibility but is not expected to lead to a change in cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Clarifies footnotes and aligns IECC-R provision with IRC Ch11 provision.

Proposal # 957

RED1-260-22

Proponents: Hendrik Shank, representing New York State, Department of State (hendrikus.shank@dos.ny.gov); Daniel Carroll, representing Division of Building Standards & Codes (daniel.carroll@dos.ny.gov)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R503.1.1 Building thermal envelope. Alterations of existing building thermal envelope assemblies shall comply with this section. New Building building thermal envelope assemblies that are part of the *alteration* shall comply with Section R402. In no case shall the R-value of insulation be reduced or the U-factor of a building thermal envelope assembly be increased as part of a building thermal envelope alteration.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the ~~building~~ *building* is not increased:

1. Storm windows installed over existing fenestration.
2. ~~Roof recover~~ *Roof recover*.
3. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
4. An existing building undergoing alterations that is demonstrated to be in compliance with Section R405 or Section R406

Reason: The purpose of this code change proposal is to change the title of the code section from “building envelope” to the defined term in Chapter 2, “building thermal envelope”, and to italicize the defined terms “building” and “roof recover” in the same code section.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change proposal is editorial so there is no cost impact associated with it.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Editorial modification to italicize terms where the use is consistent with definitions.

Proposal # 1203

RED1-261-22

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

2024 International Energy Conservation Code [RE Project]

APPENDIX RF
ALTERNATIVE BUILDING THERMAL ENVELOPE INSULATION R-VALUE OPTIONS

Add new text as follows:

RF 101 GENERAL. \
RF101.1 General. This appendix shall be used as a basis to determine alternative building assembly and insulation component R-value solutions that comply with the maximum U-factors and F-factors in Table R402.1.2 of this standard. Alternative building assembly insulation solutions determined in accordance with this appendix also shall comply with the requirements of Section R702.7 of the *International Residential Code.*

Revise as follows:

~~RF101~~ RF102
ABOVE-GRADE WALL ASSEMBLIES

Reason: Appendix RF is missing a general section establishing the scope and purpose of the appendix and also related general requirements important to proper application of the appendix in coordination with the IECC standard and also related IRC building code provisions, such as R702.7 for water vapor control (which may constrain appropriate insulation solutions used to comply with the IECC or vice versa).

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The added general section does not change requirements in Appendix RF and clarifies how to properly apply the requirements of the Appendix in coordination with the IECC provisions and the building code. This will not impact cost of construction but will help ensure it is compliant with the intended application of Appendix RF.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: This proposal adds a general section which is consistent with other appendices in the code.

Proposal # 1345

RED1-263-22

Proponents: Sean Denniston, representing New Buildings Institute (sean@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Add new definition as follows:

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 required to correct health, sanitary or safety code violations ordered by the building official.
2. Alteration of a historic building where the alteration will not affect the designation as a historic building.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.1.1(1)	≥2.5% Reduction in total UA	0	0	0	1	1	1	1	1	1
R408.2.1.1(2)	≥5% reduction in total UA	0	1	1	2	2	3	3	3	3
R408.2.1.1(3)	>7.5% reduction in total UA	0	1	2	2	2	3	3	4	4
R408.2.1.2(1)	0.22 U-factor windows	1	2	2	3	3	4	4	4	5
R408.2.1.2(2)	U-factor and SHGC for windows per Table R408.2.1	1	1	1	0	0	0	0	1	2
R408.2.1.3	Cool Roof	TBD	TBD	TBD	TBD	TBD	0	0	0	0
R408.2.2(1)	High performance cooling system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2)	High performance cooling system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)	High performance gas furnace option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4)	High performance gas furnace option 2	0	0	0	0	0	TBD	TBD	TBD	0
R408.2.2(5)	High performance gas furnace and cooling system option 2	TBD	TBD	TBD	TBD	TBD	0	0	0	TBD
R408.2.2(6)	High performance gas furnace and heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(7)	High performance gas furnace option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(8)	High performance heat pump system option 1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(9)	High performance heat pump system option 2	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(10)	High performance heat pump system option 3	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(11)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(12)	Ductless - Single zone	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(13)	Ductless - Multizone (Non-ducted indoor unit)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)	Ductless – Multizone (Ducted or Mixed)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(1)	Gas-fired storage water heaters	7	6	5	3	3	2	2	3	1
R408.2.3(2)	Gas-fired instantaneous water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(3)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(4)	Electric water heaters	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.3(5)	Solar hot water heating system	4	5	6	6	6	6	5	5	4
R408.2.3(6)	Compact hot water distribution	2	2	2	2	2	2	2	2	2
R408.2.4(1)	More efficient distribution system	4	6	7	10	10	12	13	15	16
R408.2.4(2)	100% of ducts in conditioned space	4	6	8	12	12	15	17	19	20
R408.2.4(3)	Reduced total duct leakage	1	1	1	1	1	1	2	2	2
R408.2.5(1)	2 ACH50 air leakage rate with ERV or HRV installed	1	4	5	10	10	13	15	8	8
R408.2.5(2)	2 ACH50 air leakage rate with balanced ventilation	2	3	2	4	4	5	6	6	6

R408.2.5(3)	1.5 ACH50 air leakage rated with ERV or HRV installed	2	4	6	12	12	15	18	11	11
R408.2.5(4)	1 ACH50 air leakage rate with ERV or HRV installed	2	5	6	14	14	17	21	14	14
R408.2.6	Energy efficient appliances	9	8	8	7	7	5	5	5	4
R408.2.7	Renewable energy measures	17	16	17	11	11	9	8	7	4
R408.2.9	Demand responsive thermostat	1	1	1	1	1	1	1	1	1
R408.2.10	Higher efficacy lighting	1	1	1	1	1	1	1	1	1

Add new text as follows:

R408.2.10 Higher efficacy lighting. All spaces shall be provided with hard wired lighting with a lamp efficacy of 90 lm/W or a luminaire efficacy of 55 lm/W.

Exception: Closets and other storage spaces.

Revise as follows:

R502.2.5 Additional Efficiency credit requirements for additions~~Packages~~. *Additions* shall ~~comply with Section R506~~ comply with sufficient measures from Table R408.2 to achieve not less than 5 credits. *Alterations* to the existing building that are not part of the *addition*, but permitted with the *addition*, shall be permitted to be used to achieve this requirement.

Exceptions:

1. *Additions* that increase the building's total conditioned floor area by less than 25 percent.
2. *Additions* that do not include the addition or replacement of equipment covered in Sections R403.5 or R403.7.
3. Additions that do not ~~contain~~ increase conditioned space.
4. Where the *addition* alone or the existing building and *addition* together comply with Section R405 or R406.

R503.1.5 Additional Efficiency credit r equirements for substantial improvements~~Packages~~. ~~Alterations shall comply with Section R506 where the alteration contains replacement of two or more of the following:~~ *Substantial improvements* shall comply with sufficient measures from Table R408.2 to achieve not less than 3 credits.

1. ~~HVAC unitary systems or HVAC central heating or cooling equipment serving the *work area* of the *alteration*.~~
2. ~~Water heating equipment serving the *work area* of the *alteration*.~~
3. ~~50 percent or more of the lighting fixtures in the *work area* of the *alteration*.~~
4. ~~50 percent or more of the area of interior surfaces of the thermal envelope in the *work area* of the *alteration*.~~
5. ~~50 percent or more the area of the building's *exterior wall envelope*.~~

Exceptions:

1. *Alterations* that are permitted with an *addition* complying with Section ~~R502.3.5~~ R502.2.5.
2. *Alterations* that comply with Section R405 or R406.
3. *Substantial improvements* that do not include the addition or replacement of equipment covered in either Section R403.5 or Section R403.7.

~~**R506.1 General.**~~ ~~Where required in Section R502 or R503, the building shall comply with one or more additional efficiency package options in accordance with the following:~~

1. ~~Enhanced envelope performance in accordance with Section R408.2.1.~~
2. ~~More efficient HVAC equipment performance in accordance with Section R408.2.2.~~
3. ~~Reduced energy use in service water-heating in accordance with Section R408.2.3.~~
4. ~~More efficient duct thermal distribution system in accordance with Section R408.2.4.~~
5. ~~Improved air sealing and efficient ventilation system in accordance with Section R408.2.5.~~

Reason: This public comment does two things: it correlates the language with changes that were approved for Section R408 and it clarifies the language.

Alignment

The approved language in R503.1.5 was constructed to work with the 2021 version of Section R408, but Section R408 was ultimately modified for the public comment draft in ways that made it incompatible with this language. This public comment adapts the language to make it compatible with the new credit approach in R408. Since there are no more packages and R408 incorporates a target table, the new Section R506 is not necessary and has been struck. The additions and alterations sections just reference that table directly.

- **Target Setting:** The public comment sets the targets at 5 credits (about 50% of the target for new buildings) for subject additions and 1 credit for subject alterations. The new table approach is more flexible but provides less credit forexisting systems that meet the “substantial alteration” definition.
- **Additional Credit Option:** The credit table has no credit options for lighting. Since the definition of “substantial alteration” includes alterations to the lighting, the lack of a lighting option is problematic. Therefore, this PC adds an additional credit option for lighting that sets an efficacy requirement higher than the requirements in the main body of the code. It also requires that spaces have hard-wired lighting that meets the requirement to ensure that there are actually savings.

Language clarifications

During the committee hearing process for this language and related language in the commercial section, this new code section received substantial support, but there were some concerns, particularly the clarity of the language, the alteration threshold for the requirement and the compliance criteria.

- **Clarity of the Language:** The original language was structured so that only "substantial" alterations would be subject to the requirements. This was done by creating an exception that effectively defined an alteration that was not substantial and exempted those alterations. During the committee process, concerns were raised about how this was a confusing way to structure the requirement even if the language itself was reasonably clear. In order to increase clarity, the language was reconfigured so that the threshold would not be defined through the exception.This public comment defines a new term: "substantial energy alteration" and only makes this specific kind of alteration subject to the requirements. The definition of the term is largely the same as the exception, except expressed in terms of what it is instead of what it isn't. This is clearer since alterations that are not substantial energy alterations will not even need to look at the section. This term was chosen because it follows an approach to substantial alterations that is already in the code. The International Existing Building Code (IEBC) has a definition for "substantial structural alteration" that sets a threshold for alterations to the structure that are considered substantial enough for special requirements. This definition does the same thing, it creates a threshold for alterations to the energy systems that are substantial enough for special requirements. This definition is mirrored in a public comment for the commercial section.
- **Threshold:** The other concern raised was that the original language defined the substantial alteration as one that impact more that 50% of the systems serving the alteration area. Concerns were raised that the area of an alteration is difficult to define. Concerns were also raised that even if the alteration area is defined, it could be easy for substantial alterations to a limited part of the building to meet the threshold but hard for them to achieve points, particularly areas of the building served by central systems. To address this issue, this public comment changes the threshold for the alteration from just the alteration area to the entire building. While there is some loss in stringency, this will be much easier to understand, much clearer to enforce, and much easier to comply with.
- **Compliance Criteria:** The third concern was related to clarity about what portion of the building would have to comply with the credit criteria to achieve the credit. It was not entirely clear whether the entire building would have to comply with the credit criteria or only the alteration. This was of special concern for multi-tenant buildings where portions of the building that are not part of the alteration may be inaccessible. The public comment adds language to make it clear that only the alteration needs to comply with the credits. But it also includes language to ensure that only portions of the alteration that cross that 50% impact threshold are able to be used.

Cost Impact: The code change proposal will decrease the cost of construction.
The PC results in slightly less stringency than the language in the public comment draft.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Proposal improves code by including flexibility of the additional energy efficiency table.

Proposal # 1085

RED1-264-22

Proponents: Patricia Chawla, representing Austin Energy (patricia.chawla@austinenergy.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

ADDITION. An extension or increase in the ~~*conditioned space*~~ floor area, number of stories or height of a building or structure.

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 involved 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*.

Add new definition as follows:

EXISTING BUILDING. A building erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.

Revise as follows:

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

R501.2 Compliance. *Additions*, *alterations*, *repairs* or changes of occupancy to, or relocation of, an existing *building*, *building* system or portion thereof shall comply with Section R502, R503, R504 or R505, respectively, in this code and the provisions for alterations, repairs, additions, and changes of occupancy or relocation, respectively, in the ***International Residential Code***, ***International Building Code***, ***International Existing Building Code***, ***International Fire Code***, ***International Fuel Gas Code***, ***International Mechanical Code***, ***International Plumbing Code***, ***International Property Maintenance Code***, ***International Private Sewage Disposal Code*** and **NFPA 70 as applicable**. Changes where unconditioned space is changed to *conditioned space* shall comply with Section ~~R502~~ R501.6.

~~**R501.4 Compliance.** *Alterations*, *repairs*, *additions* and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alterations*, *repairs*, *additions* and changes of occupancy or relocation, respectively, in this code and the *International Residential Code*, *International Building Code*, *International Existing Building Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *International Plumbing Code*, *International Property Maintenance Code*, *International Private Sewage Disposal Code* and NFPA 70.~~

~~**R501.5**~~ **R501.4 New and replacement materials.** Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for *repairs*, provided that hazards to life, health or property are not created. Hazardous materials shall not be used where the code for new construction would not allow their use in *buildings* of similar occupancy, purpose and location.

~~**R501.6**~~ **R501.5 Historic buildings.** Provisions of this code relating to the construction, *repair, alteration*, restoration and movement of structures, and *change of occupancy* shall not be mandatory for *historic buildings* provided that a report has been submitted to the code official and signed by the owner, a *registered design professional*, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the *building*.

~~**R501.7**~~ **R501.6 Change in space conditioning.** Any unconditioned or low-energy space that is altered to become conditioned space shall be required to be brought into full compliance with ~~this code~~ Section 502.

> **Exception:** Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.2.

R503.1.1.2 Roof alterations. Roof insulation shall comply ~~complying~~ with Section R402.1 or an *approved* design ~~shall be provided~~ for the following roof alteration conditions as applicable:

1. An alteration to roof-ceiling construction where there is no insulation above conditioned space.
2. Roof replacements for roofs with insulation entirely above deck,

Exceptions: Where compliance with Section R402.1 cannot be met due to limiting conditions on an existing roof, the following shall be permitted to demonstrate compliance with the insulation requirements:

1. Construction documents that include a report by a registered design professional or other approved source documenting details of the limiting conditions affecting compliance with the insulation requirements.
2. Construction documents that include a roof design by a registered design professional or other approved source that minimize deviation from the insulation requirements.
3. Conversion of an unconditioned attic space into conditioned space, and

4. Replacement of ceiling finishes exposing cavities or surfaces of the roof-ceiling construction to which insulation can be applied.

R503.1.1.3 Above-grade wall alterations. Above-grade wall alterations shall comply with the following requirements as applicable:

1. Where interior finishes are removed exposing wall cavities, the existing cavity shall be filled with existing or new insulation complying with Section R303.1.4;
2. Where exterior wall coverings and fenestration are removed and replaced for the full extent of any exterior wall assembly, continuous insulation shall be provided where required in accordance with Section R402.1 or an ~~approved~~ *approved* design;
3. Where Items 1 and 2 apply, the entire wall assembly shall be insulated in accordance with Section R402.1; and,
4. 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 where required in accordance with Section R402.1 or an approved design.

Where any of the above requirements are applicable, the above-grade wall alteration shall comply with the insulation and water vapor retarder requirements of Section R702.7 of the International Residential Code. Where the exterior wall coverings are removed and replaced, the above-grade wall alteration shall comply with the water and wind resistance requirements of Section R703.1.1 of the International Residential Code.

R503.1.1.5 Below-grade wall alterations. Where a ~~blow~~ below-grade space is changed to conditioned space, the below-grade walls shall be insulated where required in accordance with Section R402.1. Where the below-grade space is conditioned space and a below-grade wall is altered by removing or adding interior finishes, it shall be insulated where required in accordance with Section R402.1.

R505.1 General. Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this ~~code~~ chapter.

Exception: Where the simulated building performance option in Section R405 is used to comply with this section, the annual energy cost of the *proposed design* is permitted to be 110 percent of the annual energy cost allowed by Section R405.2.

R505.1.1 Unconditioned space. Any unconditioned or low-energy space that is altered to become a *conditioned space* shall comply with Section ~~R502~~ R501.6.

Reason: A working group of few (mostly committee) members was formed during public comment period #2 to specifically look at Chapter 5 [RE]. The proposed changes in this modification seek to clarify the existing chapter 5 language and the new chapter 5 language from public comment draft #1. No substantial changes have been made.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposed code changes will not increase nor decrease the cost of construction since they are changes to clarify the code language. The proposed new definitions are in the International Existing Building Code. Amendments to existing definitions bring the definitions in alignment with the International Existing Building Code.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Proposal coordinates and improves code by combining two sections with the same name and similar requirements. Adding a new definition for existing building.

Proposal # 1276

RED1-268-22

Proponents: Jay Crandell, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz); Greg Johnson, representing National Multifamily Housing Council (gjohnsonconsulting@gmail.com)

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**APPROVED SOURCE.** An independent person, firm or corporation, approved by the code official, who is competent and experienced in the application of engineering principles to materials, methods or system analyses.~~

Revise as follows:

R503.1.1 Building thermal envelope. Alterations of existing *building thermal envelope* assemblies shall comply with this section. New ~~Building~~ *building thermal envelope* assemblies that are part of the *alteration* shall comply with Section R402. ~~In no case shall t~~ The *R-value* of insulation shall not be reduced ,nor~~or~~ the *U-factor* of a *building thermal envelope* assembly ~~be~~ increased as part of a *building thermal envelope* alteration except where the building after the alteration complies with Section R405 or R406.

> **Exception:** The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:
>
> 1. Storm windows installed over existing fenestration.
> 2. Roof recover.
> 3. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.
> 4. *Roof replacement* where roof assembly insulation is integral to or located below the structural roof deck. ~~An existing building undergoing alterations that is demonstrated to be in compliance with Section R405 or Section R406~~

R503.1.1.1 Fenestration alterations. Where new fenestration area is added to an existing building, the new fenestration shall comply with Section R402.3. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC as specified in Table R402.1.3. Where more than one replacement fenestration unit is to be installed, an area-weighted average of the *U*-factor, SHGC or both of all replacement fenestration units shall be an alternative that can be used to show compliance.

Revise as follows:

R503.1.1.2 Roof, ceiling, and attic alterations. ~~Roof insulation~~ Insulation shall comply ~~complying~~ with Section R402.1. Alternatively, where limiting conditions prevent compliance with Section R402.1, ~~or~~ an *approved* design that minimizes deviation from Section R402.1 shall be providedfor the following alterations:~~roof alteration conditions as applicable~~:

1. An alteration to roof-ceiling construction other than *reroofing* where existing ~~there is no~~ insulation located belwo the *roof* deck or on an attic floor above conditioned space does not comply with Table R402.1.3.
2. *Roof replacements* or a roof ~~for roofs with~~ *alteration* that includes removing and replacing the *roof covering* where the roof assembly includes insulation entirely above the roof deck. Where limiting conditions require use of an *approved* design to minimize deviation from Section R402.1 for a Group R-2 building, a registered design professional or other approved source shall provide *construction documents* that identify the limiting conditions and the means to address them.
3. Conversion of an unconditioned attic space into conditioned space.
4. Replacement of ceiling finishes exposing cavities or surfaces of the roof-ceiling.

> ~~**Exceptions:** Where compliance with Section R402.1 cannot be met due to limiting conditions on an existing roof, the following shall be permitted to demonstrate compliance with the insulation requirements:~~
>
> 1. ~~Construction documents that include a report by a registered design professional or other approved source documenting details of the limiting conditions affecting compliance with the insulation requirements.~~
> 2. ~~Construction documents that include a roof design by a registered design professional or other approved source that minimize deviation from the insulation requirements.~~
> 3. ~~Conversion of an unconditioned attic space into conditioned space., and~~
> 4. ~~Replacement of ceiling finishes exposing cavities or surfaces of the roof-ceiling construction to which insulation can be applied.~~

R503.1.1.3 Above-grade wall alterations. Above-grade wall alterations shall comply with the following ~~requirements as applicable~~:

1. Where ~~interior finishes are removed exposing~~ wall cavities are exposed, the ~~existing cavity~~ cavities shall be filled with ~~existing or new~~ 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.
2. Where exterior wall coverings and fenestration are added or ~~removed and~~ replaced for the full extent of any exterior ~~wall assembly~~ facade of one or more elevations of the building, *continuous insulation* shall be provided where required in accordance with one of the following: ~~Section R402.1 or an approved design;~~

   2.1. An *R-value* of *continuous insulation* not less than that designated in Table R402.1.3;

   2.2. An *R-value* of *continuous insulation* not less than that required to comply with Table R402.1.2; or

   2.3. An approved design that minimizes deviation from Section R402.1.
3. Where Items 1 and 2 apply, the ~~entire wall assembly shall be insulated~~ insulation shall be provided in accordance with Section R402.1; and,
4. 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 ~~where required~~ in accordance with Section R402.1 or an *approved* design.

Where any of the above requirements are applicable, the above-grade wall alteration shall comply with t~~he insulation and water vapor retarder requirements of~~ Section s R702.7 and R703.1.1 of the *International Residential Code*. ~~Where the exterior wall coverings are removed and replaced, the above-grade wall alteration shall comply with the water and wind resistance requirements of Section R703.1.1 of the International Residential Code.~~

R503.1.1.4 Floor alterations. Where cavities in a floor or floor overhang are exposed ~~an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied~~ and the floor or floor overhang is part of the *building thermal envelope*, the floor or floor overhang shall comply ~~be brought into compliance~~ with Section R402.1 or an *approved* design. ~~This requirement shall apply to floor alterations where the floor cavities or surfaces are exposed and accessible prior to construction.~~

R503.1.1.5 Below-grade wall alterations. Where unconditioned ~~a~~ b elow-grade space is changed to conditioned space, ~~the below-grade~~ *building thermal envelope* walls enclosing such space shall be insulated ~~where required~~ in accordance with Section R402.1. Where the below-grade space is conditioned space and where ~~a below-grade~~ *building thermal envelope* wall s enclosing such space are ~~is~~ altered ~~by removing or adding interior finishes~~, they ~~it~~ shall be insulated ~~where required~~ in accordance with Section R402.1.

R503.1.1.6 Air barrier. Altered ~~B~~*building thermal envelope* assemblies ~~altered in accordance with Section R503.1.1~~ shall be provided with an air barrier in accordance with Section R402.5. ~~The~~ Such air barrier ~~shall~~ need not be ~~required to be made~~ continuous with unaltered portions of the building thermal envelope. Testing requirements of Section R402.5.1.2 shall not be required.~~Content~~

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

Portions of table not shown remain unchanged.

CLIMATE ZONE	0	1	2	3	4 except Marine	5 and Marine 4	6	7 and 8
Insulation entirely above roof deck	0.039	0.039	0.039	0.039	0.032	0.032	0.032	0.028

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

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. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

e. 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*.

~~f. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R U-factors of Table C402.1.2.~~

~~g.~~ f. F-factors for heated slabs correspond to the configuration described by footnote (d) of Table R402.1.3

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]
Portions of table not shown remain unchanged.

CLIMATE ZONE	0	1	2	3	4 except Marine	5 and Marine 4	6	7 and 8
Insulation entirely above roof deck	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-35ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.
ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.28.

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

f. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

g. Mass walls shall be in accordance with Section R402.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

h. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

~~i. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the Group R R-values of Table C402.1.2.~~

~~j.~~ i. "30 or 19+7.5ci or 20ci" means R30 cavity insulation alone or R19 cavity insulation with R7.5 continuous insulation or R20 continuous insulation alone.

Reason: This PC is submitted to coordinate with changes made by CEPI-221 to Section C503.1 of the commercial provisions based on additional input and review by the commercial subcommittee that occurred after the residential existing buildings and main committees had completed action on REPI-150. The two proposals intended to make the two codes consistent. So, this proposal is primarily one of editorial and formatting coordination between the IECC-C and IECC-R. It is not intended to make any technical requirement changes.
This PC also addresses a modification made to REPI-150 to provide direction for insulation entirely above the roof deck as it relates to roof replacement requirements. REPI-150 added a footnote ‘f’ to the U-factor and R-value tables to point to the commercial tables for Group R buildings for appropriate criteria since this specific roof condition (low slope roof with insulation entirely above deck) was not specifically addressed in the residential provisions. Rather than rely on a footnote pointing to IECC-C provisions for requirements, the relevant requirements are proposed to be brought directly into the R-value and U-factors tables of the IECC-R.

Finally, the following additional revisions were made to R503.1.1: (1) various editorial and formatting changes or corrections were made to simplify and improve clarity, (2) the “approved source” definition which was added by REPI-150 is now deleted preferring instead to use the term “approved third party” for consistency with this term's use in the air leakage and ERI provisions, (3) the additional approved third-party and construction document requirements which previously existed in an exception are made a part of the requirements for roof replacements with insulation entirely above deck and limited to Group R-2 buildings (e.g., apartments) which addresses the primary application and need for consistency with similar building types addressed in the IECC-C provisions. Roofs with above-deck insulation on other types of residential buildings (e.g., one- and two-family, townhouses, etc.) would comply with the charging language of Section R503.1.1.2 (allowing an approved design without additional requirement for a third party and construction documents).

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

The proposal does not change requirements and focuses on editorial and formatting improvements to coordinate with similar provisions in the IECC-C. Therefore, there should be no cost impacts.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Clarifies several sections of the code, fits appropriately in the IECC standard.

Proposal # 1210

RED1-271-22

Proponents: Daniel Carroll, representing Division of Building Standards & Codes (daniel.carroll@dos.ny.gov); Hendrik Shank, representing New York State, Department of State (hendrikus.shank@dos.ny.gov)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R503.1.1.3 Above-grade wall alterations. Above-grade wall alterations shall comply with the following requirements as applicable:

1. Where interior finishes are removed exposing wall cavities, the existing cavity shall be filled with existing or new insulation complying with Section R303.1.4;
2. Where exterior wall coverings and fenestration are removed and replaced for the full extent of any exterior wall assembly, continuous insulation shall be provided where required in accordance with Section R402.1 or an approved design;
3. Where Items 1 and 2 apply, the entire wall assembly shall be insulated in accordance with Section R402.1; and,
4. 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 where required in accordance with Section R402.1 or an approved design.

Where any of the above requirements are applicable, the above-grade wall alteration shall comply with the insulation and water vapor retarder requirements of Section R702.7 of the International Residential Code <u>or Section 1404.3 of the International Building Code, as applicable</u>. Where the exterior wall coverings are removed and replaced, the above-grade wall alteration shall comply with the water and wind resistance requirements of Section R703.1.1 of the International Residential Code <u>or 1402.2 of the International Building Code, as applicable</u>.

Reason: Not all buildings regulated by the IECC-Residential Provisions are regulated by the IRC. This change avoids confusion or the misapplication of the IRC for R-2, R-3, and R-4 buildings three stories or less that are regulated by the IECC-Residential Provisions and the IBC.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change is a clarification. There is no increase in cost, R-2, R-3 and R-4 buildings are required to comply with the IBC requirements not the IRC.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: these edits should have been in the Code already and so supports proposed language.

Proposal # 1201

RED1-273-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R503.1.1.3 Above-grade wall alterations. Above-grade wall alterations shall comply with the following ~~requirements~~ as applicable:

1. Where interior finishes are removed ~~exposing~~ <u>and</u> wall cavities <u>are exposed</u>, the ~~existing cavity~~ <u>exposed cavities</u> shall be filled with existing or new insulation complying with Section R303.1.4<u> and an interior vapor retarder shall be provided where required in accordance with Section R702.7 of the *International Residential Code*;</u>
2. Where exterior wall coverings and fenestration are removed and replaced for the full extent of any exterior wall assembly, continuous insulation shall be provided where required in accordance with Section R402.1 or <u>the wall insulation shall be in accordance with</u> an approved design <u>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* and manufacturers' instructions.</u>
3. ~~Where Items 1 and 2 apply, the entire wall assembly shall be insulated in accordance with Section R402.1; and,~~

~~4.~~ <u>3.</u> 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 where required in accordance with Section R402.1 or an approved design <u>that minimizes deviation from Section R402.1</u>.

~~Where any of the above requirements are implemented applicable and resulted in a change of the vapor retarder classsification, the above-grade wall alteration shall comply with the insulation and water vapor retarder requirements of Section R702.7 of the International Residential Code. Where the exterior wall coverings are removed and replaced, the above-grade wall alteration shall comply with the water and wind resistance requirements of Section R703.1.1 of the International Residential Code .~~

Reason: This proposal addresses conflicts with the vapor retarder and wind resistance provisions.
The IRC provisions for vapor retarders do not allow prescriptive compliance for walls with "double" Class I vapor retarders.

The alteration does not need to comply with new vapor retarder requirements if vapor permeability characteristics did not change.

Section R702.7 does not contain insulation requirements.

The intent of this section is not to require replacement of the existing structural exterior sheathing when replacing the cladding.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This change may or may not impact the cost of alterations.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Proposal provides flexibility for construction affecting existing structures – especially with regard to wall assemblies, exterior finishes, and not disturbing existing construction outside scope of work as well as providing for coordination with existing construction.

Proposal # 1360

RED1-277-22

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

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**EXTERIOR WALL ENVELOPE.** A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.~~

Revise as follows:

R503.1.5 Additional Efficiency Packages. Alterations shall comply with Section R506 where the alteration contains replacement of two or more of the following:

1. HVAC unitary systems or HVAC central heating or cooling equipment serving the *work area* of the *alteration*.
2. Water heating equipment serving the *work area* of the *alteration*.
3. 50 percent or more of the lighting fixtures in the *work area* of the *alteration*.
4. 50 percent or more of the area of interior surfaces of the <u>*building thermal envelope*</u> ~~thermal envelope~~ in the *work area* of the *alteration*.
5. 50 percent or more the <u>*exterior wall*</u> area of the <u>*building thermal envelope*</u> ~~building's *exterior wall envelope*~~ <u>, including vertical fenestration area</u>.

Exceptions:

1. *Alterations* that are permitted with an *addition* complying with Section R502.3.5.
2. *Alterations* that comply with Section R405 or R406.

Reason: This PC is submitted to coordinate with a similar proposal (CED1-149-22) submitted to the IECC commercial committee. The newly added "exterior wall envelope" definition is used only once in the entire IECC residential provisions in the newly added Section R503.1.5, Item 5. The term is deleted and existing defined terms are used instead to revise Item 5 in Section R503.1.5 to retain its intent while not requiring a new term to be created and applied. The exception is also clarified to apply the percentage trigger on the basis of area, not length of walls, number of walls, or other possible metrics that are currently left open to interpretation. It is clarified that the exterior wall area used for this purpose should also include the area of vertical fenestration. Finally, the new "exterior wall envelope" definition overlaps with the defined term "exterior wall covering" as used in the IBC and IRC and this could create confusion in coordination between the I-codes. Deleting the term and using existing definitions resolves this concern as well. However, if the intent was that "exterior wall envelope" was intended to be applied the same as "exterior wall covering", then use of the latter defined term in the building codes should be considered instead.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The intent of this proposal is to provide a clean-up of terminology and not to change requirements. However, the clarification could result in a relaxation of the trigger for additional efficiency (and possible cost reduction for some alteration projects) by clarifying that vertical fenestration is to be included in the exterior wall area for purposes of the 50% of exterior wall trigger.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Deletes an unneeded definition. If full committee passes RED1-263-22 any coordination issues can be cleaned up in the development round.

Proposal # 1134

RED1-280-22 Part I

Proponents: Fredric Zwerg, representing Southwest Gas Corporation (fredric.zwerg@swgas.com)

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**ZONAL HEATING.** A heating system in which each zone or room has a separate heater with a single controller in each zone.~~

Reason: Delete this definition entirely. Each HVAC zone is already required to have their own separate unit and controller. They are independent and considered separate units and could be confused with central HVAC systems with different zones. This definition is not necessary.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No cost impact.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: supports action on REPI-99 and RED1-325.

Proposal # 1115

RED1-280-22 Part II

Proponents: Fredric Zwerg, representing Southwest Gas Corporation (fredric.zwerg@swgas.com)

2024 ENERGY Chapter11

Delete without substitution:

~~**ZONAL HEATING.** A heating system in which each zone or room has a separate heater with a single controller in each zone.~~

Reason: Delete this definition entirely. Each HVAC zone is already required to have their own separate unit and controller. They are independent and considered separate units and could be confused with central HVAC systems with different zones. This definition is not necessary.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
No cost impact.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: supports action on REPI-99 and RED1-325.

Proposal # 1156

RED1-281-22

Proponents: Theresa Weston, representing ABAA (Air Barrier Association of America) (holtweston88@gmail.com)

2024 International Energy Conservation Code [RE Project]

Update standard(s) as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959

E283/E283M~~—2004(2012):~~ (2019)	Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
E779~~—2010(2018)~~ :2019	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
E1554/E1554M~~—E2013:~~ 2013 (2018)	Standard Test Methods for Determining Air Leakage of Air Distribution Systems by Fan Pressurization
E1827~~—: 2011(2017):~~ 2022	Standard Test Methods for Determining Airtightness of Building Using an Orifice Blower Door
D8052/D8052M~~—2017:~~ 2022	Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies
E1186-~~17~~ 2022	Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems

Reason: This is to update reference standards related to air leakage assessment in order to keep the references current.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The updates to these standards do not constitute changes in code requirements, therefore, will not effect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: needed update to reference standards

Proposal # 1367

RED1-283-22

Proponents: Shannon Corcoran, representing American Gas Association

2024 International Energy Conservation Code [RE Project]

Revise as follows:

<u>CONTINUOUS</u> PILOT ~~LIGHT, CONTINUOUSLY BURNING~~. ~~A small gas flame used to ignite gas at a larger burner. Once lit, a continuously pilot light remains in operation until manually interrupted. Pilot light ignition systems with the ability to switch between intermittent and continuous mode are considered continuous.~~ <u>Pilot which, once placed in operation, is intended to remain ignited continuously until it is manually interrupted.</u>

<u>INTERMITTENT IGNITION</u> ~~PILOT LIGHT, INTERMITTENT~~. ~~A pilot which is automatically ignited when an appliance is called on to operate and which remains continuously ignited during each period of main burner operation. The pilot is automatically extinguished when each main burner operating cycle is completed.~~ <u>Type of ignition which is energized when an appliance is called on to operate and which remains continuously energized during each period of main burner operation and where the ignition is deenergized when the main burner operating cycle is completed.</u>

~~PILOT LIGHT,~~ INTERRUPTED <u>IGNITION</u>. ~~A pilot which is automatically ignited prior to the admission of fuel to the main burner and which is automatically extinguished after the main flame is established.~~ <u>T ype of ignition which is energized prior to the admission of fuel to the main burner and which is deenergized when the main flame is established.</u>

ON-DEMAND PILOT ~~LIGHT, ON-DEMAND~~. ~~A pilot which, once placed into operation, is intended to remain ignited for a predetermined period of time following an automatic or manual operation of the main burner gas valve.~~ <u>A pilot which, once placed into operation, is intended to remain ignited for a predetermined period of time following an automatic or manual operation of the main burner gas valve, after which the pilot is automatically extinguished when no automatic or manual operation of the main burner gas valve occurs during the predetermined period of time.</u>

Reason: Definitions of industry terms should be consistent with the source of the definition. The various types of pilot lights are defined in the Standard for Automatic electrical controls — Part 2-5: Particular requirements for automatic electrical burner control systems, CSA/ANSI Z21.20:22 • CSA C22.2 No. 60730-2-5:22 ♦ UL 60730-2-5. The code should be consistent with the ANSI standard.
these proposed changes ot the definitions apply to both the IECC Residential Code as well as the IRC Chapter 11.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposal will not affect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: align with industry defintions

Proposal # 1270

RED1-285-22

Proponents: Gary Klein, representing Self (gary@garykleinassociates.com); Mark Lyles, representing California IOUs (markl@newbuildings.org); Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com)

2024 International Energy Conservation Code [RE Project]

Add new definition as follows:

AIR-HANDLING UNIT. A blower or fan used for the purpose of distributing supply air to a room, space or area.

Revise as follows:

CONDITIONED SPACE. An area, room or space that is enclosed within the *building thermal envelope* and is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ~~ducts~~ *ducts*, piping or other sources of heating or cooling.

Add new definition as follows:

DAMPER. A manually or automatically controlled device to regulate draft or the rate of flow of air or combustion gases.

Revise as follows:

DUCT SYSTEM. ~~A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances~~ A system that consists of *space conditioning equipment*, *ductwork*, and includes any apparatus installed in connection therewith.

Add new definition as follows:

DUCTWORK. The assemblies of connected *ducts*, *plenums*, boots, fittings, *dampers*, supply registers, return grilles, and filter grilles through which air is supplied to or returned from the space to be heated, cooled, or ventilated. Supply ductwork delivers air to the spaces from the *space conditioning equipment*. Return ductwork conveys air from the spaces back to the *space conditioning equipment*. Ventilation ductwork conveys air to or from any space.

HEAT EXCHANGER. A device that transfers heat from one medium to another.

OCCUPIABLE SPACE. An enclosed space intended for human activities, excluding those spaces intended primarily for other purposes, such as storage 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 space* being conditioned, that is designed to allow air movement, and thereby serve as part of the supply or return *ductwork*.

SPACE CONDITIONING. The treatment of air so as to control the temperature, humidity, filtration or distribution of the air to meet the requirements of a conditioned space.

SPACE CONDITIONING EQUIPMENT. The *heat exchangers*, *air-handling units*, filter boxes, and any apparatus installed in connection therewith used to provide *space conditioning.*

Revise as follows:

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

1. The predominant *R*-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, *basement walls*, *crawl space walls* and floors and *ducts* ~~ducts~~ outside *conditioned spaces*.
2. *U*-factors of fenestration and the *solar heat gain coefficient* (SHGC) of fenestration. Where there is more than one value for any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required *duct system* ~~duct system~~ and building envelope air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.

5. Where on-site *photovoltaic panel* systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate.
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate.
7. The code edition under which the structure was permitted, the compliance path used, and where applicable, the additional efficiency measures selected for compliance with R408.
8. Where a solar-ready zone is provided, the certificate shall indicate the location, and dimensions.

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 ~~all of~~ 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 ~~duct~~ *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.

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]
Portions of table not shown remain unchanged.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shafts, penetrations	*Duct* ~~Duct~~ and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required *R*-value.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.5.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried in or surrounded with insulation.
Electrical,communication, and other equipment boxes, housings, and enclosures	Boxes, housing, and enclosures that penetrate the air barrier shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing, or enclosure shall be sealed. The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier. Alternatively, air-sealed boxes shall be installed in accordance with R402.5.6.	Boxes, housing, and enclosures shall be ~~burried~~ buried in or surrounded by insulation.
HVAC register boots	HVAC supply and return register boots ~~that penetrate building thermal envelope~~ shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	HVAC supply and return register boots located ~~in~~ within a ~~the building's thermal envelope~~ *building thermal envelope* assembly shall be buried ~~burried~~ in or ~~and~~ surrounded by insulation.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.

b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

SECTION R403
SYSTEMS

Revise as follows:

R403.3 Duct systems. ~~Ducts and air handlers~~ *Duct systems* shall be installed in accordance with Sections R403.3.1through ~~R403.3.87~~ R403.3.9.

> **Exception:** ~~*Ducts* serving ventilation systems~~ Ventilation *ductwork* that is ~~are~~ not integrated with duct systems serving heating or cooling systems.

R403.3.1 ~~Ducts~~ Ductwork located outside conditioned space. Supply and return *ductwork* ~~*ducts*~~ located outside *conditioned space* shall be insulated to an *R*-value of not less than R-8 for *ducts* 3 inches (76 mm) in diameter and larger and not less than R-6 for *ducts* smaller than 3 inches (76 mm) in diameter. *Ductwork* ~~*Ducts*~~ buried beneath a building shall be insulated as required per this section or have an equivalent *thermal distribution efficiency*. Underground *ductwork* ~~*ducts*~~ utilizing the *thermal distribution efficiency* method shall be listed and *labeled* to indicate the *R*-value equivalency.

R403.3.2 Duct~~s~~ systems located in conditioned space. For ~~ductwork~~ *duct systems* to be considered inside a *conditioned space,* the *space conditioning equipment* shall be located completely on the conditioned sie of *building thermal envelope.* The *ductwork* ~~it~~ it shall comply with ~~one of~~ the following as applicable:

1. The ~~duct system~~ *ductwork* shall be located completely ~~within the *continuous air barrier* and within~~ on the conditioned side of the building thermal envelope.

2. *Ductwork* ~~Ductwork~~in ventilated attic spaces or unvented attic s with vapor diffusion port s shall be buried within ceiling insulation in accordance with Section R403.3.3 and ~~all of~~ shall comply with the following ~~conditions shall exist~~:

   ~~2.1. The air handler is located completely within the *continuous air barrier* and within the *building thermal envelope*.~~

   2.~~2~~ 1. The ~~duct~~ *ductwork*leakage, as measured either by a rough-in test of the supply and return ~~ducts~~ *ductwork* or a post-construction ~~total~~ *duct system* leakage test to outside the *building thermal envelope* in accordance with Section R403.3. 5~~6~~, ~~is less than or equal to~~ is not greater than 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m^2) of *conditioned floor area* served by the *duct system*.

   2.~~3~~ 2. The ceiling insulation *R*-value installed against and above the insulated ~~duct~~ *ductwork* is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the ~~duct~~ *ductwork*.

3. *Ductwork* ~~located in~~ contained within wall or floor ~~building~~ assemblies separating unconditioned from conditioned space shall comply with the following:

   3.1. A *continuous air barrier* shall be installed as part of the building assembly between the ~~duct~~ *ductwork* and the unconditioned space.

   3.2. ~~Ducts~~ *Ductwork* shall be installed in accordance with Section R403.3.1.

   Exception: Where the building assembly cavities containing ~~ducts~~ *ductwork* have been air sealed in accordance with Section R402.5.1,ductinsulation is not required.

   3.3. Not less than R-10 insulation, ~~and~~ or not less than 50 percent of the required insulation R-value specified in Table R402.1.3, whichever is greater, shall be located between the ~~duct~~ *ductwork* and the unconditioned space.

   3.4 ~~For ducts in these building assemblies to be considered within conditioned space, the air handling equipment shall be installed within conditioned space.~~ Segments of ductwork contained within these building assemblies shall not be considered completely inside conditioned space in Sections R405 or R406.

R403.3.3 Ductwork ~~Ducts~~ buried within ceiling insulation. Where supply and return *ductwork* ~~air ducts are~~ is partially or completely buried in ceiling insulation, such *ductwork* ~~ducts~~ shall comply with ~~all of~~ the following:

1. The supply and return ~~ducts~~ *ductwork* shall be insulated with ~~have an insulation *R*-value~~ not less than R-8 insulation.
2. At all points along ~~each duct~~ the *ductwork* , the sum of the ceiling insulation *R*-value against and above the top of the ~~duct~~*ductwork*, and against and below the bottom of the ~~duct~~*ductwork*, shall be not less than R-19, excluding the *R*-value of the duct insulation.
3. In Climate Zones 0A, 1A, 2A and 3A, the supply ~~ducts~~ *ductwork* shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the International Mechanical Code or Section M1601.4.6 of the International Residential Code, as applicable.

   Exception: Sections of the supply ~~ducts~~ *ductwork* that are less than 3 feet (914 mm) from the supply outlet ~~shall not be required to comply with these requirements.~~

4. In Climate Zones 0A, 1A, 2A and 3A ~~when~~ where installed in an unvented attic with vapor diffusion port s, the supply ~~ducts~~ *ductwork* shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-8 and in compliance with the vapor retarder requirements of Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

   Exception: Sections of the supply ~~ducts~~ *ductwork* duct that are less than 3 feet (914 mm) from the supply outlet ~~shall not be required to comply with these requirements.~~

   4.1 Air permeable insulation installed in unvented attics shall ~~be in compliance~~ comply with ~~the requirements of Section R806.5.2~~ Section R806.5.5.2 of the *International Residential Code*.

R403.3.3.1 Effective R-value of deeply buried ducts. Where complying using Section R405,~~the Building Simulated Performance Compliance Option in accordance with Section R401.2.2,~~ sections of ~~ducts~~ *ductwork* that are installed in accordance with Section R403.3.3 surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the ~~duct~~ *ductwork* is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

R403.3.4 Sealing. ~~Ducts, air handlers~~ *Ductwork* , *air-handling units* and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or the International Residential Code, as applicable.

R403.3.4.1 Sealed ~~air handler~~ air-handling unit. ~~Air handlers~~*Air-handling units* shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

R403.3.5 Duct system testing. Each *duct system* ~~ducts 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 ~~w.g.~~(25 Pa) across the ~~system~~ *duct system* and shall include the measured leakage from the supply and return *ductwork*. ~~Registers shall be sealed during the test.~~ A written report of the test results shall be signed by the party conducting the test and provided to the *code official*. *Duct system* ~~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* ~~duct systems~~ serving ventilation systems that are not integrated with *duct systems* ~~duct systems~~ serving heating or cooling systems.
2. Testing shall not be required where there is not more than 10 feet of total *ductwork* e xternal to the *space conditioning equipment* and both the following are met :
   a. The *duct system* is located entirely within *conditioned space* .
   b. The *ductwork* does not include *plenums* constructed of building cavities or gypsum board.
3. W here the *space conditioning equipment* is not installed , testing shall be permitted. T he total measured leakage of the supply and return *ductwork* shall be less than or equal to 3.0 cubic f eet per minute (85 L/min) per 100 square feet (9.29 m^2) of *conditioned floor area.*

~~2~~ 4. Where tested in accordance with Section R403.3.7, testing of each *duct system* ~~duct system~~ is not required.

R403.3.6 Duct system leakage. The total measured ~~duct system~~ *duct system* leakage shall not be greater than the values in Table R403.3.6, based on the conditioned floor area, number of ducted returns, and location of the *duct system.* For buildings complying with Section R405 or R406, where ~~duct system~~ *duct system* duct system leakage to outside is tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554, the leakage to outside value shall not be used for compliance with this section, but shall be permitted to be used in the calculation procedures of Section R405 and R406.

TABLE R403.3.6 MAXIMUM TOTAL DUCT SYSTEM LEAKAGE

~~ROUGH IN~~	~~POST CONSTRUCTION~~	
~~Duct systems serving more than 1,000 ft^2 of conditioned floor area~~	**~~cfm/100 ft^2 (LPM/9.29 m^2)~~**	**~~cfm/100 ft^2 (LPM/9.29 m^2)~~**
~~Air handler is not installed~~	~~3 (85)~~	~~NA~~
~~Air handler is installed~~	~~4 (113.3)~~	~~4 (113.3)~~
~~Duct systems located in conditioned space, with air handler installed~~	~~8 (226.6)~~	~~8 (226.6)~~
~~Duct systems serving less than or equal to 1,000 ft^2 of conditioned floor area~~	**~~cfm (LPM)~~**	**~~cfm (LPM)~~**
~~Air handler is not installed~~	~~30 (849.5)~~	~~NA~~
~~Air handler is installed~~	~~40 (1132.7)~~	~~40 (1132.7)~~
~~Duct systems located in conditioned space, with air handler installed~~	~~80 (2265.4)~~	~~80 (2265.4)~~

	***Duct systems* serving more than 1,000 ft^2 of conditioned floor area**		***Duct systems* serving less than or equal to 1,000 ft^2 of conditioned floor area**
	cfm/100 ft^2 (LPM/9.29 m^2)		**cfm (LPM)**
	Number of ducted returns [a]		
	< 3	**≥ 3**	Any
Space conditioning equipment is not installed[b, c]	3 (85)	4 (113)	30 (850)
All components of the *duct system* are installed[c]	4 (113)	6 (170)	40 (1133)
Space conditioning equipment is not installed, but the ductwork is located entirely in conditioned space[cd]	6 (170)	8 (227)	60 (1699)
All components of the *duct system* are installed and entirely located in *conditioned space* [c]	8 (227)	12 (340)	80 (2265)

a. A ducted return is a *duct* made of sheet metal or flexible *duct* that connects one or more return grilles to the return-side inlet of the *air-handling unit.* Any other method to convey air from return or transfer grille(s) to the *air-handling unit* does not constitute a ducted return for the purpose of determining maximum total *duct system* leakage allowance.

b. Where the *space conditioning equipment* is not installed, *duct system* testing shall be permitted and shall include the measured leakage from both the supply and return *ductwork. Duct system* testing shall not be performed if the return *ductwork* is not installed.

c. For *duct systems* to be considered inside a *conditioned space*, where the *ductwork* is located in ventilated attic spaces or unvented attics with vapor diffusion ports, *duct system* leakage to outside must comply with Item 2.1 of Section R403.3.2.

d. Prior to certificate of occupancy, where the air-handling unit is not verified as being located in *conditioned space*, the total *duct system* leakage must be re-tested.

R403.3.7 Dwelling unit sampling. For buildings with eight or more *dwelling units* the duct systems in the greater of seven, or 20 percent of the *dwelling 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*, the duct systems in each unit shall be tested. Where the leakage ~~rate~~ of a *duct system* is greater than the maximum permitted *duct system* leakage ~~rate~~, corrective actions shall be made to the *duct system* ~~system~~ and the *duct system* shall be retested until it passes. For each tested *dwelling unit* that has a greater total *duct system* leakage ~~rate~~ than the maximum permitted *duct system* leakage ~~rate~~, an additional three *dwelling units*, including the corrected unit, shall be tested.

R403.3~~.8~~ .2 Building cavities. *Building* framing cavities shall not be used as ~~ducts~~ *ductwork* or *plenums*.

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

Portions of table not shown remain unchanged.

SYSTEM TYPE	AIRFLOW RATE (CFM)	MINIMUM EFFICACY (CFM/WATT)	TEST PROCEDURE
~~Air-handler~~ *Air-handling unit* that is integrated to tested and *listed* HVAC equipment	Any	1.2	Outdoor airflow as specified. *Air-handling unit* ~~Air-handler~~ fan power determined in accordance with the HVAC appliance's test method referenced by Section C403.3.2 of the IECC-Commercial Provisions.

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

a. Design outdoor airflow rate/watts of fan used.

SECTION R405
SIMULATED BUILDING PERFORMANCE

Revise as follows:

R405.3.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other *building site* identification.
2. The name of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs ~~entered into~~ to the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation *R*-values or *U*-factors; ~~duct system~~ *duct system* and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
6. Where a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

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
Thermal distribution systems	~~Duct system~~ *Duct system* leakage to outside: For *duct systems* serving > 1,000ft^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 of conditioned floor area, the duct leakage to outside rate shall be 40 cfm (1132.7 L/min).	*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:** 1. ~~When~~ 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. ~~When~~ Where total *duct system* leakage is measured without the *space conditioning* equipment ~~air handler~~ 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).

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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

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 §130.32

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 R403.3.2, 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 R403.3.3.1, are assumed to have an effective duct insulation R-value of R-25.

TABLE R405.4.2(2) DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS[a]

DISTRIBUTION SYSTEM CONFIGURATION AND CONDITION	FORCED AIR SYSTEMS	HYDRONIC SYSTEMS[b]
Distribution system components located in unconditioned space	NA	0.95
Distribution system components entirely located in *conditioned space*[c]	NA	1
~~"~~Ductless~~"~~ systems[d]	1	NA

a. Default values in this table are for untested distribution systems, which must still ~~meet minimum requirements form~~ comply with Section R403 ~~for duct system insulation~~.

b. Hydronic systems ~~shall mean~~ means those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed-loop piping and that do not depend on ducted, forced airflow to maintain space temperatures.

c. Entire system in *conditioned space* ~~shall mean~~ means that no component of the distribution system, ~~including the air-handling unit,~~ is located outside of the *conditioned space*.

d. Ductless systems ~~shall be~~ are allowed to have forced airflow across a coil but ~~shall~~ must not have greater than 10 ft. of ~~any~~ ducted airflow external to the ~~manufacturer's air-handler enclosure~~ *space conditioning equipment*.

SECTION R408
ADDITIONAL EFFICIENCY REQUIREMENTS

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.4(2)	100% of *duct systems* ~~ducts~~ in *conditioned space*	4	6	8	12	12	15	17	19	20
R408.2.4(3)	≥80% of ductwork inside *conditioned space*	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.4(4~~3~~)	Reduced total duct leakage									

R408.2.4 More efficient ~~duct~~ thermal distribution system option. The thermal distribution system shall ~~meet one of the~~ comply with one of the following efficiencies:

1. ~~100 percent of~~ The ductless thermal distribution system or hydronic thermal distribution system is located completely ~~inside~~ on the conditioned side of the *building thermal envelope*.
2. ~~100 percent of~~ The space conditioning equipment is located inside conditioned space. In addition, 100 percent of the *duct system* ~~thermal distribution system~~ is located ~~in~~ completely inside *conditioned space* as defined by item 1 and item 2 of Section R403.3.2.
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 R403.3.2. In addition, no more than 20 percent of *ductwork* is contained within building assemblies separating unconditioned from *conditioned space* as defined by item 3 of Section R403.3.2.

~~3.~~ 4. ~~When ducts are~~ Where *ductwork* is located outside *conditioned space*, the total leakage ~~of the ducts,~~ of the *duct system* measured in accordance with R403.3.5, ~~shall be in accordance with~~ is one of the following:

~~3.1~~ 4.1 Where the *space conditioning equipment* ~~air handler~~ 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.

~~3.2~~ 4.2 Where the *space conditioning equipment* ~~air handler~~ 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.

SECTION R502
ADDITIONS

Revise as follows:

R502.2.2 Heating and cooling systems. HVAC *ductwork* ~~ducts~~ newly installed as part of an *addition* shall comply with Section R403.

Exception: Where *ductwork* ~~ducts~~ from an existing heating and cooling system ~~are~~ is extended into an *addition* Section R403.3.5 and Section R403.3.6 shall not be required.

SECTION R503
ALTERATIONS

Revise as follows:

R503.1.2 Heating and cooling systems. New heating and cooling systems and *ductwork* ~~duct systems~~ that are part of the alteration shall comply with Section R403 and this section. Alterations to existing heating and~~,~~ cooling systems and *ductwork* ~~duct systems~~ shall comply with this section.

Exception: Where *ductwork* ~~ducts~~ from an existing heating and cooling system ~~are~~ is extended to an *addition*.

R503.1.2.1 ~~Ducts~~ *Ductwork*. HVAC *ductwork* ~~ducts~~ newly installed as part of an alteration shall comply with Section R403.

Exception: Where *ductwork* ~~ducts~~ from an existing heating and cooling system ~~are~~ is extended to an *addition*.

R503.1.2.3 Duct system leakage. Where an *alteration* includes any of the following, *duct systems* ~~ducts~~ 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 (339.9 L/min) per 100 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 relocated.
2. Where 25 percent or more of the total length of all *ductwork* ~~ducts~~ in the *duct system* are relocated.
3. Where the total length of all *ductwork* ~~ducts~~ 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.

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

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

Reason: This public comment is being submitted to achieve the following:

- Better define what the code means when it says “ducts”, “ductwork”, and “duct system”, by using 2021 IMC definitions, modified as needed.
- Use these defined terms to better clarify what is meant by “ducts in conditioned space” and what components are included in the “total duct leakage test”
- Clarify what must be tested during the total duct leakage test (i.e., ALWAYS the return ‘ductwork’ which now clearly includes sheetrocked plenums, but sometimes air-handler can be excluded if lower allowance is met)
- Reduce the use of the phrase “rough-in” and “post-construction” since that is not actually the criteria of importance
- Add a test exemption for ductless systems, including ducted systems with less than 10 ft of ductwork, when in conditioned space
- Provide a greater duct leakage allowance where a greater amount of return ductwork (ducted returns) is installed (like ENERGY STAR).

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposed changes clarify existing provisions and do not increase the stringency of the requirements.

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Better define what the code means when it says “ducts”, “ductwork”, and “duct system”, by using 2021 IMC definitions, modified as needed. Use these defined terms to better clarify what is meant by “ducts in conditioned space” and what components are included in the “total duct leakage test”.Clarify what must be tested during the total duct leakage test. Reduce the use of the phrase “rough-in” and “post-construction” since that is not actually the criteria of importance.

Proposal # 1060

RED1-286-22

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

2024 International Energy Conservation Code [RE Project]

CHAPTER 4 [RE]
RESIDENTIAL ENERGY EFFICIENCY

SECTION R402
BUILDING THERMAL ENVELOPE

R402.5.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.5.1.1 through R402.5.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.5.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces *listed* and *labeled* in accordance with UL 127, the doors shall be tested and *listed* for the fireplace.

Delete without substitution:

~~**R402.5.2.1 Gas fireplace efficiency.** All gas fireplace heaters rated to ANSI Z21.88 shall be listed and labeled with a fireplace efficiency (FE) rating of 50 percent or greater in accordance with CSA P.4.1. Vented gas fireplaces (decorative appliances) certified to ANSI Z21.50 shall be listed and labeled, including their FE ratings, in accordance with CSA P.4.1.~~

SECTION R403
SYSTEMS

R403.1 Controls. Not less than one thermostat shall be provided for each separate heating and cooling system.

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

R403.1.2 Heat pump supplementary heat. Heat pumps having supplementary electric-resistance heat shall have controls that are configured to prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load. Limit supplemental heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The thermostat malfunctions.

Delete without substitution:

~~**R403.1.3 Continuously burning pilot light.** Gas fireplace systems are not permitted to be equipped with a continuously burning pilot light.~~

~~**Exception:** Any fireplace equipped with an on-demand, intermittent or interrupted ignition pilot light (as defined in ANSI Z21.20) is not considered to have a continuously burning pilot light.~~

Add new text as follows:

R403.14 Gas fireplaces. Gas fireplace systems shall not be equipped with a *continuous pilot* and shall be equipped with an *on-demand pilot*, *intermittent ignition*, or *interrupted ignition* (as defined by ANSI Z21.20).

Exception: Gas-fired appliances using pilots within a listed combustion safety device.

R403.14.1 Gas fireplace efficiency. Vented gas fireplace heaters shall have a fireplace efficiency (FE) rating not less than 50 percent as determined in accordance with CSA P.4.1, and shall be listed and labeled in accordance with CSA/ANSI Z21.88 ◦ CSA 2.33. Vented gas fireplaces (decorative appliances) shall be listed and labeled in accordance with CSA/ANSI Z21.50 ◦ CSA 2.22.

SECTION R405
SIMULATED BUILDING PERFORMANCE

Revise as follows:

TABLE R405.2 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5 except Section R403.5.2	Service hot water system
R403.5.2	Hot water pipe insulation
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
R403.14	Gas fireplaces

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

SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

Portions of table not shown remain unchanged.

SECTION[a]	TITLE
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5 except Section R403.5.2	Service hot water systems
R403.5.2	Hot water pipe insulation
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	Snow melt and ice system controls
R403.11	Energy consumption of pools and spas
R403.12	Portable spas
R403.13	Residential pools and permanent residential spas
R403.14	Gas fireplaces

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

CHAPTER 6 [RE]
REFERENCED STANDARDS

Revise as follows:

CSA

CSA Group
8501 East Pleasant Valley Road
Cleveland, OH 44131-5516

P.4.1-2021 — Testing method for measuring fireplace efficiency
R403.14.1

ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036

ANSI Z21.20-2005 (R2016) — Automatic Gas Ignition Systems And Components
R403.14

Z21-50-2019/CSA 2.22-19 — Vented Decorative Gas Appli~~e~~ances
R403.14.1

Z21.88-2019/CSA 2.23-19 — Vented Gas Fireplace Heaters
R403.14.1

Add new text as follows:

R404.1.5 Gas lighting. Gas-fired lighting appliances shall not be equipped with a continuous pilot and shall be equipped with an on-demand pilot, intermittent ignition, or interrupted ignition as defined by ANSI Z21.20.

Reason: This Public Comment is a clean-up proposal to move a gas fireplace efficiency requirement from the R402.5 Building Thermal Envelope section, into the more appropriate R403 (Systems) section. This PC also combines the moved requirement with another gas fireplace requirement for pilot lights, that does not belong in the R403.1 Controls section. They are combined in proposed new section R403.14 and this new added section is then added to Table R405.2 and Table R406.2 and updated in the Referenced Standards.

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

Bibliography: N/A

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: consolidates fireplace requirements and provides editorial cleanups.

Proposal # 1104

RED1-287-22

Proponents: Shannon Corcoran, representing American Gas Association (corcoransm@att.net)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R402.5.2.1 Gas fireplace efficiency. All gas fireplace heaters rated to CSA/ANSI Z21.88 • CSA 2.33 shall be listed and labeled with a fireplace efficiency (FE) rating of 50 percent or greater in accordance with CSA P.4.1. Vented gas fireplaces (decorative appliances) certified to CSA/ANSI Z21.50 • CSA 2.22 shall be listed and labeled~~, including their FE ratings,~~ in accordance with CSA P.4.1.

Reason: The code should use the full designation of the referenced standards.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Editorial change to use the full designation of the referenced standard, and will have no impact on construction cost.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: updates standards for applicances.

Proposal # 1285

RED1-290-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.1.2 Heat pump supplementary heat. Heat pumps having supplementary electric-resistance heat shall have controls that are configured to prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load. ~~Limit supplemental~~ Supplemental heat operation shall be limited to only ~~those times when~~ where one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The thermostat malfunctions.

Reason: Preferable code language.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: the edit is proper.

Proposal # 1092

RED1-292-22

Proponents: Adam Berry, representing Colorado Energy Office (adam.berry@state.co.us)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.1.2 Heat pump supplementary heat. Heat pumps having a supplementary electric-resistance, fuel gas, or fuel oil heat system shall have controls that are configured to prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load. Limit supplemental heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The thermostat malfunctions.

2024 ENERGY Chapter11

Revise as follows:

N1103.1.2 Heat pump supplementary heat. Heat pumps having a supplementary electric-resistance, fuel gas, or fuel oil heat system shall have controls that are configured to prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load. Limit supplemental heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.
2. The heat pump is operating in defrost mode.
3. The vapor compression cycle malfunctions.
4. The thermostat malfunctions.

Reason: Heat pumps in colder climates, such as those of Colorado, often are supported by backup systems that are not limited to just electric resistance systems. Many homeowners that upgrade to an electric heat pump will keep their natural gas furnace, propane heating system, or other non-electric heating system to function as the backup during the coldest periods where the heat pump is not able to meet the demand. Controls for these backup systems should apply to all types of systems, whether electric, fuel gas, or fuel oil, to ensure that the heat pump is the primary source of heating and that the backup systems are being used only in very limited circumstances when the heat pump is unable to keep up.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal should not increase the cost of construction, as it just widens the applicability for backup controls to apply to non-electric backup heating systems.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: provides clarity on dual fuel systems

Proposal # 1321

RED1-296-22

Proponents: Eric Tate, representing Atmos Energy (eric.tate@atmosenergy.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.1.3 Continuously burning pilot light. Gas fireplace systems ~~are not permitted to~~ <u>shall not</u> be equipped with a continuously burning pilot light.

Exception<u>s</u>:

<u>1.</u> Any fireplace equipped with an on-demand, intermittent or interrupted ignition pilot light (as defined in ANSI Z21.20) is not considered to have a continuously burning pilot light.
2. <u>Gas-fired appliances using pilots within a listed combustion safety device.</u>

Reason: Appliances such as space heaters use continuously burning pilots in oxygen depletion sensors (ODS) as a means of shutting off the appliance in the event that room oxygen is reduced to 18% by volume and as a correlated indoor air quality accumulation of carbon monoxide (CO). Disruption of the stability of the continuously burning pilot within the ODS, caused by oxygen depletion, closes the gas valve shutting of the appliance. Banning continuously burning pilots, *per se*, would disqualify use of ODS systems despite its listing and incorporation in the gas appliance. Changes to alternate means of achieving gas shut off are not currently recognized in standards for safety for gas appliances.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposed language will not affect cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: based on proponents reason statement

Proposal # 1441

RED1-298-22

Proponents: Shannon Corcoran, representing American Gas Association (corcoransm@att.net)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.1.3 ~~Continuously burning~~ Continuous pilot ~~light~~. Gas fireplace systems are not permitted to be equipped with a ~~continuously burning~~ continuous pilot ~~light~~.

> **Exception:** Any fireplace equipped with an on-demand, intermittent or interrupted ignition pilot light (as defined in CSA/ANSI Z21.20: 2 • CSA C22.2 No. 60730-2-5:22 •UL 60730-2-5) is not considered to have a continuous pilot ~~light~~.

Reason: The code should use proper designation of the referenced standard - CSA/ANSI Z21.20:22 • CSA C22.2 No. 60730-2-5:22 ♦ UL 60730-2-5. Terminology and definitions should be consistent with the standard (since the exception states "as defined in").

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The proposal does not affect construction codes.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: updates references

Proposal # 1294

RED1-299-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.11.2 Time switches. Time switches or other control methods that can automatically turn heaters and pump motors off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate ~~solar-~~ on-site renewable energy- and waste-heat-recovery pool heating systems.

Reason: This proposed change updates the exception language to be consistent with other changes in the code, such as in 403.11.3 for pool covers (which also has the same language in its exception).
In addition, there are multiple types of renewable energy systems that can be used for pool heating and should qualify for the exception.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is language for an exception to a requirement. It may change the cost of the exception, as more renewable energy systems will be allowed to be used for the exception, but it does not change the cost of the required time switch.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: brings consistency to section.

Proposal # 1020

RED1-302-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.3.2 Ducts located in conditioned space. For ductwork to be considered inside a *conditioned space,* it shall comply with one of the following:

1. The duct system shall be located completely within the *continuous air barrier* and within the building thermal envelope.
2. Ductwork in ventilated attic spaces or unvented attic with vapor diffusion port shall be buried within ceiling insulation in accordance with Section R403.3.3 and all of the following conditions shall exist:

   2.1. The air handler is located completely within the *continuous air barrier* and within the *building thermal envelope*.

   2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the *building thermal envelope* in accordance with Section R403.3.6, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m^2) of *conditioned floor area* served by the duct system.

   2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.

3. Ductwork located in wall or floor building assemblies separating unconditioned from conditioned space shall comply with the following:

   3.1. A *continuous air barrier* shall be installed as part of the building assembly between the duct and the unconditioned space.

   3.2. Ducts shall be installed in accordance with Section R403.3.1.

   Exception: Where the building assembly cavities containing ducts have been air sealed in accordance with Section R402.5.1 <u>and insulated in accordance with Item 3.3</u>, duct insulation is not required.

   3.3. Not less than R-10 insulation, and not less than 50 percent of the required R-value specified in Table R402.1.3, shall be located between the duct and the unconditioned space.

   3.4 For ducts in these building assemblies to be considered within conditioned space, the air handling equipment shall be installed within conditioned space.

Reason: This is clarification of intent. The exception applies to duct insulation. The building assembly insulation requirements of Item 3.3 must be met.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: the proposal cleans up the language in R403.3.2 clarifying the provisions.

Proposal # 1000

RED1-305-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.3.3 Ducts buried within ceiling insulation. Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation *R*-value not less than R-8.
2. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the *R*-value of the duct insulation.
3. In Climate Zones 0A, 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the International Mechanical Code or Section M1601.4.6 of the International Residential Code, as applicable.

   Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

4. In Climate Zones 0A, 1A, 2A and 3A when installed in an unvented attic with vapor diffusion port, the supply ducts shall be completely buried within the ~~ceiling~~ insulation in the ceiling assembly at the floor of the attic, insulated to an *R*-value of not less than R-8 and in compliance with the vapor retarder requirements of Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

   Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

   4.1 Air permeable insulation installed in unvented attics shall be in compliance with the requirements of Section R806.5.2 of the *International Residential Code*.

Reason: Item 4 in Section R403.3.3 was newly added during the initial public input phase. It addresses the case of a conditioned (unvented) attic space using a diffusion port to remove water vapor from the attic space by diffusion instead of ventilation. However, these unvented attic systems in the building code may be constructed with insulation at the ceiling of the attic (e.g., on or between rafters) or at the floor of the attic which is the ceiling of the story below. For Section R403.3.3, the former condition (placing buried ducts in insulation between rafters because it is consider the "ceiling" of the attic) is not intended but could be interpreted that way when constructing an unvented attic in accordance with the building code with insulation between or on rafters at the ceiling of the attic space. This would cause the diffusion port methodology to potentially not function properly. Therefore, text is added to clarify that the "ceiling insulation" being discussed in Item 4 of Section R403.3.3 is on the ceiling of the story below at the floor of the attic, not at the ceiling of the unvented attic as permitted option in the building code for unvented attics.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal clarifies what is intended and does not change requirements. Therefore, it should have no cost impact and should help avoid unintended consequences in coordination with building code requirements for unvented attics.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: The Committee voted against Disapproval in order to afford the Proponent the opportunity to speak to their proposal and be able to consider modifications, given the confusion on whether it was or was not included in 285. The committee voted to approve, after a friendly amendment which improved the original proposed wording.

Proposal # 1339

RED1-309-22

Proponents: Alex Smith, representing NAHB (asmith@nahb.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R403.3.6 MAXIMUM TOTAL DUCT SYSTEM LEAKAGE

ROUGH IN	POST CONSTRUCTION	
Duct systems serving more than 1,000 ft^2 of conditioned floor area	**cfm/100 ft^2 (LPM/9.29 m^2)**	**cfm/100 ft^2 (LPM/9.29 m^2)**
Air handler is not installed	3 (85)	NA
Air handler is installed	4 (113.3)	4 (113.3)
Duct systems located in conditioned space, with air handler not installed	6 (170)	6 (170)
Duct systems located in conditioned space, with air handler installed	8 (226.6)	8 (226.6)
Duct systems serving less than or equal to 1,000 ft^2 of conditioned floor area	**cfm (LPM)**	**cfm (LPM)**
Air handler is not installed	30 (849.5)	NA
Air handler is installed	40 (1132.7)	40 (1132.7)
Duct systems located in conditioned space, with air handler not installed	60 (1699.1)	60 (1699.1)
Duct systems located in conditioned space, with air handler installed	80 (2265.4)	80 (2265.4)

Reason: It's common practice in many markets around the country to test ducts in conditioned space before the air handler is installed. Air handlers in these situations are often installed after the drywall. Therefore, the code needs to provide a compliance metric for this construction scenario.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The change would have no effect on the cost of construction

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Committee voted to support the proposal to enable homes with duct systems inside conditioned space to test for duct leakage without the AHU installed, as long as the AHU is later verified to be inside conditioned space.

Proposal # 1042

RED1-310-22

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

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R403.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump.Gravity and thermosyphon circulation systems shall be prohibited. ~~The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosyphon circulation systems shall be prohibited.~~ Controls for circulating hot water system pumps shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water. The system return pipe shall be a dedicated return pipe or a cold water supply pipe.Where a cold water supply pipe is used as the return pipe, a temperature sensor connected to the controls shall be located on the hot water supply no more than two feet from the connection to the cold water supply pipe. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104ºF (40ºC).

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.5.1.1.1 Demand recirculation water systems. ~~Where installed, d emand~~ Demand recirculation water systems shall have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance~~, sensing the presence of a user of a fixture~~ sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance. The controls shall limit pump operation by:

1. Shutting off the pump when the temperature sensor detects one of the following:
   - 1.1 An increase in the water temperature of not more than 10ºF (5.6ºC) above the initial temperature of the water in the pipe.
   - 1.2 The temperature of the water in the pipe reaches 104ºF (40ºC).
2. Limiting pump operation to a maximum of five minutes following activation.
3. Not activating the pump for at least five minutes following shutoff or when the temperature of the water in the pipe exceeds 104ºF (40ºC).

Reason: Using a control that senses the presence of a user (i.e., an occupancy sensor) means that every time someone walks up to, or even past, a fixture – *for any reason* – the demand recirculation pump activates and may in turn activate the water heater.

There are many reasons to approach a bathroom or kitchen sink that do not involve the use of hot water. In fact, anecdotally, I kept track of my approaches and found I use hot water < 5% of the time, often using no water at all (e.g., comb hair, look in mirror, get something from cabinet under sink).

Push button control is preferred because it eliminates these "false signals" for pump operation that an occupancy sensor would generate. (California Energy Commission Building Energy Efficiency Standards Residential Compliance Manual)

"False signals" waste energy, both transporting unneeded hot water and when the draw triggers the water heater to fire up.

California Building Energy Efficiency Standards and California Green Building Standards Code specify the following recirculation system controls:

- manual activation with thermostat automatic shut off in one- and two-family dwellings
- controls that sense hot water demand and recirculation return temperatures for central recirculation systems that serve multiple dwelling units

Both of these controls remain represented in R403.5.1.1.1 after this proposed change.

The City of Scottsdale (Arizona) recently adopted the 2021 IECC with this proposed change as a local amendment.

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

The code change proposal will neither increase nor decrease the cost of construction, but will decrease the cost of energy use.

Bibliography: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency-0
https://up.codes/viewer/california/ca-green-code-2019/chapter/A4/residential-voluntary-measures#A4.303.5
https://up.codes/viewer/california/ca-green-code-2019/chapter/2/definitions#demand_hot_water_recirculation_system

Attached Files

- **CA Codes re Demand Recirc Controls.pdf**
  https://energy.cdpaccess.com/proposal/1351/3095/files/download/468/

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: addresses recommended distance language in R403.5.1.1 text in red. For R403.5.1.1.1.2 and 3 simplify language with recommendation adding friendly amendment to the “as modified.”

RED1-313-22

Proponents: Gary Klein, representing Self (gary@garykleinassociates.com); Mark Lyles, representing California IOUs (markl@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**R403.5.4 Water volume determination.** The water volume in the piping shall be calculated in accordance with this section. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered to be sources of heated water. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from Table R403.5.4. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.~~

Revise as follows:

R408.2.3 Reduced energy use in service water-heatingoptions. For measure numbers R408.2.3 (1) through R408.2.3 (5), the 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 (6), ~~the~~ <u>a compact</u> hot water <u>distribution</u> system shall comply with R408.2.3.1.
~~To field or plan review verify that the system meets the prescribed limit, one of the following must be done:~~

1. ~~At plan review, referencing ounces of water per foot of tube on plans as per Table R403.5.4.~~
2. ~~At rough in (plumbing), referencing ounces of water per foot of tube installed as per Table R403.5.4.~~
3. ~~At final inspection. In accordance with Department of Energy's Zero Energy Ready Home National Specification (Rev. 07 or higher) footnote on Hot water delivery systems.~~

R408.2.3.1 Compact hot water distribution <u>system option</u>. ~~To claim the For Ccompact Hhot W water D distribution system credit, the volume~~ <u>Thepipe</u> shall store not more than 16 ounces of water ~~in~~ <u>between</u> the nearest source of heated water and the termination of the fixture supply pipe when calculated using section R403.5.4. <u>Where the source of heated water is a circulation loop, the loop shall be primed with a *demand recirculation water system*. 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.</u> ~~When the hot water source is the nearest primed plumbing loop or trunk, this must be primed with an on-demand recirculation pump and must run a dedicated ambient return line from the furthest fixture or end of loop to the water heater. In order to claim this credit, the dwelling must have a minimum of 1.5 bathrooms.~~
~~To field or plan review, verify that the system meets the prescribed limit, one of the following must be done:~~

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

Add new text as follows:

<u>**R408.2.3.1.1 Water volume determination.** The water volume in the piping between a source of heated water and the termination of a fixture supply shall be calculated in accordance with this section. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered to be sources of heated water. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from Table R408.2.3.1. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.</u>

2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE ~~R403.5.4~~ R408.2.3.1 INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING

OUNCES OF WATER PER FOOT OF TUBE									
NOMINAL SIZE (inches)	COPPER TYPE M	COPPER TYPE L	COPPER TYPE K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE-RT SDR 9	COMPOSITE ASTM F1281	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	-	0.64	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39	2.35
1	5.81	5.49	~~5.19~~ 5.17	4.43	5.53	4.57	3.91	5.56	3.91
1 1/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49	5.81
1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48	13.86

For SI: 1 foot = 304.8 mm, 1 inch = 25.4 mm, 1 liquid ounce = 0.030L, 1 oz/ft^2 = 305.15 g/m^2.

N/A = Not available.

Reason: Minor edits were made to the language which clarify the requirements. This public comment removes the minimum requirement of 1.5 bathrooms to claim this credit. If there is only one bathroom, a kitchen and perhaps a laundry room, they could be close to each other and to the water heater or far from each other and the water heater, or one could be close and the other far. The intent of the credit is to encourage the architect to get the fixtures close to the water heater(s). If this is somehow not possible, then installing an on-demand primed circulation loop gives them good performance.
The requirements for field or plan review are recommended to be moved to the Code Commentary section. Modifications were made to these provisions and specificity was added for clarity. The proposed new language is presented below.

Recommended for inclusion in the commentary:

R408.2.3.1 Compact hot water distribution systems. The purpose of a compact hot water distribution system is to minimize the volume in the piping between the sources of hot water and the uses of hot water. Sources of hot water include water heaters, circulating water systems and heat trace temperature maintenance systems. There are many ways to meet the requirements as long as the maximum volume between the source and the use is not exceeded.

To verify compliance with R408.2.3.1

1. *Construction documents* shall indicate the lengths, diameters and ounces of water in the piping between the sources of heated water and the termination of the fixture supply.

2. At plumbing rough-in, compare the length and diameter of the piping from the sources of heated water to the termination of the fixture supply pipes to those contained in the *construction documents*.

3. At final inspection verify that either:

a. No more than 32 ounces of water comes out of the fixtures before the temperature of the water rises above 105F.

b. No more than 20 ounces of water shall come out of the fixtures before the temperature of the water rises 10F above the ambient water temperature.

c. If there is a *demand recirculation water system* or a heat trace system, ensure that these are primed with hot water prior to verifying the volume.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The changes that have been proposed clarify the language, but do not add provisions, so there is no impact on construction costs.

Bibliography: none

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: recommends moving all the provisions related to compact hot water distribution systems to Section 408. This recommendation incorporates language from RED1-311 and RED1-312 (the pipe volume table) into this one proposal. Have tried to align language with other sections in R408.

Proposal # 1079

RED1-315-22

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.5.5 Demand responsive water heating. Electric storage water heaters with a rated water storage volume of 40 gallons (150L) to 120 gallons (450L) and a nameplate input rating equal to or less than 12kW shall be provided with demand responsive controls in accordance with Table R403.5.5 ~~or another equivalent approved standard.~~

Exceptions:

1. Water heaters that are capable of delivering water at a temperature of 180°F (82°C) or greater.
2. Water heaters that comply with Section IV, Part HLW or Section X of the ASME Boiler and Pressure Vessel Code.
3. Water heaters that use 3-phase electric power.

2024 International Energy Conservation Code [CE Project]

Revise as follows:

Table R403.5.5 DEMAND RESPONSIVE CONTROLS FOR WATER HEATING

-	Controls	-
Equipment Type	Manufactured before 7/1/2025	Manufactured On or After 7/1/2025
Electric storage water heater	AHRI Standard 1430-2022 (I-P) or ANSI/CTA-2045-B Level 1 and also capable of initiating water heating to meet the temperature set point in response to a demand response signal	AHRI Standard 1430-2022 (I-P) ~~ANSI/CTA-2045-B Level 2, except "Price Stream Communication" functionality as defined in the standard~~

2024 International Energy Conservation Code [RE Project]

Add new standard(s) as follows:

AHRI

AHRI Standard 1430-2022 (I-P) Demand Flexible Electric Storage Water Heaters
2111 Wilson Blvd, Suite 500
Arlington, VA 22201

Reason: AHRI notes that AHRI Standard 1430 is a harmonized specification for demand flexible electric resistance storage and electric heat pump water heaters (HPWH)s capable of load management that policymakers can use, state government, electric utilities, authorized third parties, manufacturers, designers, installers, contractors, and users. By providing standardized requirements for Demand Flexible Electric Storage Water Heaters (DFWH), utilities and load management program managers can be assured that DFWHs can communicate using standard hardware and software.
AHRI Standard 1430 published December 2022. Therefore, the standard is ready to be included in the code to guide DFWHs.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
Referencing AHRI Standard 1430 will neither increase nor decrease the cost of construction. If anything, since manufacturers will already employ AHRI 1430, the expected cost to manufacture products will decrease.

Bibliography: AHRI notes that AHRI Standard 1430 is available as a free download at the following link: https://www.ahrinet.org/sites/default/files/2022-12/AHRI%20Standard%201430-2022%20%28I-P%29.pdf.
The standard has also been uploaded for convenience.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: provides standard for demand flexible electric resistance storage and electric heat pump water heaters.

Proposal # 1227

RED1-318-22

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.6 Mechanical ventilation. The *buildings* and *dwelling units* complying with Section R402.5.1.1 shall be provided with mechanical *ventilation* that complies with the requirements of Section M1505 of the International Residential Code or *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the *ventilation* system is not operating.

2024 ENERGY Chapter11

Revise as follows:

N1103.6 Mechanical ventilation. The *buildings* and *dwelling units* complying with Section N1102.5.1.1 shall be provided with mechanical *ventilation* that complies with the requirements of Section M1505 or with other *approved* means of *ventilation*. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the *ventilation* system is not operating.

Reason: Based on approval of RE132-19 Part 1, as modified, the text of Section R403.6/N1103.6 of the 2021 IECC-R/IRC should read as follows: **R403.6 (IRC N1103.6). Mechanical ventilation.** Buildings and dwelling units complying with Section 402.4.1 shall be provided with mechanical ventilation that complies with the requirements of M1505 of the International Residential Code or International Mechanical Code, as applicable, or with other approved means of ventilation...

(Note that in the PC draft #1, the numbering of the reference has editorially changed to R402.5.1.)

In consultation with ICC staff, an erratum has been submitted to ICC to correct the 2021 IECC-R/IRC language to read as shown above. This proposal seeks to modify the corrected 2021 IECC/IRC language by changing the R402.5.1/N1102.5.1 reference to R402.5.1.1/N1102.5.1.1. Use of the current reference could be misinterpreted to mean that mechanical ventilation is only required when each subsection of R402.5.1/N1102.5.1 is completed, including a blower door test. There are many adopting jurisdictions that waive blower door test requirements based on lack of access to qualified testers, but perhaps without exception, these jurisdictions retain the prescriptive air sealing requirements in R402.5.1.1/N1102.5.1.1. The requirement for mechanical ventilation should not be determined by whether a blower door test has been conducted but by whether air sealing measures have been pursued. The blower door test is simply there to confirm that the air sealing required by R402.5.1.1/N1102.5.1.1 has been executed properly. By modifying the reference in R403.6, the IECC sends the right message that mechanical ventilation is required in tightly constructed dwelling units and buildings, while ensuring that mechanical ventilation requirements are not inadvertently dropped by adopting jurisdictions that do not have access to blower door testers.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal clarifies existing requirements and does not affect construction costs.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Provides proper reference for air sealing requirements

Proposal # 1364

RED1-321-22

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R403.6.2 (N1103.6.2) 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
~~HRV, ERV, or balanced~~ Balanced ventilation system without heat or energy recovery	Any	1.2[a]	~~HRV or ERV: CAN/CSA 439; Balanced without heat or energy recovery: ASHRAE Standard 51 (ANSI/AMCA Standard 210)~~ 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-handler that is integrated to tested and *listed* HVAC equipment	Any	1.2	Outdoor airflow as specified. Air-handler fan power determined in accordance with the HVAC appliance's test method referenced by Section C403.3.2 of the IECC-Commercial Provisions.

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

a. ~~Design outdoor airflow rate/watts of fan used.~~

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

Reason: This proposal modifies the fan efficacy table to provide editorial changes that improve clarity and improve alignment with the IECC-C fan efficacy table, as published in PC#1 of the 2024 IECC-C.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
These are editorial changes that neither increase nor decrease costs.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: Aligns with IECC Commercial table

Proposal # 1167

RED1-322-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

Portions of table not shown remain unchanged.

SYSTEM TYPE	AIRFLOW RATE (CFM)	MINIMUM EFFICACY (CFM/WATT)	TEST PROCEDURE
HRV, ERV, or balanced	Any	1.2	HRV or ERV: CAN/CSA 439; Balanced without heat or energy recovery: ASHRAE Standard 51 (ANSI/AMCA Standard 210)
Range hood	Any	2.8	ASHRAE 51 (ANSI/AMCA Standard 210)
In-line supply or exhaust fan	Any	3.8	
Other exhaust fan	< 90	2.8	
	≥ 90 and < 200	3.5	
	≥ 200	4.0	
Air-handler that is integrated to tested and *listed* HVAC equipment	Any	1.2	Outdoor airflow as specified. Air-handler fan power determined in accordance with ~~the HVAC appliance's~~ the applicable US Department of Energy Code of Federal Regulations DOE10 CFR 430, or other approvedtest method~~ referenced by Section C403.3.2 of the IECC-Commercial Provisions~~.

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

a. Design outdoor airflow rate/watts of fan used.

Reason: Section 105 requires residential buildings to comply with the IECC-Residential and not the IECC-Commercial provisions. Referencing the IECC-C is additionally inappropriate because of ICC commitments to industry and the chance of the IECC-C not being adopted by the jurisdiction. More technically competent persons can provide the appropriate test method(s) direct reference(s) if approval by the code official is deemed inadequate.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This is a formatting issue.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Referencing federally required commercial equipment efficiency test procedures is potentially problematic for Residential equipment. The proposed modification changes the reference to require alignment with requirements for residential equipment efficiency ratings.

Proposal # 1420

RED1-324-22

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.6.3 Testing. Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6, in accordance with ANSI/RESNET/ICC 380. 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.

Exception~~s~~:

1. Kitchen range hoods that are ducted to the outside with 6-inch (152 mm) or larger , a length of 10ft (3048 mm) or less, and not more than two 90° elbows or equivalent shall not require testing.
2. A third-party test shall not be required where the ventilation system has an integrated diagnostic tool used for airflow measurement, ~~programmable airflow settings,~~ and a user interface that communicates the installed airflow rate.

Reason: AHRI notes that this language is not necessary. By reference, ANSI/RESNET/ICC 380 allows manufacturer-integrated devices to qualify airflow measurements, but it does not include the limitations of having programmable airflow settings and a communicating user interface. This language is contrary to the RESNET standard and could be directed toward specific existing equipment.

Furthermore, since this language contradicts ANSI/RESNET/ ICC 380, it may cause confusion regarding how to apply the code. Therefore, AHRI notes that this exception should be deleted.

Cost Impact: The code change proposal will decrease the cost of construction.
It is expected that by removing the exception, construction costs will decrease. Manufacturers will have clear direction on which standard to use and additional ambiguity noted in the exception will be removed. Therefore, construction costs will decrease.

Bibliography: AHRI notes that the RESNET/ICC 380 standard can be reviewed at this link https://codes.iccsafe.org/content/RESNET3802019P1

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: proposal eliminates conflict with ANSI/RESnet 380.

Proposal # 1229

RED1-325-22

Proponents: Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com); Mary Koban, representing AHRI (mkoban@ahrinet.org)

2024 International Energy Conservation Code [RE Project]

R403.7 Equipment sizing and efficiency rating. Heating and cooling *equipment* shall be sized in accordance with ACCA Manual S based on *building* loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. New or replacement heating and cooling *equipment* shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the *equipment* is installed.

Revise as follows:

R403.7.1 Electric-resistance space heating ~~zone heated units~~. ~~All d~~ Detached one- and two-family dwellings and townhouses in Climate Zones 4 through 8~~4-8~~ using electric -resistance ~~zonal~~ space heating shall limit the total installed heating capacity of all electric-resistance space heating serving the *dwelling unit* to no more than 2.0 kW, or shall install a heat pump in the largest space that is not used as a bedroom.~~as the primary heat source shall install one additional heating unit in the largest living zone. The additional unit shall have an HSPF greater than 7.4 (6.3 HSPF2). Building permit drawings shall specify the heating equipment type and location of the heating system.~~

~~**Exceptions:**~~

1. ~~Total installed heating capacity of 2 kW per dwelling or less.~~
2. ~~Dwellings that have central ducted or ductless cooling or heating systems~~

Reason: The intent of this Public Comment is to retain the intent of the original requirement as introduced and justified by REPI-99, but to use simpler, clearer language. A 3rd exception is introduced for homes where the original requirement may not be cost-effective. The language regarding permit drawings is removed because it is redundant to text already required in R103.2. A minimum efficiency is not necessary given that the federal standards for heat pumps (10 CFR 430.32(c)), other than small-duct high-velocity systems and space-constrained heat pumps, require a higher efficiency than 7.4 HSPF (6.3 HSPF2).

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

Bibliography: None

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: moved exception into charging language and provided further cleanup of section.

Proposal # 1107

RED1-329-22

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

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R403.8 Systems serving multiple dwelling units. Except for systems complying with Section R403.9, systems~~Systems~~ serving multiple *dwelling units* shall comply with Sections C403 and C404 of the *International Energy Conservation Code*—Commercial Provisions instead of Section R403.

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R403.5.2 ~~Controls for hot water storage.~~ ~~The controls on pumps that circulate water between a water heater and a heated-water storage tank shall limit operation of the pump from heating cycle startup to not greater than 5 minutes after the end of the cycle.~~

Add new text as follows:

R403.9 Mechanical systems located outside of the building thermal envelope. Mechanical systems providing heat outside of the thermal envelope of a building shall comply with Sections R403.9.1 through R403.9.4.

R403.9.1 Heating outside a building. Systems installed to provide heat outside a building shall be radiant systems. Such heating systems shall be controlled by an occupancy sensing device or a timer switch, so that the system is automatically de-energized when occupants are not present.

Revise as follows:

~~R403.9~~ R403.9.2 Snow melt and ice system controls. Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is greater than 50°F (10°C) and precipitation is not falling, and an automatic or manual control that will allow shutoff when the outdoor temperature is greater than 40°F (4.8°C).

~~R403.10~~ R403.9.3 Roof and gutter deicing controls. Roof and gutter deicing systems, including but not limited to self-regulating cable, shall include automatic controls configured to shut off the system when the outdoor temperature is above 40°F (4.8°C) maximum and shall include one of the following:

1. A moisture sensor configured to shut off the system in the absence of moisture, or
2. A programmable timer configured to shut off the system for 8 hours minimum at night.

Add new text as follows:

R403.9.4 Freeze protection system controls. Freeze protection systems, such as heat tracing of outdoor piping and heat exchangers, including self-regulating heat tracing, shall include automatic controls configured to shut off the systems when outdoor air temperatures are above 40°F (4.8°C) or when the conditions of the protected fluid will prevent freezing.

Reason: Section R101.5 clearly requires that residential buildings comply with the IECC-R rather than the IECC- commercial provisions.
The original proponent of this section should do the work of incorporating the actual requirements for the benefit of the code user instead of referencing a code that may not be adopted.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
There will be no impact if the original proponent completes the work.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The Committee agreed to vote against the Disapproval in order to hear the modification. The modification resolved objections by not fully deleting the reference to IECC-C and by beginning the process of bringing in applicable IECC-C requirements into IECC-R.

RED1-330-22

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.1 Lighting equipment. All permanently installed luminaires , shall be capable of operation with an efficacy of not less than 45 lumens per watt or shall contain lamps capable of operation ~~at~~ with an efficacy of not less than 65 lumens per watt ~~or greater~~.

Exceptions:

1. ~~Kitchen appliance lighting~~ Appliance lamps.
2. Antimicrobial lighting used for the sole purpose of disinfecting.
3. General service lamps complying with DOE 10 CFR 430.32.
4. Luminaires with a rated electric input of not greater than 3.0 watts.

Reason: This proposal correlates the language in the 2024 IECC-C PC#1 draft with the IECC-R while clarifying that range hoods are exempt from the fan efficacy provisions, maintaining the 2021 IECC-R and IECC-C exception for this product class based on concerns for durability and viability of high-efficacy lighting exposed to the elevated temperatures associated with residential cooking.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This language is an editorial clarification of the current language and will therefore neither increase nor decrease the cost of construction.

Aside: While high-efficacy lighting is now available in range hoods, the cost of products incorporating such lighting is currently much higher than for hoods without such technology.
A survey of range hoods on HomeDepot.com conducted on December 12, 2022, found the following:

- 42 results for 30" range hoods of all lighting types except LED, starting at $69.
- 186 results for 30" range hoods with LED lighting, starting at $139.

A $70 difference is a high premium to pay for a lamp that is expected to have a low duty cycle.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: avoids issue of pre-emption related to federal efficiency laws

Proposal # 1472

RED1-335-22

Proponents: Shane Hoeper, representing myself (shoeper@cityofdubuque.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.5.3 Water heaters. An ~~individual~~ dedicated branch circuit ~~outlet~~ with a rating not less than either 240-volts, 30-amperes or 120V, 20-amperes shall be installed~~,~~ and terminate within three feet (304 mm) of each ~~fossil fuel~~ water heater.

Exception: Water heaters ~~in a centralized water heating system~~ serving multiple dwelling units in an R-2 occupancy.

Reason: The changes are editorial in nature and intended to make all the sections under R404.5 consistent.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
The changes are only editorial and does not affect the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: avoids controversy on fuel type of water heater.

Proposal # 1188

RED1-336-22

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

2024 International Energy Conservation Code [RE Project]

R405.4 Calculation procedure. Calculations of the proposed design shall be in accordance with Sections R405.4.1 and R405.4.2.

R405.4.1 General. Except as specified by this section, the *standard reference design* and *proposed design* shall be configured and analyzed using identical methods and techniques.

R405.4.2 Residence specifications. The *standard reference design* and *proposed design* 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 R402.1.3.

Revise as follows:

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

Portions of table not shown remain unchanged.

<table>
<tr><th>BUILDING COMPONENT</th><th>STANDARD REFERENCE DESIGN</th><th colspan="3">PROPOSED DESIGN</th></tr>
<tr><td rowspan="12">Service water heating[d, g, k]</td><td rowspan="7">~~As proposed.~~
Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td colspan="3">~~As proposed~~
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.</td></tr>
<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>
<tr><td>Fuel Type: Same as proposed design</td><td colspan="3">As proposed</td></tr>
<tr><td>Rated Storage Volume: Same as proposed design</td><td colspan="3">As proposed</td></tr>
<tr><td>Draw Pattern: Same as proposed design</td><td colspan="3">As proposed</td></tr>
<tr><td>Efficiencies: Uniform Energy Factor complying with 10 CFR §430.32</td><td colspan="3">As proposed</td></tr>
<tr><td>Tank Temperature: 120° F (48.9° C)</td><td colspan="3">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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 §4~~1~~30.32

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.

Reason: This Public Comment proposes that the Standard Reference Design should be modeled with a 40 gallon electric resistance storage water heater when the Proposed Design is a heat pump water heater. The current language would require the Standard Reference Design to be a heat pump water heater if that system type is in the Proposed Design. Given that electric storage is permitted by code, there should be more savings associated with this upgrade to a HPWH to encourage its adoption by builders. This approach is also the same as that used in the ERI Path and similar to the approach used to calculate points for HPWHs in R408.2.3.
Note: Some of the edits shown are errata, as they were approved through REPI-122:

1. removing "As Proposed" from the table in both columns
2. adding "without a proposed water heater" to note g.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This public comment does not increase the cost of construction.

Bibliography: None.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: After the motion to Disapprove RED1-336 failed, the Committee considered a Motion to Approve As Modified, in order to hear the modification shown in the agenda. The modification raised additional questions/comments that could not be immediately resolved and therefore the motion was withdrawn and replaced with a motion to Approve as Submitted. The Committee voted to support the proposal, as submitted, such that integrated heat pump water heaters in a Proposed Design in R405 are compared to electric resistance storage water heaters in the Standard Reference Design.

Proposal # 1169

RED1-337-22

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE N1105.4.2(1) 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
Air ~~exchange~~ leakage rate	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 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.	The measured air ~~exchange~~ 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 ~~exchange~~ 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 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.	The mechanical ventilation rate[b], Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation fan energy	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)/e_f where: B and M are determined in accordance with the ~~Air Exchange~~ 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

Reason: This proposal is an editorial clarification and reorganization to improve usability.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This proposal is editorial and will therefore neither increase nor decrease the cost of construction.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Submitted

Residential Energy Committee Reason: editorial and sync with other sections and table of proposals.

Proposal # 1469

RED1-339-22

Proponents: Robert Salcido, representing DOE (victor.salcido@pnnl.gov)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

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 absorptance = 0.75.	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 absorptance = 0.75.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 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.	The measured air exchange rate.[a]
	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:	

Air exchange rate	where: B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air exchange 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 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.	The mechanical ventilation rate[b] , Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 Air Exchange 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 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.	
	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
	Non-electric furnaces: Complying with 10 CFR §430.32	As proposed
	Non-electric boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section R403.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
		As proposed Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 – *HWDS*) where:

<table>
<tr><td rowspan="6">Service water heating[d, g, k]</td><td>As proposed.
Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td>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] factor</th><th>HWDS</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>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>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>~~50%~~ 75% inside conditioned space

~~50%~~ 25% unconditioned attic</td></tr>
</table></td><td>Duct location: as proposed.</td></tr>
<tr><td>Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed.</td></tr>
<tr><td>Duct system leakage to outside:
For duct systems serving > 1,000ft2 of conditioned floor area, the total duct system leakage to outside rate shall be 48 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area.
For duct systems serving ≤ 1,000ft2 of conditioned floor area, the total duct system leakage to outside rate shall be 480 cfm (1132.7 L/min).</td><td>Duct System Leakage to Outside: The measure 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>When 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>When total duct system leakage is measured without the air handler 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>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>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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

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 §130.32

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.

Reason: Ducts that are located in unconditioned spaces can significantly increase energy use in the home or dwelling unit due to thermal losses and air leakage outside of the building envelope. As proposed, the 2024 IECC would credit ducts located within conditioned space. While locating ducts within conditioned space is indeed best practice, there is a problem in how R405, as proposed, would handle ducts, effectively crediting every system installed *as if it would have otherwise been installed outside of conditioned space.* The consequences of this approach can be severe and were not sufficiently evaluated in previous committee deliberations.
Pacific Northwest National Laboratory (PNNL) has analyzed the impact of moving ducts from unconditioned space into conditioned space and found that the associated energy impact can be up to 18% of whole-building energy use, and corresponding energy costs of almost $400 per year, with the largest impacts experienced in colder climates. In addition to thermal losses, there are many other widely recognized benefits of locating ducts in conditioned space, such as lower risk of moisture issues and increased indoor air quality, among others. The following table depicts the expected energy use reductions across U.S. climate zones.

	HVAC Distribution System	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
	100 Percent of Ducts In Conditioned Space	3.57%	5.10%	6.65%	9.58%	12.13%	14.04%	16.13%	18.44%
	100 Percent of Ducts In Conditioned Space	$74	$88	$99	$118	$104	$155	$209	$361

The challenge of modeling duct location in performance-based approaches is that it can be difficult to credit positive behaviors (i.e., encouraging ducts to be located within conditioned space) without creating a severe false credit in areas and situations where ducts are already commonly located within conditioned space, which is heavily influenced by geographic location and other design choices (e.g., foundation type and number of floors). The issue of false credit, often referenced as *free ridership*, is especially prominent in colder climate zones. DOE field study data indicates that approximately 25% of homes commonly have 100% of their duct system installed in conditioned space. Over 50% of homes with heated basements, as are common in colder climates, had duct systems located completely within conditioned space. In these areas, the resulting credit is large enough to significantly erode the overall energy efficiency of the home, costing the home owner thousands over the life of the home. This tends to be a binding decision, as duct systems are difficult and costly to relocate after initial design and construction of the home. This challenge of properly rewarding, or penalizing, duct location is a primary reason duct location has not been credited in recent editions of the IECC. As proposed, the 2024 IECC introduces this challenge without appropriate safeguards—and to a magnitude that can dwarf other design choices.

The Committee should reconsider this approach and seek alternatives with lower risk of falsely crediting common design choices. In support of this objective, PNNL is offering two proposals which are intended to function independently or work in tandem; one which specifies ducts within conditioned space as a prescriptive requirement, and the second which addresses duct location in R405. In the latter case, ducts may still be located in unconditioned space, and comply with R405, and the associated (negative) energy impact can be offset through additional energy efficiency achieved elsewhere in the home.

Cost Impact: The code change proposal will increase the cost of construction.
The costs of a prescriptive requirement to have ducts in conditioned space can range from $0 (for the many homes that already commonly include ducts in conditioned space) to $400 for dropped ceiling strategy. A higher cost strategy where ducts are installed in a conditioned attic, which typically involves insulating and sealing the roof deck is estimated at a cost of $3,000. An average cost ranges from $1,000 to $1,300 based on previous research studies. (https://energy.gov/sites/prod/files/2014/01/f6/1_1g_ba_innov_ductsconditionedspace_011713.pdf)

Cost-effectiveness analysis, based on the approach and parameters established by the 2024 IECC development committee, indicates that locating ducts within conditioned space is cost effective across all climate zones and costs up to $1300. Associated paybacks range from 3.8 to 11.0 years, and life-cycle cost savings from $520 to $8,120.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: modification allows flexibility for ducts in conditioned space.

Proposal # 1477

RED1-340-22

Proponents: Shannon Corcoran, representing American Gas Association (corcoransm@att.net)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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

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 absorptance = 0.75.	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 absorptance = 0.75.	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 area above and below grade and soil characteristics: same as proposed.	As proposed
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
	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 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.	The measured air exchange rate.[a]
	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:	

Air exchange rate	where: B = 0.01 × CFA + 7.5 × (Nbr + 1), cfm. M = 1.0 where the measured air exchange 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 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.	The mechanical ventilation rate[b], Q, shall be in addition to the air leakage rate and shall be as proposed.
Mechanical ventilation	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 Air Exchange 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 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]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section R403.7.	
	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
	~~Non-electric~~ Natural gas, propane and fuel oil furnaces: Complying with 10 CFR §430.32	As proposed
	~~Non-electric~~ Natural gas, propane and fuel oil boilers: Complying with 10 CFR §430.32	As proposed
Cooling systems[d, f, k]	As proposed. Capacity: sized in accordance with Section R403.7.	
	Fuel Type: Electric Capacity: Same as proposed design	As proposed
	Efficiencies: Complying with 10 CFR §430.32	As proposed
		As proposed Use, in units of gal/day = 25.5 + (8.5 × N_{br}) ×

<table>
<tr><td rowspan="6">Service water heating[d, g, k]</td><td>As proposed.
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] factor</th><th>HWDS</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>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>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>50% inside conditioned space

50% unconditioned attic</td></tr></table></td><td>Duct location: as proposed.</td></tr>
<tr><td>Duct insulation: in accordance with Section R403.3.1.</td><td>Duct insulation: as proposed.</td></tr>
<tr><td>Duct system leakage to outside:
For duct systems serving > 1,000ft2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area.
For duct systems serving ≤ 1,000ft2 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 measure 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>When 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>When total duct system leakage is measured without the air handler 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>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>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.</td><td>Same as standard reference design.</td></tr>
</table>

	Dehumidifier: whole-dwelling with integrated energy factor = 1.77 liters/kWh.	

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. Where required by the code official, testing shall be conducted by an approved party. 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 home 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 the following assumptions shall be made for both the proposed design and standard reference design.

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 §130.32

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.

Reason: To use proper terminology for the energy source for these appliances

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This does not affect construction costs

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: provides clarification

Proposal # 1309

RED1-343-22

Proponents: Mark Lyles, representing California IOUs (markl@newbuildings.org); Gayathri Vijayakumar, representing Steven Winter Associates, Inc. (gvijayakumar@swinter.com); Vladimir Kochkin, representing NAHB (vkochkin@nahb.org); Jennifer Amann, representing ACEEE (jamann@aceee.org)

2024 International Energy Conservation Code [RE Project]

Add new definition as follows:

BALANCED VENTILATION SYSTEM. A ventilation system that simultaneously supplies outdoor air to and exhausts air from a space, where the mechanical supply airflow rate and the mechanical exhaust airflow rate are each within 10% of the average of the two airflow rates.

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	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.5(1)	ERV or HRV installed	TBD	TBD	TBD	TBD	TBD	TBD	0	0	0
R408.2.5(~~1~~ 2)	≤2 .0 ACH50 ~~air leakage rate~~ with ERV or HRV installed	1	4	5	10	10	13	~~15~~ TBD	~~8~~ TBD	~~8~~ .TBD
R408.2.5(~~2~~ 3)	≤2 .0 ACH50 ~~air leakage rate~~ with ~~balanced ventilation~~ a *balanced ventilation system*	2	3	2	4	4	5	~~6~~ TBD	~~6~~ TBD	~~6~~ TBD
R408.2.5(~~3~~ 4)	≤1.5 ACH50 ~~air leakage rated~~ with ERV or HRV installed	2	4	6	12	12	15	~~18~~ TBD	~~11~~ TBD	~~11~~ TBD
R408.2.5(~~4~~ 5)	≤1 .0 ACH50 ~~air leakage rate~~ with ERV or HRV installed	2	5	6	14	14	17	~~21~~ TBD	~~14~~ TBD	~~14~~ TBD

R408.2.5 Improved air sealing and efficient ventilation system option. ~~The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m3/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT)~~ The measured air leakage rate and ventilation system shall meet ~~be~~ one of the following:

1. ~~Less than or equal to 2.0 ACH50, with e~~ 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. ~~2.~~ 3. Less than or equal to 2.0 ACH50, with a *balanced ventilation system* ~~as defined in Section 202 of the 2021 *International Mechanical Code*~~.
4. ~~3.~~ 4. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.
5. ~~4.~~ 5. Less than equal to 1.0 ACH50, with either an ERV or HRV installed.

In addition, for measures requiring either an ERV or HRV, ~~Mminimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m^3/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/ Moisture Transfer (LRMT).~~ 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) or Net Moisture Transfer (NMT) 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: We propose an additional efficiency option in R408.2.6. The option provides credit for installing ERV/HRV for buildings meeting prescriptive air leakage rates, as defined in Section R402.5.1.3.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Replaces 2021 IMC definition for ‘balanced ventilation’ with a 2024 IRC definition for ‘balanced ventilation system’, and then revised as needed where the term is used. Also, replaces the credits awarded in CZ 6, 7, & 8 with ‘TBD’, given that 2.5 ACH50 and ERV/HRVs are now required in those CZs and the points may need to be re-calculated by PNNL.

RED1-351-22

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

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.

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 957% 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.

~~1. High Performance Cooling (Option 1)-Greater than or equal to 16 15.2 SEER2 and 12 EER2 air conditioner in all Climate Zones~~

~~2. High Performance Cooling (Option 2)-Greater than or equal to 18 SEER (16.90SEER2) and 14 EER (13.4 12 EER2) air conditioner in all Climate Zones.~~

~~3a. High Performance Gas Furnace (Option 1)- Greater than or equal to 92 5 % AFUE natural gas furnace in Climate Zones 4A, 4C, 5, 6, 7, and 8.~~

~~3b. High Performance Gas Furnace (Option 1)-Greater than or equal to 90% AFUE natural gas furnace in Climate Zones 0,1,2,3 and 4B~~

~~4a. High Performance Gas Furnace and Cooling (Option 1) -Greater than or equal to 95 % AFUE natural gas furnace and 15.2 SEER2 / 12 EER2 in Climate Zones 4A,4C, 5, 6 and 7 and 8.~~

~~4b High Performance Gas Furnace and Cooling (Option 1)- Greater than or equal to 90% AFUE natural gas furnace and 15.2 SEER2/ 10 EER2 in climate zones 0, 1, 2, 3, and 4B for air conditioner~~

~~5a. High Performance Gas Furnace and Cooling (Option 2)-Greater than or equal to 95 7 % AFUE natural gas furnace and 16.0 SEER2 /12 EER in other Climate Zones for air conditioner in Climate Zones 4A, 4C, 5,6,7 and 8.~~

~~5b. High Performance Gas Furnace and Cooling (Option 2) - Greater than or equal to 95% AFUE and 16 SEER2/10 EER2 air conditioner in climate zones 0, 1, 2, 3, and 4B~~

~~6a. High Performance Gas Fornace and HP (Option 1)- Greater than or equal to 95 % AFUE natural gas furnace and 8.5 1 HSPF2/16.0 15.2 SEER2 air source heat pump in Climate Zones 4A, 4C, 5,6,7,and 8.~~

~~6b. High Performance Gas Furnace and HP (Option 1) - Greater than or equal to 90% AFUE furnace and 7.8 HSPF2 / 15.2 SEER2/10.0 EER2 air source heat pump in Climate Zones 0, 1,2,3, and 4B~~

~~7a. High Performance Gas Furnace (Option 2) -Greater than or equal to 96 7 % in AFUE natural gas furnace inc Climate Zones 4A, 4C, 5, 6, 7 and 8.~~

~~7b High Performance Gas Furnace (Option 2)- Greater than or equal to 95% AFUE natural gas furnace in Climate Zones 0, 1, 2, 3, and 4B.~~

~~8a. High Performance HP (Option 1)-Greater than or equal to 8.5 1 HSPF2/16.0 15.2 SEER2 air source heat pump in Climate Zones 4A, 4C, 5, 6,7 and 8.~~

~~8b High Performance HP (Option 1)– Greater than or equal to 7.8 HSPF2/ 15.2 SEER2/ 11.7 EER2 air source heat pump in Climate Zones 0, 1, 2, 3, and 4B~~

~~9a. High Performance HP (Option 2)- Greater than or equal to 9 HSPF (7.6 8.5 HSPF2) /16 SEER (15.2SEER2 /12 EER2) air source heat pump in Climate Zones 4A,4C,5,6,7 and 8.~~

~~10. 9b High Performance HP (Option 2)-Greater than or equal to 10 HSPF (8.5 2 HSPF2 /) /16SEER (15.2 16.9 SEER2 /12 EER2) air source heat pump in Climate Zones 0,1,2,3, and 4B.~~

~~11.10. Ground source HP-Greater than or equal to 16.1 EER/ 3.5 1 COP ground source heat pump.~~

~~Ductless Systems:~~

~~121a. Single Zone: Greater than or equal to 8.5 HSPF2/16.9 15.2 SEER2 variable speed air source heat pump in Climate Zones 4A, 4C, 5, 6, 7 and 8.~~

~~11b. Single Zone: Greater than or equal to 7.8 HSPF2/15.2 SEER2 / 11.7 EER2 variable spped air source heat pump in climate zones 0, 1, 2, 3, and 4B.~~

~~132. Multi Zone: 8.5 HSPF2/16.9 SEER2 variable speed air source heat pump (Non-Ducted Indoor Units).~~

~~143. Multi Zone: 8.5 HSPF2/15.2 SEER2 variable speed air source heat pump (Ducted or Mixed Indoor Units)~~

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 1	Climate Zone 2	Climate Zone 3	Climate Zone 4A	Climate Zone 4B	Climate Zone 4C	Climate Zone 5	Climate Zone 6	Climate Zone 7	Climate Zone 8
R408.2.2(1)	Ground source heat pump	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(2)	Cooling (Option 1)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(3)	Cooling (Option 2)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(4)	Gas Furnace (Option 1)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(5)	Gas Furnace (Option 2)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(6)	Gas Furnace (Option 3)	TBD	TBD	TBD	TBD	-	-	-	-	-	-	-
R408.2.2(7)	Gas Furnace and cooling (Option 1)	TBD	TBD	TBD	TBD	-	--	-	-	-	-	-
R408.2.2(8)	Gas Furnace and Cooling (Option 2)	TBD	TBD	TBD	TBD	-	--	-	-	-	-	-
R408.2.2.(9)	Gas Furnace and Heat Pump (Option 1)	TBD	TBD	TBD	TBD	-	-	-	-	-	-	-
R408.2.2(10)	Heat Pump (Option 1)	TBD	TBD	TBD	TBD	-	-	--	-	-	-	
R408.2.2(11)	Gas Furnace and Cooling (Option 3)	-	-	-	-	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(12)	Gas Furnace and Cooling (Option 4)	-	-	-	-	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2. (13)	Gas Furnace and Heat Pump (Option 2)	-	-	-	-	TBD	TBD	TBD	TBD	TBD	TBD	TBD
R408.2.2(14)	Heat pump (Option 2)	-	-	-	-	TBD	TBD	TBD	TBD	TBD	TBD	TBD

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

Reason: Dear IECC Residential SC and Committee Members, we noted that Table 408.2 was difficult to update in cdpaccess. We did truncate the table and only concentrated on the HVAC portion for the submission. However, cdpaccess still did not capture our edits clearly. Therefore, we are attaching a spreadsheet (PDF) for your reference so you can see what we did. We provded more energy efficient product options by climate zones matched with potential credits.This caused us to add rows 3b, 4b, 5b, 6b, 7b, 8b, and 11b. (The concept in 9b was already captured in the original table.) We also split out Climate zones 4A, 4B, and 4C since credits are noted by granularity of climate zone 4. We also split out climate zones 0, 1 as we are still waiting for analysis from PNNL. Therefore, climate zones 0 and 1 may be different.

On August 16, 2022, President Joe Biden signed the Inflation Reduction Act (IRA) into law. The Act, which contains dozens of provisions related to climate change and prescription drug prices, includes measures that provide federal income tax credits for high efficiency HVAC and water heater products. This proposal aligns Additional Energy Credits with the IRA, provides even more energy credits for higher-efficiency equipment, and will encourage homeowners and builders to install efficient water heater products. Therefore, AHRI members suggest to align with Energy Star product specifications and CEE tiers when defining efficiency levels for HVAC options in R408.2.2. AHRI notes that the following sections of R408.2.2 align with these sections of either Energy Star v5.0 or CEE Tier 2 or 3. AHRI members note that aligning with these options provide the industry at large multiple product options that provide energy benefits and potentially provide tax credits.
AHRI reiterates that data from PNNL was not available. Therefore, AHRI felt it was prudent to provide multiple options/scenarios to ensure energy-efficient options are available to the marketplace based on the current energy efficiency levels noted by Energy Star and CEE.

- **R408.2.2.1 –** The proposal aligns with Energy Star
- **R408.2.2.2**- The proposal aligns with CEE Tier 2
- **R408.2.2.3a**- The proposal aligns with Energy Star
- **R408.2.2.3b**- The proposal aligns with Energy Star

- **R408.2.2.4a-** The proposal aligns with Energy Star
- **R408.2.2.4b-** The proposal aligns with Modified Energy Star due to lack of exact equipment type under Energy Star
- **R408.2.2.5a-** The proposal aligns with CEE Tier 3/ CEE Tier 2
- **R408.2.2.5b-** The proposal aligns with Modified CEE Tier 2 due to lack of exact equipment type under Energy Star
- **R408.2.2.6a-** The proposal aligns with Energy Star
- **R408.2.2.6b-** The proposal aligns with Modified Energy Star due to lack of exact equipment type under Energy Star
- **R408.2.2.7a-** The proposal aligns with CEE Tier 3
- **R408.2.2.7b-** The proposal aligns with CEE Tier 2
- **R408.2.2.8a-** The proposal aligns with Energy Star
- **R408.2.2.8b-** The proposal aligns with Energy Star
- **R408.2.2.9a-** The proposal aligns with Energy Star Most Efficient
- **R408.2.2.9b-** The proposal aligns with Energy Star Most Efficient
- **R408.2.2.10**- The proposal aligns with Energy Star
- **R408.2.2.11a-** The proposal aligns with Energy Star
- **R408.2.2.11b-** The proposal aligns with Energy Star

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change is not expected to increase or decrease the cost of construction. This code will enable more architects, builders and consumers to use energy efficient products due to potential Tax Incentives provided by the Inflation Reduction Act. Therefore, since there are more energy efficient HVAC options available, which may shorten lead time to complete residential build, this code may actually result in decreased construction costs.

Bibliography: AHRI notes that the Tax Provisions in the Inflation Reduction Act of 2022 can be found at this link https://crsreports.congress.gov/product/pdf/R/R47202
For convenience, AHRI also provided AHRI's review of the Inflation Reduction Act.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason:

RED1-358-22

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org); Mark Lyles, representing California IOUs (markl@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Delete and substitute as follows:

~~TABLE R408.2.3 Service water-heating efficiencies~~

~~Measure Number~~	~~Water Heater~~	~~Size and Draw Pattern~~	~~Type~~	~~Efficiency~~
~~R408.2.3(1)~~	~~Gas-fired storage water heaters~~	~~≤ 55 gallons, Medium~~		~~UEF ≥0.81~~
		~~≤ 55 gallons, High~~		~~UEF ≥0.86~~
		~~>55 gallons, Medium or High~~		~~UEF ≥0.86~~
~~R408.2.3 (2)~~	~~Gas-fired instantaneous water heaters~~	~~Medium or High~~		~~UEF ≥0.95~~
~~R408.2.3 (3)~~	~~Electric water heaters~~	~~Low, Medium, or High~~	~~Integrated HPWH~~	~~UEF ≥ 3.30~~
~~R408.2.3 (4)~~	~~Electric water heaters~~	~~Low, Medium, or High~~	~~Integrated HPWH, 120 Volt/15 Amp Circuit~~	~~UEF ≥ 2.20~~
		~~Low, Medium, or High~~	~~Split-system HPWH~~	~~UEF ≥ 2.20~~
~~R408.2.3 (5)~~	~~Solar water heaters~~		~~Electric backup~~	~~SUEF ≥ 3.00~~
			~~Gas backup~~	~~SUEF ≥ 1.80~~

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
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 heater (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)	Low, Medium or High	Integrated HPWH, 120 Volt/15 Amp Circuit	UEF≥2.20
R408.2.3(5)(a)	Electric water heaters (option 4)	Low, Medium or High	Split-system HPWH	UEF≥2.20
R408.2.3(5)(b)	Electric water heaters (option 5)	Low, Medium or High	Split-system HPWH	UEF≥3.75
R408.2.3(6)(a)	Solar water heaters (option 1)	All storage volumes, all draw patterns	Electric backup	SUEF≥3.00
R408.2.3(6)(b)	Solar water heaters (option 2)	All storage volumes, all draw patterns	Gas backup	SUEF≥1.80

Reason: Dear IECC Residential Sub-Committee and Committee members, please note that the cdpacess system did not allow me to edit the existing table. Therefore, I attached the code modification in track changes to this proposal. Please note we only changed a few items and not the entire table as it appears in the code proposal.
This table comes from aligning process for former code proposals (RECPI-10, REPI-18, REPI-33).

AHRI further notes that we made these changes due to new potential tax incentives. On August 16, 2022, President Joe Biden signed the Inflation Reduction Act (IRA) into law. The Act contains dozens of provisions related to climate change and prescription drug prices. It includes measures that provide federal income tax credits for high-efficiency HVAC and water heater products. This proposal aligns Additional Energy Credits with the IRA, provides even more energy credits for higher-efficiency equipment, and will encourage homeowners and builders to install efficient water heater products. Therefore, AHRI members suggest aligning with Energy Star product specifications and CEE tiers when defining efficiency levels for HVAC options in R408.2. AHRI notes that the following sections of R408.2.3 align with Energy Star and CEE tiers

R408.2.3(1)(a)- this is the proposed CEE level for all draw patterns, baseline condensing type WH. R408.2.3(1)(b)- this is aligned with Energy Star v5.0

R408.2.3(2)(a)- this is a baseline condensing level well above the minimum in the market and will probably align with utility incentives.

R408.2.3(2)(b)- this is aligned with Energy Star v5.0, but it is also important to note that this level is well above current products on the market.

R408.2.3(3)(a)-aligns with Energy Star v5.0

R408.2.3(3)(b)-aligns with CEE levels

R408.2.3(4)-aligns with both CEE levels and Energy Star v5.0

R408.2.3.(5)(a)-aligns with Energy Star v5.0

R408.2.3(5)(b)-aligns with CEE levels

R408.2.3.6(a)-aligns with Energy Star v5.0

R408.2.3.(6)-aligns with Energy Star v5.0 and may qualify for federal tax incentives

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
This code change is not expected to increase or decrease the cost of construction. This code will enable more architects, builders and consumers to use energy efficient products due to potential Tax Incentives provided by the Inflation Reduction Act.

Bibliography: AHRI notes that the Tax Provisions in the Inflation Reduction Act of 2022 can be found at this link https://crsreports.congress.gov/product/pdf/R/R47202
AHRI provides the following link to Energy Star version 5.0 https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Residential%20Water%20Heaters%20Version%205.0%20Specification%20and%20Partner%20Commitments.pdfAHRI provides the following link to the CEE Residential Water Heating Specification https://library.cee1.org/content/cee-residential-water-heating-specification/

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: updates requirements for water heater types and draw patterns.

Proposal # 1228

RED1-360-22

Proponents: Mark Lyles, representing California IOUs (markl@newbuildings.org)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R408.2.6 MINIMUM EFFICIENCY REQUIREMENTS: APPLIANCE S ~~SPECIFICATION REFERENCE DOCUMENT~~

Appliance	Efficiency Improvement	Test Procedure
Refrigerator	~~Energy Star Program Requirements, Product Specification for Consumer Refrigeration Products, Version 5.1 (08/05/2021)~~ Maximum Annual Energy Consumption (AEC), No greater than 620 kWh/yr	10 CFR 430, Subpart B, Appendix A
Dishwasher	~~Energy Star Program Requirements for Residential Dishwashers, Version 6.0 (01/29/2016)~~ Maximum Annual Energy Consumption (AEC), No greater than 240 kWh/yr	10 CFR 430, Subpart B, Appendix C1
~~Clothes dryer~~	~~Energy Star Program Requirements, Product Specification for Clothes Dryers, Version 1.1 (05/05/2017)~~	
Clothes Washer and Clothes Dryer	~~Energy Star Program Requirements, Product Specification for Clothes Washers, Version 8.1 (02/05/2018)~~ Clothes washer located within dwelling units: Maximum Annual Energy Consumption (AEC), 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: 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

R408.2.6 Energy efficient appliances. Appliances installed in a *residential building* ~~dwelling unit~~ shall ~~meet~~ comply with the ~~product energy~~ efficiency requirements specified ~~specifications listed~~ in Table R408.2.6~~, or equivalent energy efficiency specifications~~. Not less than three appliance types from Table R408.2.6 shall be installed ~~for compliance with this section~~.

> **Exception:** In Group R-2 occupancies where a dishwasher is not installed in each *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.

2024 International Energy Conservation Code [CE Project]

Add new definition as follows:

COMMON AREAS. All conditioned spaces within Group R occupancy buildings that are not dwelling units or sleeping units.

Reason: The objective of Section R408.2.5 was to encourage installation of appliances meeting ENERGY STAR criteria. Unfortunately, IECC does not allow direct reference to ENERGY STAR product specifications. The intent of the proposed change is to specify requirements which will meet the Energy Star product specification criteria in a way that is easily confirmed by a code official. Specifically, the proposed changes remove the reference to Energy Star program requirements and introduce maximum Annual Energy Consumption requirements for Refrigerators, Dishwashers and Clothes Washers and Clothes Dryers. Code officials will be able to readily confirm compliance by comparing the Annual Energy. Consumption listed on the Energy Guide label of products in the building with these maximum Annual Energy Consumption requirements.

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

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: Improves clarity of the requirements to meet the appliance credit.

Proposal # 1067

RED1-365-22

Proponents: Kristopher Stenger, representing ICC (kstenger@iccsafe.org)

2024 International Energy Conservation Code [CE Project]

Revise as follows:

R403.6.3 Testing. Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6, in accordance with ANSI/RESNET/ICC 380. 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.

Exceptions:

1. Kitchen range hoods that are ducted to the outside with 6-inch (152 mm) or larger , a length of 10ft (3048 mm) or less, and not more than two 90° elbows or equivalent shall not require testing.
2. A third-party test shall not be required where the ventilation system has an integrated diagnostic tool used for airflow measurement, programmable airflow settings, and a user interface that communicates the installed airflow rate.
3. Where tested in accordance with Section R403.6.4, testing of each mechanical ventilation system is not required.

Add new text as follows:

R403.6.4 Dwelling unit sampling. For buildings with eight or more dwelling units the mechanical ventilation systems in seven, or 20 percent of the dwelling 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 with the largest conditioned floor area. Where buildings have fewer than eight dwelling 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 system with a ventilation flow rate lower than the minimum permitted three additional systems, including the corrected system, shall be tested

Reason: The committee approved a sampling methodology for demonstrating compliance in the envelope leakage and duct leakage sections. Not approving the same methodology and as a result requiring every bath fans, kitchen hoods, and supply fans to be tested in every dwelling unit does not make sense. The ventilation testing can be more time-consuming that the duct leakage and envelope testing while the resulting negative impact of non-compliance of ventilation systems is less than that of the envelope and duct leakage testing.
Updated Simulated Path table to give direction on how to input results when testing is performed with or with a sampling methodology.

Cost Impact: The code change proposal will decrease the cost of construction.
Reducing the number of tests required to demonstrate compliance will reduce the burden and cost of compliance verification.

Workgroup Recommendation

Residential Energy Committee Committee Action: As Modified

Residential Energy Committee Reason: The Committee agreed that since sampling in Group R-2 buildings had already been approved for air leakage and duct leakage testing, that same sampling approach could be permitted for ventilation air flow testing, without adverse effects on energy consumption, while also decreasing costs for multifamily buildings to comply with the energy code.

Proposal # 1509