International Energy Conservation Code
Consensus Committee-Residential

Draft Meeting Agenda (4/1 posting)

Webex Meeting Link

April 7, 2022
2:00 PM EST to 5 PM EST (3 hours)

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

1. Call to order.

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

3. Roll Call.

4. Approve Agenda

5. Approval of Minutes

6. Administrative issues-staff

7. Subcommittee Reports
   a. Consistency and Administration
   b. Economics, Modeling, and Whole-Building Metrics
   c. Electrical Power, Lighting, Renewables and Storage
   d. Envelope and Embodied Energy
   e. Existing Buildings
   f. HVACR & Water Heating

8. Action Items
   a. Code Change Proposals

REPI-116-21 (Perf. Path Renewables)	(Econ/Modeling as modified 12-5)
REPI-21-21 (ERI remove 5%)	(Econ Modeling as modified 8-7-3)
REPI-22-21 (ERI modifications)	(Econ Modeling disapprove 18-0)
REPI-23-21 (ERI modifications)	(Econ Modeling disapprove 17-0)
REPI-131-21 (ERI Airflow Rate)	(Econ Modeling as modified 18-0-3)
REPI-132-21 (ERI Airflow Rate)	(Econ Modeling disapprove 17-0)
REPI-124-21 (Perform. Path Airflow Rate)	(HVACR approve 8-1-3)
IRCEPI-3-21 (Duct airflow balancing def)	(HVACR approve 12-0)
IRCEPI-4-21 (Duct leakage exception)	(HVACR approve 12-0)

IRCEPI-6-21 (Duct design)	(HVACR approve 12-0)
REPI-95-21 (Fan Efficacy Table)	(HVACR as modified 8-3)
REPI-96-21 (Mech Ventilation Testing)	(HVACR approve 9-1-1)
REPI-140-21 (Air Sealing Recirc Defrost)	(HVACR approve 6-1-2)
REPI-85-21 (Duct testing multi-family units)	(HVACR as modified 9-2-1)
REPI-61-21 (Air Leakage Testing Multifamily)	(Envelope as modified 8-7)
REPI-63-21 (Air Tightness Improvements)	(Envelope approve 14-1-3)
REPI-64-21 (Air Tightness Improvements)	(Envelope as modified 13-4-1)
REPI-60-21 (Air Leakage Testing Rate)	(Envelope as modified 8-7-3)
REPI-38-21 (Air Sealing Rim Joist)	(Envelope disapprove 10-5-3)
REPI-39-21 (Attic knee or pony wall)	(Envelope approve 10-8)
REPI-44-21 (Thermal Envelope Installation)	(Envelope disapprove unanimously)
CEPI-19-21 Part II (Insulation Mark Install)	(Envelope as modified 17-0-1)
REPI-5-21 (Embodied Energy)	(Envelope disapprove 12-6)
REPI-150-21 (Alterations Building Envelope)	(Existing Buildings as modified 8-0)

9. Other business.

10. Upcoming meetings. April 14 at 2 PM EST

11. Adjourn.

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

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

Kristopher Stenger, AIA, CBO
Director of Energy Programs
International Code Council
kstenger@iccsafe.org

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-116-21 Performance Path Renewable tradeoffs
CDP ID #	127
Code	IECC RE
Code Section(s)	R405.1, R405.2, TABLE R405.4.2(1) New Section n
Location	base
Proponent	Rob V. Salcido jeremy.williams@ee.doe.gov
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Proponent submitted a significant modification at prior meeting. Proposal modified to reduce trade-off for renewables.
Recommendation	Approve as Modified Motion by Gayathri Vijayakumar 2nd by Rob Salcido
Vote	Approve as Modified: 12 - 5
Recommendation Date	2-23-22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

Note to Voting Members: This MOD highlights and strikes out text added to R405.2 that were proposed in the monograph version of REPI-116. To reflect the same text in R405.2 that is in 2021 IECC now, text that was struck in the monograph version is brought back and shown in underline, but is not text that is new to the code. Edits to this R405.2 section that were already approved through REPI-118 are not shown. This MOD also replaces "None" with "As-Proposed" in Table 405.4.2(1).

At SC, this was approved as modified below: 12Y, 5N

REPI-116-21

IECC®: R405.1, R405.2, TABLE R405.4.2(1)

Proponents: Jeremy Williams, representing U.S. Department of Energy (jeremy.williams@ee.doe.gov)

2021 International Energy Conservation Code

Revise as follows:

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

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

1. The requirements of the sections indicated within Table R405.2.
2. The building thermal envelope ~~efficiency requirements~~ shall ~~comply with one of the following: be greater than or equal to levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 20152009 *International Energy Conservation Code*.~~ be greater than or equal to levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 *International Energy Conservation Code*.

   ~~2.1 Where on-site renewable energy is included for compliance using the Total Building Performance of Section R405.2, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.1 or Table R402.1.3 of the 2015 International Energy Conservation Code.~~

   ~~2.2 Where on-site renewable energy is NOT included for compliance using Total Building Performance of Section R405.2, the building thermal envelope shall be greater than or equal to the levels of efficiency in Table R402.1.1 or R402.1.3 of the 2012 International Energy Conservation Code.~~
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.

   Exception: 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 multiplier for fuels other than electricity shall be 1.1.

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
On-site renewable energy	~~None~~ As-Proposed	As-Proposed

Reason: This proposal seeks to clarify how renewable energy should be handled as part of Section 405 performance calculations. Onsite renewable energy sources, particularly PV and energy storage systems, play a critical role in decarbonizing the building sector. However, these technologies are not clearly recognized within the scope of Section 405 and in performing whole-building energy calculations for the purposes of demonstrating code compliance. This has sometimes led to confusion in application, as Section 405 is portrayed as representing "total building performance" yet is silent on this significant aspect of whole-building energy consumption, particularly as more people are looking to the performance path in pursuit of advanced energy and climate goals.

In addressing the important role of onsite renewable energy sources in reducing net onsite energy consumption, and clarifying their role via Section 405, it's also critical that resulting tradeoffs between energy efficiency and renewable energy be handled appropriately. Mechanisms must exist that avoid eroding cost-effective energy efficiency measures, particularly those with a long measure-life, and which ensure a more energy efficient and lower energy building, overall. Renewables are therefore handled in a way similar to equipment tradeoffs, which ensures that energy loads which are not historically regulated by building energy codes cannot be traded against cost-effective efficiency measures. The proposal also retains the existing energy efficiency "backstop" while updating that specification based on the 2015 IECC, which has been demonstrated cost effective by DOE and others and adopted as such by a number of U.S. states and local governments.

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

The proposed change does not increase or decrease the required stringency of the Standard Reference Design, and therefore there is no direct cost impact. Section R405 is an optional compliance path that allows trade-offs of prescriptive requirements at the discretion of the designer. This proposal is intended to provide clearer guidance on how renewables should be handled in whole-building performance calculations but does not affect the stringency of the mandatory or prescriptive requirements.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-021-21 ERI remove 5%
CDP ID #	294
Code	IECC RE
Code Section(s)	R401.2.5 New Section n
Location	base
Proponent	Vladimir Kochkin vkochkin@nahb.org
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Vladimir submitted a modified proposal. Removes additional 5% efficiency requirement for R406 ERI path. The vote was close in part due to uncertainty around future action on related R406 ERI proposals. Recommended to hold this proposal until other R406 and R408 proposals are ready to be heard.
Recommendation	Voted as modified Reason statement: streamlines ERI path which is already a performance path by removing the additional 5% efficiency requirement from R408.
Vote	Yes- 8, No-7, Abstain-3, Not Present-3,
Recommendation Date	March 9, 2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-21-21

IECC®: R401.2.5

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

2021 International Energy Conservation Code

Revise as follows:

R401.2.5 (N1101.13.5) Additional energy efficiency.

This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

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

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

TABLE R406.2
REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
~~R401.2.5~~	~~Additional efficiency packages~~
R401.3	Certificate

Reason Statement:

This proposal removes the unjustified penalty on the ERI compliance path. The 2018 ERI threshold values in Table R406.5 were developed based on energy modeling that included above-federal minimum equipment efficiencies. Therefore, the ERI path complies with the additional requirements of Sections R401.2.5 and R408 by default via meeting the minimum thresholds. The 2021 IECC further reduced the ERI targets through a separate proposal. Approval of both proposals was due to lack of coordination during the 2021 IECC development process. This change will not impact the DOE determination because DOE analysis does not include the ERI compliance path.

The 5% penalty in combination with the 2021 IECC revised ERI thresholds results in ERI values close to the zero-energy ready levels listed in Appendix RC ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS in the IECC. This level of performance has not been justified for minimum code provisions. According to RESNET, less than 7% of all rated dwelling units reached an ERI/HERS below 50 and only 1% of rated dwelling received an ERI/HERS below 45 in year 2020. Less than 25 percent of dwelling units constructed in the US obtain an ERI/HERS rating.

Cost Impact:

The code change proposal will decrease the cost of construction.

This proposal removes an unjustified penalty on the ERI path.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-022-21 ERI modifications
CDP ID #	297
Code	IECC RE
Code Section(s)	R401.2.5, R406.3.1, R406.3.2 New Section n
Location	base
Proponent	Amanda Hickman amanda@thehickmangroup.com
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Vote for disapproval approved by the proponent based on prior action on REPI-21
Recommendation	Disapproval based on prior action on REPI-21
Vote	Yes- 18, No-0, Abstain-0, Not Present-3
Recommendation Date	March 9, 2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-023-21 ERI
CDP ID #	175
Code	IECC RE
Code Section(s)	R401.2.5, TABLE R406.2, R406.3, R406.3.1, R406.3.2, R406.4 New Section n
Location	base
Proponent	Ryan Meres ryan.meres@gmail.com
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Removes additional efficiency reqt for ERI (same as REPI-21), edits Env Backstop & edit vent rate (same as REPI-132)
Recommendation	Disapproval, based on prior action on REPI-131 and REPI-21 (Proponent supported motion)
Vote	Yes- 17, No-0, Abstain-0, Not Present-4
Recommendation Date	
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-131-21 ERI renewable 5 percent
CDP ID #	293
Code	IECC RE
Code Section(s)	R406.4 New Section n
Location	base
Proponent	Vladimir Kochkin vkochkin@nahb.org
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Vladimir provided a modified recommendation, having coordinated with proponents for REPI-132 and REPI-23.
Recommendation	As Modified Reason statement: This proposal better aligns the R406 ERI path with the ICC/RESNET standard 301 and HERS ratings
Vote	Yes- 18, No-0, Abstain-0, Not Present-3
Recommendation Date	March 9, 2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-131-21 – MOD1

IECC®: R406.4

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

2021 International Energy Conservation Code

Revise as follows:
R406.4 (N1106.4) Energy Rating Index.
The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 ~~except the air exchange rate in RESNET/ICC 301 shall be in accordance with items (1) and (2) as follows:~~

1. ~~Air exchange rate for the Energy Rating Reference Home in RESNET/ICC 301 Table 4.2.2(1) shall be replaced by the air exchange rate for the Standard Reference Design as defined in Table R405.4.2(1) of this code.~~
2. ~~Air exchange rate for the Rated House in RESNET/ICC 301 Table 4.2.2(1) and Table 4.3.1(1) shall be replaced by the air exchange rate for the Proposed Design as defined in Table R405.4.2(1) of this code.~~

~~Buildings designed in accordance with this code shall not be required to meet the RESNET/ICC 301 air exchange rates or mechanical ventilation rates used for the purpose of determining the ERI.~~

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.

~~for buildings covered by the International Residential Code , the ERI reference design ventilation rate shall be in accordance with Equation 4-2.~~
~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] (Equation 4-2)~~

Reason Statement:
The purpose of this proposal is to fix an inadvertent error that was introduced in the 2018 IECC during an effort to coordinate the ERI calculation procedure with the residential ventilation rates. The change in 2018 IECC resulted in a significant increase in the ERI scores. That was never the intent of the change as was confirmed by the original proponent, and it was the result of using terms that were not fully coordinated with the specific terms in Standard 301. Proposals and public comments attempted to fix this issue in 2021 IECC, but in the end none of them were approved. The proposed amendment resolves the issues in accordance with the original intent by requiring the calculation of air exchange rate in Standard 301 be aligned with IECC Table R405.4.2(1) used in the performance path calculations. This amendment will coordinate the ERI procedure with the residential mechanical code provisions on this subject. The proposed amendment also makes it clear that IECC buildings rated using the ERI are not required to meet the Standard 301 air exchange and ventilation rates -- this is added because Standard 301 uses the terms "required dwelling unit total exchange rate" and "total required ventilation rate." It's noted that the coordination between Standard 301 and this code should be done such that there is a single ERI index for buildings complying with the IECC.

Cost Impact:
The code change proposal will neither increase nor decrease the cost of construction.
This proposal fixes an error. There is no impact on construction practices. The change will allow designers to calculate correct ERI scores.

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-132-21 ERI airflow rate
CDP ID #	296
Code	IECC RE
Code Section(s)	R406.4 New Section n
Location	base
Proponent	Mike Moore mmoore@statorllc.com
Proposal Status	SC rev
Subcommittee	RE Econ, Model, Metric
Subcommittee Notes	Edits remove the equation for the ventilation rate (same as REPI-23 & 126)
Recommendation	Disapproval based on prior action on REPI-21 (Proponent supported)
Vote	Yes- 17, No-0, Abstain-0, Not Present-4
Recommendation Date	March 9th, 2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-124-21 Performance Path Airflow Rate
CDP ID #	272
Code	IECC RE
Code Section(s)	R405.4.2(1) table New Section n
Location	base
Proponent	Mike Moore mmoore@statorllc.com
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Vote to approve as written
Recommendation	Approve REPI-124-21
Vote	Vote subcommittee 8/1/3
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	IRCPI-003-21 Duct airflow balancing definition
CDP ID #	480
Code	IRC
Code Section(s)	R202 New Section n
Location	base
Proponent	David Bixby david.bixby@acca.org
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approved 11/0/0
Recommendation	vote to approve presenting David Bixby Proponent
Vote	approve 11/0/0
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	IRCPI-004-21 Duct leakage exception
CDP ID #	482
Code	IRC
Code Section(s)	R403.3.6 New Section n
Location	base
Proponent	David Bixby david.bixby@acca.org
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approve subcommittee HVACR 3/21/2022 11/0/0
Recommendation	vote to approve
Vote	11/0/0
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee____yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	IRCPI-006-21 Duct design
CDP ID #	483
Code	IRC
Code Section(s)	R403.3 New Section n
Location	base
Proponent	David Bixby david.bixby@acca.org
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approved subcommittee 3/21/2022 vote 12/0/0
Recommendation	vote to approve
Vote	12/0/0
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-095-21 Fan Efficacy Table
CDP ID #	395
Code	IECC RE
Code Section(s)	R403.6.2, Table R403.6.2 New Section n
Location	base
Proponent	Mike Moore mmoore@statorllc.com
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	Vote taken on 3/7/2022 to approve as modified- 8 yes 3 no
Recommendation	**Replacement proposal for REPI-95** **R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy.** Fans used to provide whole-dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with the test procedure referenced by Table R403.6.2 and listed. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c. (49.85 Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c. (24.91 Pa).

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

SYSTEM TYPE	AIRFLOW RATE (CFM)	MINIMUM EFFICACY (CFM/WATT)	TEST PROCEDURE
HRV, 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 Standard 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 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.

Add new standard(s) as follows:

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

CAN/CSA-C439-18 Laboratory methods of test for rating the performance of heat/energy-recovery ventilators

ASHRAE ASHRAE 180 Technology Parkway NW Peachtree Corners GA 30092

ASHRAE Standard 51-16 (ANSI/AMCA Standard 210-16). Laboratory Methods of Testing Fans For Certified Aerodynamic Performance Rating

vote taken and approved with the proponent accepting a friendly amendment with revised language

Vote	unanimous

Recommendation Date	3/7/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-096-21 Mechanical ventilation testing
CDP ID #	417
Code	IECC RE
Code Section(s)	R403.6.3, R403.6.2.1, R403.6.2.2 New Section y
Location	base
Proponent	Mike Moore mmoore@statorllc.com
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approved subcommittee HVACR 3/21/2022
Recommendation	vote to approved with the Proponent adding cost/savings calculations when it goes to vote IECC Consensus Committee
Vote	approve 9/1/1
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

Replacement for REPI-096-21

Please replace REPI-096-21 with the following language which greatly simplifies the proposal. This replacement language references ANSI/RESNET/ICC 380 (*Standard for Testing Airtightness of Building, Dwelling Unit, and Sleeping Unit Enclosures; Airtightness of Heating and Cooling Air Distribution Systems; and Airflow of Mechanical Ventilation Systems*) for the testing requirements. By referencing ANSI/RESNET/ICC 380, which is already referenced by the 2021 IECC-R, we can stipulate how the test needs to be performed (allowing us to remove redundant language in R403.6.3) and also the minimum accuracy of the test equipment (referencing an ANSI consensus standard for this).

2021 International Energy Conservation Code

R403.6.3 (IRC N1103.6.3) Testing. Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation airflow rates required by Section R403.6, in accordance with ANSI/RESNET/ICC 380. ~~Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts.~~ 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 ducting have a diameter of 6” or larger, a length of 10 feet or less, ~~duct~~ and not more than ~~one~~two 90° elbows or equivalent ~~in the duct run~~ 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.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-140-21 Air Sealing Recirculation defrost
CDP ID #	420
Code	IECC RE
Code Section(s)	R408.2.5 New Section n
Location	base
Proponent	Mike Moore mmoore@statorllc.com
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approved subcommittee vote 6/1/2
Recommendation	vote to approve
Vote	approve 6/1/2
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-085-21 Duct testing multifamily units
CDP ID #	521
Code	IECC RE
Code Section(s)	R403.3.5, R403.3.6, R403.3.7 (New), R403.3.7 New Section y
Location	base
Proponent	Aaron Gary aaron.gary@texenergy.org
Proposal Status	SC rev
Subcommittee	RE HVACR & WH
Subcommittee Notes	vote to approve HVACR meeting 3/21/2022
Recommendation	Vote to approve as modified
Vote	9/2/1
Recommendation Date	3/21/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___yes _____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

Proposed Modification:

Revise as follows:
R403.5 (N1103.3.5) Duct testing.

Each Duct~~s~~ system shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods.

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measure with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

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. A duct air-leakage test shall not be required for ducts serving ventilation systems that are not integrated with ducts serving heating or cooling systems.

2. Where tested in accordance with R403.3.x, testing of each duct system is not required.

R403.3.6 (N1103.3.6) Duct leakage

[No change]

Add new text as follows:

R403.3.x 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 leakage rate, corrective actions shall be made to the system and the system retested until it passes. For each tested *dwelling unit* that has a greater duct leakage rate than the maximum permitted leakage rate, an additional three *dwelling units*, including the corrected unit, shall be tested.

Where buildings qualify under the scope of Section R101.2 of the *International Residential Code*, each *duct system* in each *dwelling unit* shall be tested.

R403.3.7 Dwelling unit ~~S~~sampling ~~for R2 multifamily dwelling units~~.

For buildings with eight or more ~~testing units~~ *dwelling units* ~~complying with R403.3.5~~, the *duct systems* in the greater of seven ~~units~~ or 20 percent of the ~~testing units~~ *dwelling units* in the building shall be tested, including a top floor unit, a ground floor unit, a middle floor unit, and ~~a~~ the unit with the largest ~~testing unit floor area~~ *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 leakage rate, corrective actions shall be made to the system and the system retested until it passes. For each ~~tested unit~~ *dwelling unit* that exceeds the maximum permitted ~~duct~~ leakage rate, an additional three ~~units~~ *dwelling units*, including the corrected unit, shall be tested~~, including a mixture of testing unit types and locations~~. ~~Where buildings have fewer than eight testing units, each testing unit shall be tested.~~

Where buildings qualify under the scope of Section R101.2 of the *International Residential Code*, each *duct system* in each *dwelling unit* shall be tested.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-061-21 Air leakage testing multifamily units
CDP ID #	516
Code	IECC RE
Code Section(s)	R402.4.1.2, R402.4.1.3, R402.4.1.4 (New) New Section y
Location	base
Proponent	Aaron Gary aaron.gary@texenergy.org
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Air leakage test sampling proposal had mixed response. Was debated on both sides. Not consistent with what's in the commercial code. Edits have improved proposal. Significant weakening of testing provision by allowing sampling.
Recommendation	AM Reason: sampling increase efficiencies Drumheller motions to approve as modified, Hickman seconds
Vote	8-7
Recommendation Date	3/2/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee _____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-61-21 (Modification replaces version in the monograph)

IECC®: R402.4.1, R402.4.1.4 (New)

Proponents: Aaron Gary, representing Self (aaron.gary@texenergy.org)

2021 International Energy Conservation Code

Revise as follows:

R402.4 Air leakage. The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 through R402.4.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation. The components of the *building thermal envelope* as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction. Where required by the code official, an approved third party shall inspect all components and verify compliance.

R402.4.1.2 Testing.

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 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [0.0079 m 3/(s × m 2)] of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). 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.

Exception:….

[No change]

During testing:….

[No change]

Exception:….

[No change]

Exception: Where tested in accordance with R402.4.1.4, testing of each *dwelling unit* is not required.

R402.4.1.3 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, and 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

Add new text as follows:

R402.4.1.4 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.

Monograph version for context:

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-063-21 Air Tightness improvements
CDP ID #	312
Code	IECC RE
Code Section(s)	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1) New Section n
Location	base
Proponent	William Fay bill@energyefficientcodes.org
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Aims to limit air leakage in warmer climates, some discussion on whether it should be even lower.
Recommendation	Alison Lindberg motions to approve and Joel Martell seconded Reason: controlling air leakage is important in warm climates as well.
Vote	14-1-3 - motions carries
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee___X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-064-21 Air Tightness improvements
CDP ID #	299
Code	IECC RE
Code Section(s)	R402.4.1.2, R402.4.1.3, TABLE R405.4.2(1), R408.2.5 New Section y
Location	base
Proponent	William Fay bill@energyefficientcodes.org
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Heard as modified, presented by Gayathri, confirmation does not conflict with REPI-60 as passed, straw poll for consensus on air leakage values
Recommendation	Chris Mathis moves as modified, Rob Buchanan seconded Reason: air leakage tightness is essential to energy efficiency, lasts the life of the building, and is the largest contributor to errors in HVAC equipment.
Vote	13-4-1
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee__X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-64-21 – this modification replaces what is in the monograph

IECC®: R402.4.1.2, R402.4.1.3, Table R405.4.2 (1), R408.2.5

Proponents: William Fay, representing Energy Efficient Codes Coalition; Amy Boyce, representing Energy Efficient Codes Coalition (amy.boyce@imt.org); Amber Wood, representing Energy Efficient Codes Coalition (awood@aceee.org); Jason Reott, representing Energy Efficient Codes Coalition

2021 International Energy Conservation Code

Revise as follows:

R402.4 Air leakage. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 Building thermal envelope. The building thermal envelope shall comply with Sections R402.4.1.1 through R402.4.1.3….

R402.4.1.1 Installation. The components….

R402.4.1.2 (N1102.4.1.2) Testing and maximum air leakage rate.

The *building* or *dwelling unit* shall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [0.0079 $m^3/(s \times m^2)$] of *dwelling unit enclosure area*. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). 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.

> **Exception:** 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 R402.4.1.1, 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 R402.2.12 and R402.3.5, as applicable.

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.

Exception: When testing individual *dwelling units*, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [0.008 $m^3/(s \times m^2)$] 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. Attached single-family and multiple-family building *dwelling units*.
2. Buildings or *dwelling units* that are 1,500 square feet (139.4 m^2) or smaller.

R402.4.1.3 (N1102.4.1.3) Prescriptive air ~~l~~Leakage rate.

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and **2.0** ~~**3.0**~~ air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

TABLE R405.4.2(1) (TABLE N1105.4.2(1)) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	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: 2.0 ~~3.0~~ 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 than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ 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.	The mechanical ventilation rate[b] shall be in addition to the air leakage rate and shall be as proposed.

R408.2.5 (N1108.2.5) Improved air sealing and efficient ventilation system option.

The measured air leakage rate shall be less than or equal to **2.0** ~~**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 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).

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-060-21 Air leakage testing rate
CDP ID #	419
Code	IECC RE
Code Section(s)	R402.4.1.2, R402.4.1.3 New Section n
Location	base
Proponent	Robby Schwarz robby@btankinc.com
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Presented by air leakage working group considered 60, 63 and 64 together. Working groups conducted straw poll of SC voting members on leakage rates.
Recommendation	Approve as Modified. Chris Mathis motion, Alison Lindberg seconded.
Vote	AM 10-6
Recommendation Date	
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee ____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-60-21 (this modification replaces what is in the monograph)

IECC®: R402.4.1.2

Proponents: Robby Schwarz, BUILDTank, Inc., representing Colorado Chapter of the ICC (robby@btankinc.com)

2021 International Energy Conservation Code

Revise as follows:

R402.4.1.2 (N1102.4.1.2) Testing.

The ***b****uilding* or *dwelling unit* shall be tested for air leakage. The maximum air leakage rate for any *building* or *dwelling unit* under any compliance path shall not exceed ~~5.0~~ ~~3.0~~ 4.0 air changes per hour or ~~0.28~~ ~~0.19~~ 0.22 cubic feet per minute (CFM) per square foot [0.00632 ~~0.0079~~ $m^3/(s \times m^2)$] of *dwelling unit enclosure area*. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). 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.

> **Exception:** 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 R402.4.1.1, 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 R402.2.12 and R402.3.5, as applicable.

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.

> **Exception:** When testing individual *dwelling units*, an air leakage rate not exceeding ~~0.30~~ 0.25 cubic feet per minute per square foot [0.006 ~~0.008~~ $m^3/(s \times m^2)$] 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. Attached single-family and multiple-family building *dwelling units*.

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

R402.4.1.3 Leakage rate. When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

~~**R402.4.1.3 Leakage rate.** When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.~~

Reason Statement:

This proposal was changed through the Air leakage working group to be a proposal that put forward the idea of a single air leakage rate for the entire country to a proposal that is being used to lower the back stop air leakage rate for performance modeling from 5.0 to 4.0 ACH50. That is all the modification does is lower the air leakage rate in Section R402.4.1.2 Testing.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-38-21 Air Sealing Rim Joist
CDP ID #	544
Code	IECC RE
Code Section(s)	R402.2.11 (New), TABLE R402.4.1.1 New Section y
Location	base
Proponent	Robby Schwarz robby@btankinc.com
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	rim joists are under insulated. Reason: Repetitive and unnecessary. The language ”six-sided” is a concept, not good code language
Recommendation	Motion to disapprove Bobby Parks, Rob Austin
Vote	10-5-3
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee__X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-38 New Rim Joist section – Edited as passed by Envelope SC

IECC®: R402.2.11 (N1102.2.11) (New), TABLE R402.4.1.1
Proponents:
Robby Schwarz, BUILDTank, Inc., representing BUILDTank, Inc. (robby@btankinc.com)
2021 International Energy Conservation Code

Add new text as follows:
R402.2.11 (N1102.2.11) Rim ~~/band~~ joist and sill plate requirements.
~~At~~ Where a rim joist rests upon a sill plate on top of a foundation wall that separates conditioned from unconditioned space ~~locations adjacent to the foundation~~, the junction of the sill plate to the foundation shall be sealed. Capillary break materials installed between the sill plate and the foundation shall not be used as air sealing materials unless specifically designed for such ~~that~~ use. For all rim ~~and band~~ joists separating conditioned from unconditioned space, the rim joist ~~board~~ to the sill plate, and the rim joist ~~board~~ to the subfloor ~~adjacent to the building thermal envelope~~ shall be air sealed. Plates and rim joists ~~boards~~ which are part of the ~~rim and band joist~~ thermal envelope assembly shall be insulated to at least the same R-value as the above grade exterior wall and shall be enclosed on six sides ~~of the assembly with an air barrier~~.

Revise as follows:

TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER, AIR SEALING CRITERIA	INSULATION INSTALLATION CRITERIA
Rim ~~/ band~~ joists	Rim ~~/band~~ joists shall include an ~~exterior~~ 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 ~~/band~~ joist shall be insulated per Section R402.2.11 ~~Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.~~[b]

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
b. Air barrier and insulation full enclosure is not required in unconditioned or ventilated attics spaces ~~and at rim joists~~.

Reason:
Rim joist at foundations and between floor are notoriously leaky and difficult to insulate. They are one of the first areas of the Building Thermal Envelope that are addresses when seeking to build a more air tight house, yet the IECC continues not to address them well or call them out specifically in the installation sections or R402. A specific requirement section is needed to address them. This proposal deals with the air leakage issues and the insulation issues. For too long fibrous insulation has been allowed to be installed in location without complete enclosure. Fibrous air permeable insulation in any cavity must be enclosed on six sides. This cavity is not tall, but convection through the material occurs because it is open to large volume spaces within the floor system or potentially the greater volume of the basement or crawl space. Building durability is often associated with this location and lack of enclosure when warm moist air migrates through air permeable insulation and condenses on the rim joist surface.

Some believe that the above grade wall definition should be enough to ensure that the rim joist is insulated to the same R-value as the above grade wall. It does include the language "peripheral edges of floors" in the definition, but it is almost comical to believe that builders, trades, and code officials in the field read the definition especially when "Above Grade Wall" is not a term that is used in Table R402.4.1.1. It is common to see the Rim Joist insulated with less R-value that the above grade wall. This section just makes it clear that the minimum requirement is the same above grade walls as the rim joist is a unique and separate building envelope assembly.

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

This will impact the first cost of construction as it is a new code requirement to enclose the fibrous insulation installed in the rim/band joist. However, performance will improve, and operational cost and comfort will be impacted positively.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-039-21 Attic knee or pony wall
CDP ID #	375
Code	IECC RE
Code Section(s)	R402.2.3 (New), Table R402.4.1.1 (New), TABLE R405.2, TABLE R406.2 New Section y
Location	base
Proponent	Robby Schwarz robby@btankinc.com
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	provides more details on how to insulate knee walls, adds additional clarity for these spaces
Recommendation	Motion to approve Rob Buchanan, Chris Mathis seconded Reason: assembly often overlooked and with low compliance rates. Language has issues but it's necessary.
Vote	10-8-0
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee__X_____
Consensus Committee	
Committee Response	

Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

REPI-39 Knee Wall

Definition

Knee wall – usually a short wall assembly of the *building thermal envelope* that may support rafters or is defined by ceiling trusses and is used to separated conditioned space from unconditioned buffered space such as ventilated attics.

R402.2.3 Attic knee ~~or pony~~ wall.

Attic knee ~~or pony~~ wall assemblies that separate conditioned space from unconditioned attic spaces shall be constructed to be insulated to the R-value of the above grade wall. ~~described in Table R402.1.3.~~ ~~Knee or pony~~ Such knee walls shall have a sealed air barrier between conditioned and unconditioned space and shall be sheathed on the attic or unconditioned side of the assembly. ~~to the unconditioned side of the assembly. Air permeable insulation installed in knee or pony wall cavities shall be enclosed on six sides of the cavity. Insulation installed in knee or pony wall cavities shall be installed in substantial contact with the air barrier.~~

R402.2.3.1 Where ~~Knee or pony wall cavities defined by~~ roof truss framing members are used to create a knee wall that separates conditioned and unconditioned space, they shall be insulated to the same R-value as the above grade wall. ~~level as other exterior above grade walls~~.

R402.2.3.2 When Vertical or diagonal surfaces built to raise a ceiling into the attic space ~~that~~ are greater than 1' foot in height into a ventilated attic, they shall be considered a knee wall. ~~or pony wall.~~ Vertical or diagonal surfaces that are 1' foot or less in height into a ventilated attic shall be buried with insulation to maintain the ceilings required R-value.

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

COMPONENT	AIR BARRIER, AIR SEALING CRITERIA	INSULATION INSTALLATION CRITERIA
Knee ~~or pony~~ wall~~s~~	Knee ~~or pony~~ walls shall have a sealed air barrier between conditioned and	Insulation installing in a knee ~~or pony~~ wall assembly shall

	unconditioned space and shall be sheathed on the attic or unconditioned side of the assembly. ~~be constructed to have a sealed air barrier on six sides of the wall assembly including to the unconditioned side of the assembly.~~	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.

Reason Statement

Attic knee walls, in the field, are a unique assembly that have been overlooked by the IECC. The assembly separates interior conditioned space from exterior unconditioned space but is buffered from directly being connected to the ambient outdoors by a ventilated attic. The ventilated attic space often has harsher unconditioned side temperatures than normal above grade walls causing more significant heat loss or gain through the assembly than through normal insulated above grade walls. This being the case we see across the country, in the field, that attic knee walls are often insulated to a lower R-value than the exterior walls associated with the same house. In addition, the IECC has not been clear about the need for attic sheathing and a sealed air barrier systems installation.

This proposal defines, describes how to address, and adds this unique assembly to the list of required assemblies that must be detailed in the requirements section of the IECC. It will ensure proper air barriers, insulation installation, air sealing of the assembly and will increase the performance of the home.

Raised ceiling that protrude into the attic are unique knee wall applications on which the code offers no guidance. They are particularly troublesome for maintaining the continuity of the building thermal envelope and therefore have been added to this section as a means to define when the vertical or diagonal surface must be treated as a knee wall and when normal attic insulation can be mounded over the raised ceiling.

Cost

In theory, this assembly has been addressed as an above grade wall so this new section of code should not add cost to the construction of a home. In reality, this assembly has not been viewed in most of the country as a typical above grade wall so cost will be added to construction because of the realization of the significance of the assembly and the heat loss and gain that is driven through it because of it being adjacent to the ventilated attic.

The R-value of this part of the above grade wall assembly could be traded off to a lower R-value, or the same R-value that is currently being installed when using the UA alternative, Total Building Performance, or ERI compliance pathways. This would lower the cost associated with this code proposal. However, as cost goes down implementation would still become better because the proposal would ensure that the installed insulation is enclosed with sheathing on the attic side and that an air barrier has been defined this making the assembly perform better.

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	REPI-044-21 Thermal Envelope Installation
CDP ID #	229
Code	IECC RE
Code Section(s)	R402.4.1.1 New Section n
Location	base
Proponent	Charles Haack chaack@naima.org
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Proponent recommends disapproval and says proposal is not ready at this time.
Recommendation	Motion to disapprove Parks, Johnson Seconded. Reason: Proponent says not ready
Vote	18-0-0
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_x_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code
Code Change Proposal Tracking Sheet

Proposal #	CEPI-019-21 Part II Insulation mark installation
CDP ID #	570
Code	IECC RE
Code Section(s)	R303.1.1, R303.1.2 New Section n
Location	base
Proponent	Darren Meyers dmeyers@ieccode.com
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	Part I approved by commercial SC with minor modification
Recommendation	Charles Allen Motion to approve as modified, Abendroth seconded Reason: simply a clarification that R value should be visible
Vote	17-0-1
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee__X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-005-21 Embodied Energy
CDP ID #	332
Code	IECC RE
Code Section(s)	R103.2 New Section
Location	base
Proponent	Seth Wiley seth@siteisreal.com
Proposal Status	SC rev
Subcommittee	RE Envelope
Subcommittee Notes	addresses carbon directly, adds definition of carbon equivalent
Recommendation	motion to disapprove Greg Johnson, Amanda Hickman Reason: There is nothing for the CEO to do with this information. The information will be inaccurate as the electric grid becomes cleaner.
Vote	12-6
Recommendation Date	3/16/22
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____

Date	

REPI-5-21 - MODIFIED

Clerical Key:

~~**Red strike through is language proposed in monograph version that is removed in this MOD.**~~

Yellow highlighted text is current Code text brought into this MOD as reference and unchanged.

Blue highlighted underlined text is NEW language being proposed in this MOD.

IECC®: R103.2, R401.3, (New), R401.3.1 (New)

Proponents: Seth Wiley, Architect, Representing Self

2021 International Energy Conservation Code

Revise as follows:

R103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as
herein governed. Details shall include the following as applicable:

1. Energy compliance path.
2. Insulation materials and their R-values.
3. Fenestration U-factors and solar heat gain coefficients (SHGC).
4. Area-weighted U-factor and solar heat gain coefficients (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

~~10. CO2e annual electric energy usage emissions from building or dwelling unit operations, reported in kilograms (kgCO2e).~~

~~11. CO2e annual fossil fuel energy usage emissions from building or dwelling unit operations, reported in kilograms (kgCO2e).~~

R401.3 Certificate. A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the

visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the following:

1. The predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, basement walls, crawl space walls and floors and ducts outside conditioned spaces.
2. U-factors of fenestration and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for any component of the building envelope, the certificate shall indicate both the value covering the largest area and the area weighted average value if available.
3. The results from any required duct system and building envelope air leakage testing performed on the building.
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment. Where a gas-fired unvented room heater, electric furnace or 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 CO2e 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 and the compliance path used.
~~8. CO2e annual electric energy usage emissions from building or dwelling unit operations, reported in kilograms (kgCO2e).~~
~~9. CO2e annual fossil fuel energy usage emissions from building or dwelling unit operations, reported in kilograms (kgCO2e).~~

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 and CO2e 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 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 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.

~~**Add new definition as follows:**~~

CARBON DIOXIDE EQUIVALENT (CO2e). A measure used to compare the impact of various greenhouse gases based on their global warming potential (GWP). CO2e approximates the timeintegrated warming effect of a unit mass of a given greenhouse gas relative to that of carbon dioxide (CO2). GWP is an index for estimating the relative global warming contribution of atmospheric emissions of 1 kg of a particular greenhouse gas compared to emissions of 1 kg of CO2. The following GWP values are used based on a 100-year time horizon: 1 for CO2, 25 for methane (CH4), and 298 for nitrous oxide (N2O). [Carbon Dioxide Equivalent Definition courtesy of New Buildings Institute]

Add new text as follows:

R401.3.1 Calculation of CO2e annual emissions. Building or dwelling unit CO2e annual emissions shall be calculated in kgCO2e in the following manner:

1. Based on annual energy use in Mbtus as calculated in and documented on building or dwelling unit ANSI/RESNET/ICC 301 Standard Energy Rating Certificate and process.
    1. That portion of building or dwelling energy use derived from electric grid sources as calculated per ANSI/RESNET/ICC 301 Standard Energy Rating Certificate process in Mbtus converted to kgCO2e based on current U.S. Environmental Protection Agency eGrid Summary Table 3 State Output Emissions Rates, lbCO2/MWh. https://www.epa.gov/egrid/summary-data
    2. Megawatt-hours shall be converted to Mbtus.
    3. That portion of building or dwelling energy use as derived from natural gas, liquefied petroleum gas, and fuel oil fossil fuel sources as calculated per ANSI/RESNET/ICC 301 Standard Energy Rating Certificate process in Mbtus converted to kgCO2e based on current U.S. Energy Information Administration Carbon Dioxide Emissions Coefficients by Fuel, lbCO2/Mbtu.
        https://www.eia.gov/environment/emissions/co2_vol_mass.php
    4. Pounds shall be converted to kilograms.
    5. In coordination with the Energy Rating Certificate process, on-site electric energy generated by on-site renewable sources such as rooftop photovoltaic sources shall not be included in on-site electric energy usage provided the building or dwelling unit primary occupant has secured an annual or longer operational system installation agreement in cooperation with the local utility company, and can provide such agreement as required.
    6. In coordination with the Energy Rating Certificate process, on-site electric energy generated by off-site renewable sources such as hydropower sources shall not be included in on-site electric energy usage provided the building or dwelling unit primary occupant has secured an annual or longer power purchase agreement in cooperation with the local utility company, and can provide such agreement as required.
    7. Results shall separately indicate building or dwelling annual operational kgCO2e emissions from electric energy usage and fossil fuel energy usage for documentation per R103.2 and R401.3.

2. When a building or dwelling unit will not receive an ANSI/RESNET/ICC 301 Standard Energy Rating Certificate and accompanying calculation process, current U.S. Environmental Protection Agency (EPA) Estimated Home Energy Use shall be used to assess building and home annual energy use emissions in kgCO2e.
    1. Current EPA Estimated Home Energy Use values equate to the following Emissions:

1. 2.839 kgCO2e/sf from electricity usage;
2. 1.181 kgCO2e/sf from natural gas usage;
3. 0.119 kgCO2e/sf from liquefied petroleum gas usage; and
4. 0.150 kgCO2e/sf from fuel oil usage.

https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-andreferences

2. Multiply building or dwelling unit square footage by the EPA Estimated Home Energy Use values to calculate the building or dwelling annual operational kgCO2e emissions for documentation per R103.2 and R401.3.
3. Results shall separately indicate building or dwelling annual operational kgCO2e emissions from electric energy usage and fossil fuel energy usage for documentation per R103.2 and R401.3.

Reason:

To improve occupant health and safety, improve energy efficiency, and decrease greenhouse gas emissions. An example as to how to calculate CO2e annual emissions is as follows.

Example:

A 2,000 square foot new construction or renovation project will be appropriately documented, filed with authorities having jurisdiction, and constructed.
There will not be an ANSI/RESNET/ICC 301 Energy Rating Certification and its standard supporting analysis performed as part of the project.
The project's annual emissions from electric usage equate to 5,678.184 kgCO2e (2,000 x 2.839).
The project's annual emissions from natural gas usage equate to 2,362.042 kgCO2e (2,000 x 1.181).
The project's annual emissions from liquefied petroleum gas usage equate to 237.236 kgCO2e (2,000 x 0.119).
Therefore, the project's annual emissions from fuel oil usage equate to 299.123 kgCO2e (2,000 x 0.150).
Therefore, the project's CO2e annual emissions from electric energy usage is 5,678.184 kgCO2e and from fossil fuel energy usage is 2,898.401 kgCO2e (2,362.042 + 237.236 + 299.123) for documentation per R103.2 and R401.3.

Bibliography:

Based on professional knowledge and experience, feedback from other professionals, established research, and established local and national construction quality frameworks

Cost Impact:

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

International Energy Conservation Code

Code Change Proposal Tracking Sheet

Proposal #	REPI-150-21 Alterations building envelope
CDP ID #	442
Code	IECC RE
Code Section(s)	R503.1.1, R503.1.1.1, R503.1.1.2 (New), 503.1.1.3 (New), R503.1.1.4 (New), R503.1.1.5 (New), R503.1.1.6 (New) New Section y
Location	base
Proponent	Jay Crandell jcrandell@aresconsulting.biz
Proposal Status	SC rev
Subcommittee	RE Existing Bldg
Subcommittee Notes	
Recommendation	Stephen Dent: Motion to approve as modified Paul Demers: Second
Vote	8-0 for, motion to approve carries
Recommendation Date	3/22/2022
Next Step	To Subcommittee_____ To Advisory Group_____ To Consensus Committee_____X_____
Consensus Committee	
Committee Response	
Vote	Affirmative_____ Negative_____ Table_____ To Subcommittee_____
Date	

Proponents: Jay Crandell, P.E., ABTG/ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

2021 International Energy Conservation Code

Add new definitions as follows:

APPROVED SOURCE. An independent person, firm or corporation, approved by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building *permit*.

Revise existing definition as follows:

ROOF REPLACEMENT. ~~The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.~~ An alteration that includes the removal of all existing layers of roof assembly materials down to the roof deck and installing replacement materials above the existing roof deck.

Revise text as follows:

R503.1.1 (N1111.1.1) Building thermal envelope. Alterations of existing *building thermal envelope* assemblies shall comply with this section. New ~~B~~*building thermal envelope* assemblies that are part of the *alteration* shall comply with Section R402 ~~R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5~~. 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 is not increased:

1. Storm windows installed over existing fenestration.
2. ~~Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.~~
3. ~~Construction where the existing roof, wall or floor cavity is not exposed.~~

2.4. ~~.~~ Roof recover.

5. ~~Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.~~

3.6. ~~.~~ 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.

R503.1.1.1 (N1111.1.1.1) ~~Replacement f~~ 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.

Add new text as follows:

R503.1.1.2 (N1111.1.1.2) Roof alterations. Roof insulation 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 replacement* for roofs with insulation entirely above deck.

   Exception: 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 minimizes 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 (N1111.1.1.3) 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*. 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 (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, 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.

R503.1.1.5 (N1111.1.1.5) Below-grade wall alterations. Where a blow-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.

R503.1.1.6 (N1111.1.1.6) Air barrier. *Building thermal envelope* assemblies altered in accordance with Section R503.1.1 shall be provided with an *air barrier* in accordance with Section R402.4. The *air barrier* shall not be required to be made continuous with unaltered portions of the *building thermal envelope*. Testing requirements of Section R402.4.1.2 shall not be required.

Add a new footnote to Tables R402.1.2 and Table R402.1.3 as follows (portions of tables not shown are unchanged):

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

CLIMATE ZONE	FENESTRATION U-FACTOR[f]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC[d,e]	CEILING U-FACTOR[g]	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR[b]	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR

...

g. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the "Group R" U-factors of Table C402.1.4.

TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[a,j]	SKYLIGHT[a] U-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING R-VALUE[i]	WOOD FRAME WALL R-VALUE[g]	MASS WALL R-VALUE[h]	FLOOR R-VALUE	BASEMENT[c,g] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c,g] WALL R-VALUE

...

i. Roofs with insulation entirely above deck shall comply with Section C402.2.1 and the "Group R" R-values of Table C402.1.3.

Reason (Revisions): This revised REPI-150 proposal coordinates with action taken by the Commercial Building Envelope Subcommittee on proposals CEPI-225 and CEPI-17. Included are new and revised definitions in coordination with a new exception added in Section R503.1.1.2, Item 2 to provide flexibility in addressing roof replacements with insulation entirely above deck. A related revision provides appropriate reference to R-value and U-factor requirements for these types of roof systems which currently are not addressed in the residential energy provisions, yet are commonly used for 3-story or lower multi-family buildings which have roof types no different than used on 4-story or taller multi-family buildings covered under the commercial energy provisions. Finally, some clarifying wording was added to Section R503.1.1.3 at the request of the IECC Residential Existing Buildings Committee resulting in a 5-0 (non-quorum) vote in support of REPI-150 as modified.

Cost Impact (Revisions): The revisions to REPI 150 will decrease the cost of construction.
The revisions provide flexibility and help avoid impractical requirements being applied to existing building alterations, particularly for roof replacements and above-grade wall alterations. Thus, depending on the existing building conditions and the particular alterations being performed, the overall revised REPI-150 proposal may actually lower cost.

Reason (Original Proposal): Existing building alterations are perhaps one of the primary opportunities to reduce national energy consumption, yet Chapter 5 does little to address this need. There are many opportunities to cost-effectively improve energy efficiency of the existing building stock by use of reasonable criteria to trigger (or avoid) requirements with flexibility in the manner or extent of compliance where needed. This proposal attempts to strike that balance in a practical and cost-effective manner for building envelope assemblies of existing buildings that are undergoing specific types of alterations. Consequently, this proposal will help to address the 40% of national energy use that is attributed to the existing building stock and will only apply where alterations are proposed that provide opportunity to improve the performance of the existing building stock. A similar coordinated proposal was also submitted for the IECC-C committee.

Key changes made in this proposal are summarized as follows:

1. The revisions to charging language in Section R503.1.1 are made to be consistent with commercial building provisions in C503.2.

2. A clause is added to Section R503.1.1 to prevent reduction in existing building thermal envelope insulation levels as is included in the IECC provisions.

3. Exceptions 2 and 3 of Section R503.1.1 are deleted as they are now addressed and preserved within requirements in new subsections for above-grade walls, floors, and roofs.

4. Existing exception 5 of Section R503.1.1 is deleted because it is a requirement (not an exception) that is now moved to new Section R503.1.1.2 for roof alterations.

5. New exception 4 is added to Section R503.1.1 to provide the flexibility of a "whole" existing building compliance path using the existing total building performance and ERI paths in Sections R405 and R406. This would be most applicable to extensive or multiple alterations as may occur in a building renovation.

6. Section 503.1.1.1 for fenestration replacements is modified to address fenestration alterations including both added fenestration and fenestration replacements as both are also addressed in the IECC-C provisions for existing buildings and are relevant to existing residential building alterations.

7. A new Section R503.1.1.2 is provided to address multiple types of roof alterations to identify conditions where it is appropriate to provide insulation (if not already present).

8. A new Section R503.1.1.3 is provided for above-grade wall alterations which identifies conditions where it is appropriate and practical to provide insulation (if not already present). Language is also provided to ensure coordination with building code moisture control requirements which require integration with and can influence the method of complying with the insulation requirements.

9. A new Section R503.1.1.4 is provided for floor alterations and takes an approach similar to that done for above-grade walls (although with fewer conditional requirements).

10. A new Section R503.1.1.5 is provided for below-grade wall alterations. This captures the cases where a below-grade space (e.g., basement) is being converted to conditioned space and where basement walls are altered and the basement is already conditioned.

11. Finally, new Section R503.1.1.6 is provided to address air barrier installations in altered building thermal envelope assemblies. However, it is made clear that continuity of the air barrier is not required with unaltered portions of the building thermal envelope as that would cause the alteration to extend beyond its intended scope. It also is made clear that whole building air leakage testing is not required.

Cost Impact: The code change proposal will increase the cost of construction.
Where requirements are triggered and where upgrades in energy efficiency were not already planned for an alteration, this proposal will increase cost for a limited set of envelope alteration activities for existing buildings. Some existing requirements such as roof replacements and filling of exposed stud cavities remain unchanged. For those existing buildings with deficient insulation levels (or no insulation) and where planned alterations allow that deficiency to be addressed efficiently, the cost-benefits are expected to closely align with that for new buildings. However, it is not possible to conduct a simple cost-benefit analysis for existing buildings because of the multitude of variables involved and the flexibility provided in this proposal that make it nearly impossible to quantify with any reasonable level of certainty. Thus, we consider these proposed provisions to be cost- effective by judgment as these types of existing building thermal envelope upgrades are currently being used in the existing building/remodeling/renovation market, although not consistently or in an enforceable manner. In addition, the current charging language in Section R503.1.1 requires compliance with insulation requirements for new buildings for all alterations, barring only those few excepted. Now, this proposal provides requirements that also provide flexibility in means of compliance for the many alterations that are currently not included in exceptions to Section 503.1.1. For these cases, this proposal could be considered to reduce cost.