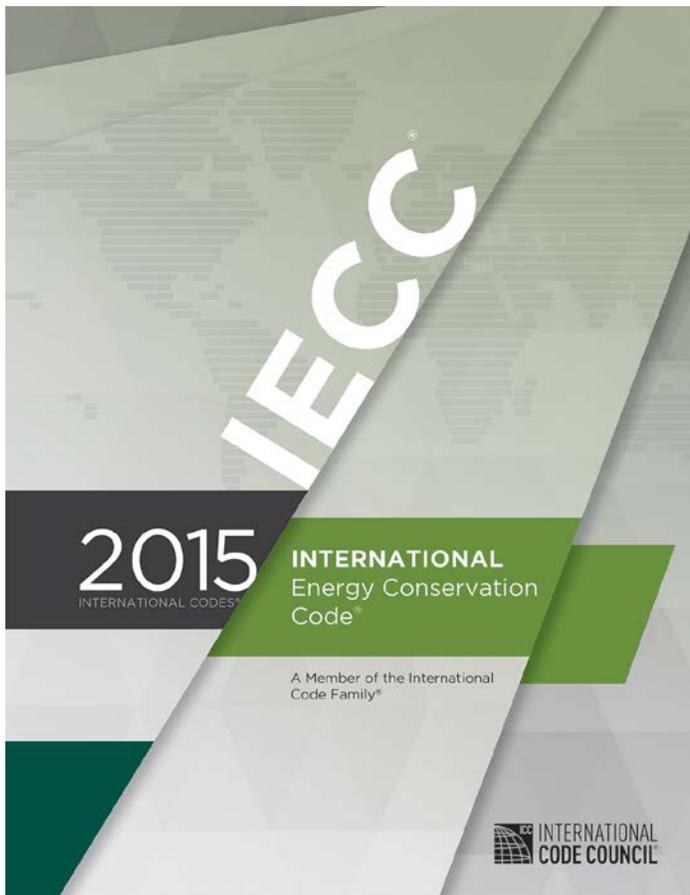




**National
Association
of Home
Builders**

2015

International Energy Code Suggested Amendments





State and local HBAs should consider these amendments to maintain cost-effective and affordable code provisions when discussing the adoption of the 2015 International Energy Code. NAHB developed these amendments based on the outcome of the 2012-2014 ICC Code Development Cycles.

Each amendment is shown in *legislative text* (underline and ~~strikethrough~~) and includes a supporting reason s explaining why the jurisdiction should consider them. Some of the suggested amendments, such as those for energy code provisions and the residential sprinklers, have additional supporting documents and information on the NAHB website and are so indicated.

From the “*Amendment Lookup*” page read the brief introduction and choose the amendment you are interested in. The underlined portion is a hotlink to the amendment.

This document is available upon request in “Word” format. You can copy and or change any portion of the “Word” document to fit you precise needs, if you would like the word document sent to you or if you have questions, please contact:

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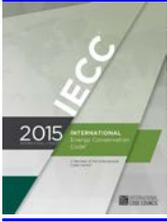
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2015 International Residential Code

1. Comprehensive Energy Amendment

This is a comprehensive amendment, providing flexibility for meeting energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that allows for cost-optimized construction of an energy-equivalent house utilizing energy neutral options. Incorporating; building tightness tradeoff, equipment efficiency tradeoff and window area tradeoff. *(Includes Amendments 17, 25, 26)*

2. Remove “Mandatory” Requirements for Above-Code Programs

This amendment eliminates the need to meet all “mandatory” requirements identified by the IRC Chapter 11 as long as the program exceeds the energy-efficiency levels required.

3. Overhang Credit for SHGC (climate zones 1-4)

This amendment allows the use of overhangs to meet the solar heat gain coefficient requirements in the IECC.

4. Multifamily Air Leakage Testing

This amendment adds an exception to allow compliance to the air barrier requirements and allow builders to test the entire building as a whole, as permitted for commercial buildings.

5. Air Leakage Rate Correction (climate zones 1-8)

This amendment modifies the requirement from 3 air changes per hour (ACH) to 5 ACH in Climate Zones 1-8.

6. Air Leakage Trade-Off

This amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results, provides flexibility in meeting the air-tightness requirements and provides options for recovering from an unexpected air-tightness test failure. *(Part of Amendment # 12)*

7. Prescriptive Table Requirements

This amendment replaces 2015 IRC Chapter 11 Tables N1102.1.2 and N1102.1.4 with tables from the 2009 IRC Chapter 11.

8. Basement Wall R-Value/U-Factors Reduction (Climate Zone 5)

This amendment reduces the basement wall R-value requirement in Climate Zone 5 to a more reasonable R-value based those acceptable to both NAHB and DOE in the 2009 IRC.

9. Ceiling R-Value/U-Factors Reduction (climate zones 2-5)

This amendment reinstates the appropriate minimum ceiling R-values in climate zones 2, 3, 4 and 5, those published in the 2009 IRC, Chapter 11.

10. Correct SHGC for Climate Zone 4

This amendment changes the Climate Zone 4 SHGC back to N/R, because a prescriptive restriction for the SHGC of 0.40 in Climate Zone 4 does not save energy.

11. Wall R-Value/U-Factors Corrections (Climate Zone 3)

This amendment reinstates the appropriate minimum wall assembly R-values/U-factors in Climate Zone 3 published in the 2009 IECC.

12. Wall R-Value/U-Factors Corrections (Climate Zones 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

13. Mechanical Equipment Trade-Off

This amendment reinstates the performance option in the IRC Chapter 11 to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by code. *(Part of Amendment # 12)*

14. Window Area Trade-Off

This amendment provides the building designer the ability to reduce window area and get credit for the energy saved. *(Part of Amendment # 12)*

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1. Comprehensive Energy Amendment

This is a comprehensive amendment, providing flexibility for meeting energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that allows for cost-optimized construction of an energy-equivalent house utilizing energy neutral options. Incorporating; building tightness tradeoff, equipment efficiency tradeoff and window area tradeoff. (Includes Amendments 17, 25, 26)

Revise as follows:

N1102.4 (R402.4) Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.4.

N1102.4.1 (R402.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.4.1.1 (R402.4.1.1) Installation (Mandatory). The components of the *building thermal envelope* as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer’s instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction. Where required by the *building official*, an *approved* third party shall inspect all components and verify compliance.

N1102.4.1.2 (R402.4.1.2) Testing (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inches 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*. 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, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

N1102.4.1.3 (R402.4.1.3) Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section N1102.4.1.2.

**TABLE N1105.5.2(1) [R405.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Total area ^b = (a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area. (b) 15% of the conditioned floor area; where the proposed glazing area is 15% or more of the conditioned floor area. Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W) U-factor: from Table R402.1.3 SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used. Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design) External shading: none	As proposed As proposed As proposed As proposed 0.92-(0.21 × SHGC as proposed) As proposed
Heating Systems ^{d, e}	As proposed for other than electric heating without a heat pump. 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. Fuel type: same as proposed design <u>Efficiencies:</u> <u>Electric: air-source heat pump with prevailing federal minimum standards</u> <u>Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards</u> <u>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards</u> Capacity: sized in accordance with Section N1103.7	As proposed <u>As proposed</u> <u>As proposed</u> <u>As proposed</u> <u>As proposed</u> As proposed
Cooling Systems ^{d, f}	As proposed Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section N1103.7	As proposed As proposed
Service Water Heating ^{d, e, f}	As proposed Fuel type: same as proposed design <u>Efficiency: in accordance with prevailing federal minimum standards</u> <u>Use: gal/day = 30 + 10 × Nbr Tank</u> <u>temperature: 120°F</u> Use: same as proposed design	As proposed <u>As proposed</u> <u>Same as standard reference</u> <u>Same as standard reference</u> gal/day = 30 + (10 × Nbr)

Footnotes remain unchanged

Reason:

This is a comprehensive amendment, providing flexibility for meeting energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that will allow for cost-optimized construction of an energy-equivalent house.

The amendment provides alternatives that encourage innovation and the use of materials and equipment which will result in a home which is at least equivalent of that prescribed in the energy code.

The modifications will reinstate many of the changes made since the 2006 IRC Chapter 11. Those changes restricted the flexibility of the builder/designer to construct an energy-efficient code compliant home while still meeting the energy performance levels of the current code.

Items included in this amendment:

Energy neutral building tightness trade-offs

Credit for more energy-efficient buildings which incorporate reduced window area

Energy neutral heating, cooling and water heating equipment efficiency trade-offs

Currently all homes have a mandatory requirement to be equal to or tighter than 3ACH50 or 5ACH50, depending on climate zone. Proposed changes will allow for homes to be less tight provided other efficiency changes are made to the house which offset energy lost due to the change in air infiltration.

Currently, when conducting a performance analysis, a building glazing area greater than 15% of the conditioned floor area (CFA) is penalized for using more energy. However, a building with less than 15% window to CFA does not get credit for saving energy. This amendment allows the builder/designer to optimize window area that is both energy efficient and pleasing to the consumer.

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2. Remove Mandatory Requirement for Above Code Programs

This amendment eliminates the need to meet all “Mandatory” requirements identified by the IRC Chapter 11 as long as the program exceeds the energy-efficiency levels required.

Revise as follows:

N1101.4 (R102.1.1) Above code programs. The *building 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 in compliance with this code. ~~The requirements identified as “mandatory” in Chapters 4 and 5 of this code, as applicable, shall be met.~~

Reason:

The key element of an above code program is that it must meet or exceed the energy-efficiency requirements of the IRC Chapter 11. Requiring such a program to also meet the detailed prescriptive requirements labeled as “mandatory” defeats the purpose of performance based above-code program. This amendment will allow flexibility in the methodology used for any above-code program to meet or exceed the minimum energy-efficiency requirements.

3. Overhang Credit for SHGC (Climate Zones 1-4)

This amendment allows the use of overhangs to meet the solar heat gain coefficient requirements within the IECC.

Add new text as follows:

N1101.9 (R202) Defined Terms.

PROJECTION FACTOR. The ratio of the horizontal depth of an overhang, eave, or permanently attached shading device, divided by the distance measured vertically from the bottom of the fenestration glazing to the underside of the overhang, eave, or permanently attached shading device.

N1102.3.2.1 (R402.3.2.1) Glazed fenestration SHGC exception. In Climate Zones 1 through 4, permanently shaded vertical fenestration shall be permitted to satisfy the SHGC requirements. The projection factor of an overhang, eave, or permanently attached shading device shall be greater than or equal to the value listed in table N1102.2.3.1 for the appropriate orientation. The minimum projection shall extend beyond each side of the glazing a minimum of 12 inches (0.3 m). Each orientation shall be rounded to the nearest cardinal orientation (+/-45 degrees or 0.79 rad) for purposes of calculations and demonstrating compliance.

**TABLE N1102.2.3.1 (R402.3.2.1)
MINIMUM PROJECTION FACTOR REQUIRED BY ORIENTATION FOR SHGC EXCEPTION**

ORIENTATION	PROJECTION FACTOR
<u>North</u>	$\geq 0.40^a$
<u>South</u>	≥ 0.20 -
<u>East</u>	≥ 0.50
<u>West</u>	≥ 0.50

a. For the north orientation, a vertical projection located on the west-edge of the fenestration with equivalent PF ≥ 0.15 shall also satisfy the minimum projection factor requirement.

Reason:

The concept of using shading to reduce heat gain is integral to the architecture of some of the oldest world cultures. Shading in modern construction offers many possibilities. This proposed code change allows for the use of overhangs to meet the solar heat gain coefficient requirements within the IRC Chapter 11. Permanent exterior shading features such as overhangs are allowed to be used in IECC Chapter 5 as a prescriptive trade-off to meeting SHGC requirements within the code. The calculation for determining the projection factor for overhangs has been in the 2000, 2003, 2006, and 2009 IECC for commercial buildings and has been proven to be very simple to calculate, fitting well into a prescriptive approach. Shading devices are allowed if using the 2003 IECC and are allowed as a trade-off under the commercial provisions of the IECC. Allowing flexibility in meeting the solar heat gain coefficient through the use of proven shading alternatives will increase the usability of the code for the building and design community while ensuring that the new fenestration is energy efficient. When credit for shading is permitted, it encourages an integrated approach to building designs, energy use, construction materials, renewable resources particularly as part of urban infrastructure, site and town planning and building design to be considered holistically. It also creates the opportunity for aesthetically pleasing and ingenious designs that might not otherwise be permitted.

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4. Multi-Family Air Leakage Testing

This amendment adds an exception to allow compliance to the air barrier requirements and allow an exception for testing the entire building as a whole, as is permitted for commercial buildings.

Revise as follows:

N1102.4 (R402.4) Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Section N1102.4.1 through N1102.4.4.

Exception: Two family dwelling units and townhouses shall be permitted to comply with IECC Section C402.5

Reason:

Air-tightness testing for single-family detached homes is very straightforward; however, it is much more difficult to accurately test attached dwelling units, including multifamily buildings. The IECC treats low-rise multi-family buildings of 3 stories or less like single-family homes and multifamily buildings of 4 stories or more like commercial buildings. Regardless of height, all multifamily buildings have the same air-tightness testing complications, such as: Does the entire building need to be tested at one time? What about multifamily buildings with open corridors? Does every dwelling need to be tested? Can the leakages be averaged between units? Is the leakage tested only to the “outside” or should it include leakage to adjacent units?

By approving this amendment, low-rise multifamily buildings and attached single-family dwellings will avoid these complications while still being held to the same level of performance as high-rise (R-2) residential and commercial buildings.

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5. Air Leakage Rate Correction (Climate Zones 1-8)

This amendment modifies the requirement from 3 air changes per hour (ACH) to 5 ACH in climate zones 1-8.

Revise as follows:

N1102.4.1.2 (R402.4.1.2) Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding five air changes per hour in Climate Zones 1 ~~and 2, and three air changes per hour in Climate Zones 3~~ through 8. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inches 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*.

Table N1105.5.2(1) [R405.5.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

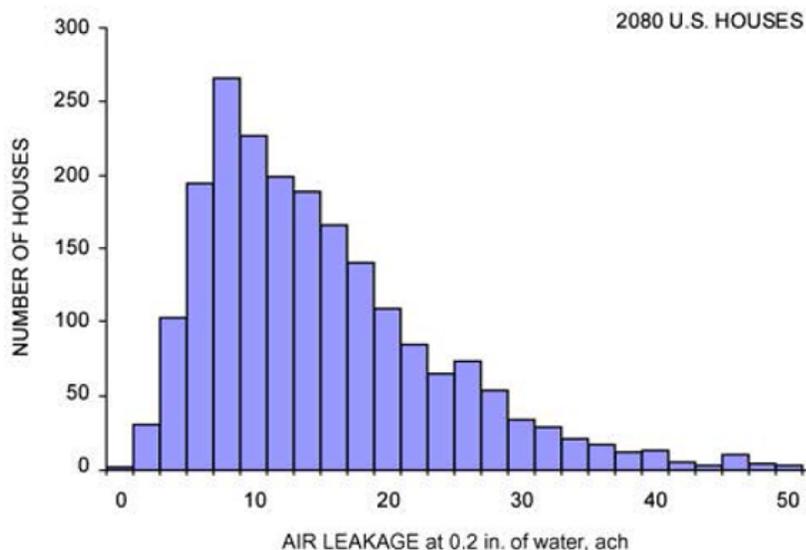
BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>Air leakage rate of 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8 at a pressure of 0.2 inches w.g (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than $0.01 \times CFA + 7.5 \times (Nbr + 1)$</p> <p>where:</p> <p><i>CFA</i> = conditioned floor area</p> <p><i>Nbr</i> = number of bedrooms</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate^a.</p> <p>The mechanical ventilation rated shall be in addition to the air leakage rate and shall be as proposed.</p>

Footnotes remain unchanged

Reason:

Building tightness is an important part of an energy-efficient and comfortable house. However, 3 air changes (ACH) per hour at 50 Pascals is an extremely low target tightness, especially for smaller homes. The ASHRAE Handbook of Fundamentals shows that around 8% of U.S. homes achieve 3 ACH or less, 13% achieve 4 and less than 23% achieve 5. The proposed 5 ACH while still an aggressive tightness level will provide a tight, comfortable, energy-efficient home.

2013 ASHRAE Handbook—Fundamentals



6. Air Leakage Trade-Off

This amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results, provides flexibility in meeting the air-tightness requirements and provides options for recovering from an unexpected air-tightness test failure. (Part of Amendment # 12)

Revise as follows:

N1102.4 (R402.4) Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.4.

N1102.4.1 (R402.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.4.1.1 (R402.4.1.1) Installation (Mandatory). The components of the *building thermal envelope* as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

N1102.4.1.2 (R402.4.1.2) Testing (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be conducted with a blower door at a pressure of 0.2 inches 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*. 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, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

N1102.4.1.3 (R402.4.1.3) Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate ~~not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section N1102.4.1.2.~~

Reason:

These modifications remove the mandatory maximum air-tightness requirement and provide designers and builders the flexibility to trade off building tightness with other performance path measures when using the performance path. Currently the building tightness requirement is "mandatory" and the 3 and 5 ACH tightness levels, even under ideal circumstances, are very difficult to achieve. This amendment will provide energy neutral trade-offs, for expensive and sometimes unattainable requirements, with other building improvements. This amendment does not change the stringency; it only increases its flexibility while achieving the required energy efficiency.

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7. Prescriptive Table Requirements

This amendment replaces 2015 IRC Chapter 11 Tables N1102.1.2 and N1102.1.4 with tables from the 2009 IRC Chapter 11.

Delete Table N1102.1.2 and Table N1102.1.4 in their entirety and replace with the following:

**TABLE N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50 ^j	0.60	0.30	30	13	5 / 8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13 / 17	30 ^g	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15 / 19	30 ^g	15/19	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38 ^g	15/19	10, 4ft	10/13

For SI: 1 foot = 304.8 mm.

- R-values are minimums. U-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 x 6 framing cavity such that the R-value is reduced by R-1 or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.
- The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.
- Or insulation sufficient to fill the framing cavity, R-19 minimum.
- "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
- The second R-value applies when more than half the insulation is on the interior of the mass wall.
- For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum U-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

TABLE N1102.1.4 (R402.1.4) EQUIVALENT U-FACTORS^a

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.050	0.065

- Non-fenestration U-factors shall be obtained from measurement, calculation or an approved source.
- When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall U-factor in Marine Zone 4 and Zones 5 through 8.

- c. Basement wall U-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.
- d. Foundation U-factor requirements shown in Table 402.1.3 include wall construction and interior air films but exclude soil conductivity and exterior air films. U-factors for determining code compliance in accordance with Section 402.1.4 (total VA alternative) of Section 405 (Simulated Performance Alternative) shall be modified to include soil conductivity and exterior air films .

Reason:

The increased table values in the 2012 IECC and the 2015 IECC did not show justification for the cost increases from the 2009 IECC. Studies indicate nationally almost a \$6,000 increase to the cost of constructing a single-family detached dwelling with a 13-year simple payback. With statistics showing that for every \$1,000 increase to the cost of construction nearly 206,000 potential home buyers will not qualify for a mortgage. This, increase disqualifies approximately 1.3 million families from purchasing a home every year. That equates to approximately \$24,000,000 in potential taxes revenues never being generated for municipalities.

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8. Basement Wall R-Value/U-Factor Reduction (Climate Zone 5)

This amendment reduces the basement wall R-Value requirement in Climate Zone 5 to a more reasonable R-value based on values that were acceptable to both NAHB and DOE in the 2009 IRC.

Revise as follows:

TABLE N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R -VALUE	WOOD FRAME WALL R -VALUE	MASS WALL R -VALUE ⁱ	FLOOR R -VALUE	BASEMENT ^c WALL R -VALUE	SLAB ^d R -VALUE AND DEPTH	CRAWL SPACE ^c WALL R -VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	10/13 15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

TABLE N1102.1.4 (R402.1.4) EQUIVALENT U-FACTORS^a

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050 0.059	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

The prescriptive basement wall requirement increased from R-10 to R-15 in the 2012 IRC Chapter 11. Calculations used to justify the change were based on energy models, which had less sophisticated algorithms than Energy Plus, now the preferred modeling software for the Department of Energy (DOE). When using Energy Plus, the energy savings in a 700 square foot basement totaled \$7/yr in Chicago (Climate zone 5). The additional cost for this is conservatively estimated at \$590. This makes the simple payback in excess of 58 years. This also will create a negative cash flow for the consumer. The values being modified by this amendment are the same as what was proposed by DOE in its proposal EC13 from the 2009 cycle. The excessive values currently in code were not submitted by DOE.

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
5	Chicago, IL	R-10->R-15	\$7/yr	\$590 (\$0.82/ft2)	84 years

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9. Ceiling R-Value/U-Factor Reductions (climate zones 2-5)

This amendment reinstates the appropriate minimum ceiling R-Values in climate zones 2, 3, 4 and 5, those published in the 2009 IRC Chapter 11.

Revise as follows:

TABLE N1102.1.2(R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R -VALUE	WOOD FRAME WALL R -VALUE	MASS WALL R -VALUE ⁱ	FLOOR R -VALUE	BASEMENT ^c WALL R -VALUE	SLAB ^d R -VALUE AND DEPTH	CRAWL SPACE ^c WALL R - VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38 30	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38 30	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49 38	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49 38	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

TABLE N1102.1.4 (R402.1.4)
EQUIVALENT U-FACTORS^a

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U- Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030 0.035	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030 0.035	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026 0.030	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026 0.030	0.060	0.082	0.033	0.050 0.059	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

There were four changes in the Ceiling R-value requirements in the 2012 IECC, none of which are cost effective. An energy and cost analysis was performed to show that the simple paybacks are in the 80-130 year range.

Climate Zone	Representative City	Change	Energy Savings	Incremental Cost	Simple Payback
2	Orlando, FL	R-38->R-30	\$10/yr	\$1,305	130 years
3	Atlanta, GA	R-38->R-30	\$16/yr	\$1,305	82 years
4	Richmond, VA	R-49->R-38	\$15/yr	\$1,379	92 years
5	Indianapolis, IN	R-49->R-38	\$15/yr	\$1,379	92 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Vaulted or cathedralized ceiling are very problematic when trying to achieve R- 49, which is about 16 inches thick. This would require a rafter at least 17" tall (which does not exist) or an insulated panel, which represents a very small portion of the market.

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10. Correct SHGC for Climate Zone 4

This amendment changes the Climate Zone 4 SHGC back to N/R, because a prescriptive restriction for the SHGC of 0.40 in Climate Zone 4 does not save energy.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL ^c SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40 NR	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Reason:

The addition of a prescriptive restriction for the SHGC of 0.40 was added in the 2012 IECC. This is not a requirement that saves energy. In Climate Zone 4, heating degree days outnumber cooling degree days by about 2 to 3 times. Therefore for most of the year, the “sun is your friend” and solar heat gain is beneficial and reduces heating loads. There are some exceptions to this, but the majority of homes will not benefit from this restriction. The values being modified by this proposal are the same as what was proposed by the Department of Energy in their proposal EC13 from the last cycle. The values currently adopted were an increase from proposals not submitted by the Department of Energy

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11. Wall R-Value/U-Factors Corrections (Climate Zone 3 & 4)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in Climate Zone 3 & 4 published in the 2009 IECC.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	13 20 or 13+5^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	13 20 or 13+5^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060 <u>0.84</u>	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060 <u>0.84</u>	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

Frame wall requirements in Climate Zone 3 changed from R-13 to R-20, which is not cost effective for the consumer.

Climate Zone	Representative City	Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
3	Atlanta, GA	R-13->R-20	\$50/yr	\$1,199	24 years
4	Richmond, VA	R-13->R-20	\$59/yr	\$1,199	20 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Not only is the payback is extremely long, but for a consumer, there would be a negative cash flow based on the incremental cost and energy savings. The increase in the monthly mortgage would be \$6.43 (@ 5%) and the average monthly energy savings would be \$4.17 in zone 3 and \$4.92 in zone 4 causing the home owner to pay more in additional monthly mortgage payments than the energy savings returns.

The values being modified by this amendment are the same as what was proposed by the Department of Energy in its proposal EC13 from the last cycle. The values currently adopted were an increase from proposals not submitted by the Department of Energy.

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12. Wall R-Value/U-Factors Corrections (Climate Zone 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

Revise as follows:

TABLE N1102.1.4 (R402.1.4) EQUIVALENT U-FACTORS^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 or 13+5^{h,i} 20+5 or 13+10^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 or 13+5^{h,i} 20+5 or 13+10^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045 <u>0.060</u>	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045 <u>0.060</u>	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

The prescriptive wall requirement increased to R-20+R5 in climate zones 6, 7 and 8 of the 2012 IRC Chapter 11. The additional cost for this is estimated at \$1,819 for 1,016 square feet of wall. This makes the simple payback between 26 and 55 years depending on the climate zone. This also will create a negative cash flow for the consumer in all cases.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
6	Minneapolis, MN	R-20->R-20+5	\$33/yr	\$1,819 (\$1.79/ft2)	55 years
7	Bemidji, MN	R-20->R-20+5	\$41/yr	\$1,819 (\$1.79/ft2)	44 years
8	Fairbanks, AK	R-20->R-20+5	\$71/yr	\$1,819 (\$1.79/ft2)	26 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

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13. Mechanical Equipment Trade-Off

This amendment reinstates the performance option in IRC Chapter 11 to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code. (Part of Amendment # 1)

Revise as follows:

TABLE N1105.5.2 (1) (R405.5.2(1))
SPECIFICATIONS FOR THE STANDARD REFERENCE DESIGN AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d,e}	<p>As proposed for other than electric heating without a heat pump, 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 R403 of the IECC-Commercial Provisions.</p> <p>Fuel type: same as proposed design</p> <p>Efficiencies:</p> <ul style="list-style-type: none"> - Electric: air-source heat pump with prevailing federal minimum standards - Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards - Nonelectric boilers: natural gas boiler with prevailing federal minimum standards <p>-Capacity: sized in accordance with Section R403.6</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Cooling systems ^{d, f}	<p>As proposed</p> <ul style="list-style-type: none"> -Fuel type: Electric -Efficiency: in accordance with prevailing federal minimum standards <p>-Capacity: sized in accordance with Section N1103.6</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Service Water Heating ^{d,e,f,g}	<p>As proposed</p> <ul style="list-style-type: none"> -Fuel type: same as proposed design -Efficiency: in accordance with prevailing federal minimum standards -Use: gal/day = 30 + 10 × Nbr -Tank temperature: 120°F -Use: same as proposed design 	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>Same as standard reference Same as standard reference</p> <p>gal/day = 30 + (10 × Nbr)</p>

Footnotes remain unchanged

Reason:

This amendment serves to retain energy-neutral equipment trade-off provisions from 2006 IRC Chapter 11 for heating systems, cooling systems, and service water heating. By retaining these, builders can optimize a code-compliant house design by using energy-efficient equipment. Quite often, the use of this high-efficiency equipment provides a more cost-effective solution to achieve code compliance. Eliminating this ability discourages the concept of the “house as a system” approach which is a cornerstone of building science.

Rejecting this amendment will create a disincentive to install state-of-the-art, energy-efficient equipment. It will increase the cost of construction by driving builders to often use less efficient equipment while increasing the cost of construction.

Significant improvements in the efficiency of HVAC and water heating equipment have been made in the last 20 years. With the increased emphasis on new and improved technologies, this trend is expected to continue and will result in even higher energy savings in future years. If builders are forced to comply with the energy code by installing requirements which are not cost effective, there will be a resistance to install higher efficiency equipment. This could end up hurting energy efficiency in the long term: For instance, consumers in homes with non-condensing furnaces will be less likely to install a higher efficiency condensing replacement furnace because of the additional cost to run an exhaust vent.

Industries such as log home manufacturers may no longer be able to construct to projected higher envelope requirements. The combination of increases in envelope thermal requirements, building tightness and duct tightness combined with the elimination of energy-neutral trade-offs pose a serious threat to the viability of the log home industry. There are practical limitations to the thickness of log home walls, increases in log diameter have an exponential increase to the cost of logs, making log walls with a U-factor of 0.082 or lower prohibitively expensive.

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14. Window Area Trade-Off

This amendment provides the building designer the ability to reduce window area and get credit for the energy saved. (Part of Amendment # 12)

Revise as follows:

**TABLE N1105.5.2 (1) (R405.5.2(1))
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Glazing ^a	Total area ^b =	As proposed
	(a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area.	
	(b) 15% of the conditioned floor area; where the proposed glazing area is 15% or more of the conditioned floor area.	
	Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W)	As proposed
	U-factor: from Table N1102.1.3	As proposed
SHGC: From Table N1102.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed	
Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design)	0.92-(0.21 × SHGC as proposed)	
External shading: none	As proposed	

Footnotes remain unchanged

Reason:

Walls generally have better thermal performance than windows. The code contains no incentive in the performance path for the building designer to optimize the window area to save energy and provide daylighting, egress and views that makes for a safe and comfortable house. These modifications provide the building designer the ability to reduce window area and get credit for the energy saved. As this section is currently written in the code, the house is penalized for having more than 15% window area yet receives no credit toward code compliance when the window area is reduced below 15%. This change rectifies this disparity and makes the performance path more representative of actual energy use.

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2015 International Energy Conservation Code

E1. Comprehensive Amendment

This is a comprehensive amendment to provide flexibility for meeting energy code requirements while maintaining energy performance. It will provide a “true” unrestricted performance path to allow for cost-optimized construction of an energy-equivalent house.

(Includes Amendments E6,13,14)

E2. Remove Mandatory Requirements for Above Code Program

This proposal eliminates the need to meet all “Mandatory” requirements identified by the IRC/IECC as long as the program exceeds the energy-efficiency levels required.

E3. Overhang Credit for SHGC (Climate Zone 1-4)

This amendment allows for the use of overhangs to meet the solar heat gain coefficient requirements within the IECC

E4. Multi-Family Air Leakage Testing

This amendment adds an exception to allow compliance to the air barrier requirements as and allow builders to test the entire building as a whole, as is permitted for commercial buildings.

E5. Air Leakage Rate Correction (Climate Zones 1-8)

This amendment modifies the requirements from 3 air changes per hour (ACH) to 5 ACH in Climate Zones 1-8.

E6. Air Leakage Trade-Offs

This Amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results. This performance option provides flexibility in meeting the air tightness requirements and provides options for recovering from an unexpected air tightness test failure. *(Part of Amendment E1)*

E7. Prescriptive Table Requirements

This amendment replaces 2015 IECC Tables R402.1.2 and R402.1.4 in the residential section of the 2015 with the following tables from the 2009 IECC.

E8. Basement Wall R-Value/U-Factors Reduction (Climate Zone 5)

This amendment reduces the basement wall insulation values requirements in Climate Zone 5, to a more reasonable R-Value/U-Factor based on values acceptable to both NAHB and DOE in the 2009 IRC.

E9. Ceiling R-Value/U-Factors Reduction (Climate Zones 2-5)

This amendment reinstates the appropriate minimum ceiling R-Values in climate zones 2, 3, 4 and 5, those published in the 2009 IRC CHAPTER 11.

E10. Correct SHGC for Climate Zone 4

This amendment changes the Climate Zone 4 SHGC back to N/R, because the addition of a prescriptive restriction for the SHGC of 0.40 is not a requirement that saves energy.

E11. Wall R-Value/U-Factors Corrections (Climate Zone 3 & 4)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 3 & 4 published in the 2009 IECC.

E12. Wall R-Value/U-Factors Corrections (Climate Zones 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in

climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

E13. Mechanical Equipment Trade-Off

This amendment reinstates the performance option in IRC Chapter 11 to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by code. *(Part of Amendment E1)*

E14. Window Area Trade-Off

This amendment provides the building designer the ability to reduce window area and get credit for the energy saved. *(Part of Amendment E1)*

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E1. Comprehensive Amendment

This is a comprehensive amendment that provides flexibility for meeting the energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that will allow for cost-optimized construction of an energy-equivalent house. (Includes Amendments E6, E7, 14, 15)

Revise as follows:

R402.4 Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.4.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation (Mandatory). The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed 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 (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be conducted with a blower door at a pressure of 0.2 inches 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*. 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, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

R402.4.1.3 Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section N1102.4.1.2.

**TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE DESIGN AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	<p>Total area^b =</p> <p>(c) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area.</p> <p>(d) 15% of the conditioned floor area; where the proposed glazing area is 15% or more of the conditioned floor area.</p> <p>Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W)</p> <p>U-factor: from Table R402.1.3</p> <p>SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.</p> <p>Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design)</p> <p align="center">External shading: none</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>0.92-(0.21 × SHGC as proposed)</p> <p>As proposed</p>
Heating Systems ^{d, e}	<p>As proposed for other than electric heating without a heat pump. 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.</p> <p><u>Fuel type: same as proposed design</u></p> <p><u>Efficiencies:</u></p> <p><u>Electric: air-source heat pump with prevailing federal minimum standards</u></p> <p><u>Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards</u></p> <p><u>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards</u></p> <p>Capacity: sized in accordance with Section N1103.7</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Cooling Systems ^{d, f}	<p>As proposed</p> <p>Fuel type: Electric</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section N1103.7</p>	<p>As proposed</p> <p>As proposed</p>
Service Water Heating ^{d, e, f}	<p>As proposed</p> <p><u>Fuel type: same as proposed design</u></p> <p><u>Efficiency: in accordance with prevailing federal minimum standards</u></p> <p><u>Use: gal/day = 30 + 10 × Nbr Tank temperature: 120°F</u></p> <p>Use: same as proposed design</p>	<p>As proposed</p> <p><u>As proposed</u></p> <p><u>Same as standard reference</u></p> <p><u>Same as standard reference</u></p> <p>gal/day = 30 + (10 × Nbr)</p>

Footnotes remain unchanged

Reason:

This is a comprehensive amendment that provides flexibility for meeting the energy code requirements while maintaining energy performance. It provides a “true” unrestricted performance path that will allow for cost-optimized construction of an energy-equivalent house. The proposed changes provide alternatives

that encourage innovation and the use of materials and equipment to result in a home which is at least equivalent to that prescribed in the energy code.

The modifications will reinstate many of the changes made since the 2006 IRC Chapter 11 that restricted the flexibility of the builder/designer to construct an energy efficient code compliant home while still meeting the energy performance levels of the current code.

Items included in this amendment:

Energy-neutral building tightness tradeoffs

Credit for more energy-efficient buildings which incorporate reduced window area

Energy-neutral heating, cooling and water heating equipment efficiency tradeoffs

Currently all homes have a “mandatory” requirement to be equal to or tighter than 3ACH50 or 5ACH50, depending on climate zone. Proposed changes will allow for homes to be less tight provided other efficiency changes are made to the house to offset energy lost due to the change in air infiltration.

Currently, when conducting a performance analysis, a building glazing area greater than 15% of the conditioned floor area (CFA) is penalized for using more energy. However, a building with less than 15% window to CFA does not get credit for saving energy. This amendment allows the builder/designer to optimize window area that is both energy efficient and pleasing to the consumer.

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E2. Remove Mandatory Requirements for Above Code Program

This proposal eliminates the need to meet all “Mandatory” requirements identified by the IRC/IECC as long as the program exceeds the energy-efficiency levels required.

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 in compliance with this code. ~~The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Reason:

The key element of an above-code program is that it must meet or exceed the energy-efficiency requirements of the IECC. Requiring such a program to also meet the detailed prescriptive requirements labeled as “mandatory” in the IECC defeats the purpose of performance based above code program. This code change proposal will allow flexibility in the methodology used for any above-code program to meet or exceed IECC minimums.

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E3. Overhang Credit for SHGC (Climate Zone 1-4)

This amendment allows for the use of overhangs to meet the solar heat gain coefficient requirements within the IECC.

Add new text as follows:

PROJECTION FACTOR. The ratio of the horizontal depth of an overhang, eave, or permanently attached shading device, divided by the distance measured vertically from the bottom of the fenestration glazing to the underside of the overhang, eave, or permanently attached shading device.

R402.3.2.1 Glazed fenestration SHGC exception. In Climate Zones 1 through 4, permanently shaded vertical fenestration shall be permitted to satisfy the SHGC requirements. The projection factor of an overhang, eave, or permanently attached shading device shall be greater than or equal to the value listed in table 402.3.3 for the appropriate orientation. The minimum projection shall extend beyond each side of the glazing a minimum of 12 inches (0.3 m). Each orientation shall be rounded to the nearest cardinal orientation (+/-45 degrees or 0.79 rad) for purposes of calculations and demonstrating compliance.

**TABLE R402.3.2.1
MINIMUM PROJECTION FACTOR REQUIRED BY ORIENTATION FOR SHGC EXCEPTION**

ORIENTATION	PROJECTION FACTOR
<u>North</u>	<u>$\geq 0.40^a$</u>
<u>South</u>	<u>≥ 0.20</u>
<u>East</u>	<u>≥ 0.50</u>
<u>West</u>	<u>≥ 0.50</u>

a. For the north orientation, a vertical projection located on the west-edge of the fenestration with equivalent PF ≥ 0.15 shall also satisfy the minimum projection factor requirement.

Reason:

The concept of using shading to reduce heat gain is integral to the architecture of some of the oldest cultures. Shading in modern construction offers many possibilities. This proposed code change allows for the use of overhangs to meet the solar heat gain coefficient requirements within the IECC. Permanent exterior shading features such as overhangs are allowed to be used in IECC Chapter 5 as a prescriptive tradeoff to meeting SHGC requirements. The calculation for determining the projection factor for overhangs has been in the 2000, 2003, 2006, and 2009 IECC for commercial buildings and has been proven to be very simple to calculate, fitting well into a prescriptive approach. The use of shading devices was allowed under the 2003 IECC and is currently allowed as a tradeoff under the commercial provisions of the IECC. Allowing flexibility in meeting the solar heat gain coefficient through the use of proven shading alternatives will increase the usability of the code for the building and design community while ensuring that the new fenestration is energy efficient. When credit for shading is permitted in the building code, it encourages an integrated approach to building designs, energy use, construction materials and renewable resources particularly as part of urban infrastructure, site and town planning and building design to be considered holistically. It also creates the opportunity for aesthetically pleasing and ingenious designs that might not otherwise be permitted.

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E4. Multi-Family Air Leakage Testing

This amendment adds an exception to allow compliance to the air barrier requirements as and allow builders to test the entire building as a whole, as is permitted for commercial buildings.

Revise as follows:

R402.4 Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Section R402.4.1 through R402.4.4.

Exception: Dwelling units of R-2 Occupancies and multiple single family dwellings shall be permitted to comply with IECC Section C402.5

Reason:

Air tightness testing for single-family detached homes is very straightforward; however, it is much more difficult to accurately test attached dwelling units, including multi-family buildings. Currently the IECC treats low-rise multifamily buildings of three stories or less like single-family homes and multifamily buildings of four stories or more like commercial buildings. Regardless of height, all multifamily buildings have the same air-tightness testing complications, such as: Does the entire building need to be tested at one time? What about multifamily buildings with open corridors? Does every dwelling need to be tested? Can the leakages be averaged between units? Is the leakage tested only to the “outside” or should it include leakage to adjacent units?

By approving this change, low-rise multifamily buildings and attached single-family dwellings will avoid these complications, but still held to the same level of performance as high-rise (R-2) residential as well as all commercial buildings.

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E5. Air Leakage Rate Correction (climate zones 1-8)

This amendment modifies the requirements from 3 Air Changes per Hour (ACH) to 5 ACH in climate zones 1 through 8.

Revise as follows:

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 ~~and 2, and three air changes per hour in Climate Zones 3~~ through 8. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 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*.

Table R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

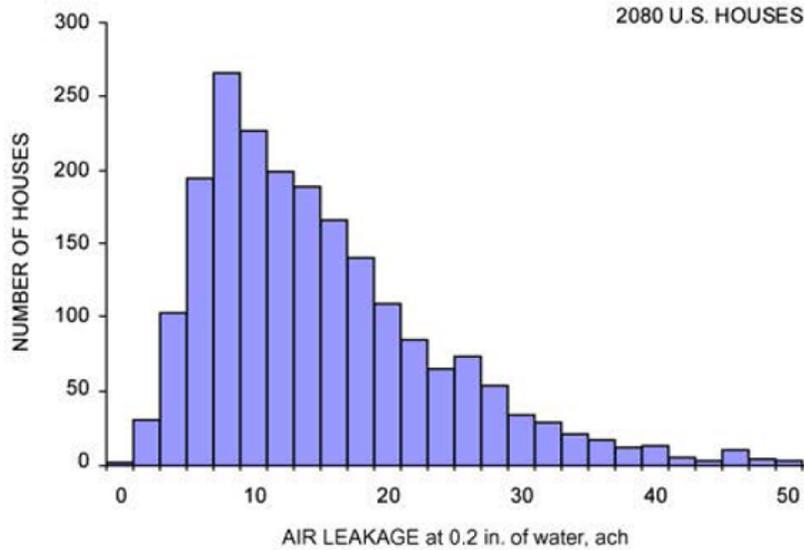
BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	<p>Air leakage rate of 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8 at a pressure of 0.2 inches w.g (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than $0.01 \times CFA +$</p> <p>$7.5 \times (Nbr + 1)$</p> <p>where:</p> <p><i>CFA</i> = conditioned floor area</p> <p><i>Nbr</i> = number of bedrooms</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate^a.</p> <p>The mechanical ventilation rated shall be in addition to the air leakage rate and shall be as proposed.</p>

Footnotes remain unchanged

Reason:

Building tightness is an important part of an energy-efficient and comfortable house. However, 3 air changes(ACH) per hour at 50 Pascals is an extremely low target tightness, especially for smaller homes. The ASHRAE Handbook of Fundamentals shows that around 8% of U.S. homes achieve 3 ACH or less, 13% achieve 4 and less than 23% achieve 5. The proposed 5 ACH while still an aggressive tightness level will provide a tight, comfortable, energy-efficient home.

2013 ASHRAE Handbook—Fundamentals



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E6. Air Leakage Trade-Offs

This Amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results. This performance option provides flexibility in meeting the air tightness requirements and provides options for recovering from an unexpected air tightness test failure. (Part of Amendment E1)

Revise as follows:

R402.4 Air leakage (Mandatory). The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation (Mandatory). The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed 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 (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be conducted with a blower door at a pressure of 0.2 inches 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*. During testing:

7. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
8. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
9. Interior doors, if installed at the time of the test, shall be open;
10. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
11. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
12. Supply and return registers, if installed at the time of the test, shall be fully open.

R402.4.1.3 Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

Reason:

These modifications remove the mandatory maximum air-tightness requirement and provide designers and builders the flexibility to trade off building tightness with other performance path measures. Currently the building tightness requirement is mandatory and the 3 and 5 ACH tightness levels, even under ideal circumstances, are very difficult to achieve. This will provide energy neutral tradeoffs for expensive and sometimes unattainable requirements with other building improvements. This proposal does not change the stringency or efficiency of the code; it only increases the flexibility.

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E7. Prescriptive Table Requirements

This amendment replaces 2015 IECC Tables R402.1.2 and R402.1.4 in the residential section of the 2015 with the following tables from the 2009 IECC.

Revise as follows:

Delete Table 402.1.1 and Table 402.1.3 in their entirety and replace with the following:

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50 ^j	0.60	0.30	30	13	5 / 8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13 / 17	30 ^g	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15 / 19	30 ^g	15/19	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38 ^g	15/19	10, 4ft	10/13

For SI: 1 foot = 304.8 mm.

- R-values are minimums. U-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 x 6 framing cavity such that the R-value is reduced by R-1 or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.
- The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.
- Or insulation sufficient to fill the framing cavity, R-19 minimum.
- "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
- The second R-value applies when more than half the insulation is on the interior of the mass wall.
- For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum U-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

TABLE 402.1.4
EQUIVALENT U-FACTORS^a

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.050	0.065

Footnotes remain unchanged

Nonfenestration Ufactors shall be obtained from measurement, calculation or an approved source.

- a. When more than half the insulation is on the interior, the mass wall Ufactors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall Ufactor in Marine Zone 4 and Zones 5 through 8.
- b. Basement wall Ufactor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.
- c. Foundation Ufactor requirements shown in Table 402.1.3 include wall construction and interior air films but exclude soil conductivity and exterior air films. Ufactors for determining code compliance in accordance with Section 402.1.4 (total VA alternative) of Section 405 (Simulated Performance Alternative) shall be modified to include soil conductivity and exterior air films .

Reason:

The increased table values in the 2012 IECC and the 2015 IECC did not show justification for the cost increases from the 2009 IECC. Studies indicate nationally almost a \$6,000 increase to the cost of constructing a single-family detached dwelling with a 13-year simple payback. With statistics showing that for every \$1,000 increase to the cost of construction nearly 206,000 potential home buyers will not qualify for a mortgage. This, increase disqualifies approximately 1.3 million families from purchasing a home every year. That equates to approximately \$24,000,000 in potential taxes revenues never being generated for municipalities.

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E8. BASEMENT WALL R-Value/U-Factors Reduction (Climate Zone 5)

This amendment reduces the basement wall insulation value requirements in Climate Zone 5, to a more reasonable R-Value/U-Factor based on values acceptable to both NAHB and DOE in the 2009 IECC.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	10/13 15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.059 0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

The prescriptive basement wall requirement increased from R-10 to R-15 in the 2012 IECC. Calculations used to justify the change were based on energy models with less sophisticated algorithms than Energy Plus, now DOE's preferred modeling software. When using Energy Plus, the energy savings in a 700-square-foot basement totaled \$7 a year in Chicago (Climate Zone 5). The additional cost for this is conservatively estimated at \$590. This makes the simple payback in excess of 58 years. The values being modified by this proposal are the same as those that DOE proposed in EC13 during the last code cycle. The values currently adopted were an increase from proposals not submitted by DOE.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
5	Chicago, IL	R-10->R-15	\$7/yr	\$590 (\$0.82/ft2)	84 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

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E9. Ceiling R-Value/U-Factors Reduction (Climate Zones 2-5)

This amendment reinstates the appropriate minimum ceiling R-Values in climate zones 2, 3, 4 and 5, those published in the 2009 IRC Chapter 11.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38 30	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38 30	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49 38	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49 38	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030 0.035	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030 0.035	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026 0.030	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026 0.030	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

There were four changes in the Ceiling R-value requirements in the 2012 IECC, none of which should have been considered cost effective. An energy and cost analysis was performed to show that the simple paybacks are in the 80-130 year range.

Climate Zone	Representative City	Change	Energy Savings	Incremental Cost	Simple Payback
2	Orlando, FL	R-38->R-30	\$10/yr	\$1,305	130 years
3	Atlanta, GA	R-38->R-30	\$16/yr	\$1,305	82 years
4	Richmond, VA	R-49->R-38	\$15/yr	\$1,379	92 years
5	Indianapolis, IN	R-49->R-38	\$15/yr	\$1,379	92 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Vaulted or cathedral ceiling are very problematic when trying to achieve R-49, which is about 16 inches thick. This would require a rafter at least 17" tall (which does not exist) or an insulated panel, which represents a very small portion of the market.

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E10. Correct SHGC for Climate Zone 4

This amendment changes the Climate Zone 4 SHGC back to N/R, since the addition of a prescriptive restriction for the SHGC of 0.40 is not a requirement that saves energy.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40 NR	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Reason:

The addition of a prescriptive restriction for the SHGC of 0.40 was added in the 2012 IECC. This is not a requirement that saves energy. In Climate Zone 4, heating degree days outnumber cooling degree days by about 2 to 3 times. Therefore for most of the year, the “sun is your friend” and solar heat gain is beneficial and reduces heating loads. The majority of homes will not benefit from this restriction. The values being modified by this proposal are the same as what DOE proposed in its EC13 during the 2009 code cycle. The values currently adopted were an increase from proposals not submitted by DOE.

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E11. Wall R-Value/U-Factors Corrections (Climate Zone 3 & 4)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zone 3 & 4 published in the 2009 IECC.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h+} 13 ⁱ	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^{h+} 13	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^{h,i}	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060 0.84	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060 0.84	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

All Footnotes remain unchanged

Reason:

Frame wall requirements in Climate Zone 3 changed from R-13 to R-20, which was, is not cost effective for the consumer.

Climate Zone	Representative City	Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
3	Atlanta, GA	R-13->R-20	\$50/yr	\$1,199	24 years

4	Richmond, VA	R-13->R-20	\$59/yr	\$1,199	20 years
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The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481. Not only is the payback is extremely long, but for a consumer, there would be a negative cash flow based on the incremental cost and energy savings. The increase in the monthly mortgage would be \$6.43 (@ 5%) and the average monthly energy savings would be \$4.17 in Zone 3 and \$4.92 in Zone 4 causing the home owner to pay more in additional monthly mortgage payments than the energy savings returns.

The values being modified by this proposal are the same as what DOE proposed in its EC13 during the 2009 code cycle. The values currently adopted were an increase from proposals not submitted by DOE.

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E12. Wall R-Value/U-Factors Corrections (Climate Zones 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

Revise as follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT WALL R-VALUE ^c	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^{h,i}	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^{h,i}	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^{h,i}	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 or 13+5 ^{h,i} 20+5 13+10	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 or 13+5 ^{h,i} 20+5 13+10	19/21	38 ^g	15/19	10, 4 ft	15/19

Footnotes remain unchanged

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor ^b	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.048 0.057	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.048 0.057	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

The prescriptive wall requirement increased to R-20+R5 in climate zones 6, 7 and 8 in the 2012 IECC. The additional cost for this is estimated at \$1,819 for 1,016 square feet of wall. This makes the simple payback between 26 and 55 years depending on the climate zone. This also will create a negative cash flow for the consumer in all cases.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
6	Minneapolis, MN	R-20->R-20+5	\$33/yr	\$1,819 (\$1.79/ft ²)	55 years
7	Bemidji, MN	R-20->R-20+5	\$41/yr	\$1,819 (\$1.79/ft ²)	44 years
8	Fairbanks, AK	R-20->R-20+5	\$71/yr	\$1,819 (\$1.79/ft ²)	26 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

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E13. Mechanical Equipment Trade-Off

This amendment reinstates the performance option in IRC Chapter 11 to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code. (Part of Amendment E1)

Revise as follows:

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems ^{d,e}	<p>As proposed for other than electric heating without a heat pump, 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 R403 of the IECC Commercial Provisions.</p> <p>Fuel type: same as proposed design</p> <p>Efficiencies:</p> <p>Electric: air-source heat pump with prevailing federal minimum standards</p> <p>Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards</p> <p>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section R403.6</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Cooling systems ^{d,e}	<p>As proposed</p> <p>Fuel type: Electric</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section R403,6</p>	<p>As proposed</p> <p>As proposed</p> <p>As proposed</p>
Service Water Heating ^{d,e,f,g}	<p>As proposed</p> <p>Fuel type: same as proposed design</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Use: gal/day = 30 + 10 × Nbr</p> <p>Tank temperature: 120°F</p> <p>Use: same as proposed design</p>	<p>As proposed</p> <p>As proposed</p> <p>Same as standard reference</p> <p>Same as standard reference</p> <p>gal/day = 30 + (10 × Nbr)</p>

Footnotes remain unchanged

Reason:

This amendment serves to retain energy-neutral equipment trade-off provisions from the 2006 IECC for heating and cooling systems and service water heating. By retaining these, builders have an opportunity to optimize a code-compliant house design by using energy-efficient equipment. Quite often, the use of this high-efficiency equipment provides a more cost-effective solution to achieve code compliance. Eliminating this ability discourages the concept of the “house as a system” approach, which is a cornerstone of building science.

Rejecting this amendment will reduce any incentive to install state-of-the-art, energy-efficient equipment. It will increase the cost of construction by driving builders to often use less efficient equipment.

Significant improvements in the efficiency of HVAC and water heating equipment have been made in the last 20 years. With the increased emphasis on new and improved technologies, this trend is expected to continue and will result in even higher energy savings in future years. If builders are forced to comply with the energy code by installing requirements which are not cost-effective, there will be a resistance to install higher efficiency equipment. This could end up hurting energy efficiency in the long term, consumers which have non-condensing furnaces will be less likely to install a higher efficiency condensing replacement furnace because of the additional cost to run an exhaust vent.

Industries such as log home manufacturers may no longer be able to construct to projected higher envelope requirements. The combination of increases in envelope thermal requirements, building tightness and duct tightness combined with the elimination of energy neutral trade-offs pose a serious threat to the viability of the log home industry. There are practical limitations to the thickness of log home walls. Increasing requirements for the log diameter has an exponential increase in the cost of the logs, making log walls with a U-factor of 0.082 or lower prohibitively expensive

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E14. Window Area Trade-Off

This amendment will provide the building designer the ability to reduce window area and get credit for the energy saved. (Part of Amendment E1)

Revise as follows:

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Vertical fenestration other than opaque doors	Total area ^b = (a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area. (b) 15% of the conditioned floor area; where the proposed glazing area is 15% 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: from Table R402.1.3	As proposed
	SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design)	0.92-(0.21 × SHGC as proposed)
	External shading: none	As proposed

Footnotes remain unchanged

Reason:

Walls generally have better thermal performance than windows. There is no incentive in the performance path for the building designer to optimize the window area to save energy and provide daylighting, egress and views that makes for a safe and comfortable house. These modifications will provide the building designer the ability to reduce window area and get credit for the energy saved. As this section is now written, the house is penalized for having more than 15% window area yet receives no credit toward code compliance when the window area is reduced below 15%. This change rectifies this disparity and makes the performance path more representative of actual energy use.

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