Review of Comments Submitted to SECO on Chapter 11, 2015 IRC & 2015 IECC during July 4-Auguat 4, 2014 Period

ATTACHMENT C

Analysis of Proposed Amendments

This attachment contains the stringency analysis of the proposed amendments to the 2015 IRC or the 2015 IECC energy efficiency provisions for residential buildings[1], in comparison to the Texas Building Energy Performance Standards (TBEPS), which are based on Chapter 11 of the 2009 IRC and Chapter 4 of the 2009 IECC. Each analysis was performed using a base-case single-family house that complies with Chapter 11 of the 2015 IRC and Chapter 4[RE] of the 2015 IECC with the proposed amendment vs. a TBEPS code-compliant base-case house. The analysis was performed for each of the proposed amendments separately and therefore does not represent the impact of implementing combinations of the proposed amendments. A complete description of the amendments are available on Pgs. C.15-C.35 of this attachment. Details of this analysis are provided in a separate report[2].

No.	Proposed Amendment - Synopsis	Commenter	Laboratory's Stringency Analysis[3]
C-1	Modifications to Section N1102.4, 2015 IRC and to Section R402.4, 2015 IECC: ○ The proposed amendment removes the maximum test values from mandatory testing requirement for air leakage. The maximum test values are now reported in a separate section on leakage rates, which is prescriptive. Modifications to Chapter 11, Table N1105.5.2(1), 2015 IRC and to Table R402.4, 2015 IECC: ○ The proposed amendment requires the glazing area of the standard reference house to be retained at 15% for all cases of glazing area in the proposed design house. Modifications to Chapter 11, Table N1105.5.2(1), 2015 IRC and to Table R402.4, 2015 IECC: ○ The proposed amendment reinstates the trade-off option for heating, cooling and domestic hot water equipment by recommending federal minimum standards for equipment of the standard reference house. *(See TAB Suggestion C-1, pgs. C.14- C.16, for details and reason)*	Texas Association of Builders (TAB)	**The stringency of the proposed comprehensive amendment is addressed individually in proposed amendments C-6, C-13 and C-14.**
C-2	Modifications to Section N1101.4, 2015 IRC, and to Section R102.1.1, 2015 IECC – This proposed amendment eliminates the need to meet all mandatory requirements identified by the IRC/IECC as long as the program exceeds the energy-efficiency levels that are required. *(See TAB Suggestion C-2, pg. C.17 for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS if the above code energy-efficiency program is the US EPA ENERGY STAR.** Note: The proposed amendment is less stringent than the published 2015 IECC.

[1] Residential buildings include detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

[2] Mukhopadhyay, J, G Zilbershtein, S Ellis, JC Baltazar, JS Haberl, BL Yazdani. 2014. Detailed Stringency Analysis of Suggested Amendments to Chapter 11 of the 2015 IRC and the 2015 IECC that were Submitted to the Texas State Energy Conservation Office (SECO) during July 4-August 4, 2014 Comment Period. ESL-TR-14-11-01. November 2014.

[3] Section N1101.2 of the 2009 IRC requires that compliance shall be demonstrated by either meeting the 2009 IECC or meeting the requirements of the 2009 IRC. Compliance with the performance path as described in the 2009 IECC was adopted for this analysis.

No.	Proposed Amendment - Synopsis	Proposer	Laboratory's Stringency Analysis
C-3	Additions to text in Section N1101.6 and Section N1102.3.3, 2015 IRC, and Section R202 and Section R402.3.3, 2015 IECC – The proposed amendment allows for the use of overhangs to meet the solar heat gain coefficient requirements within the IECC. *(See TAB Suggestion C-3, pg. C.18 for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS provided the values in the proposed Table R402.3.3 are equivalent to or more stringent than the values in Table 5.5.4.4.1, SHGC Multipliers for Permanent Projections, found in ASHRAE Standard 90.1-2013.** Note: The proposed amendment is as stringent as the 2015 IECC provided the values in the proposed Table R402.3.3 are equivalent to or more stringent than the values in Table 5.5.4.4.1, SHGC Multipliers for Permanent Projections, found in ASHRAE Standard 90.1-2013.
C-4	Modifications to Section N1102.4, 2015 IRC, and Section R402.4, 2015 IECC – This proposed amendment eliminates the need to test dwelling units individually and allow the builders to test the entire multi-family building structure as a whole, as is done in commercial buildings. *(See TAB Suggestion C-4, pgs. C.19, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS for R-2 occupancies provided it meets all the requirements of Section C402.5 of the 2015 IECC.** Note: The proposed amendment referenced the 2012 IECC section for air-leakage requirements instead of the corresponding section in the 2015 IECC.
C-5	Modifications to N1102.4.1.2 and Table N1105.5.2(1) 2015 IRC, and Section 402.4.1.2 and Table R405.5.2(1), 2015 IECC – The proposed amendment modifies the requirement from 3 ACH_{50} to 4 ACH_{50} in Climate Zones 3 through 8. *(See TAB Suggestion C-5, pg. C.20 for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 IECC.
C-6	Modifications to Chapter 11, N1102.4, 2015 IRC and to Section R402.4, 2015 IECC – The proposed 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 unexpected air tightness test failure. *(See TAB Suggestion C-6, pg. C.21, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is as stringent as the published 2015 IECC.
C-7	Modifications to Table N1102.1.2 and Table 1102.1.4 2015 IRC, Tables R402.1.1 and Table R402.1.3, 2015 IECC – This proposed amendment replaces the 2015 IECC Tables R402.1.2 and R402.1.4 in the residential section of the 2015 with Table 402.1.1 and Table 402.1.3 of the 2009 IECC. *(See TAB Suggestion C-7, pg. C.22-C.23, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 IECC.

No.	Proposed Amendment - Synopsis	Proposer	Laboratory's Stringency Analysis
C-8	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.	TAB	**This amendment is not applicable to the Climate Zones of Texas.**
C-9	Modifications to Table N1102.1.2 and Table 1102.1.4 2015 IRC, Tables R402.1.1 and Table R402.1.3, 2015 IECC – This proposed amendment reinstates the appropriate minimum ceiling R-values in Climate Zones 2,3,4 and 5 to those published in the 2009 IRC, Chapter 11. *(See TAB Suggestion C-9 pg. C.24-C.25, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 IECC.
C-10	Modifications to Table N1102.1.1 , 2015 IRC, Tables R402.1.1, 2015 IECC – This proposed 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. *(See TAB Suggestion C-10 pg. C.26, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 IECC.
C-11	Modifications to Table N1102.1.1 and Table N1102.1.3 , 2015 IRC, Table R402.1.1 and Table 402.1.3, 2015 IECC – This proposed amendment reinstates the appropriate minimum wall assembly R-values / U-factors in Climate Zone 3 and 4 published in the 2009 IECC. *(See TAB Suggestion C-11 pgs. C.27-C.28, for details and reason)*	TAB	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 IECC.
C-12	This amendment reinstates the appropriate minimum wall assembly R-values/U-factors in Climate Zones 6, 7 and 8 as published in the 2009 IRC.	TAB	**This amendment is not applicable to the Climate Zones of Texas.**
C-13	Modifications to Table N1105.5.2(1), 2015 IRC, Table R405.5.2(1), 2015 IECC – This proposed amendment reinstates the performance option in the IRC Chapter 11 to reduce the prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code. *(See TAB Suggestion C-13 pgs. C.29-C.30, for details and reason)*	TAB	**The proposed amendment meets the annual energy cost performance requirement of the TBEPS.** Note: The 2009, 2012 and 2015 IECC do not allow trade-offs between equipment and building thermal envelope.

No.	Proposed Amendment - Synopsis	Proposer	Laboratory's Stringency Analysis
C-14	Modifications to Table N1105.5.2 (1), 2015 IRC, Table R405.5.2 (1), 2015 IECC – This proposed amendment provides the building designer the ability to reduce window area and get credit for the energy saved. *(See TAB Suggestion C-14 pg. C.31, for details and reason)*	TAB	**The proposed amendment meets the TBEPS requirements for a house with typical dimensions in Texas.** Note: The 2009, 2012 and 2015 IECC do not allow credit for reducing window area below 15% WFAR.
C-15	Modifications to Table N1102.1.2, 2015 IRC, Table R402.1.2, 2015 IECC – The proposed amendment proposes changes to the wood framed wall insulation specification as identified in Table 402.1.2 of the 2015 IECC to an R-15 for Climate Zones 2, 3 and 4. *(See Fox Energy Specialists Suggestion C-15 pg. C.32, for details and reason)*	Fox Energy Specialists	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 code.
C-16	Modifications to Section N1102.4.1.2, 2015 IRC, Section R402.4.1.2, 2015 IECC – The proposed amendment changes the air infiltration testing requirements as identified in Section R402.4.1.2 of the 2015 IECC to 5 ACH_{50} for all Texas Climate Zones. *(See Fox Energy Specialists Suggestion C-16 pg. C.33, for details and reason)*	Fox Energy Specialists	**The proposed amendment is as stringent as the TBEPS.** Note: The proposed amendment is less stringent than the published 2015 code.
C-17	Modifications to Section N1106, 2015 IRC, Section R406, 2015 IECC – The proposed amendment amends the Energy Rating Index Compliance Alternatives as adopted in Section R406 of the 2015 IECC to more realistic scores as proposed in a joint study conducted by the Natural Resources Defense Council (NRDC), Leading Builders of America (LBA), Institute for Market Transformation (IMT), and Britt/ Makela Group, Inc (BMG). *(See Fox Energy Specialists Suggestion C-17 pg. C.34, for details and reason)*	Fox Energy Specialists	**The ERI is currently not a requirement in the TBEPS.** Note: In the referenced IMT, LBA, NRDC and BMG study insufficient information was provided for assessing the stringency of this proposed amendment in comparison to the 2015 IECC.

Analysis C-5

This analysis was performed to evaluate the proposed amendment to modify Section 402.4.1.2 and Table R405.5.2 (1), 2015 IECC (Chapter 11, N1102.4.1.2 and Table N1105.5.2(1), 2015 IRC) by modifying the blower door test requirement from 3ACH_{50} to 4 ACH_{50} for Climate Zones 3 and 4.

For this analysis, the modified leakage rates of 4 ACH_{50} were considered for three different house sizes. The impact of the modified leakage rates was compared to a corresponding TBEPS compliant base-case house with air leakage rates of 0.00036 SLA as prescribed by Table 405.5.2(1) of the 2009 IECC. The analysis was performed for the Climate Zone 3 and Climate Zone 4 as described in the TBEPS.

Table C-1 presents the difference in annual source energy consumption between 2015 IECC compliant test-case with the proposed increased leakage rates and the TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-1: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with Increased Leakage Rates to the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	House Size (ft^2)	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
			Gas Space Heating, Gas DHW	Heat-Pump Space Heating, Electric DHW
Tarrant	**3**	1,000	7%	4%
		2,500	16%	11%
		5,000	21%	16%
Potter	**4**	1,000	12%	8%
		2,500	18%	12%
		5,000	24%	16%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ increased air leakage rates)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with the 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to wall ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW; and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.
5. As per the 2009 IECC, the air leakage rates of 7 ACH_{50} was modeled for Climate Zones 3 and 4. As per the proposed amendment a decreased air leakage rate of 4 ACH_{50} was modeled for Climate Zones 3 and 4.

Analysis C-7

This analysis was performed to evaluate the proposed amendment to modify Table R402.1.1 and Table R402.1.3, 2015 IECC (Table N1102.1.2 and Table 1102.1.4 2015 IRC). The proposed amendment replaces the information in Tables R402.1.2 and R402.1.4 in the residential section of the 2015 IECC (Table N1102.1.2 and Table 1102.1.4, 2015 IRC) with corresponding information in Table 402.1.1 and Table 402.1.3 of the 2009 IECC.

For this analysis, a 2015 IECC compliant house with modified envelope components was compared to a corresponding TBEPS compliant base-case house. The analysis was performed for Climate Zone 2, 3 and 4 as described in the TBEPS.

Table C-2 presents a difference in the annual energy consumption when replacing the content in Table R402.1.1 and Table R402.1.3 of the 2015 IECC with the information provided in Table 402.1.1 and Table 402.1.3 of the 2009 IECC for the three Climate Zones in Texas. The test case was compared to the corresponding TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-2: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with Modified Envelope Components in Three Climate Zones to the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
		Gas Space Heating, Gas DHW	Heat-Pump Space Heating, Electric DHW
Harris	**2**	3%	2%
Tarrant	**3**	9%	6%
Potter	**4**	16%	10%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ updated envelope specifications)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a 2,500 ft^2 single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.

Analysis C-9

This analysis was performed to evaluate the proposed amendment to modify, Tables R402.1.1 and Table R402.1.3, 2015 IECC (Table N1102.1.2 and Table 1102.1.4 2015 IRC). The proposed amendment reinstates the appropriate minimum ceiling R-values in Climate Zones 2, 3, 4 and 5 to those published in the Table 402.1.3 2009 IECC, Chapter 4.

For this analysis, the 2015 IECC compliant test-case was updated with modified values for ceiling insulation and was compared to a corresponding TBEPS compliant base-case house. The analysis was performed for Climate Zone 1, Climate Zone 3 and Climate Zone 4 as described in the TBEPS.

Table C-3 presents a difference in the annual energy consumption when replacing the content for ceiling insulation in Table R402.1.1 and Table R402.1.3 of the 2015 IECC with the corresponding values for ceiling insulation provided in Table 402.1.1 and Table 402.1.3 of the 2009 IECC for the three Climate Zones in Texas. The test-case was compared to the corresponding TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-3: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with Modified Ceiling Insulation in Three Climate Zones with the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
		Gas Space Heating, Gas DHW	Heat Pump Space Heating, Electric DHW
Harris	**2**	8%	6%
Tarrant	**3**	17%	12%
Potter	**4**	20%	13%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ updated envelope specifications)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a 2,500 ft^2 single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.

Analysis C-10

This analysis was performed to evaluate the proposed amendment to modify Table R402.1.2 of the 2015 IECC (Table N1102.1.1, 2015 IRC) by removing the specifications of the solar heat gain coefficient for Climate Zone 4.

For this analysis the specifications for window SHGC were changed from 0.4 as specified in Table R402.1.2, 2015 IECC (Table N1102.1.1, 2015 IRC) to 0.5, which is assumed to be the highest possible SHGC corresponding to the U-value specified in the 2015 IECC for Climate Zone 4. The modified test-case was compared to a corresponding TBEPS compliant base-case house. The analysis was performed for Climate Zone 4 as described in the TBEPS.

Table C-4 presents the difference in annual energy consumption from increasing the SHGC from 0.4 to 0.5 in Climate Zone 4 of the 2015 IECC compliant test-case. The test-case was compared to the TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-4: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with Increased SHGC in Climate Zone 4 to the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	% Difference in Total Energy Consumption (2009 Source) Positive values indicate increase in stringency	
		Gas Space Heating, Gas DHW	Heat Pump Space Heating, Electric DHW
Potter	**4**	22%	14%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ 0.5 SHGC)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a 2,500 ft^2 single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.
5. As per the 2009 IECC, the SHGC of 0.4 was modeled for Climate Zone 4. As per the proposed amendment an increased SHGC of 0.5 was modeled for Climate Zone 4.

Analysis C-11

This analysis was performed to evaluate the proposed amendment to modify, Tables R402.1.1 and Table R402.1.3, 2015 IECC (Table N1102.1.2 and Table 1102.1.4, 2015 IRC). The proposed amendment reinstates the appropriate minimum wall R-values in Climate Zones 3 and 4 to those published in the Table 402.1.1 and Table 402.1.3 2009 IECC, Chapter 4.

For this analysis, the 2015 IECC compliant test-case was updated with proposed minimum wall R-values and compared to a corresponding TBEPS compliant base-case house. The analysis was performed for Climate Zone 3 and Climate Zone 4 as described in the TBEPS.

Table C-5 presents a difference in the annual energy consumption when replacing the content for wall insulation in Table R402.1.1 and Table R402.1.3 of the 2015 IECC with the corresponding values for ceiling insulation provided in Table 402.1.1 and Table 402.1.3 of the 2009 IECC for the three Climate Zones in Texas. The test-case was compared to the corresponding TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-5: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with Modified Wall Insulation in Two Climate Zones to the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
		Gas Space Heating, Gas DHW	Heat Pump Space Heating, Electric DHW
Tarrant	**3**	15%	10%
Potter	**4**	17%	11%

Notes:

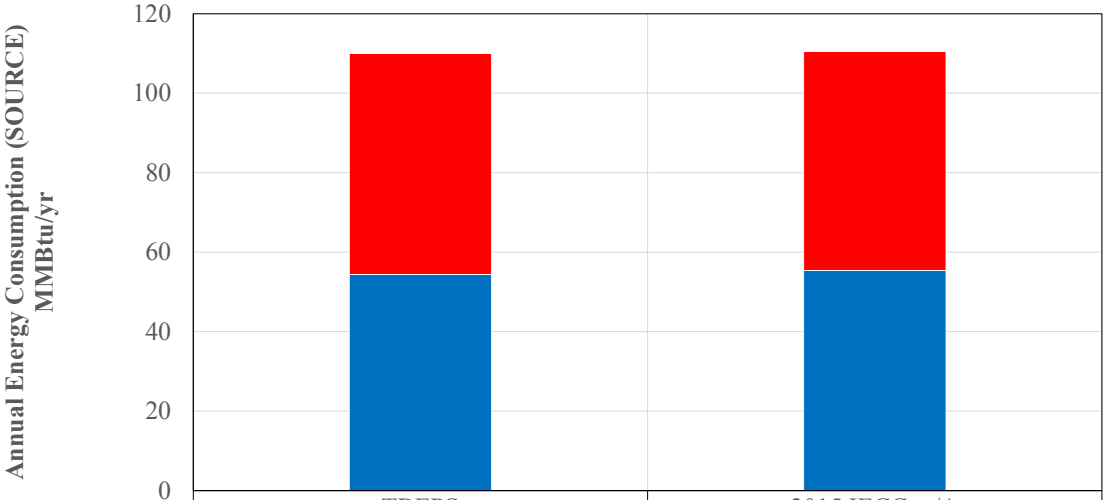
1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ updated wall insulation specifications)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a 2,500 ft^2 single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.

Analysis C-14

This analysis was performed to evaluate the proposed amendment to modify Table R405.5.2 (1), 2015 IECC (Table N1105.5.2 (1), 2015 IRC) by fixing the window-to-floor-area-ratio of the Standard Reference Design house at 15% in order to get credit for the energy saved in the Proposed Design house for various window sizes.

For this analysis, the window-to-wall-area-ratio of a Proposed Design house was varied for three different house sizes. Respective energy consumption of the corresponding Standard Reference house designed in accordance with TBEPS and the 2015 IECC with the WFAR fixed at 15% was evaluated.

Figure C-1 presents the annual source energy consumption of a house with typical dimensions in Texas[4] for TBEPS compliant base-case and the 2015 compliant test-case with the WFAR fixed at 15%. The typical house in Texas is single-storied with a conditioned floor area of 2,398 ft^2 and a window-to-floor area ratio of 11.9%. For a typical house in Texas, the annual source energy consumption of the 2015 IECC compliant test case with the proposed amendments was lower than the corresponding source energy consumption of the TBEPS compliant base-case. Table C-6 presents the annual source energy consumption of the TBEPS compliant base-cases, with various window-to-wall-area-ratios (WWAR), and the 2015 IECC compliant test-cases with the WFAR fixed at 15%.In certain cases the 2015 IECC compliant test-cases with the proposed amendment consume more energy than the TBEPS compliant base-cases.
For a typical house in Texas, the proposed amendment meets the TBEPS. For certain other test cases as seen in Table C-6, the proposed amendment is less stringent than the corresponding TBEPS compliant base-case.



	TBEPS	2015 IECC w/A
TOTAL	110.0	93.6
Source Gas	55.7	55.1
Source Electric	54.4	55.4

Figure C-1: Comparing the Annual Energy Consumption of TBEPS and 2015 IECC w/ Amendments Compliant Standard Reference Design House for a Typical House in Texas

[4] Home Innovation Research Labs. 2012. Annual Builders Practices and Consumer Practices Report. Home Innovation Research Labs, Upper Marlboro, Maryland.

Table C-6: Comparing the Annual Energy Consumption of TBEPS and 2015 IECC w/ Amendments Compliant Standard Reference Design House for Different Window-to-floor Area Ratios

County & 2009 IECC Climate Zones	House Size (ft^2)	WFAR (%) (WWAR %)	IECC Source Energy Consumption (Standard Reference Design) (MMBtu/yr)			
			Gas Space Heating, Gas DHW		Heat-Pump Space Heating, Electric DHW	
			2009 IECC	2015 IECC w/ Amend.	2009 IECC	2015 IECC w/ Amend.
Harris Climate Zone 2	1,000	10.1% (10%)	55.1	54.7	66.4	66.8
		15.0% (15%)	57.9	54.7	68.6	66.8
	2,500	6.4% (10%)	89.5	92.4	99.9	104.1
		9.6% (15%)	94.9	92.4	104.6	104.1
		12.8% (20%)	100.3	92.4	109.3	104.1
		15.0% (25%)	104.0	92.4	112.8	104.1
	5,000	4.5% (10%)	140.3	149.2	150.4	162.0
		6.8% (15%)	147.9	149.2	157.4	162.0
		9.1% (20%)	156.0	149.2	164.6	162.0
		11.3% (25%)	163.6	149.2	171.6	162.0
		13.6% (30%)	171.5	149.2	178.2	162.0
		15.0% (35%)	176.4	149.2	182.6	162.0

1. This analysis used the performance path approach to show compliance with 2009 and 2015 IECC.
2. Base-case Simulation Assumptions:
   Analysis used a single-family house with an area of 1000 ft^2, 2500 ft^2 and 5000 ft^2, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC or Chapter 4 [RE] of the 2015 IECC for the counties shown. Supply-only mechanical ventilation operating for 24 hours in a day is modeled for the 2015 cases. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
3. 2009 IECC and 2015 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC and Section R405.1, compliance with the 2009 code is established using heating, cooling, and service water heating only.
   As per Section 405.3 of the 2009 IECC and SectionR405.3, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.
4. As per the 2009 IECC, the window-to-floor area ratio (WFAR) of the Standard Reference Design was the same as that of the Proposed Design house for cases where the WFAR of the Proposed Design were lower than or equal to 15%. For cases where the WFAR of the Proposed Design were greater than 15 %, the WFAR of the Standard Reference Design was retained at 15%.
5. As per the specifications in the 2015 IECC with Amendments, the WFAR of the Standard Reference Design was retained at 15% regardless of the WFAR of the Proposed Design house.
6. Cells marked in red indicate cases where the 2015 IECC with amendments is less stringent than the corresponding TBEPS.

Analysis C-15

This analysis was performed to evaluate the proposed amendment to modify, Tables R402.1.1 and Table R402.1.3, 2015 IECC (Table N1102.1.2 and Table 1102.1.4, 2015 IRC). The proposed amendment changes the wall R-values in Climate Zones 2, 3 and 4 to R-15.

For this analysis, the 2015 IECC compliant test-case was updated with the proposed wall R-values. The updated test-case was compared to a corresponding TBEPS compliant base-case house. The analysis was performed for Climate Zone 3 and Climate Zone 4 as described in the TBEPS.

Table C-7 presents a difference in the annual energy consumption when replacing the content for wall insulation in Table R402.1.1 and Table R402.1.3 of the 2015 IECC with R-15 for the three Climate Zones in Texas. The test-case was compared to the corresponding TBEPS compliant base-case. The proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-7: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case with R-15 Wall Insulation in Three Climate Zones with the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
		Gas Space Heating, Gas DHW	Heat-Pump Space Heating, Electric DHW
Harris	**2**	11%	7%
Tarrant	**3**	17%	11%
Potter	**4**	19%	13%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ updated wall insulation specifications)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a 2,500 ft^2 single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.

Analysis C-16

This analysis was performed to evaluate the proposed amendment of Chapter 11, N1102.4.1.2 and Table N1105.5.2(1), 2015 IRC and Section 402.4.1.2 and Table R405.5.2(1), 2015 IECC by modifying the blower door test requirement to 5 ACH_{50} for all Climate Zones.

For this analysis, the modified leakage rates of 5 ACH_{50} were considered for three different house sizes. The impact of the modified leakage rates was compared to a corresponding TBEPS compliant base-case house with air leakage rates of 7 ACH_{50} as prescribed by Section 402.4.2.1 of the 2009 IECC. The analysis was performed for the Climate Zone 2, 3 and 4 as described in the TBEPS.

Table C-8 presents the difference in annual source energy consumption of the 2015 IECC compliant test-case with the proposed increased leakage rates when compared to the energy consumption obtained at the TBEPS compliant base-case. The 2015 IECC compliant test-case with the proposed amendment is as stringent as the TBEPS compliant base-case.

Table C-8: Comparing Annual Energy Consumption for 2015 IECC Compliant Test-Case Implementing Increased Leakage Rates of 5ACH_{50} with the TBEPS Compliant Base-Case

County	2009 IECC Climate Zones	House Size (ft^2)	% Difference in Total Energy Consumption (2009 IECC Source) Positive values indicate increase in stringency	
			Gas Heating, Gas Domestic Hot Water	Heat Pump Heating, Electric Domestic Hot Water
Harris	**2**	1,000	6%	3%
		2,500	10%	7%
		5,000	14%	10%
Tarrant	**3**	1,000	10%	6%
		2,500	15%	10%
		5,000	17%	13%
Potter	**4**	1,000	9%	6%
		2,500	15%	10%
		5,000	19%	13%

Notes:

1. Percent Difference in Total Energy Consumption:
   [Base-case energy consumption (2009 IECC) – Test-case energy consumption (2015 IECC w/ 5ACH_{50} air leakage rates)] / Base-case energy consumption (2009 IECC) %.
2. This analysis used the performance path approach to show compliance with 2009 IECC.
3. Base-case Simulation Assumptions:
   Analysis used a single-family house, single-story, three bedrooms, slab-on-grade, ducts in the unconditioned and ventilated attic, window-to floor ratio: 15%, windows equally distributed (N,E,S,W) with no exterior shading. All other roof, wall and window parameters were modeled as per specifications in Chapter 4 of the 2009 IECC for the counties shown. Two base-case buildings were considered: Natural gas space heating and DHW, and heat-pump space heating and electric DHW.
4. 2009 IECC Source Energy:
   As per Section 405.1 of the 2009 IECC, compliance with the 2009 code is established using heating, cooling, and service water heating only. As per Section 405.3 of the 2009 IECC, a factor of 3.16 is used to calculate the source energy generation for electricity consumption and a factor of 1.1 was used to calculate source energy generation for natural gas consumption.
5. As per the 2009 IECC, the air leakage rates of 7 ACH_{50} was modeled for Climate Zone 2, 3 and 4. As per the proposed amendment a decreased air leakage rate of 5 ACH_{50} was modeled for Climate Zone 2, 3 and 4.

Detailed Description of Suggested Amendments to the 2015 IECC
TAB Suggestion C-1

E1. Comprehensive Amendment

This amendment is a comprehensive amendment, which provides flexibility for meeting the energy code requirements while maintaining the energy performance. It will provide 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.

7/18/2014

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

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Glazing[a]	Total area[b] =	
	~~(c)The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area.~~	As proposed
	~~(d)~~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 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 0.92-(0.21 × SHGC as proposed)
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design) External shading: none	As proposed
Heating systems [f, g]	~~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.~~	As proposed
	Fuel type: same as proposed design	As proposed
	Efficiencies:	
	Electric: air-source heat pump with prevailing federal minimum standards	As proposed
	Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards	As proposed
	Nonelectric boilers: natural gas boiler with prevailing federal minimum standards	As proposed
	Capacity: sized in accordance with Section N1103.6	
Cooling systems [f,h]	~~As proposed~~ Fuel type: Electric	
	Efficiency: in accordance with prevailing federal minimum standards	As proposed
	Capacity: sized in accordance with Section N1103.6	As proposed
Service Water Heating [f,g,h,i]	~~As proposed~~	As proposed
	Fuel type: same as proposed design	As proposed
	Efficiency: in accordance with prevailing federal minimum standards	Same as standard reference Same as standard reference ~~gal/day = 30 + (10 × *Nbr*)~~
	Use: gal/day = 30 + 10 × *Nbr*	
	Tank temperature: 120°F	
	~~Use: same as proposed design~~	

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

7/18/2014

provide 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 which 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.

Return to Table of Contents

7/18/2014

TAB Suggestion C-2

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 the minimum energy efficiency requirements of the IECC.

Return to Table of Contents

7/18/2014

TAB Suggestion C-3

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.

R402.3.3 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 R402.3.3
MINIMUM PROJECTION FACTOR REQUIRED BY ORIENTATION FOR SHGC EXCEPTION

ORIENTATION	PROJECTION FACTOR
North	>=0.40[a]
South	>=0.20
East	>=0.50
West	>=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 architectural 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 IECC. 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. The use of the shading devices was previously allowed under the 2003 IECC and is currently 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 in the building code, 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.

Return to Table of Contents

7/18/2014

TAB Suggestion C-4

E4. Multi-Family Air Leakage Testing

This amendment eliminates the need to test dwelling units individually and allow builders to test the entire structure as a whole, as is done in 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 C402.4

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 multi-family buildings, which are 3 stories or less, like single family homes and multi-family buildings of 4 stories or more like commercial buildings. Regardless of height, all multi-family buildings have the same air tightness testing complications, such as: Does the entire building need to be tested at one time? What about multi-family 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 multi-family buildings and attached single family dwellings will avoid these complications, but yet will still held to the same level of performance as high rise (R-2) residential building as well as all commercial buildings.

Return to Table of Contents

7/18/2014

TAB Suggestion C-5

E5. Air Leakage Rate Correction (Climate Zones 3-8)

This amendment modifies the requirements from 3 Air Changes per Hour (ACH) to 4 ACH in Climate Zones 3-8

Revise as follows:

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and ~~3~~ 4 air changes per hour in Climate Zones 3 through 8. 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*.

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

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	Air leakage rate of 5 air changes per hour in Climate Zones 1 and 2, and ~~3~~ 4 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 $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ where: CFA = conditioned floor area Nbr = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation.	For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate[c]. The mechanical ventilation rated shall be in addition to the air leakage rate and shall be as proposed.

Reason:
Building tightness is an important part of an energy efficient and comfortable house; however, 3 air changes per hour at 50 Pascals is an extremely low target tightness especially for smaller homes. The ASHRAE Handbook of Fundamentals shows that less than 10% of new homes achieve 3 ACH or less. Four ACH is still an aggressive tightness level, which will provide a tight, comfortable, energy efficient home for the consumer.

Return to Table of Contents

7/18/2014

TAB Suggestion C-6

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 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 will provide energy neutral trade-offs for expensive and sometimes unattainable requirements with other building improvements. This proposal does not change the stringency of the code it only increases the flexibility while not lowering efficiency.

Return to Table of Contents

7/18/2014

TAB Suggestion C-7

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.

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

TABLE 402.1.1
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.

a. 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-I or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. "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.

d. 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.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. "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.

i. The second R-value applies when more than half the insulation is on the interior of the mass wall.

j . 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 402.1.3
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

7/18/2014

Nonfenestration Ufactors shall be obtained from measurement, calculation or an apprCNed 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) ofSection 405 (Simulated Performance Alternative) shall be modified to include soil conductivity and exterior air films .

Reason:
The 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 250,000 potential home buyers will not qualify for a mortgage. That puts the impact of the increased cost of a home to disqualifying approximately 2.5 million families from purchasing a home. That equates to approximately $48,000,000 in potential taxes revenues never being generated for municipalities.

Return to Table of Contents

7/18/2014

TAB Suggestion C-9

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:

TABLE N1102.1.1 (R402.1.1)
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[c] SPACE 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	5/13f	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

TABLE N1102.1.3 (R402.1.3) 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	0.091c	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

All Footnotes remain unchanged

Reason:

There were four changes in the Ceiling R-value requirements in the 2012 IECC Edition, 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	epresentative City	Change	Energy Savings	Incremental Cost	Simple Payback
2	Orlando, FL	R-38->R-30	$10/yr	$1,305	130 years

7/18/2014

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.

Return to Table of Contents

7/18/2014

TAB Suggestion C-10

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:

TABLE N1102.1.1 (R402.1.1)
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[c] SPACE 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	5/13f	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	30g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h,i]	15/20	30g	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

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.

Return to Table of Contents

7/18/2014

TAB Suggestion C-11

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:

TABLE N1102.1.1 (R402.1.1)
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[c] SPACE 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]~~ 13[i]	8/13	19	5/13f	0	5/13
4 except Marine	0.35	0.55	0.40	49	~~20 or 13+5[h,i]~~ 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	30g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h,i]	15/20	30g	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

TABLE N1102.1.3 (R402.1.3) 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~~ 0.84	0.098	0.047	0.091c	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

7/18/2014

4	Richmond, VA	R-13->R-20	$59/yr	S1,199	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 homeowner 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 their proposal EC13 from the last cycle. The values currently adopted were an increase from proposals not submitted by the Department of Energy.

Return to Table of Contents

7/18/2014

TAB Suggestion C-13

E13. 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 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 [f, g]	~~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.~~ Fuel type: same as proposed design Efficiencies: 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 Capacity: sized in accordance with Section R403.6	~~As proposed~~ As proposed As proposed As proposed As proposed
Cooling systems [f,h]	~~As proposed~~ Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section R403,6	As proposed As proposed
Service Water Heating [f,g,h,i]	~~As proposed~~ 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~~	~~As proposed~~ As proposed Same as standard reference Same as standard reference ~~gal/day = 30 + (10 × *Nbr*)~~

Reason:
This amendment serves to retain energy neutral equipment trade-off provisions from the 2006 International Energy Conservation Code (IECC) for the heating systems,

6/19/2014

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 create a negative impact on the installation of 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, 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, increases in the log diameter has a exponential increase in the cost of the logs making log walls with a U- factor of 0.082 or lower prohibitively expensive

Return to Table of Contents

6/19/2014

TAB Suggestion C-14

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
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.~~	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W)	
	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

Reason:

Walls generally perform better thermally than windows. Currently in the code there is no incentive in the performance path for the building designer to optimize the window area in order 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 currently 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 a more representative of actual energy use.

Return to Table of Contents

6/19/2014

Fox Energy Specialists Suggestion C-15

Wall Assembly Requirements

One area of major concern that the 2015 IECC will impose are those regarding wood framed wall assembly requirements to accommodate for the insulation specifications as outlined in Table R402.1.2 of the 2015 IECC. In climate zones 3 and 4, insulation values will either need to be a minimum of R20 or R13+R5 of continuous rigid insulation. Climate zone 2 is unaffected by this change, as this specification is identical to the 2009 IECC requirement for wood framed wall insulation (R13).

The added costs associated with the R13+5 specification builders will use in CZs 3 and 4 is approximately $3600 on your average 2,300 square foot home. An R20 insulation value inside a wood framed wall assembly would force builders to construct 2x6 exterior walls, rather than conventional 2x4 wall construction. The added cost to that change in framing design, lumber supply, and construction could potentially be even higher than the alternative (R13+5) specification.

Recommendation – Amend the wood framed wall insulation specification as identified in Table R402.1.2 of the 2015 IECC to an R15 for **all** Texas climate zones. This provides a consistent specification for all professionals in the residential construction industry (Texas builders and enforcement), while achieving a higher level of thermal performance (approx. 15%) on all wood framed wall assemblies constructed moving forward.

Fox Energy Specialists Suggestion C-16

Air Infiltration

As is the case with wall assembly requirements, there are also differing air infiltration specifications outlined in the 2015 IECC depending on where you build a home in Texas. Section R402.4.1.2 of the 2015 IECC specifies that the building thermal envelope shall not exceed an air leakage rate of 5 ACH50 in climate zone 2, and 3 ACH50 in climate zones 3 and 4. It is fair to say that the building industry in general has largely embraced the air infiltration testing requirements introduced in the 2009 IECC, as it is a good way to verify and demonstrate the overall building envelope performance. However, moving from 7 ACH50 for all Texas climate zones (2009 IECC) to the proposed 5 ACH50 and 3 ACH50 requirements is a monumental hurdle that will blind-side many builders in the State. To provide a frame of reference, ENERGY STAR® Certified Homes are currently required to achieve 6 ACH50 in climate zone 2 and 5 ACH50 in climate zones 3 and 4[2]. To amend the state energy code to 2015 IECC requirements, ENERGY STAR builders across Texas would have to adhere to a more stringent air leakage requirement without receiving any credit (or market differentiation) for building to a higher energy efficiency standard, such as ENERGY STAR.

Recommendation – Amend the air infiltration testing requirements as identified in section R402.4.1.2 of the 2015 IECC to 5 ACH50 for **all** Texas climate zones. This proposed amendment is consistent with what many local municipalities are currently adopting as an alternative to the 2012 IECC. This amendment would also provide a consistent specification across the State (as the 2009 IECC did) while still lowering the minimum air infiltration rate by almost 30%.

Fox Energy Specialists Suggestion C-17

Energy Rating Index

The introduction of the Energy Rating Index (ERI) Compliance Alternative is a welcomed new addition to the 2015 IECC, *in theory*. The ERI score is defined as a numerical score where 100 is equivalent to the 2006 IECC and 0 is equivalent to a net-zero home. The most commonly known ERI process used nationally is RESNET's ANSI Approved[3] Home Energy Rating System (HERS) Index® method for inspecting and calculating a home's energy performance. The HERS Index provides credit to homes in areas previous versions of the IECC did not recognize (i.e. mechanical efficiencies, radiant barrier roof decking, etc.). However, it is our opinion that the ERI scores adopted in the 2015 IECC are extremely way too low for mainstream construction in Texas. In today's marketplace, the vast majority of builders that utilize the HERS Index are doing so because they are choosing to build to an above energy code standard (i.e. ENERGY STAR, National Green Building Standard, Green Built Texas, etc.). Since 2012, these above energy code homes built in Texas received an average HERS Index of 65. Suggesting an ERI score of 51, 52, or 54 as the alternative standard to meeting the 2015 IECC will basically nullify this otherwise very builder and consumer friendly compliance alternative.

Recommendation – Amend the Energy Rating Index Compliance Alternative as adopted in section R406 of the 2015 IECC to more realistic scores as proposed in a joint study conducted by the Natural Resources Defense Council (NRDC), Leading Builders of America (LBA), Institute for Market Transformation (IMT), and Britt/Makela Group, Inc. (BMG)[4]. These proposed ERI scores for all Texas climates zones are listed below.

Texas Climate Zones	2015 IECC Adopted Scores	IMT, LBA, NRDC, BMG Proposed Scores
Zone 2	52	**59**
Zone 3	51	**59**
Zone 4	54	**63**

[2] ENERGY STAR Certified Homes, Version 3 National Program Requirements - http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/National_Program_Requirements.pdf?eda8-6196

[3] ANSI RESNET Standard 301-2014 - http://www.resnet.us/standards/ANSI-RESNET_301-2014.pdf

[4] http://www.imt.org/uploads/resources/files/Fact_Sheet_on_ERI_Proposal.pdf