EC57-09/10 Part I & Part II
EECC Requested Final Action: Approved as Modified by the Public Comment

EECC Reason Statement:

EC57, parts I and II, should be approved as modified by this public comment.

This public comment incorporates the additional changes that were recommended by the Steel Framing Alliance and the RESNET technical committee chair. In addition, this public comment addresses the "footnote h" issue by modifying footnote c to be consistent with public comments that are being submitted to modify note h from Table 402.1.1. The result is a uniform set of assumptions to be used in compliance worksheets and software applications that will ensure more accurate and consistent results whenever the Total UA Alternative or the Simulated Performance Alternative is used.

This proposal was disapproved by a tiebreaker vote from the chair of the IECC committee, due to a split vote among the voting members of the IECC committee. It should be noted that the Committee did not conclude that this proposal was technically flawed or otherwise problematic, only that it was not necessary to include this information directly in the code. We disagree with the Committee conclusion that these provisions need not be in the code. It is important to include these provisions in the code to ensure consistent modeling for code compliance. These provisions are not intended for design guidance, but instead set code requirements that otherwise can currently be changed by any energy modeling tool or code compliance calculator. There are dozens of compliance software packages in use today, and each one necessarily incorporates a number of assumptions that are not set in the IECC. Currently there is inconsistency among the energy modeling tools and therefore inconsistency in the results, depending on the tools used. As long as the IECC allows a Total UA Alternative and/or the Simulated Performance Alternative, we believe the fundamental underlying assumptions for the software should be established in the code, and not in an informational appendix.

EECC Proposed Modification to Original Proposal:

Part I - IECC

402.1.5 Calculating opaque envelope component U-factors. When determining the U-factor of an opaque assembly as part of Sections 402.1.3, 402.1.4, or ~~404.5.2~~ 405.5.2, Table 402.1.5 shall be used to calculate the U-factor by using a series-parallel path calculation. Where actual insulation and framing fractions have been calculated for the proposed design, they shall be used; otherwise the default insulation and framing fractions in Table 402.1.5 shall be used. The *code official* may require: (1) actual insulation and framing fractions to be calculated and documented and (2) the calculated and documented values to be inspected and reviewed by a~~n independent~~ party *approved* by the *code official.*

TABLE 402.1.5
COMPONENT R-VALUE AND INSULATION AND FRAMING FRACTIONS BY ASSEMBLY TYPE

	Interior Air Film	Interior Layer	Cavity Insulation Layer	Insulation Fraction	Cavity Framing Layer	Framing Fraction	~~Insulating Sheathing~~ Continuous Insulation Layer [c]	Structural Sheathing Layer [c]	Siding Layer	Exterior Air Film
	R-Value	R-Value	R-Values	Percent	R-Values	Percent	R-Value	R-Value	R-Value	R-Value
Wood Frame Ceiling	0.61	0.45	As Specified [a]	93%	R-1.25 per inch [b]	7%	-	-	-	0.61
Wood Frame Wall	0.68	0.45	As Specified	~~77~~ 75%	R-1.25 per inch [b]	~~23~~ 25%	0 or as specified	0.62	0.61	0.25
Steel Frame	0.68	0.45	As	[d]	[d]	[d]	0 or as	0.62	0.61	0.25

Wall			Specified				specified			
Mass Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Wood Frame Floor	0.92	1.23 + 0.94	As Specified	90%	R-1.25 per inch [b]	10%	-	-	-	0.92
Basement Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25
Crawlspace Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25

Notes:

a. ~~In~~ When calculating the equivalent u-factor for the standard reference design, the depth of the insulation shall be calculated to account for limited depth at the edge of the ceiling based on a standard truss with available depth of 3.86 inches at the edge of the ceiling and a roof slope of 1 foot for every 3 feet across. In the proposed design, the ceiling insulation u-value shall be calculated with the actual insulation depths in the proposed design.

b. The depth of the wood framing shall be based on the actual depth of the wood framing. ~~In~~ When calculating the equivalent u-factor for the standard reference design, ~~it~~ the depth of the wood framing shall be calculated as the cavity insulation R-Value divided by 4 and then rounded up to the following depths in inches: 3.5 for a 2x4 frame, 5.5 for a 2x6 frame, 7.5 for a 2x8 frame or 9.5 for a 2x10 frame.

c. When calculating the equivalent u-factor for ~~If insulating sheathing is used in~~ the standard reference design using continuous insulation, ~~only 80%~~ 100% of the net wall is assumed to be covered by continuous insulation ~~the insulating sheathing. The other 20% is assumed to be covered with plywood~~. The proposed design shall be calculated with the actual percentage of continuous insulation ~~insulating sheathing~~ and structural sheathing.

d. When determining the U-factor of a steel framed assembly using Table 402.1.5, a series path calculation shall be used. The R-value of the cavity/framing layer for steel framed assemblies shall be calculated by multiplying the specified cavity insulation R-value by the corresponding correction factor located in Table 402.1.6. If there is no specified cavity insulation, the R-value of the cavity/framing layer shall be taken as R-0.8 for 16 inch on center assemblies and R-0.9 for 24 inch on center assemblies.

TABLE 402.1.6 STEEL FRAMED ASSEMBLIES CAVITY INSULATION CORRECTION FACTORS

Nominal Stud Size[a]	Cavity Insulation R-Value	Nominal Framing Spacing	
		16 in. on center	24 in. on center
2x4	11	0.50	0.60
2x4	13	0.46	0.55
2x4	15	0.43	0.52
2x6	19	0.37	0.45
2x6	20	0.36	0.44
2x6	21	0.35	0.43
2x8	25	0.31	0.38

Part II - IRC

N1102.1.4 Calculating opaque envelope component U-factors. When determining the U-factor of an opaque assembly as part of Section N1102.1.2 or N1102.1.3, Table N1102.1.4 shall be used to calculate the U-factor by using a series-parallel path calculation. Where actual insulation and framing fractions have been calculated for the proposed design, they shall be used; otherwise the default insulation and framing fractions in Table N1102.1.4 shall be used. The *building official* may require: (1) actual insulation and framing fractions to be calculated and documented and (2) the calculated and documented values to be inspected and reviewed by a~~n independent~~ party *approved* by the *building official.*

TABLE N1102.1.4
COMPONENT R-VALUE AND INSULATION AND FRAMING FRACTIONS BY ASSEMBLY TYPE

	Interior Air Film	Interior Layer	Cavity Insulation Layer	Insulation Fraction	Cavity Framing Layer	Framing Fraction	Continuous Insulation Layer [c]	Structural Sheathing Layer [c]	Siding Layer	Exterior Air Film
	R-Value	R-Value	R-Values	Percent	R-Values	Percent	R-Value	R-Value	R-Value	R-Value
Wood Frame Ceiling	0.61	0.45	As Specified [a]	93%	R-1.25 per inch [b]	7%	-	-	-	0.61
Wood Frame Wall	0.68	0.45	As Specified	~~77~~ 75%	R-1.25 per inch [b]	~~23~~ 25%	0 or as specified	0.62	0.61	0.25
Steel Frame Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Mass Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Wood Frame Floor	0.92	1.23 + 0.94	As Specified	90%	R-1.25 per inch [b]	10%	-	-	-	0.92
Basement Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25
Crawlspace Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25

Notes:

a. ~~In~~ When calculating the equivalent u-factor for the standard reference design, the depth of the insulation shall be calculated to account for limited depth at the edge of the ceiling based on a standard truss with available depth of 3.86 inches at the edge of the ceiling and a roof slope of 1 foot for every 3 feet across. In the proposed design, the ceiling insulation u-value shall be calculated with the actual insulation depths in the proposed design.

b. The depth of the wood framing shall be based on the actual depth of the wood framing. ~~In~~ When calculating the equivalent u-factor for the standard reference design, ~~it~~ the depth of the wood framing shall be calculated as the cavity insulation R-Value divided by 4 and then rounded up to the following depths in inches: 3.5 for a 2x4 frame, 5.5 for a 2x6 frame, 7.5 for a 2x8 frame or 9.5 for a 2x10 frame.

c. When calculating the equivalent u-factor for ~~If insulating sheathing is used in~~ the standard reference design using continuous insulation, ~~only 80%~~ 100% of the net wall is assumed to be covered by continuous insulation ~~the insulating sheathing. The other 20% is assumed to be covered with plywood~~. The proposed design shall be calculated with the actual percentage of continuous insulation ~~insulating sheathing~~ and structural sheathing.

d. When determining the U-factor of a steel framed assembly using Table N1102.1.5, a series path calculation shall be used. The R-value of the cavity/framing layer for steel framed assemblies shall be calculated by multiplying the specified cavity insulation R-value by the corresponding correction factor located in Table N1102.1.6. If there is no specified cavity insulation, the R-value of the cavity/framing layer shall be taken as R-0.8 for 16 inch on center assemblies and R-0.9 for 24 inch on center assemblies.

TABLE N1102.1.5
STEEL FRAMED ASSEMBLIES CAVITY INSULATION CORRECTION FACTORS

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2x4	15	0.43	0.52
2x6	19	0.37	0.45
2x6	20	0.36	0.44
2x6	21	0.35	0.43
2x8	25	0.31	0.38

Proposal History:

Committee Recommended Action on Original Proposal at Public Hearing:

Part I IECC – Disapproved

Part II IRC – Disapproved

Committee Reason(s) for Recommended Action:

Part I IECC – This information does not need to be included in the code. It could be provided in commentary, some type of design guide, or in an informational appendix.

Part II IRC – This information does not need to be included in the code. The proper application is not clear. It could be provided in commentary, some type of design guide, or in an informational appendix.

Initial Recommendation of EECC: Approve

Initial Proposal for Reference:

EC57–09/10

402.1.5 (New), Table 402.1.5 (New); IRC N1102.1.4 (New), Table N1102.1.4 (New)

Proponent: Bill Prindle, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Garrett Stone, Brickfield, Burchette, Ritts & Stone; Steve Rosenstock, Edison Electric Institute; Brian Dean, ICF International

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING/ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IECC

Add new text and table as follows:

402.1.5 Calculating opaque envelope component U-factors. When determining the U-factor of an opaque assembly as part of Sections 402.1.3, 402.1.4, or 404.5.2, Table 402.1.5 shall be used to calculate the U-factor by using a series-parallel calculation. Where actual insulation and framing fractions have been calculated for the proposed design, they shall be used; otherwise the default insulation and framing fractions in Table 402.1.5 shall be used. The *code official* may require: (1) actual insulation and framing fractions to be calculated and documented and (2) the calculated and documented values to be inspected and reviewed by an independent party *approved* by the *code official.*

TABLE 402.1.5
COMPONENT R-VALUE AND INSULATION AND FRAMING FRACTIONS BY ASSEMBLY TYPE

	Interior Air Film	Interior Layer	Cavity Insulation Layer	Insulation Fraction	Cavity Framing Layer	Framing Fraction	Insulating Sheathing Layer[c]	Structural Sheathing Layer[c]	Siding Layer	Exterior Air Film
	R-Value	R-Value	R-Values	Percent	R-Values	Percent	R-Value	R-Value	R-Value	R-Value
Wood Frame Ceiling	0.61	0.45	As Specified[a]	93%	R-1.25 per inch[b]	7%	-	-	-	0.61
Wood Frame Wall	0.68	0.45	As Specified	77%	R-1.25 per inch[b]	23%	0 or as specified	0.62	0.61	0.25
Steel Frame Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Mass Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Wood Frame Floor	0.92	1.23 + 0.94	As Specified	90%	R-1.25 per inch[b]	10%	-	-	-	0.92
Basement Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25
Crawlspace Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25

a. In the standard reference design, the depth of the insulation shall be calculated to account for limited depth at the edge of the ceiling based on a standard truss with available depth of 3.86 inches at the edge of the ceiling and a roof slope of 1 foot for every 3 feet across. In the proposed design, the ceiling insulation u-value shall be calculated with the actual insulation depths in the proposed design.

b. The depth of the wood framing shall be based on the actual depth of the wood framing. In the standard reference design, it shall be calculated as the cavity insulation R-Value divided by 4 and then rounded up to the following depths in inches: 3.5 for a 2x4 frame, 5.5 for a 2x6 frame, 7.5 for a 2x8 frame or 9.5 for a 2x10 frame.

c. If insulating sheathing is used in the standard reference design, only 80% of the net wall is assumed to be covered by the insulating sheathing. The other 20% is assumed to be covered with plywood. The proposed design shall be calculated with the actual percentage of insulating sheathing and structural sheathing.

PART II – IRC BUILDING/ENERGY

Revise as follows:

N1102.1.4 Calculating opaque envelope component U-factors. When determining the U-factor of an opaque assembly as part of Section N1102.1.2 or N1102.1.3, Table N1102.1.4 shall be used to calculate the U-factor by using a series-parallel calculation. Where actual insulation and framing fractions have been calculated for the proposed design, they shall be used; otherwise the default insulation and framing fractions in Table N1102.1.4 shall be used. The *building official* may require: (1) actual insulation and framing fractions to be calculated and documented and (2) the calculated and documented values to be inspected and reviewed by an independent party *approved* by the *building official.*

TABLE N1102.1.4
COMPONENT R-VALUE AND INSULATION AND FRAMING FRACTIONS BY ASSEMBLY TYPE

	Interior Air Film	Interior Layer	Cavity Insulation Layer	Insulation Fraction	Cavity Framing Layer	Framing Fraction	Insulating Sheathing Layer[c]	Structural Sheathing Layer[c]	Siding Layer	Exterior Air Film
	R-Value	R-Value	R-Values	Percent	R-Values	Percent	R-Value	R-Value	R-Value	R-Value
Wood Frame Ceiling	0.61	0.45	As Specified[a]	93%	R-1.25 per inch[b]	7%	-	-	-	0.61
Wood Frame Wall	0.68	0.45	As Specified	77%	R-1.25 per inch[b]	23%	0 or as specified	0.62	0.61	0.25
Steel Frame Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Mass Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	0.62	0.61	0.25
Wood Frame Floor	0.92	1.23 + 0.94	As Specified	90%	R-1.25 per inch[b]	10%	-	-	-	0.92
Basement Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25
Crawlspace Wall	0.68	0.45	As Specified	-	-	-	0 or as specified	-	-	0.25

a. In the standard reference design, the depth of the insulation shall be calculated to account for limited depth at the edge of the ceiling based on a standard truss with available depth of 3.86 inches at the edge of the ceiling and a roof slope of 1 foot for every 3 feet across. In the proposed design, the ceiling insulation u-value shall be calculated with the actual insulation depths in the proposed design.

b. The depth of the wood framing shall be based on the actual depth of the wood framing. In the standard reference design, it shall be calculated as the cavity insulation R-Value divided by 4 and then rounded up to the following depths in inches: 3.5 for a 2x4 frame, 5.5 for a 2x6 frame, 7.5 for a 2x8 frame or 9.5 for a 2x10 frame.

c. If insulating sheathing is used in the standard reference design, only 80% of the net wall is assumed to be covered by the insulating sheathing. The other 20% is assumed to be covered with plywood. The proposed design shall be calculated with the actual percentage of insulating sheathing and structural sheathing.

Reason: The calculations between the R-Values and U-Values for envelope components have not been available in the IECC or IRC. This proposal is intended to make the calculations within the code and the use of code consistent and transparent. The proposal does not change the insulation R-value or U-Value requirements, but rather is intended to be the means for future calculations to be consistent and for software tools to be consistent. This proposal makes the standard reference design and proposed design framing fractions explicit, along with all of the layers of the envelope components that are used in energy calculations.

Without explicit values that indicate how energy modeling tools are to model exact building envelope components, software tools have the discretion to select “appropriate” but inconsistent envelope layers. This inconsistency between modeling tools can create inconsistent results for what proposed designs comply with code. By adopting explicit component default value tables, the industry tools can increase consistency in how buildings are modeled.

This proposal offers an easy way to understand the true energy efficiency of the homes that are being constructed, by defining the home default construction values, the home building industry is encouraged to meet the standard construction techniques and improve to advanced framing construction techniques.

This proposal uses the values that are based on ASHRAE where possible and further supplemented with Rescheck, HERS and Washington State Energy code information.

This proposal also allows the code to be transparent where it is currently silent. Currently energy software and code officials do not have any official guidance from the code on the actual translation between R-Value and U-Value. This leads to confusion and lack of consistency in the implementation of code across the country.

Cost Impact: The code change proposal will not increase the cost of construction.

PART I – IECC

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART II – IRC BUILDING/ENERGY

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

ICCFILENAME: PRINDLE-EC-17-402.1.5-N1102.1.4