

EECC Recommended Action: Approved as Modified by the Public Comment

Public Comment

Proposed Modification to Original Proposal:

Revise table as follows:

**TABLE 402.1.3
EQUIVALENT U-FACTORS ^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKY-LIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
1	1.20	0.75	0.035 36	0.081 82	0.197	0.063 60	0.360	0.477
2	0.75	0.75	0.035 36	0.081 82	0.165	0.063 60	0.360	0.477
3	0.65	0.65	0.035 36	0.081 82	0.141	0.049 46	0.360	0.136
4 except Marine	0.40	0.60	0.027 34	0.081 82	0.141	0.049 46	0.059	0.065
5 and Marine 4	0.35	0.60	0.027 34	0.059 60	0.082	0.033 37	0.059	0.065
6	0.35	0.60	0.021 26	0.059 60	0.060	0.033	0.059	0.065
7 and 8	0.35	0.60	0.021 26	0.056 57	0.057	0.033	0.041	0.057

a. Nonfenestration U-factors shall be obtained from measurement, calculation, or an approved source.

Add new text and tables as follows:

402.1.5 Envelope Component Descriptions and Default Values. When calculating the U-factor of an assembly as part of Section 402.1.3, 402.1.4, or 404.5.2, the values in Table 402.1.5.1 through 402.1.5.3 shall be used unless alternate values are approved by the code official. In addition, the U-factor of the assembly shall be calculated using a series-parallel calculation with the default framing fractions in Table 402.1.5.1 through 402.1.5.3. Subject to approval by the code official, the frame fractions for the proposed design shall be permitted to be determined by the type of construction (Satisfactory, Intermediate or Advanced) as defined in sections 402.1.5.1 through 402.1.5.3.

402.1.5.1 Wood stud frame walls. The type of construction (Satisfactory, Intermediate or Advanced) for determination of default framing fractions in wood stud frame walls are defined as follows:

Satisfactory Insulation and Framing Fractions:

Satisfactory wood stud frame walls include studs framed on 16 inch centers with double top plate and single bottom plate. Corners use three studs and each opening is framed using two studs.

Studs and plates: 21%

Insulated cavity: 75%

Headers: 4%

Intermediate Insulation and Framing Fractions:

Intermediate wood stud frame walls include studs framed on 16 inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and each opening is framed by two studs.

Studs and plates: 18%

Insulated cavity: 78%

Headers: 4%

Advanced Insulation and Framing Fractions:

Advanced wood stud frame walls include studs framed on 24 inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header.

Studs and plates: 13%

Insulated cavity: 83%

Headers: 4%

**TABLE 402.1.5.1
FRAME WALL COMPONENT DEFAULT VALUES**

Component	Default Value	
Interior Air Film R-Value	0.68	
Drywall Layer R-Value	0.45	
Cavity Layer R-Values	Insulation: As Specified	Framing: R-1.25 per inch of wood
Standard Reference Design Insulation / Framing Fraction	Insulation: 77 78%	Framing: 23 22%
Proposed Design Default Insulation / Framing Fraction	Insulation: 77 78%	Framing: 23 22%
<u>Insulating Sheathing Layer R-Value</u>	<u>0 or as installed</u>	
<u>Structural Sheathing Layer R-Value</u>	0. 62 63	
Siding Layer R-Value	0. 61 44	
Exterior Air Film R-Value	0. 25 45	

402.1.5.2 Wood frame floors. The type of construction (Satisfactory, Intermediate or Advanced) for determination of default framing fractions in wood frame floors are defined as follows:

Satisfactory Insulation and Framing Fractions:

Satisfactory wood floors include open joist systems framed 12 inch centers or solid joists framed 16 inch centers.

Framing: 12%

Insulated cavity: 88%

Intermediate Insulation and Framing Fractions:

Intermediate wood floors include open joist systems framed 16 inch centers or solid joists framed 20 inch centers.

Framing: 10%

Insulated cavity: 90%

Advanced Insulation and Framing Fractions:

Advanced wood floors include open joist systems framed 20 inch centers or joists framed 24 inch centers.

Framing: 8%

Insulated cavity: 92%

**TABLE 402.1.5.2-6
FLOOR COMPONENT DEFAULT VALUES**

Component	Default Value	
Interior Air Film R-Value	0.92	
Floor Covering R-Value	1.23	
Floor Subfloor R-Value	0.94 63	
Cavity Layer R-Values	Insulation: As Specified	Framing: R-1.25 per inch of wood
Standard Reference Design Insulation / Framing Fraction	Insulation: 90%	Framing: 10%
Proposed Design Default Insulation / Framing Fraction	Insulation: 90%	Framing: 10%
Exterior Air Film R-Value	0.92	

402.1.5.3 Wood frame ceilings. The type of construction (Satisfactory, Intermediate or Advanced) for determination of default framing fractions in wood frame ceilings are defined as follows:

Satisfactory Insulation and Framing Fractions:

Satisfactory ceiling insulation and framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation.

Framing: 11%

Insulated cavity: 89%

Intermediate Insulation and Framing Fractions:

Intermediate ceiling insulation and framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation.

Framing: 9%

Insulated cavity: 91%

Advanced Insulation and Framing Fractions:

Advanced ceiling insulation and framing assumes full and even depth of insulation extending to the outside edge of exterior perimeter of the ceiling.

Framing: 7%

Insulated cavity: 93%

**TABLE 402.1.5.3-7
CEILING COMPONENT DEFAULT VALUES**

Component	Default Value	
Interior Air Film R-Value	0.61	
Drywall Layer R-Value	0.45	
Cavity Layer R-Values	Insulation: As Specified	Framing: R-1.25 per inch of wood
Standard Reference Design Insulation / Framing Fraction	Insulation: 89 91%	Framing: 11 9%
Proposed Design Default Insulation / Framing Fraction	Insulation: 89 91%	Framing: 11 9%

Exterior Air Film R-Value	0.61
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Reason Statement:

EC-38 is an important proposal that offers an easy way to understand the true energy efficiency of the homes that are being constructed. By defining both the standard and proposed home default construction values, the home building industry is encouraged to meet the standard construction techniques and improve to the advanced framing construction techniques.

EC-38 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.

The language added is based on the Washington State Energy Code language that defines wall framing. While not all of the language defining the walls has been included in this proposal, the code language significantly adopts the structure and values already in use in the Washington State Code.

The committee had concerns with the values in the original EC-38 proposal. This public comment modifies the values to be based on ASHRAE where possible and further supplemented with Rescheck, HERS and Washington State Energy code information.

Proposal History:

Committee Recommended Action on Original Proposal at Public Hearing: Disapproved

Committee Reason(s) for Recommended Action:

The proposed values would not be consistent with ASHRAE.

Initial Recommendation of EECC: Approve

Initial Proposal for Reference:

EC38–07/08

Table 402.1.3, 402.1.5 (New), Table 402.1.5 (New), Table 402.1.6 (New), Table 402.1.7 (New)

Proponents: Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Bill Prindle, American Council for an Energy Efficient Economy (ACEEE); Jeff Harris, Alliance to Save Energy (ASE); Steven Rosenstock, Edison Electric Institute (EEI)

1. Revise table as follows:

**TABLE 402.1.3 (Supp)
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKY-LIGHT 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 0.036	0.082	0.197	0.064 0.060	0.360	0.477
2	0.75	0.75	0.035 0.036	0.082	0.165	0.064 0.060	0.360	0.477
3	0.65	0.65	0.035 0.036	0.082	0.141	0.047 0.046	0.360	0.136
4 except Marine	0.40	0.60	0.030 0.031	0.082	0.141	0.047 0.046	0.059	0.065
5 and Marine 4	0.35	0.60	0.030 0.031	0.060	0.082	0.037	0.059	0.065
6	0.35	0.60	0.026	0.060	0.060	0.033	0.059	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.041	0.057

- a. Nonfenestration U-factors shall be obtained from measurement, calculation, or an approved source.
- b. When more than half the insulation is on the interior, the mass wall U-factors shall be 0.17 in zone 1, 0.14 in zone 2, 0.12 in zone 3, 0.10 in zone 4 and the same as the wood frame wall in zones 5 through 8.

2. Add new text and tables as follows:

402.1.5 Envelope component default values. When calculating the U-factor of an assembly as part of Section 402.1.3, 402.1.4, or 404.5.2, the values in Table 402.1.5 through 402.1.7 shall be used unless alternate values are approved by the code official. In addition, the U-factor of the assembly shall be calculated using a series-parallel calculation.

**TABLE 402.1.5
FRAME WALL COMPONENT DEFAULT VALUES**

<u>Component</u>	<u>Default Value</u>	
<u>Interior Air Film R-Value</u>	0.68	
<u>Drywall Layer R-Value</u>	0.45	
<u>Cavity Layer R-Values</u>	<u>Insulation:</u> As Specified	<u>Framing:</u> R-1.25 per inch of wood
<u>Standard Reference Design Insulation / Framing Fraction</u>	<u>Insulation:</u> 77%	<u>Framing:</u> 23%
<u>Proposed Design Default Insulation / Framing Fraction</u>	<u>Insulation:</u> 77%	<u>Framing:</u> 23%
<u>Sheathing Layer R-Value</u>	0.63	
<u>Siding Layer R-Value</u>	0.44	
<u>Exterior Air Film R-Value</u>	0.45	

**TABLE 402.1.6
FLOOR COMPONENT DEFAULT VALUES**

<u>Component</u>	<u>Default Value</u>	
<u>Interior Air Film R-Value</u>	0.92	
<u>Floor Covering R-Value</u>	1.23	
<u>Floor Subfloor R-Value</u>	0.63	
<u>Cavity Layer R-Values</u>	<u>Insulation:</u> As Specified	<u>Framing:</u> R-1.25 per inch of wood
<u>Standard Reference Design Insulation / Framing Fraction</u>	<u>Insulation:</u> 90%	<u>Framing:</u> 10%
<u>Proposed Design Default Insulation / Framing Fraction</u>	<u>Insulation:</u> 90%	<u>Framing:</u> 10%
<u>Exterior Air Film R-Value</u>	0.92	

**TABLE 402.1.7
CEILING COMPONENT DEFAULT VALUES**

<u>Component</u>	<u>Default Value</u>	
<u>Interior Air Film R-Value</u>	0.61	
<u>Drywall Layer R-Value</u>	0.45	
<u>Cavity Layer R-Values</u>	<u>Insulation:</u> As Specified	<u>Framing:</u> R-1.25 per inch of wood
<u>Standard Reference Design Insulation / Framing Fraction</u>	<u>Insulation:</u> 89%	<u>Framing:</u> 11%
<u>Proposed Design Default Insulation / Framing Fraction</u>	<u>Insulation:</u> 89%	<u>Framing:</u> 11%
<u>Exterior Air Film R-Value</u>	0.61	

Reason: 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 requirements, but does change the U-factors to be calculated based on the component default value tables. 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.

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