Satisfying Energy Code Requirements with ZIP System® sheathing and ZIP System® R-sheathing

The International Energy Conservation Code (IECC) governs the minimal thermal performance of commercial and residential structures. The IECC is composed of two sections; the first focuses on commercial construction, and the second focuses on residential construction. The thermal requirements in each section are in chapter four. ZIP System® sheathing and ZIP System® R-sheathing can satisfy portions of the IECC following the prescriptive R-value requirements or the U-Factor alternative. This technical tip will introduce each method and give an example of when to choose the preferred method.

General Terminology

R-value is the resistance to the flow of heat traveling through a material. A numerical value is used to represent the R-value of a material. Materials with larger the R-values will have greater thermal resistance.

U-factor is the inverse of R-value and is often utilized to analyze the entire wall assembly rather than a single component. Because U-factor is the inverse of R-value, U-factors with a lower number have better thermal performance.

Prescriptive R-Value

The most common method to satisfy an energy code requirement is to follow the prescriptive R-value method. Under this method, one ensures each component meets or exceeds the value of Table C402.1.3 (commercial projects) or Table R402.1.3 (residential) listed in the IECC. For a wall assembly, any value presented by an R followed by a number (example: R-13) gives the minimum required R-value for the wall cavity. If an R-number is followed by a "+" and a second number (example R13 + 3.8c.i.), the first number is the required R-value for the wall cavity and the second number is the required R-value for the continuous insulation. Table 1 and Table 2 below show how R-value requirements are listed for wood-framed walls in the IECC for commercial and residential projects.

Table 1: Excerpt from Table C402.1.3 from the 2021 IECC

Climate Zone	0-4 EXCEPT MARINE		5-7 AND MARINE 4		8	
	All other	Group R	All other	Group R	All other	Group R
Wood Framed and other	R-13 + 3.8c.i. or R-20	R-13 + 3.8c.i. or R-20	R-13 + 7.5c.i. or R-20 + 3.8c.i.	R-13 + 7.5c.i. or R-20 + 3.8c.i.	R-13 + 18.8c.i.	R-13 + 18.8c.i.

Table 2: Excerpt from Table R402.1.3 from the 2021 IECC

Climate Zone	0-2	3	4-8 AND MARINE 4
Wood Framed and other	R13 or R0+10ci	R20, R13 + 5ci, or R0 + 15 ci	R30, R20+5ci, R13+10ci, or R0 + 20ci

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U-Factor Alternative

The U-factor method is an alternative way to satisfy thermal requirements for a structure. Much like the R-value requirements, the IECC publishes U-factor thermal requirements for commercial and residential projects in Table C402.1.4 and Table R402.1.4. Table 3 and Table 4 below show how the U-factor requirements are listed for wood framed walls in the IECC for commercial and residential projects.

Two ways to verify the U-factor requirements have been satisfied; the first would be to manually calculate the composite wall section, or the second method would be to use Table A3.4 of ASHRAE*, a chart look-up function.

Table 3: Excerpt from Table C402.1.4 from the 2021 IECC

Climate Zone	0-4 EXCEPT MARINE		5-7 AND MARINE 4		8	
Wood Framed and other	All other	Group R	All other	Group R	All other	Group R
	0.064	0.064	0.051	0.051	0.032	0.032

Table 4: Excerpt from Table R402.1.2 from the 2021 IECC

Climate Zone	0-2	3	4-8 AND MARINE 4
Wood Framed and other	0.084	0.060	0.045

Practical Example

Why would one choose to use the U-factor alternative over the R-value method when using ZIP System products? As an example, let us assume the following proposed parameters for a project:

Proposed Project Parameters	
Construction Type	Type V
Thermal Code	2021 IECC
Thermal Requirements	R-13 + 3.8c.i
Climate Zone	4
Framing	2x4
Cavity Insulation	R-13
Continuous Insulation	R-3

In this scenario, the ZIP System R-sheathing R-3 panel was proposed; however, the R-value of the foam in the R-3 panel is 3.0 and the R-value of the panel is 0.6, which does not satisfy the prescriptive R-value requirements. Therefore, analyzing the wall system under the U-factor method makes sense. The required U-factor for this scenario is 0.064, and the actual U-factor for this scenario is 0.068 based on Table A3.4.3.1* of ASHRAE. Since 0.068 is greater than 0.064, the wall assembly fails; however, if the cavity insulation is changed from R-13 to R-15, the U-factor now becomes 0.064, which is equal to the required U-factor for the project. This allows for the use of the thinner ZIP System R-sheathing R-3 panel without having to bump up to the ZIP System R-sheathing R-6 panel.

In addition to satisfying the thermal requirements, ensure the proper amounts of continuous insulation and/or vapor control measures are implemented to prevent condensation within the wall assembly. To learn more, please refer to the technical tip "Interior Vapor Retarders with ZIP System R-sheathing" available at huberwood.com.

* Table version based on ASHRAE 90.1-2022

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