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**Air Films and Simplified R-Value for Walls in One- and Two-Family Dwellings**

**Code:** 2018 Energy Conservation Code  
**Section:** R402.1.2

**Date:** July 31, 2019

**Question:**

When using Table R402.1.2, can I add all construction materials in a wall assembly and the indoor and outdoor air film's resistance to meet the prescriptive R-value requirements in this table?

**Answer:**

No.

The value of the insulation materials determined as minimally meeting the code, is already taking into account that these insulation materials are part of an overall assembly that would include other building materials such as gypsum, siding<sup>i</sup>, and the air films that have some insulative value; however, their insulative value cannot be added to the insulation material's R-Values when using Table R402.1.2. Refer to Section R402.1.3 for details:

**R402.1.3 R-Value computation.** Insulation materials used in layers, such as framing cavity insulation, or continuous insulation shall be summed to compute the corresponding component R-value. The manufacturer's settled R-value shall be used for blown insulation. **Computed R-values shall not include an R-value for other building materials or air films.** Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.2, the manufacturer's labeled R-value for insulated siding shall be reduced by R-0.6.

The prescriptive R-value requirements indicated in Table R402.1.2 are for installed insulation materials only. The sum of the R-values of the insulation materials installed in the framing cavities combined with **insulating** sheathing must meet or exceed the minimum required R-value in Table R402.1.4. Framing, drywall, structural sheathing or exterior siding materials shall not be considered as contributing to the required R-value. Truly insulated siding can be used towards the continuous insulation requirement, but R-0.6 is required to be **SUBTRACTED** from the manufacturer's labeled R-value per R402.1.3.

Similarly, the R-value requirements in the Table 402.1.1 for ceiling, floor, basement wall, crawl space wall, and slab perimeter must be met by the installation of insulation materials only.

### **Follow-up Question #1**

Isn't the U factor just 1/R?

#### **Answer #1:**

Only for a homogenous cross section. Building assemblies are rarely homogenous over their entire area. Assuming a building assembly is homogenous will lead to incorrect results. For example, Table R402.1.2, Zone 3, wood frame wall, requires cavity R-value insulation of R-15<sup>ii</sup>. However, there is plenty of R-13 batt cavity insulation available. Can I do a simple 1/R of the R-13 batt to show compliance with Table R402.1.4?

Let's do the math:

If I take 1/R with the R-13 batt, I get a value of  $U=0.077$ <sup>iii</sup>. This is equal to the value of  $U=0.077$  for a Zone 3 framed wall in Table R402.1.4, therefore does this not show compliance?

**It does not**, because the simple  $1/R = U$  did not take into account all the areas of the framed wall that have considerably less thermal performance than the R-13 batt itself. For further information, see interpretation on Table R402.1.4.

### **Follow-up Question #2**

If I want to explicitly take credit for all the individual components that make up my assembly, including building components like gypsum, structural sheathing, framing, some sidings, etc, which table can I use?

#### **Answer #2:**

Table R402.1.4.

Please remember, the U-factors in Table R402.1.4 already have values built into them for air-films, gypsum and sheathing. For further information, see interpretation on Table R402.1.4

### **Keywords:**

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<sup>i</sup> Sidings is a generic term here, and could be face brick, vinyl, lapped, etc.

<sup>ii</sup> Or R-13 + R2.5 ci, the R-15 is used in this example

<sup>iii</sup>  $1/13 = 0.07692$ , rounded to 0.077