# IECC 2015 Building Envelope Changes

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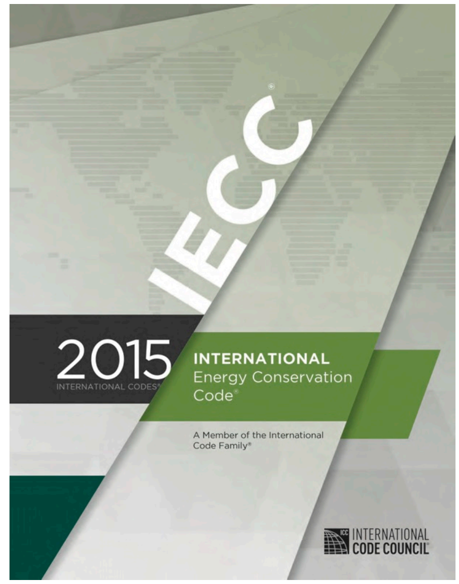
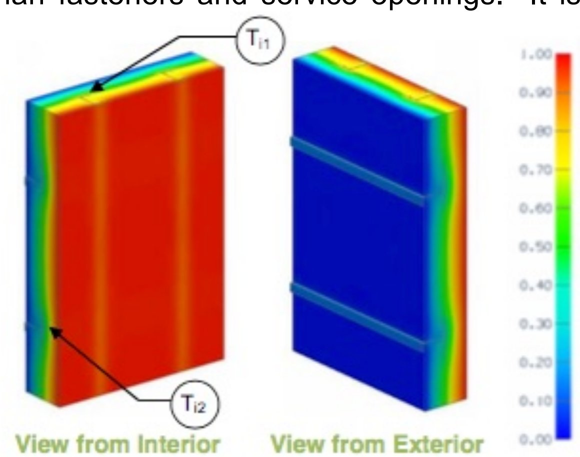
The IECC 2015 is the latest national model energy code published by the International Code Council (ICC) and is anticipated to be widely adopted across New England by the end of 2017[1]. While many of the building envelope requirements for Climate Zones 5 & 6 have not changed from the IECC 2012, there are a few changes to the IECC 2015 that project teams should be aware of including, but not limited to:




- Added a definition for Continuous Insulation
- Added requirements for calculating wall assembly U-Factors
- Increased the requirement insulation entirely above roof deck to R-30ci
- Added fenestration SHGC requirements by orientation and Projection Factor
- Reduced the enclosed area threshold requiring skylights for select spaces

The two biggest changes relative to the building envelope both address the thermal effectiveness of the opaque thermal envelope.

<u>Continuous Insulation:</u>
First, a definition for Continuous Insulation was added to Chapter 2. This is the same definition used in ASHRAE Standard 90.1 dating back to 1999. The IECC 2015 defines continuous insulation as "Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building." The addition of this definition in the IECC directly addresses, and prohibits, the categorizing of insulation installed with continuous metal zees (or other structural materials) though it as Continuous Insulation. When the Continuous Insulation requirement for Steel-Framed walls in Climate Zones 5 & 6 was first introduced in the IECC 2006, there was not much information or market ready solutions to help project teams meet this requirement. We did the best we could at the time and convinced ourselves that an 18ga metal zee between rigid insulation performed better thermally than an 18ga metal stud between batt insulation.

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[1] Vermont and Massachusetts have already adopted the IECC 2015, Rhode Island is expected to adopt by July 1, 2017, Connecticut and Maine by the end of 2017.

Recent industry studies[2] have supported this belief, indicating that wall assemblies using metal zees can achieve 45-55% thermal effectiveness versus the <40% thermal effectiveness of batt insulation between metal studs. Not great, but better than fluffy stuff between metal studs right? Fortunately, there are now several manufacturers that offer engineered and thermally broken rain screen cladding attachment systems that allow project teams to meet the definition of Continuous Insulation and/or provide the thermal effectiveness necessary to comply using the assembly U-Factor method.

<u>Thermal Effectiveness</u>:
Second, Section C402.1.4.1 was added to address the calculation of U-Factors of wall assembly using insulation in steel stud cavities. The section includes Equation 4-1 $U=1/[R_s+(ER)]$ for calculating the thermal resistance (i.e., U-Factor) of metal framed wall assemblies. This section requires a corrected Effective R-Value (*ER*) to be used for insulation installed between metal studs when calculating the assembly U-Factor. The *ER* is determined by the stud depth, spacing and rated R-Value of the stud cavity insulation in accordance with Table C402.1.4.1 *Effective R-Values for Steel Stud Wall Assemblies*. The ER is then added to the cumulative R-Value of the remaining wall assembly components ($R_s$) to determine the assembly U-Factor. The addition of this section addresses the ambiguity of previous version of the IECC regarding how project teams were supposed to determine an assembly U-Factor.

**TABLE C402.1.4.1**
**EFFECTIVE *R*-VALUES FOR STEEL STUD WALL ASSEMBLIES**

| NOMINAL STUD DEPTH (inches) | SPACING OF FRAMING (inches) | CAVITY *R*-VALUE (insulation) | CORRECTION FACTOR ($F_c$) | EFFECTIVE *R*-VALUE (ER) (Cavity *R*-Value × $F_c$) |
|---|---|---|---|---|
| $3^1/_2$ | 16 | 13 | 0.46 | 5.98 |
| | | 15 | 0.43 | 6.45 |
| $3^1/_2$ | 24 | 13 | 0.55 | 7.15 |
| | | 15 | 0.52 | 7.80 |
| 6 | 16 | 19 | 0.37 | 7.03 |
| | | 21 | 0.35 | 7.35 |
| 6 | 24 | 19 | 0.45 | 8.55 |
| | | 21 | 0.43 | 9.03 |
| 8 | 16 | 25 | 0.31 | 7.75 |
| | 24 | 25 | 0.38 | 9.50 |

Other select changes to the IECC 2015 include:

- The prescriptive R-Value requirement for insulation entirely above the roof deck increased from R-25ci to R-30ci in Climate Zone 5. (note Climate Zone 6 already required R-30ci) See Table 402.1.3.
- Component performance alternative calculations allowing tradeoffs among building thermal envelope components.
- Solar Heat Gain Coefficient (SHGC) requirements are now based on the orientation and Projection Factor of the fenestration. See Table C402.4.
- The area threshold for enclosed spaces in select uses required to have daylight zone under skylights was decreased from 10,000sf to 2,500sf. See Section C402.4.2.

Industry studies have concluded that our opaque thermal envelope assemblies are only achieving 40-80% of the thermal effectiveness they are being designed for resulting in increased energy use, decreased occupant comfort and decreased system service life. The IECC 2015 includes select changes intended to improve the thermal effectiveness and performance of the opaque thermal envelope. These changes will ensure insulation R-Values and assembly U-Factors are calculated consistently, account for thermal bridging and help bring our opaque thermal envelop assemblies closer to the thermal effectiveness we are designing for.

[2] The following are recommended must reads for anyone interested in opaque envelope thermal effectiveness. Morrison Hershfield, *Thermal Performance of Building Envelope Details for Mid- and High-Rise Buildings (ASHRAE 1365-RP)*, July 2011 | Payette, *Thermal Performance of Facades*, November 2014.