10. Insulation Requirements for Metal Stud Walls

Builders and designers are increasingly aware of the potential for *thermal bridging* in construction assemblies. Thermal bridging occurs is when heat is more readily conducted through structural members compared to the areas of cavity insulation. This thermal bridging reduces the effective R-value of the entire assembly. For this reason the International Energy Conservation Code (IECC) and various above code programs such as ENERGY STAR for New Homes are adding continuous insulation to their wall insulation requirements. The effects of thermal bridging is especially critical when it comes to metal stud walls. The IECC refers to such walls as *steel-frame.*

Structural framing and the effectiveness of the thermal barrier. Building materials conduct heat at different rates. Both wood and steel framing will conduct heat more readily than cavity insulation products. Steel framing is much worse than wood as a thermal bridge. When 2x6 metal studs are spaced at 16 inches-on-center the insulation value of R-19 insulation is reduced by 63% to an effective R-7.1. By comparison, wood framing reduces the insulation value by about 16%.

Excerpt from 2012 IECC Table R402.2.6
Steel-Frame Wall Insulation (R-Value)

Wood Frame R-value Requirement	Cold-Formed Steel Equivalent R-Value	
	Steel-Framed Wall 16" o.c.	
	Cavity Insulation	Continuous Insulation
R-21	**R-13**	**9.5**
R-21	**R-15**	**9.1**
R-21	**R-19**	**8.4**
R-21	**R-21**	**8.1**
	Steel-Framed Wall 24" o.c.	
	Cavity Insulation	Continuous Insulation
R-21	**R-13**	**9.3**
R-21	**R-15**	**7.7**
R-21	**R-19**	**6.9**
R-21	**R-21**	**6.5**

The residential energy code includes a table that lists the steel-frame insulation equivalent to the wood frame R-value requirement. That table, as it applies to walls, is summarized in the table on the previous page. The complete IECC table includes values for ceiling and floor assemblies as well as for walls.

For example, a steel-frame wall with studs at 16" on center will comply with the required R-21 for wood frame if R-19 is installed in the cavity of the steel stud wall and the wall also has at least R-8.4 continuous insulation. The table provides multiple options of cavity and continuous insulation to comply with the code required R-21. The required insulation varies based on stud spacing in the wall.

The benefits of continuous insulation. Continuous insulation is important regardless of the type of framing but it is critically important when metal framing is used. That is why the IECC established the effective insulation equivalency discussed above.

Plan Review

1. **Determine the wall framing type.**
2. **If steel-framing is used, refer to Table R402.2.6 to determine the combination of cavity and continuous insulation that is required to meet the R-21 equivalency.**

Field Inspection

1. **Verify wall framing type and stud spacing.**
2. **Verify cavity and wall insulation is per permit submittal documents.**
3. **Verify that the insulation is installed per manufacturer's instructions. This is especially important with batt insulation where poor installation results in reduced thermal effectiveness.**

Code References

2012 IECC Section R402.2.6 Steel-Frame Ceilings, Walls, and Floors
Steel-frame ceilings, walls, and floors shall meet the insulation requirements of Table R402.2.6 or shall meet the *U*-factor requirements of Table R402.1.3. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

Resources

2012 International Energy Conservation Code, Copyright August 2011 by the International Energy Codes Council, Inc., Falls Church, Virginia.

2012 IECC Code and Commentary, Copyright August 2012 by the International Energy Codes Council, Inc., Falls Church, Virginia.