

Energy Codes: Understanding Continuous Insulation

One of the most confusing items in the energy code is **continuous insulation**. Continuous insulation (also known as CI) is defined by the energy code as: *“Insulation that is uncompressed and continuous across all structural members without thermal bridges other than fasteners and service openings.”*

In this article, we will look at two instances that can present a challenge.

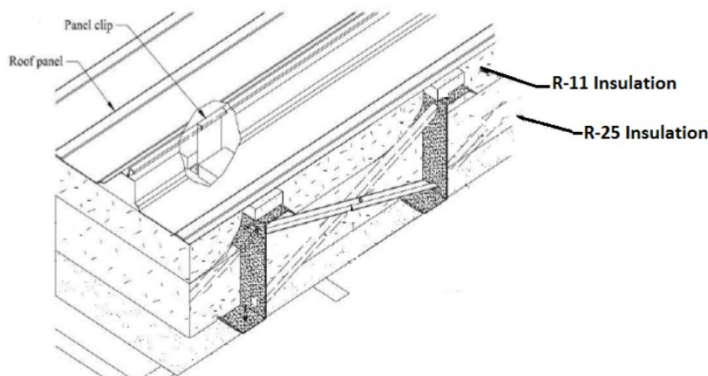
Example 1 – COMcheck™

When entering insulation R values into COMcheck™ for roof and wall assemblies under the Envelope tab, the user has the option to enter cavity insulation and continuous insulation R-values.

Cavity Insulation R-Value	Continuous Insulation R-Value
0.0	0.0

It is a common mistake to assume the exterior layer of insulation of a multi-layer system that is continuous over the purlin or girt should be listed in the continuous insulation R-Value column. This is not the case.

As an example, consider a standing seam roof liner system with R-25 + R-11 insulation with thermal blocks as shown below. The R-11 layer of insulation is installed over the purlins. However, because the insulation is compressed at each purlin, which diminishes the thermal performance of the insulation, it is not considered continuous insulation.



The correct method to enter multiple layers of roof and wall insulation is to sum the R-Values of each layer and enter the total value as the cavity insulation R-Value. In our example, we have R-25 and R-11 insulation for a total R-Value of 36. The continuous insulation R-Value is 0. When entered correctly the listed U-Factor is 0.031 for ASHRAE 90.1 2013. Please note that it is important to select the correct system under the Construction Details column as shown below. In this example, the system is a liner system with thermal blocks.

Construction Details	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor
Liner System with Thermal Blocks	36.0	0.0	0.031

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Example 2 – What to do when the Project Specification Requires Continuous Insulation for the Walls?

We have received many phone calls asking how to provide an R-13 + R-6.5 CI wall system. This system consists of a layer of R-13 fiberglass insulation on the exterior of the girts and an R-6.5 rigid insulation board on the exterior of the fiberglass insulation. This system is seldom if ever supplied. It is too difficult to provide rigid insulation board over R-13 fiberglass insulation. This requirement appears in project specifications because Table C402.1.3 of the International Energy Conservation Code (IECC) versions 2012 and 2015 list this option as shown below. Table C402.1.3 is based on the R-VALUE METHOD. Many project specifiers see this table and assume this is the only means of code compliance per the Prescriptive Method and use the information in their project specifications.

The IECC code permits an additional method of compliance via the Prescriptive Method. The U-FACTOR METHOD is shown in Table C402.1.4. The U-FACTOR METHOD allows for alternate assemblies that meet the listed U-Factor from Table C402.1.4.

Table C402.1.3

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, R-VALUE METHOD

CLIMATE ZONE	1	2	3	4	5	6	7
	All Other	All Other	All Other	All Other	All Other	All Other	All Other
Roofs							
Metal Building	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-25 + R11 LS	R-30 + R11 LS
Walls, above grade							
Metal Building	R-13 + R-6.5 ci	R-13 + R-6.5 ci	R-13 + R-6.5 ci	R-13 + R-6.5 ci	R-13 + R-6.5 ci	R-13 + R-6.5 ci	R-13 + R-6.5 ci

Table C402.1.4

OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD

CLIMATE ZONE	1	2	3	4	5	6	7
	All Other	All Other	All Other	All Other	All Other	All Other	All Other
Roofs							
Metal Building	U-0.044	U-0.044	U-0.044	U-0.044	U-0.044	U-0.044	U-0.044
Walls, above grade							
Metal Building	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052

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Energy Update

For Climate Zone 5, the required U-factor is 0.052 for walls. There are a number of economical solutions that can be used. Insulated metal panels as well as single and double layer fiberglass filled cavity systems listed below are common solutions. For more information refer to *Energy Codes: ASHRAE 90.1 2013 ADDENDUM cp UPDATE* on the ToolBox app.

Cavity System	R-Value	Thermal Break	U Factor
Single Layer	R-30	R-0.750 thermal break	0.052
Double Layer	R-25+R-10	NA	0.047

The next time you see R-13 + R-6.5 specified as the wall solution for your metal building walls, please let the project specifier know that the code also permits code compliance using the U-Factor Method as shown in Table C402.1.4 of the 2012 and 2015 editions of the IECC code. While we only discussed wall solutions in the above, the same is true for roof assemblies.