

Insulating Metal Buildings

ASHRAE Standard 90.1-2013 effects metal buildings

By Brad Rowe

Last October, ASHRAE published its new 2013 energy standard which incorporates a variety of changes to building envelope, lighting and mechanical requirements. The new 90.1-2013 also incorporates major revisions to claimed thermal performance of certain common insulation products for metal buildings. The changes relating to metal buildings will likely result in a significant impact on energy efficiency, confidence in design and of course lower cost of ownership for the building owner. The revisions effecting metal building insulation include:

INCREASES IN STRINGENCY

The prescriptive criteria for metal buildings found in Tables 5.5-1 through 5.5-8 increase the minimum insulation levels for roof and walls in all eight climate zones and throughout all three categories: non-residential, residential and semi-heated. The graphs highlight the stringency (Budget U-factors) for non-residential metal building roofs dating back to the 90.1-2004 Standard through the 2013 Standard, as well as a glance of the upcoming 2015 IECC (International Energy Conservation Code).

Insulating a metal building roof with fiberglass insulation has traditionally been installed on the topside of the structure and compressed when the roof panels are attached. However the new stringency levels and the new prescriptive R-value assemblies listed, require some additional installation from the bottomside of the structure to support a layer of fiberglass insulation uncompressed and unobstructed inside the purlin/framing cavity.

The prescriptive R-value for metal building walls list only assemblies featuring "ci" continuous insulation versus the traditionally prescribed fiberglass insulation. The Standard defines "continuous insulation ci" as "insulation that is uncompressed and continuous across all structural members without thermal bridges other than

fasteners and services openings." This definition would preclude foam board type insulation from being attached to the inside surfaces of girts. Keep in mind, alternative methods and assemblies, such as fiberglass built assemblies, are allowed to be used if you can determine appropriate compliance using the U-factor alternatives.

MODIFIED DESCRIPTIONS

There are slight modifications to roof and wall assembly descriptions found in Normative Appendix A as it provides additional insulation assembly configuration details, components and descriptions for roof and walls which are directly linked to default assembly U-factor tables A2.3 and A3.2.

The new edition makes more of an attempt to describe what is typical when describing the insulation methods, the spacing of secondary members and the use of thermal spacer blocks. It also includes new U-factor equations found in A9.4.5 which may now be used to help determine alternate assembly U-factors for traditional methods.

CORRECTED U-FACTORS

The Standard acknowledges dramatic performance reduction from all of ASHRAE's previously published U-factors of traditional compressed laminated insulation in roof and walls. ASHRAE published its news release regarding the revised U-factors for compressed metal building roof and wall insulation assemblies in January 2010 and are now finally implemented in their 2013 Standard. Corrections are found in the default assembly U-factor roof Table A2.3 and wall Table A3.2 and reflect installed performance expectations for roof assemblies overstated up to 35 percent and wall assemblies up to 42 percent when comparing to all previous versions of ASHRAE Standard 90.1 dating back to 1999. The dashed line on the graphs demonstrate how far below code intent (U-factor) the roof and wall insulation would typically perform if the prescribed R-value assembly from the tables in previous 90.1 Standards were installed.

The default U-factor corrections in 90.1-2013 provides code officials, designers, installers,

suppliers and building owners a more accurate account of installed thermal performance of traditionally installed insulation assemblies. The previously published R-values/U-factors did not reflect the thermal performance from such installation methods, which typically yield lower R-values and higher U-factors. For example, meeting a roof U-factor of U-0.065 using traditional topside methods may require compressing an additional R-16 to the already compressed and prescribed R-19. That is a total pre-installed R-value of R-35 just to net an installed R-15 (U-0.065). For walls, compressing a single laminated fiberglass blanket between the wall panels and girts will only net an installed R-value between R-5 or R-6 for a nominal R-10 to R-19 blanket.

Due to the heavy reliance on the 90.1 Standard, the inflated thermal performance (U-factors) for metal building insulation assemblies are still directly embedded and referenced within COMcheck, 2006 and 2009 IECC, 90.1-1999, 2001, 2004, 2007 and 90.1-2010, along with multiple ASHRAE Advanced Energy Design Guides. With the exception of the state of Washington, essentially every state throughout the country, even those adopting and enforcing the 2012 IECC with reference to 90.1-2010, are relying upon overstated performance values at this time.

Now is an excellent time to review your metal building insulation specifications and tailor them in a manner to achieve the desired installed performance you have been intending to specify all along. All parties from insulation manufacturers to suppliers, to designers, including installers, must accept their responsibilities to achieve the installed performance of the product specified. So specify it, demand it, order it, install it, inspect it and reject it if it does not meet the specifications and expectations. If you don't, there is little chance it will perform as expected. Building owners, your clients, deserve nothing less. 

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