Location, Location, Location

By Brad Rowe

A vapor retarder's success is dependent on where it is placed

Vapor retarders play a crucial part of pre-engineered metal buildings. Vapor retarders control moisture movement and try to help prevent condensation.

However, many may not realize the importance of location of the vapor retarder indirectly referenced in the energy codes. The new energy codes have increased energy efficiency stringency (lowers the assembly U-factor) thus featuring different prescriptive R-value assemblies. The 2012 International Energy Conservation Code and ANSI/ASHRAE/IES Standard 90.1-2013 both feature a Liner system (LS) roof assembly and are heavily listed in each of the prescriptive tables. Standard 90.1-2013 lists liner systems in climate zones 4 through 8, while the 2012 IECC lists liner systems in all eight climate zones throughout the country. The newly published 2015 IECC also lists liner systems in all eight climate zones.

Two primary factors

A liner's system's high performance can be contributed to two primary factors: 1) uncompressed insulation in the purlin cavities and 2) the vapor retarder is properly placed entirely below the purlins, which isolates them from the inside conditioned space. The vapor retarder for a liner system is typically continuous and is essentially a large, single-piece tarp made to fit the width and length of a bay without erector-applied field seams. The vapor retarder is typically held in place with steel straps and fastened into the bottom side purlin flange. This creates the depth space for the unfaced, uncompressed fiberglass insulation to be installed from the topside of the building in new construction. The vapor retarder is sealed around perimeter atop rafters and below sidewall eave struts.

The other newly listed prescriptive method is in Filled Cavity (FC) assembly, also known as a long tab banded system. This method is prescriptively listed in only climate zones 1 through 3 in Standard 90.1-2013. The IECC voted not to include this assembly in their prescriptive tables in its 2012 or 2015 IECC.

Similar to liner systems, the filled cavity method includes steel strap bottom side installation to the lower purlin flange so the uncompressed insulation can rest upon it. However, there are crucial differences in the length, width and most importantly, location, of the vapor retarder. Unlike the liner systems, filled cavity method uses insulation in which the vapor retarder is glued/laminated onto the fiberglass. Thus, each roll of fiberglass has its own vapor retarder that must be field seamed during the installation process.

Continuously sealed facings

Installed high-performance claims are based on the two adjoining vapor retarder facings sealed continuously on the top of each purlin flange, no gaps along the purlin webs and without insulation compression of purlin bracing/stiffeners within the cavities. Long vapor retarder tabs of sufficient width on each side of the fiberglass roll is needed to allow the full thickness of insulation in the cavity. For example, an 8-inch purlin depth with purlins spaced 60-inch on-center would require each long tab extending beyond the insulation width to be at least 14 inches to allow the vapor retarder to travel up the vertical purlin web (8 inches), extend from the purlin web to the edge of the top purlin flange (3 inches) and sealed horizontally over the top purlin flange (3 inches).

Considering this must be done on both sides, each 60-inch purlin spacing would require at least 88 inches of vapor retarder (14 inches + 60 inches + 14 inches). This type of sealing is required for every linear foot atop each purlin flange, essentially twice considering the overlap field seam.

The long tabs of the filled cavity method establish the depth within the cavity, and the objective is that it's long enough to rest on the support straps. Industry instructions state not to pull the tabs so tight that they pull away from the purlins. This disclaimer or warning is apparently stated to help prevent any gaps along each vertical purlin web where the inside conditioned air can easily circulate around the purlin and hit the exposed roof (or standing seam clip) fastener tip. This is a caution area where condensation may be likely to first occur with the slightest percent of humidity inside the building. The thermal performance claims for these assemblies assume no air is allowed to circulate around the purlin and will degrade substantially when exposed to conditioned air.

Considering the new energy codes, the demand for high installed R-values and the overall finished interior appearance, choosing a proper vapor retarder may be dependent on where you place it in the metal building roof and walls to get the success and acceptance desired. If you want to be certain that you cover all your bases, first start by covering your purlins and girts. MCN

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Liner system roof assembly (right) shows a single-piece vapor retarder encapsulating purlins versus filled-cavity assembly (left), which shows vapor retarder sealed atop framing, leaving purlins exposed.