All of us involved in the commercial roofing business in Illinois by now are well aware of new 2015 International Energy Conservation Code (IECC) requirements. These new requirements are creating challenges for roofing contractors and also driving up the cost of new or replacement roofs for building owners and managers.

At the same time, we are learning new information about Polyisocyanurate insulation (polyiso), its R-value and how it is impacted by temperature. These two factors have created a “Perfect Storm” of higher costs for roof assemblies. Now, more than ever, would be a great time to look at the advantages of Expanded Polystyrene (EPS) in roof assemblies.

For over 50 years, EPS insulation has played an important role in the roofing industry. In the 1970’s, as the use of EPDM single ply membranes grew, so did the use of EPS tapered and flat insulation. Since the early 1980’s, how EPS is used in roof assemblies has changed. This was largely due to the membrane suppliers started manufacturing their own polyiso. While many membrane manufacturers have private label agreements with EPS insulation manufacturers, providing their own polyiso with their membrane is now the most common practice.

Why Give EPS a Closer Look Now?
One of the changes in the latest version of the 2015 IECC (which has been adopted by the State of Illinois, with some amendments), is how to meet R-value requirements when tapered insulation is being used. A simplified explanation of the new code says that if the insulation is sloping 1/4” in 12”, minimum R-30 continuous insulation (ci) must be met 4’ from the drain. If the insulation is sloping 1/8” in 12” minimum, R-30 ci must be met 8’ from the drain.

With this change, tapered systems certainly will be thicker and possibly have more layers of insulation, needed to meet the new code requirements. EPS roof insulation provides an ideal solution in two basic ways:

1. EPS can provide steep slopes to help minimize the insulation thickness at the drain, but can also easily reach the min. R-30 ci in 4’ or 8’, using only one layer of tapered EPS and one layer of coverboard.

2. A tapered EPS system can be designed using a single layer of tapered EPS and a single layer of coverboard (only two layers) over the entire roof. Keep in mind that the coverboard could be 1.5” or 2” polyiso, if allowed by the membrane manufacturer to be direct applied to the polyiso. Limiting the overall tapered insulation system to only two layers can reduce installation and handling costs, as well as adhesive costs.

Another area where EPS roof insulation provides great value is in cold climate zones, such as seen in Illinois. In the past five years, it has been widely publicized that the published R-value of polyiso has been dropping.

The NRCA and other building science consultants have been stating that R-5 per inch is a more realistic long term R-value for polyiso. (Graham, 2015), (Building Science 2013). Looking closer at some of the published R-value testing results, you see that polyiso R-values drop...
further in cold temperatures, as low as 4.0 per inch at 25 degrees. To the contrary, the R-value of EPS increases as temperatures get colder. A 15 psi EPS is R4.6 per inch at 25 degrees.

Why is this important? While it may be simpler to publish one R-value for an insulation, clearly in northern climates, we spend more money heating buildings than we do cooling buildings. Therefore, in the northern climate zones, choosing an insulation that performs better in colder temperatures may be very important.

**EPS Roof Insulation and Membrane System Compatibility**

A minimum of 13 psi Type VIII EPS insulation is preferred for “under roof membrane” applications. This is backed up by a recent NRCA Technical Bulletin. (Graham, 2016). EPS roof insulation products can be used with a wide variety of membranes and attachment methods.

First, EPS can be bonded to concrete and metal roof decks using low-rise foam adhesives or mechanical attachment. A subsequent layer of gypsum sheathing, high density insulation, regular polyiso and other coverboards can be bonded to EPS using the same low-rise foam adhesive. While typically EPS directly have a membrane bonded to it using conventional bonding adhesive, certainly any of the above mentioned coverboards are acceptable as a break between the adhesive and the membrane that needs to be bonded and an adhesive that is compatible with EPS. In fact, using a base layer of tapered or flat EPS and a coverboard of polyiso is viewed as a universal way to accept any membrane attachment method. This “hybrid” insulation approach can be very cost effective.

Some roof membrane manufacturers offer fleece back membrane assemblies that can be adhered directly to EPS products. Manufacturers of inductive plate welding systems now offer an insulating disc that broadens the use of EPS products with this attachment method.

With mechanically attached membrane systems using inductive plate welding, a top layer of an EPS and fiberglass composite and a base layer of EPS meets project requirements and is a very cost effective insulation system.

**Using EPS and Meeting Code**

EPS can be applied direct to metal roof decks and meets Chapter 26 of the International Building Code. Most roof membrane manufacturers have several UL listed assemblies that include EPS products in a variety of applications.
Most EPS manufacturers have their products listed as part of UL listings which provide code compliance proof. Many manufacturers also have listings at other organizations such as FM Approvals, Energy Star and others. Manufacturer material warranties and thermal warranties are also available with EPS roof insulation.

**Plazas, Inverted Roofs, Vegetative Roofs and Other Above Membrane Applications.**

While the use of EPS below roof membranes has been growing steadily, there are benefits using EPS under a membrane. There has also been a dramatic increase in the use of EPS above the waterproofing membrane. The City of Chicago is arguably the vegetative roof captial of the US. The EPS Geofoam is making these dramatic roof top renovations into vegetative systems possible.

High profile projects, like Millennium Park or Maggie Daley Park in Chicago, shine a positive light on EPS Geofoam products helping make these beautiful urban landscapes possible. Don’t forget, every day there are smaller projects happening in the Chicago providing the same benefits. The combination of light weight, large pieces and exceptional compressive strength makes EPS Geofoam a great choice as a lightweight fill material for vegetative covered roofs.

Please note EPS insulation and EPS Geofoam are the same material but are tested to a different ASTM standard, emphasizing the physical properties important to the two applications.

EPS rigid insulation is available in 13, 15, 25, 40 and 60 psi products. The growth and successful performance of EPS Geofoam in vegetative roofs has also resulted in architects specifying EPS rigid insulation in plaza’s with pedestals and pavers, split slab applications, and other applications where the insulation is above membrane. Larger insulation piece sizes, lower cost, and superior performance handling bulk moisture, have made EPS a leader in above membrane applications.

**Summary**

Rising code required R-values and requirements for tapered systems have arrived. EPS insulation provides solid solutions to help minimize these challenges, and should be in every roofing professional’s tool box, when choosing the right insulation for a particular project.

**References:**


http://www.professionalroofing.net/Articles/Tech-Today-01-01-2016/3762

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