By Rob Reale, Manager, Carlisle Creative Services

American consumers are always looking for value, and we love to have options. Fast food restaurants with their medium, large and supersize value meals are perfect examples of our desire for choices. The roofing industry is no different. The commercial roofing market offers a variety of choices and, according to a 2007 market share study conducted by NRCA, 50 percent of that is dominated by various types, applications and thicknesses of single ply.

What’s the Difference?

Highly reflective TPO membrane is popular in warm southern climates, while EPDM continues to be favored in northern markets where winters are harsh and heating-degree days outnumber cooling-degree days. Single-ply membranes can be ballasted, mechanically fastened, or fully adhered, resulting in even more choices of fasteners and adhesives. Finally, regardless of membrane type, the thickness must also be chosen. Of all the choices along the way, thickness may be the most important, though its significance is often overlooked.

Selecting a thinner roofing membrane over its thicker counterparts can be a shortsighted decision, not to mention a costly one. Whether it’s EPDM, TPO or PVC, there are several reasons that a thicker membrane will deliver both greater performance and a more solid return on investment.

An Issue of Dollars and Sense

In many instances, cost is the deciding factor in selecting membrane thickness for a given project. However, in most cases, the membrane cost is viewed in the wrong context, creating a misleading perception of its effect on the overall cost of the job. For instance, the increase of a 45-mil to a 60-mil single-ply membrane is slightly more than 20 percent, which might sound like a hefty increase but is minimal in relation to the overall installed cost of the entire roof system. When considering the additional cost, total installed cost vs. return on investment is the accurate barometer.

A typical project involves costs for design, insulation, labor and materials. A membrane upgrade only affects material costs. Thicker TPO or PVC membrane can be welded without changing the welder speed or temperature settings. EPDM makes use of the same seam tapes, regardless of membrane thickness. Detail flashings do not change based on the membrane thickness. In either case – thermoplastic or elastomeric systems – labor and flashing costs should remain virtually unchanged. Increasing from a 45- to a 60-mil membrane typically adds as little as 5 percent to the cost of the roofing installation. If the project involves the added expense of a tear-off, the percentages are even less: approximately 2-3 percent. However, the return on investment from making that switch is substantially improved, as the projected life-span of the roof can be increased by as much as 33 percent.

In almost any situation, most individuals would pay a little extra for a yield of that magnitude. That’s how the fast food chains continue to supersize the American population! However, unlike extra fries and soda, a beefed-up roof provides additional protection from its mortal enemies – careless tradesmen, chemicals, animal fats and UV exposure. When the numbers are added up, the supersized roof is clearly the greater value.

Return on Investment (ROI)

A basic math calculation can be used to determine ROI in roofing. Simply divide the cost per square foot by the projected length of service, and the results are a no-brainer. This equation shows that the increased installed cost of thicker membrane actually saves the building...
owner money over the projected life of the roof. This same logic can easily be applied to the remainder of the assembly. *Figure 1* compares the average installed cost per square foot of a 30-, 20- and 15-year fully adhered single-ply system. The 30-year system is based upon one manufacturer’s 30-year warranted EPDM specification that calls for 90-mil EPDM, cover board and prefabricated, ES-1 certified metal edging, among other design enhancements. Even with the enhancements, the 30-year system more than pays for itself with additional service life. In the spirit of supersizing, this 30-year system also features increased warranty protection for higher wind uplift, hail up to two inches in diameter and accidental puncture. That’s even better than getting a free hot apple pie with your value meal!

**Save Green While Building Green**

The numbers are clearly favorable when projected over the life expectancy of the roof. However, these estimates are based on a typical roof installation using the ASHRAE 90.1 minimum standard for insulation: R-20 (in climate zones 2-8). If these equations were calculated, using the PIMA recommendations of R-25 (ASHRAE zone 2) for the vast majority of Florida, the percentage of the cost increase for thicker membrane relative to the total installed cost of the roof system would appear even less significant. In all climate zones, insulation can aid dramatically in reducing cooling and heating loads, lowering energy costs and reducing pollution and carbon emissions.

Now, it is hard to imagine specifying a roof that is destined for a landfill in approximately 15 years. Seldom do architects or specifiers design 15-year systems. The push for these systems typically rests with building owners who value-engineer their roof designs in order to generate a system with a low sticker price. This approach is no more responsible for the planet than it is for the build owners’ bottom lines. Those in the roofing community are often puzzled by this conventional wisdom, or lack thereof, which does not seem to happen at any other point throughout the building process. Imagine the impact and potential fallout of specifying a 15-year foundation or exterior wall. The rest of the building is intended to stay erect for a very long time; yet often, the roof is not. If the building is designed to last for decades or more, it should have a roof protecting its contents and inhabitants for that same duration. A 15-year roof – especially one that is minimally insulated – is a promissory note to the landfill: “See you soon!”

**Can the Membrane Be Recycled in 15 Years?**

Although initiatives are under way for recycling membranes at the end of their service lives, the industry as a whole is still in its infancy. Currently, systems have to be torn off, packaged and transported to a grinder. Post-consumer, recycled content can be reintroduced into the bottom ply of thermoplastics and into EPDM sheeting, but it is more often used in accessories such as walkway pads. The current reality is that recycled materials cost significantly more than virgin raw materials, and it will remain this way while additional uses for the recycled materials are identified and production volumes are increased. Rather than dispose of the material, roofing contractors sometimes find it more expensive to tear off materials in accordance with grinder specifications and then ship them to the nearest recycling facility. In those instances, building owners are rarely willing to absorb the additional cost associated with recycling the aged roofing membrane.

In the last several years, the EPDM roofing community has made great strides in terms of recycling. Since 2006, almost six million square feet of EPDM have been removed, transported and recycled from buildings across North America and Canada. More grinders have learned to handle the materials throughout North America, reducing the transportation needs and helping attain cost neutrality compared to hauling and disposal. More importantly, several uses for recycled EPDM rubber have been identified such as rubber matting and artificial turf. TPO and PVC membranes are also recyclable, but fewer end uses have been identified yet, limiting the amount of material that can be recycled.

Clearly, recycling is a priority for most roofing **Continued on page 8**
Thicker Membrane Increases Puncture Resistance

Unlike choosing the varying grades of gasoline at the pump, which offer the consumer similar performance at different prices, with the buyer returning a week later for another fill-up, regardless of grade, there are several benefits to choosing a premium or ultra-grade roofing system. With a little common sense, it is easy to realize that thicker material will be more puncture resistant than thinner material. Sources of puncture on a roof can vary, but the most common are abuse by other construction trades and foreign objects being dropped by maintenance personnel (Figure 2). Thicker materials will not resist all of these inappropriate actions, but they can significantly minimize potential damage. Laboratory testing shows a 50 percent increase in puncture resistance from a 45-mil-thick membrane to an 80-mil-thick TPO membrane (Figure 3).

Mother Nature takes her shots at roofing materials, too. Reports of TPO and EPDM roofing systems surviving substantial hailstorms are common, and simulated hail testing over a variety of substrates and temperatures showed membranes 60-mil or greater displaying excellent resistance to damage.

Thick TPO Contains More Sunscreen

The high-reflectivity properties of TPO membranes offer an enhanced weathering package that protects the integrity of the sheet and prolongs its service life. As the sun beats down on the rooftop, these protective ingredients act much like a sunscreen protecting the surface from degradation caused by exposure to UV rays. As the weathering package on the surface of the membrane is depleted, the reserves within the remainder of the membrane will continue migrating upward (Figure 5). The thicker the membrane, the greater the weathering package and the longer the surface will retain its smooth, glossy appearance. A common term for this phenomenon is the reservoir effect.

Although thicker TPO membrane offers longer protection against the dangers of solar UV rays, this is not to say that thinner TPO membranes are not a solid investment. When exposed to excessive solar UV rays though, their weathering package will predictably dissipate more quickly than that of a thicker membrane.

What a Roof Wants to Be When It Grows Up

In the past, a rooftop was intended to keep the building dry. Advancements in the green building movement have revealed that a roofing system can save significantly on energy costs with the addition of insulation and the use of reflective roofing in warm southern climates. Most vegetated roofing specifications require a minimum of 60-mil membrane and recommend even thicker membranes. Since roof garden system costs can soar to over $30 per square foot, the membrane cost on a garden roof is very insignificant.

While energy-saving roofs are the trend today, energy-producing roofs are inevitably where the industry is headed. As roof-mounted photovoltaic (PV) solar systems become more popular, the issues of puncture and traffic resistance become even more serious. PV systems will require regular maintenance and inspections, which will increase the chances of damage caused by traffic and by tools dropped on the roof. At a cost that can reach $40 - $50 per square foot, property owners will need to understand that the extra cost of a thicker membrane pales in comparison to the expense of prematurely replacing the roof membrane below a PV system.

Conclusion

There are many rooftops throughout the country with aged 45-mil EPDM roofs. Most will survive longer than 15 years without needing major service. This is admirable performance by any measure but when thicker materials are specified, the roof inherits the supersize qualities, which allow it to last more that twice as long.

Footnotes
1. Based on a Carlisle SynTec 30-year Sure-Seal EPDM system, other manufacturer specifications may vary.
2. Life expectancy refers to the warranted term for coverage of the roof system. In many cases, the roof will last beyond the warranty term.

About the Article

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About the Author
Rob Reale has over 15 years of experience in the construction industry, starting as a laborer framing houses in New England in the early 1990s. After earning a bachelor’s degree in visual communications from the Art Institute of Fort Lauderdale, he went on to become a partner in Brand Identity Group in Newton, MA, which specialized in both the commercial roofing and aerospace industries. Reale now serves on the communications committee for the EPDM Roofing Association and is manager of Carlisle Creative Services.

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