

PVC Roofing

By Richard L. Fricklas

For the last year or so, attention seems to be more on cool roofing, LEED, and vegetated roofs rather than what the roofing system is made of or what it can do. Perhaps this can be explained by the fact that our current roofing systems are all well established, so they're no longer newsworthy.

We also seem to have maxed out on how much insulation can go into a roof system, perhaps recognizing that, as thickness of insulation goes up, we need to install thicker nailers, use longer fasteners, and greater metal fascia to close off our roof edges, and these are not cheap. Currently, cellular foams with R-values of 5 to 6 per inch are used, whereas the earlier non-cellular wood-fiber, perlite, and glass fiber insulations were closer to 3. Thinner is definitely an advantage.

In the recent editions of *ASHRAE 90.1* and various other building codes, we seem to have finally recognized that cool roofs aren't the only way to conserve energy. Ballasted roofs, vented tile roofs, and massive roof deck constructions are being recognized as equals, and more attention is being given to air leakage and heat conduction through mechanical fasteners as ways to conserve energy.

From an environmental point of view, a great number of claims are being made as to who has the lowest carbon footprint and which products are truly recyclable. If we look at what's out there, we should be comfortable knowing that we have a wide choice of materials, all of which are proven.

Let's take a closer look at single-ply roof systems based upon polyvinylchloride (PVC) ...

Reflectivity (for cool roofing)

Thermoplastics are provided in a wide variety of colors, although most often in light (cool) colors for higher reflectivity and, since they soften (by definition), with excess heat. Rather than pure white, light gray, tan, and most custom colors are off-white since roofs get dirty and brilliant white shows dirt the most. Cool roofs are most effective in hot climates where air conditioning and peak loads are of concern.

Recyclable

Probably more than any other membrane system, PVC trim from the manufacturing process can be 100 percent recycled, and post-consumer membranes are already being returned and recycled back into new membranes.

Sustainable

PVC membranes are weldable throughout their lifetime, remaining thermoplastic. This facilitates roof modification for new equipment, solar panels, and routine maintenance.

Durability

The life expectancy of a material has the greatest impact on environmental life-cycle assessment calculations. PVC membranes have many decades of proven performance.

Light in Weight

Systems are generally in the 45mil range, weighing roughly 0.25 pounds/square foot. More and more 60+ mil products are being promoted for longer life and greater resistance to impact and abrasion (likely with photovoltaic panels on the roof).

Attachment Options

Depending upon the roof deck, mechanically fastened and fully adhered systems are first choices. Sheets can be factory fabricated into wide panels, reducing the number of seams that need to be sealed in the field. Fastener patterns can be modified depending upon expected wind loads. The recent introduction of double welds (the membrane is welded on both sides of the seam fasteners to distribute stresses) greatly increases wind resistance. Virtually all of the thermoplastic single-ply membranes used today have internal scrim reinforcement for better stress distribution and dimensional stability.

Seam Strength

Welded seams are stronger than the sheet itself. This is a great advantage in vegetated roofs where root penetration is of concern.

Compatibility with PV

Flexible PV cells can be directly attached to PVC membranes, providing conformability to the substrate and better impact resistance with far fewer penetrations through the roof membrane.

Standards and Specifications for PVC

ASTM D 4434 was the first single-ply specification published by ASTM (back in 1985). The standard has been upgraded several times, with the current edition dated 2006.

ASTM D 5036 is a recommended practice for application of fully adhered PVC roofing.

ASTM D 5082 is for application of intermittently attached (mechanically fastened) PVC systems.

Issues with Chlorine

Some documents are being circulated by the USGBC, such as *Pilot Credit 2: PBT Source Reduction: Dioxins and Halogenated Organic Compounds*. This document implies that chlorine, bromine, and other halogens degrade the atmosphere or are toxic.

For roofing, the USGBC recommends that we avoid:

- PVC
- CSPE (Hypalon)
- Chlorinated Polyethylene
- Neoprene (Chloroprene)
- PVDF Kynar and Hylar
- Chlorinated PVC
- Chlorobutyl Rubber
- Teflon

This amazing document also suggests that we not use PVC pipe, vinyl flooring, vinyl siding, chlorine for our swimming pools, bromine for our hot tubs and, by association, salt for our omelets. Perhaps we should avoid PL 146 PVC used for blood bags, IV tubing, and platelet storage, even though PL 146 has been studied and approved for medical usage for decades. (This author has a Teflon implant to repair a damaged vocal cord.)

Readers may have also noted similar off-the-wall statements in a roofing magazine that *“bituminous roofs form carbon dioxide as they weather.”* (You must assume by association that asphalt pavements do the same.) In fact, with bituminous substances, the carbon-to-hydrogen ratio *increases* with age, and the air-blowing process for manufacture of asphalt for roofing and paving is one of dehydrogenation, in which longer carbon chains are formed, and no CO₂ is released.

Negative (and erroneous) claims, such as those mentioned above, are not to our benefit. Commercial roofing is better, more durable, and more sustainable than ever before. The halogens in PVC, CSPE, and CPE are an integral part of the hydrocarbon chain and aren't extractable under any circumstances. They greatly enhance fire resistance and do not have adverse effects on durability (something of concern with non-halogenated polymers).

Is PVC safe? Visit these suggested hyperlinks for a critique of some of these claims.

- [PVC vs. TPO Flat Roofing](#)
- [Environmental Safety & Benefits of PVC Roofing](#)
- [The Facts on PVC & the Environment](#)
- [Environmental Profile: Vinyl Roofing Membranes](#)

Durable and practical roofing needs to be our focus, and the market needs to stay with what's best on a cradle-to-grave basis. To condemn any product that contains chlorine, bromine, fluorine, and other halogens makes about as much sense as condemning salt water (sodium chloride) in our oceans.

[Back to Roofing News](#)

[Dick Fricklas](#), educator and author, received the William C. Correll award from RCI Inc. during RCI's 24th Intl. Convention & Trade Show in March 2009.

Dick previously received the William C. Cullen Award and the Walter C. Voss awards from ASTM Intl., as well as honorary membership in Committee D08 on Roofing and Waterproofing.

Fricklas participates in roofing technology programs for the University of Wisconsin Extension Division, and assists RCI Inc. (formerly The Roof Consultants Institute) in the development of curricula for its registration programs. He is a columnist for Interface Magazine, as well as Buildings' Roofing Newsletter. In 2006, he, along with coauthor Bill Griffin, completed the fourth edition of the Manual of Low Slope Roofing.

Dick is an honorary member of RCI Inc. and has received many other honors, including the JA Piper Award from the National Roofing Contractors Association (NRCA), the James Q. McCawley Award from the Midwest Roofing Contractors Association (MRCA), and Lifetime Achievement Awards from the Educational Foundation of the Institute of Roofing and Waterproofing Consultants, and from the Colorado Roofing Association.

He's a graduate of Hofstra University and received an MS in physical chemistry from Rutgers University.

Before retiring, Fricklas was technical director of the Roofing Industry Educational Institute (RIEI). He had previously held positions as director of the Better Understanding of Roofing Systems Institute (BURSI) and as a research chemist for Johns Manville and the Riegel Paper Corp. He, with his wife, Anita, resides in Centennial, CO.