

A REVISIT OF SELF-ADHERED ROOFING MATERIALS

BY VINCENT HILL

From 2005 to 2011, three articles focusing on self-adhered (SA) single-ply roofing systems were published in *RCI Interface*. A decade later, it is time to revisit self-adhered roofing systems and see what, if anything, has changed. Why were SA systems created? What are some of the drawbacks of SAs? What are the benefits? Lastly, what is new?

To understand SA systems, one should look into the history of roofing to understand how they came to exist. For over a century, asphalt and pitch were the only choices for a low-sloped roof. These roofs were very good at keeping water out of the building, but they had some shortcomings. The systems were built on the roof, layer by layer. The roofers, occupants, and neighbors needed to endure the offensive and toxic odors and the dirty and sometimes flammable roof as it was being installed. These were not some of the best attributes—particularly in occupied facilities.

In the early 1970s, the Arab Oil Embargo dominated the headlines and greatly affected material prices. This event changed roofing dramatically. Over the next decade,

modified-bitumen roofing systems and single-ply roofing systems took root and started to change the complexion of roofing for the next 40 years. Modified systems were installed with torches, hot asphalt, and/or cold adhesives. These asphalt-based roofing systems—like their built-up roofing (BUR) counterparts—were fully adhered to the substrate for a uniform and complete attachment of the roofing system. But the issues of fire safety, odors, and adhesive compounds with high volatile organic compounds (VOCs) were still creating headaches for specifiers, contractors, building owners, and the building occupants.

Ethylene propylene diene monomer (EPDM) single-ply roofing systems also grew in popularity in the 1980s. Due to their low cost and ease of installation, a rapid transition to ballasted roofing systems occurred. Other membranes were mechanically attached and adhered. In many cases, they were adhered with glues that were very flammable and high in VOC content. Even if the field of the roof was mechanically attached, all of the flashings were being glued. If tapes were employed to flash curbs and walls, they still required high-VOC-content primers. This continued to cause major concerns in occupied buildings.

In the past 20 years, we have witnessed a significant transition to the installation of thermoplastic single-ply roofing systems. Today, mechanically attached and adhered thermoplastic olefin and polyvinyl chloride

(TPO and PVC) assemblies have become the preferred roofing systems.

One of the unintended consequences of the proliferation of mechanically attached roofing systems is the fluttering of the membrane. Structurally, these linearly attached systems place greater stresses on fasteners and decks compared to traditional systems that have loads distributed across the deck. Code bodies (Miami Dade) and building insurers (FM Global) have taken note of these changes and have responded by setting standards that limit the width of the membrane panels.

Fluttering of the membrane also has two other negative factors. One is the noise created by the movement of the membrane as the winds lift and drop the membrane, creating a slapping sound in the structure below. The other negative factor is that the fluttering draws conditioned air into the unconditioned space above the insulation, which is then forced back into the conditioned space. A study by Simon Pallin, Manfred Kehrer, and André Desjarlais at Oak Ridge National Laboratories demonstrated that the recirculated air creates an energy penalty of 3-8% in mechanically attached compared to adhered roofing systems. Adhered systems effectively eliminate the noise, point-loading, and energy penalty issues, but tend to have a greater installed cost due to the additional materials and labor.

An alternative to mechanically attached and adhered roofing systems was needed—something that could address one or more of the concerns of occupants, roofers, and society. Self-adhered roofing systems fill this need. Basically, an SA system is a roofing membrane that has a factory-installed adhesive on the underside of the sheet. Some of these were peel-and-stick systems where the adhesive was protected



**ODORLESS AND
ENVIRONMENTALLY
FRIENDLY**

VARIOUS BONDING ADHESIVES and SA VOC* CONTENT

600-700 Grams/Liter
200-250 Grams/Liter
0 Grams/Liter

Standard Bonding Adhesive
Low VOC Bonding Adhesive
SA Products

*grams VOC per rule 1168

Figure 1.

by a film that was removed just prior to adhering the roofing membrane. Others needed priming of the surface to activate the adhesive component, and others needed to be heated to melt or activate the bonding component of the sheet.

Addressing odor issues was probably the first driver into SA products. (see *Figure 1*). Many roofing jobs have been impacted because of the odors coming from the roofing installation. There are numerous times when the local code official or fire department was called because of the excessive odors coming from the roof. Even when everything is code-compliant, this issue creates problems that slow down or even shut down the project until the roofer and the roofing manufacturer can prove that they are in compliance with the law. Still, it has caused too many eyes to be focused on the roofing project—all of which will cost the contractor time and money.

All roofing manufacturers with SA products highlight the speed at which they can be installed as a major selling feature. When using low-VOC (LVOC) or water-based bonding adhesive, they need to flash-off before mating the materials. The lower the temperatures and/or the higher the humidity, the longer it takes for the flash-off to occur. In ideal conditions, using LVOCs or water-based bonding adhesives takes slightly longer to install than SA products. In adverse conditions, this timeframe can increase 50% or more (*Figure 2*).

Another advantage to SA products is in the transportation cost. There is a shortage of truck drivers, and even fewer are available to move hazardous materials (HAZMAT). But since these materials are nonhazardous, they do not need to be shipped via a HAZMAT carrier, making it easier and less expensive to find drivers.

In addition, there is less waste generated on the roof. Since the material is self-contained, there is no need for pails of bonding adhesives to be transported onto the roof and then later removed and disposed of.

Where are SA products being used? Certainly they are being utilized when installing the entire roof. Another area where they can be used is in wall flashings. Using SA products on the walls is an easy and quick way to flash the building. Because the contractor does not have to wait for the materials to flash, using SA materials on wall flashings decreases construction time.

INSTALLATION SPEED ADHESIVE FLASH-OFF TIMES* AT VARIOUS TEMPERATURES

*in minutes

	SA	SECURE BOND	STANDARD BONDING ADHESIVE	LVOC BONDING ADHESIVE
90°	0	0	9	14
70°	0	0	17	19
50°	0	0	19	24
30°	N/A	0	20	27

Figure 2.

We see the use of SAs in hospitals, condominiums, and schools. As stated earlier, odor concerns are very real. Often, roof consultants, manufacturers, and roofers have received phone calls from building occupants complaining about odors caused by the installation of the roof. Imagine completing a roofing project on a hospital or condominium and not being concerned about odors or hazardous fumes. Imagine roofing a school year-round without adversely affecting the students and teachers. Prior

to SA products, these scenarios were not possible.

The negative aspect of SA products is the cost. The membrane does come at a premium over mechanically attached (MA) or factory-assembled (FA) membranes. This premium is usually offset by the speed with which the membranes can be installed over other FA systems. This is particularly true with the new SA products.

What is different about the new SA products? First is their bond strength (*Figure 3*).

ADHESIVE STRENGTH at 70°F Peel Test – Maximum Load (lbf/in.)

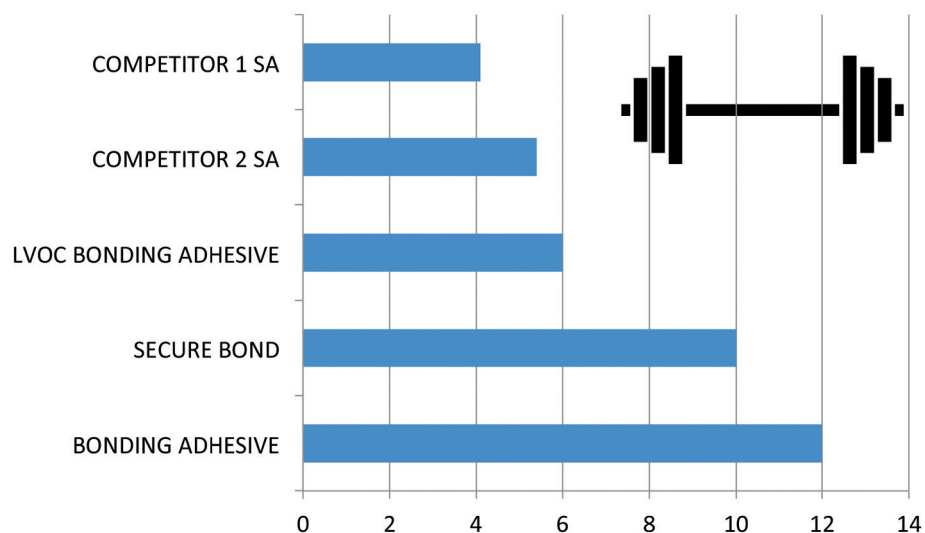


Figure 3.

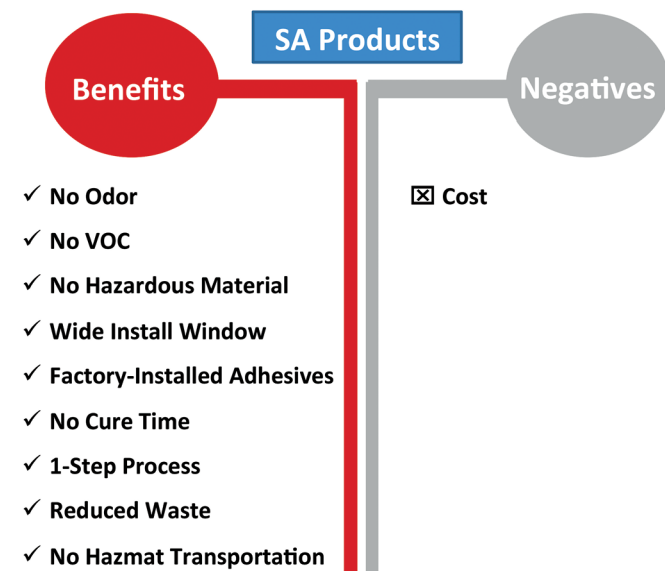



Figure 4.

They have a significantly stronger bond than previous generations of SA products. They can be nearly as strong as traditional bonding adhesive, and even stronger than LVOC or water-based bonding adhesives. Secondly, they have impressive low temperature characteristics.

The Ozone Transport Commission (OTC) requires only LVOC or water-based bonding adhesives be used from Virginia to Maine. Since LVOC bonding adhesives and water-based bonding adhesives cannot be utilized below 40 degrees and rising, this limits the weather window that roofers can install fully adhered single-ply roofing systems. With the new SA

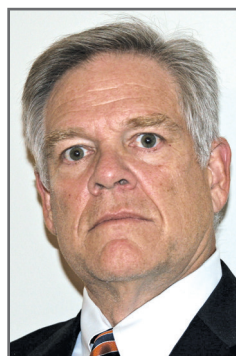
products with Secure Bond™ technology by Firestone Building Products, roofs can still be installed with temperatures as low as 20 degrees. Additionally, because EPDM is naturally more flexible than thermoplastics at low temperatures, the RubberGard™ EPDM SA product is much easier to use and install in cold weather. Prior to this technology being introduced, there were no EPDM SA products on the market. Having the ability to install adhered roofing systems in the OTC states throughout the winter was limited prior to this new technology of SA products. Traditionally, SAs were used on occupied facilities. With the low temperature capabilities of the new-generation SA products, we are seeing them being installed on new construction projects where VOC limitations restrict other forms of adhered systems.

Thanks to government regulations and the benefits of SAs (Figure 4), these new products are becoming a larger piece of the roofing industry. As more states adopt stricter VOC limits, SA products will find their way onto even more rooftops. 

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