

# Pressurized Canister Adhesives and Their Impact on the Commercial Roofing Market

By Adam Cincotta and Chris Mader

The only constant in the commercial roofing industry is change. Over the past few decades, adhesive fastening technology has evolved to the point that today there are many options and solutions for virtually every building and deck type.

Single-component polyurethane-based insulation adhesives first entered the commercial roofing industry in the 1980s, and by the mid-1990s, two-component urethanes were introduced to the industry as an alternative.

Two-component urethanes differed from the earlier single-component urethane

adhesives in that they did not rely on ambient temperature and humidity to cure, and thus provided specifiers and contractors with more predictable cure times.

According to industry studies, the category of two-component polyurethane adhesives holds the largest market share in the commercial roofing market when it comes to adhering insulation to roof decks in new and reroofing applications. In addition to adhering a wide variety of board stocks to most roof decks, these products can also be used to adhere insulation board to insulation board. Securing multiple layers of insulation with two-component adhesives has become increasingly popular as

an effective method for providing increased insulation R-value to commercial buildings. Mechanically attaching insulation to the deck

and adding a second layer with staggered joints (*Figure 1*) not only breaks the thermal bridge but also greatly reduces air migration, according to a study conducted by the National Research Council of Canada (NRCC), in collaboration with the Canadian Roofing Contractors Association (CRCA), the National Roofing Contractors Association (NRCA), the Roofing Industry Alliance for Progress, and the Single Ply Roofing Industry (SPRI).

Historically, extrusion has been the most common method of applying a two-component insulation adhesive. For these applications, contractors typically use a large caulk-gun-type of hand applicator that holds 1500-ml cartridges, or a larger low-pressure dispensing cart that typically holds five to 15 gallons of each part.

Products are typically dispensed in liquid beads that spread to several inches wide while rising  $\frac{3}{4}$  to 1 inch above the substrate (*Figure 2*). Some manufacturers allow the insulation to be placed before the adhesive



Figure 1 – Adhering a second layer of insulation over the first mechanically fastened layer.



Figure 2 – Liquid beads of adhesive spread to several inches wide and rise  $\frac{3}{4}$  to 1 inch above the substrate.



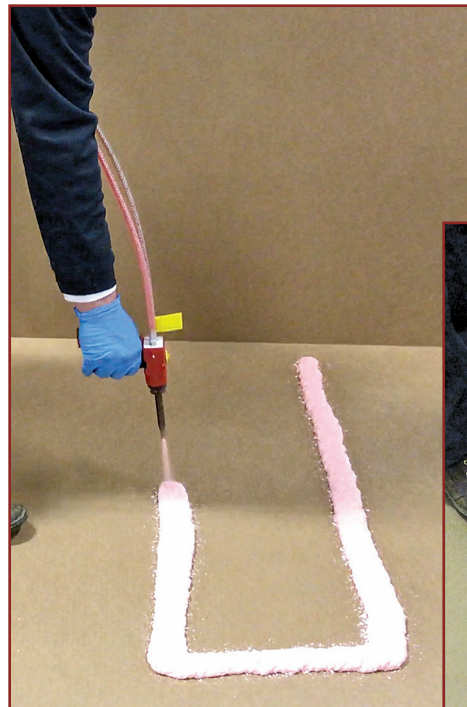
Figure 3 – Pressurized canisters are self-contained, and some are sold complete with hoses, application guns, mix tips, extension tips, and everything necessary for assembly.

has risen; others suggest allowing the adhesive to rise first before walking the boards into place. A chemical cure takes place in a matter of minutes, depending on the adhesive formulation. Since the insulation is a component of the roofing assembly, it is highly recommended that contractors follow the membrane manufacturer's recommendations for adhesive spacing, as well as for

2 components are mixed when they are dispensed, allowing the chemical reaction to take place. Because the adhesive is not atomized as it can be with larger, high-pressure spray units, personal protection equipment (PPE) is typically limited to eye protection and gloves, and there's little risk of adhesive overspray being carried by the wind or air currents to unwanted surfaces such as walls and cars.

### PRESSURIZED CANISTERS ENTER THE MARKET

As an alternative to 1500-ml cartridges and 5- and 15-gallon box or drum containers, low-pressure canisters of various roof



Figures 4 and 5 – The most common application is a continuous serpentine bead at the prescribed bead spacing—typically 12 inches on center.



fleece membrane attachment.

Cartridges are particularly useful on smaller roofs, hard-to-reach areas, and on roofs with many penetrations and cut-outs. On larger projects where the roof is more wide open, dispensing carts are frequently preferred.

In either case—carts or cartridges—the Part 1 and Part

insulation adhesives have entered the market in the past few years. Pressurized canisters are differentiated from their nonpressurized counterparts in that these systems are self-contained and do not require any additional or external equipment or external power sources (Figure 3).

As such, adhesive canister systems appeal to contractors for many different reasons. For example, contractors who get the occasional commercial job, but who do not currently own any adhesive-dispensing equipment, now have an option for effectively installing insulation adhesives. Canisters are ideal for use on smaller roofs or roofs with lots of penetrations and obstacles where large dispensing equipment and carts are too big to manage.

More important, given the current labor shortage, canisters also appeal to contractors who want better rooftop productivity when compared to adhesives supplied in 1500-ml cartridges. Consider that adhesives applied from cartridges in a serpentine pattern have a yield of about 1.5 squares/cartridge. With canisters, the yield with the same fastening pattern is up to 35 squares/set, eliminating 23 cartridge changeovers, which would represent unproductive or lost time and therefore have a negative impact on project productivity. Depending on the size of the roof, the labor savings and increased application speed with canisters can be highly significant.

One of the biggest differences between adhesives packaged in pressurized canisters and those packaged for use with other dispensing equipment, is that external dispensing equipment all requires some level of maintenance, such as ensuring that valves and hoses are clean, hand-gun batteries are recharged, etc., not to mention the time required to manage the equipment inventory. By contrast, adhesives packaged in pressurized canisters do not typically require any maintenance, so the time and labor associated with equipment maintenance is not part of the equation.

Last, but certainly not least, low-rise foam adhesives from canisters are getting traction when it comes to installing fleece membranes. It is no surprise, then, that during the past

few years, pressurized canister adhesives have seen significant market growth and are a rapidly growing method for installing two-component low-rise foam adhesives in the commercial roofing industry.

### COMPONENTS, ACCESSORIES, AND REQUIRED ASSEMBLY

Pressurized adhesive canister sets are generally self-contained and include two tanks: Part 1 and Part 2. The components are mixed in the dispensing tip during application to create a controlled chemical reaction for a quick setup and cure time. Similar to liquid-extruded systems, the adhesive is dispensed at low pressure and not atomized, so PPE is typically limited to gloves and eye protection. In addition to the two canisters, these systems typically include a disposable hose about 25 ft. long, secured to a hand applicator assembly. Other components of the system include short (i.e., 4-in.) mix tips, and some also include longer (i.e., 17-in.) extension tubes that enable roofers to stand upright during application for better ergonomics and less fatigue.

### APPLICATION OPTIONS

As with many insulation adhesives, canister-based adhesives are highly flexible. They are compatible with most commercial roof decks and substrates, including structural concrete, gypsum, cementitious wood fiber, lightweight insulating concrete, steel, plywood, smooth-surfaced built-up roofing systems, smooth and granular-surfaced modified bitumen, base sheets, most vapor barriers, and most insulation types, including expanded polystyrene, polyisocyanurate, high-density wood fiber, perlite, certain extruded polystyrene, and most cover boards.

The most common application method is to apply a continuous serpentine bead (Figures 4 and 5) at the prescribed bead spacing—typically 12 inches on center. As with all fastening options, the roof system manufacturer determines the acceptable spacing requirements. The coverage rates will vary depending on the manufacturer, but in general at 12 inches on center, installers should expect to yield anywhere from 20 to 45 squares of coverage per set, according to published data from the manufacturers.

One of the biggest differences between pressurized canister applications and non-pressurized extruded applications from

carts or hand equipment is the contractor's ability to quickly stop the adhesive flow by letting go of the trigger in the gun assembly. With carts or cartridge sets, the adhesive continues to flow from the mix tip for a short time after letting go of the trigger, making a clean stop difficult at best. While this may not seem like a huge benefit, it enables—pending system manufacturer approval—installers to apply parallel lines of adhesive, rather than applying it in a serpentine pattern. Using this “parallel-line” method (Figure 6), some canister adhesives

can get up to 40 or more squares of coverage per set, according to the manufacturer, or approximately 20% more coverage per set when compared to the serpentine application method. Work with your system manufacturer to determine if the straight-line method is something that is approved for their systems.

For fleece membranes, pressurized canisters also allow for easy “spattering” for great-looking applications. Spattering refers to a process in which the adhesive is splattered onto the substrate in a random

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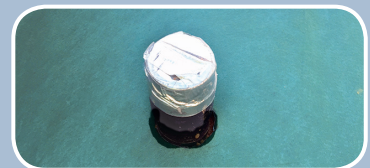


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Figure 6 – Some canister adhesives can yield up to 40 or more squares of coverage per set using the “parallel line” application method.

pattern of various-size droplets vs. being extruded in a serpentine pattern (Figures 7A and 7B). With pressurized canisters, the adhesive is easy to apply by this process—particularly when compared to extruded adhesives from carts or cartridges. The difficulty with spattering is that it can be difficult to gauge coverage rates accurately. Coverage rates again vary by system, but typical spatter application rates range from 8 to 24 squares per canister set.

Over the years, roofing manufacturers

have had different recommendations and philosophies when it comes to letting the adhesive rise and foam before putting in the board, or allowing insulation to be put into “wet” adhesive. With pressurized canister adhesives, most manufacturers recommend that the adhesive be allowed to react before laying out the insulation. When dispensed, adhesives from canisters are “frothed,” but it takes a minute or two for the two parts to chemically react. For optimum performance, installers should work with the

system manufacturer to clearly understand when the adhesive is ready for the board to be installed, and to determine if there are any specific instructions or best practices.

### TEMPERATURE RESTRICTIONS

When using pressurized canister adhesives, it is critical to work within the temperature guidelines provided by the manufacturer, just as it is with cartridges and other extrusion applications. While cartridges and bag-in-box adhesives are also susceptible to temperature restrictions, these nonpressurized dispensing systems are less sensitive than pressurized canisters when it comes to ambient temperature. With pressurized canister systems, drops in ambient temperature by as little as 6 to 10 degrees Fahrenheit can result in reduced tank pressure and an increase in chemical viscosity within the canisters. Using canister adhesives below the suggested ambient temperatures (typically 40°F [4.4°C] and rising) can potentially cause the product to be applied off-ratio or insufficiently mixed.

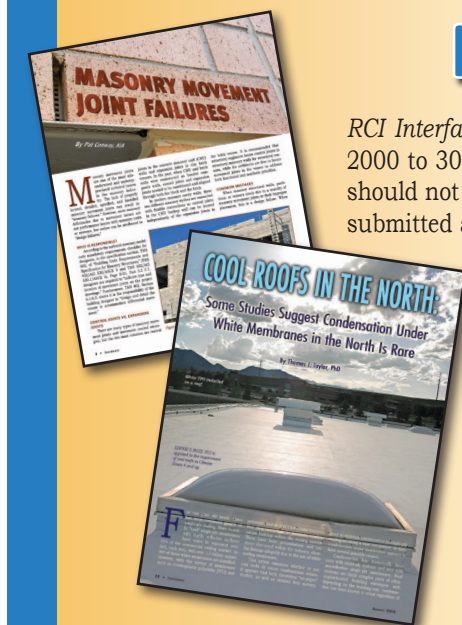
It’s also important that the canisters are stored at or around room temperature (i.e., 70° to 90°F [21° to 32°C]). This ensures that there’s adequate pressure in the tanks and that the viscosity of each part is maintained to keep the final mixture “on-ratio.” When ambient temperatures fall outside of the application range, care should be taken to keep the adhesives at the desired application temperature by using a hotbox in cooler temperatures and shading canisters from excessive sun exposure in warmer weather

## Publish in RCI Interface

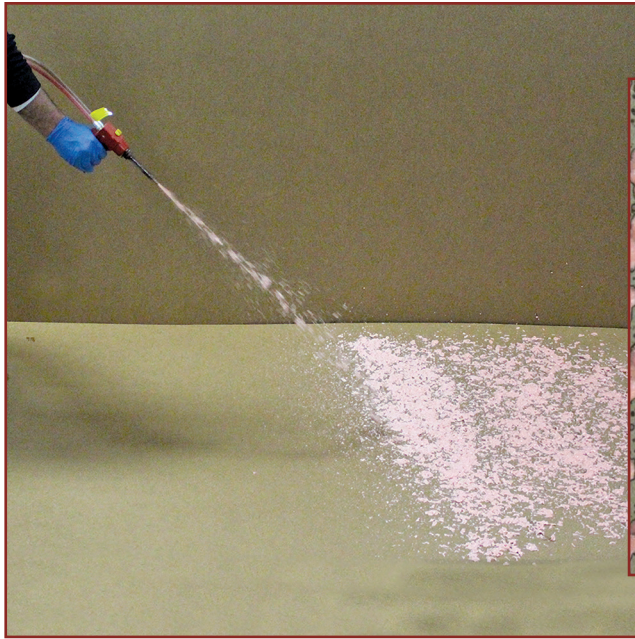
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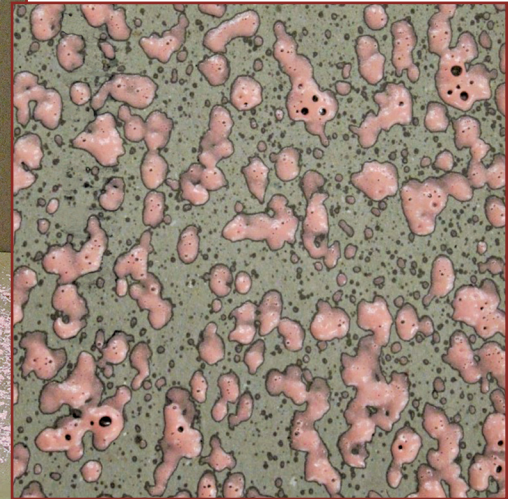
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*Figure 7A – Spattering is a process where the adhesive is spattered onto the substrate in a random pattern by pulling the trigger on the application gun and gently swinging the applicator back and forth.*



*Figure 7B – Coverage of about 60-75% is typically appropriate.*




or by keeping canisters in conditioned space, if that is an option.

#### **DISPOSAL**

As with other construction and roofing-related trash, canisters can be recycled or disposed of in approved landfills. Tanks must be completely empty of all material for proper disposal. Once empty, turn the tank over and open the valve completely to fully evacuate the pressure from the canister. Once the pressure is evacuated, locate and punch out the button on the shoulder of the canister with a nonferrous punch.

#### **CONCLUSION**

Two-part polyurethane adhesives in pressurized canisters are gaining strong acceptance in the North American roofing market, appealing to a wide spectrum of the market for their ease of application, freedom from the need for external dispensing equipment, and the potential of increased productivity per set and its related issue of qualified labor. Depending on the project and the contractor's approach, pressurized canisters can be an ideal solution. 



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## **OSHA Fines Roofing Company for Hyperthermia Death**

The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) has cited Middleburg, Florida-based Southeastern Subcontractors Inc. for failing to protect employees from the dangerous hazards of working outdoors in extreme heat.

OSHA investigated the roofing company after an employee died from hyperthermia while working at a residential site in Jacksonville. Hyperthermia occurs when the body's temperature is abnormally high because it cannot regulate the heat from the environment. The agency issued one serious citation for exposing employees to heat-related injuries, and one other-than-serious violation for failing to report a workplace fatality to OSHA within eight hours of its occurrence. The company faces proposed penalties of \$22,173.

"Employees exposed to heat on the job—whether indoors or outdoors—are at an increased risk of suffering heat-related illnesses, such as heat exhaustion and heat stroke," said Brian Sturtecky, OSHA Jacksonville Area Office Director. "Tragedies such as these can be prevented if employers develop and implement a heat illness prevention program, and provide employees with water, rest, and shade."