

Cap-sheet application recommendations

Advantages and disadvantages of three SBS cap-sheet application methods

by Jim Carlson

Editor's note: The following recommendations are those of the author and not necessarily those of NRCA.

Granule-surfaced asphalt cap sheets have been used with built-up roof (BUR) systems for decades. They first were used as organic-reinforced asphalt sheets mainly in warm U.S. regions during the 1960s and 1970s; they then evolved to fiberglass-reinforced lightweight sheets, which were used during the late 1970s through the 1990s. However, there always has been debate, fueled by occurrences of blistering, about the best way to apply these roll materials.

Because of various regional affinities for certain application methods, little research has been completed to address the application issue technically. Rather, various roofing products manufacturers established restrictions within U.S. geographic areas where they would allow granule-surfaced BUR cap sheets to be installed on warranted projects. Generally, contractors in more temperate, warmer regions of the United States were allowed to use cap sheets, and contractors in cold regions were restricted from cap-sheet use by most BUR materials manufacturers.

In general, cap sheets were used widely in the western regions of the United States with relatively few problems, and aggregates (e.g., pea gravel) predominantly were used in other regions. However, during the

past few years, the debate about application techniques has reoccurred as blistering of hot-applied SBS-polymer-modified asphalt cap sheets has come under scrutiny.

The methods

The principal application techniques for granule-surfaced asphalt cap sheets used with hot asphalt BUR membranes and SBS-polymer-modified asphalt sheets do not differ much. There are three techniques for applying these sheets into hot asphalt: flying-in, mopping and flopping, and setting and rolling.

Depending on the ambient temperature, substrate temperature, relative humidity, wind conditions, asphalt temperature and roofing workers' skill levels, the results of the application methods can be quite different.

Flying-in

Flying-in BUR cap sheets and SBS-modified asphalt membrane sheets is one of the easier application methods to perform. For this method, a roll-good material is cut to a desired length (e.g., between 6 feet to 9 feet

[1.8 m to 2.7 m]) and placed next to the location where it is to be installed. Hot asphalt is applied to the substrate, which typically is the exposed top surface of the interply sheets that compose the underlying roof membrane. Then, two workers (one at each end of the sheet) pick up the dry sheet (i.e., a sheet that has not been back-mopped) and, while moving it in unison through the air, set it into hot bitumen (see Photos 1 and 2). Often, wide push brooms or rubber-bladed squeegees are pushed or pulled over the freshly installed sheet to remove any trapped air and promote sheet adhesion.

Although the flying-in method is easy to perform, achieving quality installation can be challenging. For



Photo 1: Two workers fly in a cap sheet onto a mopped substrate.

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example, it can be difficult for roofing workers to place sheets into asphalt while the asphalt remains sufficiently hot and fluid. Asphalt must be fluid to properly wet out the back of a sheet (i.e., achieve film contact and adhesion). In addition, a sheet's backside parting agent can hamper wet-out as asphalt cools and begins to solidify. Flying-in sheets also requires craftsmanship because it is difficult to set sheets into hot asphalt without trapping any air under the sheets, which can create voids that likely may become blisters.

To achieve a successful fly-in application, the following must occur:

- Outside temperature should be high (e.g., between 80 F to 90 F [27 C to 32 C] or higher).
- Substrate temperature should be warm (e.g., the underlying plies should be warmed by the sun). Afternoon applications often produce better results.
- Asphalt must be hot (i.e., at the equiviscous temperature [EVT] or above).
- Wind must not be blowing too hard or the asphalt will cool.
- There must be an ample quantity of asphalt applied to the substrate without holidays (i.e., bare locations).

- Experienced roofing workers must fly in the sheets.

Mopping and flopping

Mopping and flopping is more difficult to perform than the flying-in method. First, a roll-good material is cut to a desired length (e.g., between 6 feet to 9 feet [1.8 m to 2.7 m]) and then placed upside down next to the location where it is to be installed. Workers then should apply hot asphalt to the substrate and sheet's backside. Next, two workers (one at each end of the pre-cut sheet) should pick up the asphalt-laden sheet while turning it in unison to set the sheet right-side up onto the intended location, as shown in Photo 3.

Not all BUR cap sheets are waterproof; in fact, most are not.

For success with the mopping-and-flopping method, significant quality control must be exercised. The back-mopped sheets obviously are heavier with the asphalt's added weight and, as a result, harder to handle than dry sheets used with the flying-in method. As with any cap-sheet application

method, asphalt used in the mopping-and-flopping method must be hot and remain hot during sheet application to promote proper sheet lamination. Flopping sheets requires a practiced technique—it is an art to set heavy sheets into hot asphalt without trapping air under the sheets, which creates voids that can become blisters.

It is difficult to

ensure 100 percent success with the mopping-and-flopping method unless the outside temperature is relatively high (e.g., 70 F [21 C] or higher); substrate temperature is warm; asphalt is hot; wind is not blowing hard; there is an ample quantity of asphalt applied to a substrate and sheet's back; and experienced workers are installing the sheets.

Similar to the flying-in method, wide push brooms or rubber-bladed squeegees may be pushed or pulled over freshly installed sheets to remove trapped air and promote sheet adhesion. Roofing workers sometimes are less likely to broom in a sheet after using the mopping-and-flopping method. However, just because more asphalt is applied with the mopping-and-flopping method does not guarantee that an applied sheet will bond more fully to an underlying ply or plies. The additional asphalt supplied by mopping both surfaces can aid adhesion if all surfaces are coated and the asphalt is adequately fluid.

Setting and unrolling

The setting-and-unrolling method is the least used cap-sheet application method but can be, in the author's opinion, the most successful.

As with the other two methods, a roll-good material usually is cut to a desired length (e.g., 6 feet, 9 feet, 12 feet, 15 feet, 18 feet [1.8 m, 2.7 m, 3.6 m, 4.5 m, 5.4 m]). However, unlike the other methods, cut rolls are rerolled before application. The rerolled "short rolls" should be staggered across a roof system and stood on end next to the location where they are to be installed. When hot asphalt first is applied to a substrate, a roll can be set immediately, similar to setting a ply-sheet roll (see Photo 4).

As asphalt is applied farther out onto a substrate, a roll can be unrolled directly behind the mop or bitumen spreader. As a result, the roll will be kept in the hot asphalt. In other words, as soon as asphalt is applied, a roll can be set immediately



Photo 2: Workers, using the flying-in method, finish installing a cap sheet.

and unrolled into it. This immediate unrolling application is performed without having to wait until a larger-sized area is mopped out, which is required for the flying-in and mopping-and-flopping methods. For these methods, the asphalt usually has cooled by the time a sheet is in place.

Not allowing sheets to relax before application potentially can lead to dimensional stability issues with polyester-reinforced sheets.

In addition to the advantage of a roll being set immediately into hot asphalt, air is not trapped as easily between a sheet and asphalt film when the setting-and-unrolling method is used. As a roll is kept flush on a substrate, it creates a small wave of hot asphalt that can be kept in front of the roll, ensuring full embedment of a sheet into the bitumen. If the ambient temperature is cool or wind is blowing, a push broom or rubber-bladed squeegee may be pushed or pulled over the sheet as it is installed to ensure full adhesion.

Potential problems

Although the application methods mentioned seem relatively straightforward, roofing professionals should be aware of several problems that can occur. Roofing professionals should watch for:

- Voids. Sometimes, the flying-in and mopping-and-flopping methods are used without thought to alternative methods and their advantages. As a result, during cool temperatures or other undesirable conditions (e.g., windy weather), full sheet adhesion may be difficult to achieve. If voids are created during the flying-in or mopping-and-flopping processes, blisters may develop.
- Unrelaxed sheets. Not allowing

sheets to relax before application potentially can lead to dimensional stability issues with polyester-reinforced sheets. To relax sheets, the author recommends workers unroll each roll, stack the sheets, and allow sufficient time for the material and its internal reinforcement(s) to stabilize in length. Roofing professionals should note that this does not mean roll goods with built-in fabric-tensioning problems caused by poor manufacturing practices can be remedied in the field by relaxation.

- Impermeable, trapped vapor or gas. Not all BUR cap sheets are waterproof; in fact, most are not. A roofing professional should cut a small piece of material from a roll and hold it up to light. Seventy-two- and 83-pound (32.4- and 37.4-kg) granule-surfaced cap sheets may allow some mopping vapor/gases to migrate through, therefore facilitating more trouble-free embedment in hot asphalt without the potential for latent blistering.

However, the SBS-polymer-modified asphalt sheets currently being used have relatively low permeabilities. These typical heavy-weight sheets are not perforated and allow no large margins for error with regard to trapping vapor or gas under a sheet during application. Typically, these membrane sheets do not tolerate voids without the potential for some blistering.

Roofing professionals should not misunderstand these warnings—multiple-ply polymer-modified membranes are durable and can be long-lasting. However, it is time some pragmatic recommendations regarding their application be considered.

Recommendations

To ensure a trouble-free cap-sheet application, regardless of method, a roofing professional should:

1. Consider a project's conditions. A roofing professional should anticipate the conditions that will be encountered during a particular project. After considering ambient temperature, distance bitumen must be pumped and transported (which greatly affects application temperatures), wind, humidity, etc., the correct method of cap-sheet or polymer-modified membrane application can be selected.

For success with the mopping-and-flopping method, significant quality control must be exercised.

2. Try to cap soon after base-and/or ply-sheet application. Rather than leaving large areas of installed base and/or ply sheets exposed to dust and other contaminating factors that can impair cap-sheet adhesion, a roofing professional should try to schedule membrane application so phased plying does not occur. In other words, a roofing professional should try to install cap sheets and heavyweight polymer-modified



Photo 3: One worker prepares to finish mopping the roof area while two other workers flop a cap sheet.

