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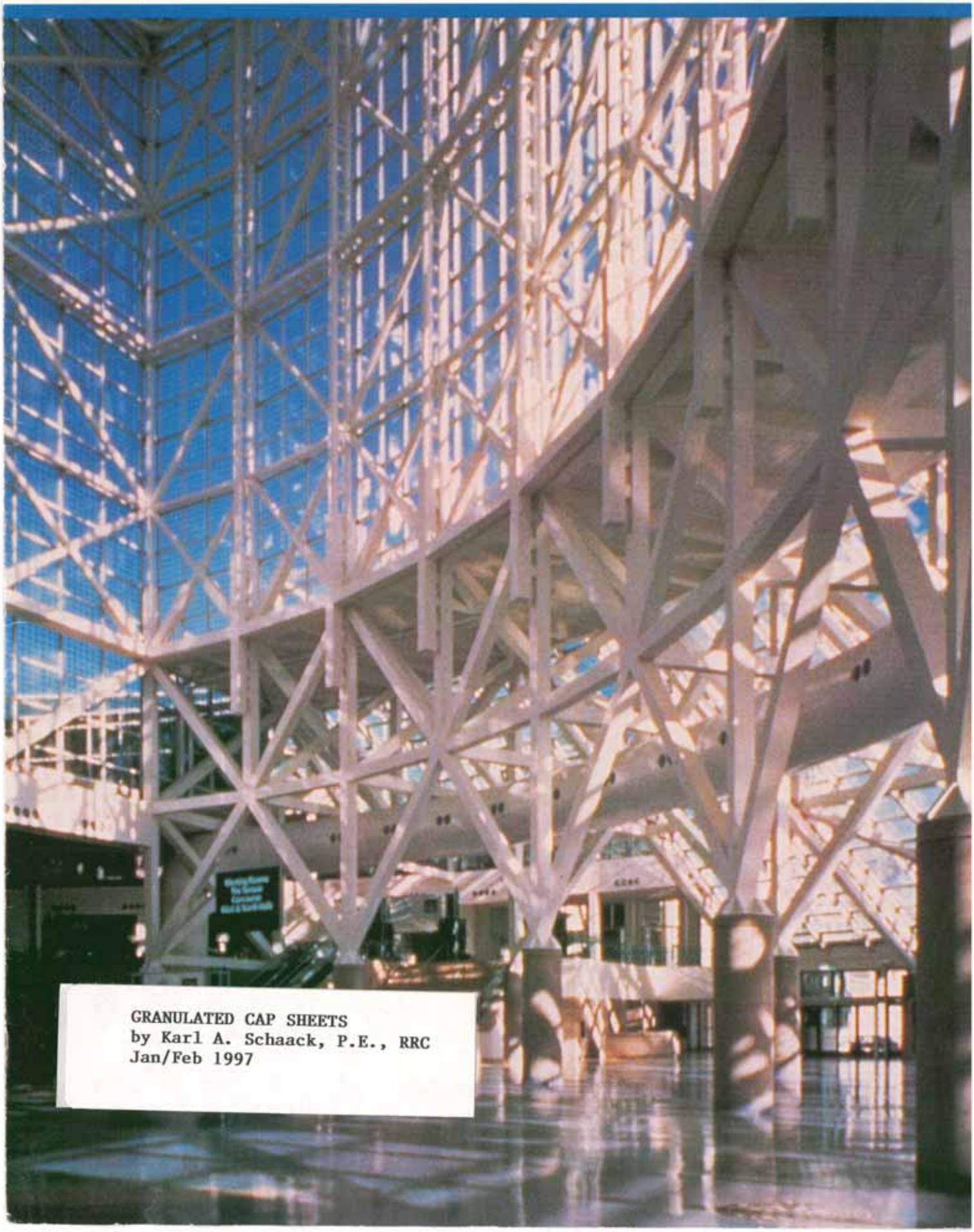

GRANULATED CAP SHEETS
by Karl A. Schaack, P.E., RRC
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Granulated Cap Sheets

by Karl Schaack, P.E.

GRANULATED CAP SHEETS ARE commonly used as protective surface of finish ply in the application of bituminous roof systems. These sheets, whether in single- or multi-ply assemblies, include modified bitumen products and asphalt-coated fiberglass reinforced rolled roofing cap sheets. According to the National Roofing Contractors Association (NRCA), Rosemont, Ill., modified bitumens now account for approximately 20 percent to 25 percent of the commercial roofing market.

Not all modified bitumen systems incorporate granulated cap sheets. "Hybrid" built-up roof systems, which incorporate cap sheets and multiple layers of built-up roofing plies, are grouped within the built-up category. Roof systems utilizing granulated cap sheets comprise ¼ of the commercial roofs installed today.

A critical step in the application of granule surfaced sheet materials is the proper adhesion of lap seams that occur at the sides and the ends of sheets. According to NRCA's "Project Pinpoint Analysis" (1983-1992), lap seam deficiencies were considered the number one problem associated with modified bitumen membranes. They represented approximately 43 percent of the problems associated with modified bitumen membranes, and modified bitumen roof membranes represented about 14 percent of the problem roofs recorded in the Project Pinpoint survey.

Seam Applications

There are several techniques that can be utilized during the application process to achieve long-term performing lap construction. The basic techniques consist of those that are typically associated with and commonly used in the general application recommended for modified bitumen sheet products.

Here contractors chalk lines for the installation of cap sheets – staggering side laps from the base ply.

The first technique involves the type of product or process used to adhere the cap sheet. When using traditional mopping grade asphalt as the adhesive, the maximum temperature should be maintained for the asphalt at the point of application. In the process, the criteria for heating asphalt (finished blowing temperate, flash point) should be maintained. This technique will allow the hot asphalt to melt the coating on the backside of the sheet at the time of the application.

ASTM D 312, Type III and Type IV asphalt are recommended by the membrane manufacturers for application of cap sheets. Membrane manufacturers recommend maintaining a minimum temperature of 400 degrees F for the asphalt at the point of application of cap sheets. By using Type IV grade asphalt for the application of granulated sheet materials, the highest possible temperature can be obtained at the point of application.

The EVT of Type IV asphalt varies depending on the manufacturer. Typically, The EVT of Type IV is approximately 450 degrees F vs. an EVT of 430 degrees F for Type III. Some manufacturers recommend that only Type IV be used to install the cap sheets. The reason is two fold: the first being the higher EVT; and the second is the higher softening point. These two characteristics aid in achieving optimum adhesion and avoid slippage.

There are several practices that can be followed to assist in maintaining optimum temperatures during the application of roofing materials. 1) Keep the kettle/tanker in close proximity to the point of application. 2) Use insulated piping and luggers. 3) Minimize holding time of asphalt in luggers/mop carts. 4) Keep the roll in close proximity to the applied asphalt.

When the sheet is adhered by either torching or heat-welding methods, two basic techniques are utilized. One method involves heating the entire width of the sheet with either a hand-held torch or wagon-mounted type equipment. Upon heating/melting the coating, the sheet is adhered to the substrate. The second method involves heating the width of the sheet, except for the last 3 to 4 inches, or the width of the salvage edge. The remaining edge can then be addressed utilizing a smaller or "detail" torch.

When using cold process materials such as adhesive, the material is dis-

Karl Schaack, P.E., is vice president and general manager of the Houston division for Price Consulting Inc., a roofing and exterior restoration specialty company. He is also a registered roof consultant.

If granules are not placed in the bleed-out during the application, they can be applied after the cap sheet is installed.

A modified bitumen torch applied cap sheet application – torching side laps, rolling side laps and broadcasting granules in bleed-out.

Staggering the end laps of cap sheets.

persed on the substrate and the sheet is applied into the adhesive. The cold process adhesive can be dispersed on the substrate by pouring the material from pails and distributing it across the subject area, utilizing either a squeegee, roller or notched towel. The material can also be dispersed utilizing spray-type equipment. After the adhesive is appropriately applied, the sheet is laid into the adhesive and then rolled. A large weighted roller is typically used in the field of the sheet and a hand-held roller is used at the lap seams.

Other techniques involve methods that can be implemented during the application of the sheet goods. A common method involves the "mop and flop" technique. This technique involves applying the hot asphalt directly to both the backside of the cut sections of the sheet, that are positioned granule-side-down prior to application, and adjacent to the subject area to receive the product. After the asphalt is applied to the sheet, it is "flopped" into place. This technique allows the hot asphalt to be applied directly to the bituminous coating on the sheet, providing more opportunity for the coating to be melted. The practice of maintaining the highest maximum temperature for the asphalt should also be used in conjunction with the mop and flop technique.

Another commonly recommended application method is maintaining a constant downward pressure on the roll while it is being laid into the asphalt mopping, adhesive and/or molten coating. This can be accomplished with a properly positioned foot or hand on top of the roll. During the initial installation, the weight of the roll provides relatively good downward pressure. However, as the roll is unrolled and the weight diminishes, manually applied downward pressure becomes more critical.

To aid in achieving the proper downward pressure and subsequent adhesion, the roll should be maintained in a relatively tight configuration during the application. "Kicking out" a roll, commonly used with felt products, should be avoided during the application of cap sheet products with asphalt adhesive. If the roll is not wound relatively tight and downward pressure is not exerted on the roll, inadequate adhesion will result and the cap sheet material will just sit on top of the mopping/adhesive.

Cap Sheets

Cap sheets, like most roofing products, are installed in a shingle fashion with the sheets extending over the preceding adjacent sheet. This overlap (side lap) is typically a minimum of either 3 or 4 inches or the width of the salvage edge (non-granulated edge).

(more on next page)

At the end of a roll, the cap sheet installation is continued by overlapping an end of a new roll on top of the end of the previously installed sheet. This overlap (end lap) is usually a minimum of 6 inches. To maintain continuity of these laps and sheet alignment during the application, chalk lines should be marked on the substrate to line up the side and end laps.

During the installation of the cap sheet, the asphalt, adhesive or molten coating is usually extended or exposed beyond the edge of the sheet. This exposed bituminous material is commonly referred to as "bleed out." The asphalt applicator or "mop man" will apply the mopping of hot asphalt on the substrate extending about ¼ top ½ inch beyond the chalk line and/or salvage edge of the previously laid sheet. To minimize the low of asphalt across the previous sheet, position a sacrificial piece (approximately 18 inches wide) with the granule side down and located about a ½ inch from the outer edge of the subject salvage sheet.

If the asphalt mopping is extended to the sacrificial piece, a relatively straight line or strip of bleed-out can be achieved. With cold process adhesive applications, the adhesive is usually extended past the edge of the sheet, typically ½ inch. With torch applied methods, the molten back coating is "pressed" out beyond the edge of the sheet during application. For torch applications, a bleed-out of ¼ to ½ inch in width indicates that the proper temperature was obtained during the torching process.

Alternative Techniques

Several techniques can be utilized during application that will assist in attaining well performing end lap seams. During the application process, as a sheet is overlapped on the end of the proceeding sheet, the outside corner of the upper sheet can be trimmed to create a rounded finished corner. A non-rounded corner often will act like a piece of "dog-eared" paper and the corner can be pulled up and away or become readily disbonded.

Another method utilized at end laps includes trimming the outside corner of the underlayment sheet. Starting at the end of the sheet, and at 3 or 4 inches from the outside corner, the corner should be trimmed at a 45-degree angle. This particular technique helps achieve a well adhered and superior watertight "T-joint" at the end lap.

Hot mopping a cap sheet. Cracks from an unprotected asphalt bleed-out.

Because end laps are constructed by overlaying the cap sheet onto the granule surfacing of the underlying sheets, attention to detail becomes critical at these locations. Sweeping loose granules and a light application of primer on the subject area can aid in positive adhesion of end laps. With torch applied products, the subject area of the underlying sheet can be heated and the granules pressed down into the sheet with a trowel. This technique creates a bituminous surface on which to apply the overlapping sheet.

If, during the initial process, proper lap seam adhesion is not achieved, there are several methods that can be followed to rectify the condition. One method involves heating a metal trowel with a torch and applying the heated trowel under the disbonded or unbonded area in order to melt the coating. After melting the coating, the subject area can then be rolled or pressed into place. Another method involves inserting a cold process adhesive into the subject area and then stepping in or rolling the lap seam together.

Broadcasting Granules

A common practice, often implemented during the installation of cap sheets and the adhering of lap seams, is the broadcasting of loose granules into the bleed out. This practice can result in well-constructed and performing lap seams. Loose granules are usually manufactured and supplied by the manufacturer of the cap sheet in 100-pound paper bags. The granules are small mineral fines that have a colored ceramic coating that is baked on. There are two critical steps in this process: 1) The granules are broadcast into the bleed-out while the bituminous material is sufficiently hot or in a non-cured state; and 2) Ensuring embeddment of the broadcast granules.

Because the granules are relatively light in nature, simply broadcasting them will not result in complete adhesion to the bleed-out. Ensuring embeddment of the granules into the bleed-out can be accomplished by tamping or stepping the granules down into the bleed-out. If the granules are not embedded into the bleed-out, once the bleed-out cools or cures, wind or water will carry them toward the low part or corners of the roof – drains, gutters.

This application of granules usually involves a roofing laborer, with material in a readily accessible container, following in close proximity of the roofing technician(s) rolling out the sheet goods. Once the cap sheet is applied in place, the granule applicator broadcasts the granules into the bleed-out. A linear mound of granules plied on top of the bleed-out allows "step-in" of the granules while not allowing hot asphalt and granules to become stuck to the bottom of the applicator's shoes.

Once an area is completed, the excess granules should be removed from the roof surface. This can be accomplished with typical leaf-blower-type equipment or a soft-bristled broom. If the excess granules are not removed,

they can collect at low points or in drainage mediums, possibly resulting in restricted flow of rooftop drainage. Significant amounts could also be considered unsightly if deposited on parking or walk surface areas located adjacent to the building.

Appearance and Function

The application of embedded granules provides two valuable functions – enhanced performance and aesthetic. By embedding granules in the bleed-out, a more homogenous roof surface appearance is achieved. Together with the alignment of end laps and rounded corners of end laps, embedded granules provide a finished roof surface that by appearance calls attention to detail. The finished appearance often important to the designer, the contractor and/or the owner. The appearance of the completed roof is often the final judge of the performance of the contractor. In addition, roof areas are often visible from higher adjacent viewing points and a pleasing appearance is always desirable.

From a functional or performance point of view, granules can provide both stabilizing effect and protective effect for the bituminous bleed-out. These effects may be compared to similar effects gravel has when embedded in a bituminous floodcoat. The granules stabilize the bleed-out and act like a reinforcement, which can minimize movement (cracking)

... several techniques can be utilized ...

due to shrinkage caused by curing/weathering. Additionally, the granules can also reflect ultraviolet rays and promote moisture evaporation from the roof surface.

If the bleed-out remains exposed, it will deteriorate due to weathering. Direct exposure to ultraviolet light and moisture will result in increased weathering, consequently resulting in oxidation, embrittlement and cracking.

Cracks in the bleed-out (commonly referred to as alligatoring in asphaltic floodcoats) are like "fissures." They can extend into and/or under the overlaying sheet, consequently allowing possible moisture migration past the lap seam.

If granules are not placed in the bleed-out during the application, they can be applied after the cap sheet is installed. A hand-held torch can be utilized to remelt the bleed-out and then the granule application can take place. However, extreme care must be taken to prevent damage to the surfacing sheet.

Topically applied bituminous or modified bituminous cements/mastics with embedded granules can be used to conceal bleed-out and other surface irregularities (bitumen spillage scars, etc.). The membrane manufacturer should be consulted regarding compatibility of these products with the respective cap sheet.

These basic techniques should be implemented during the application process of cap sheet materials to achieve the best possible lap seam construction and minimize problems typically associated with these products. ■