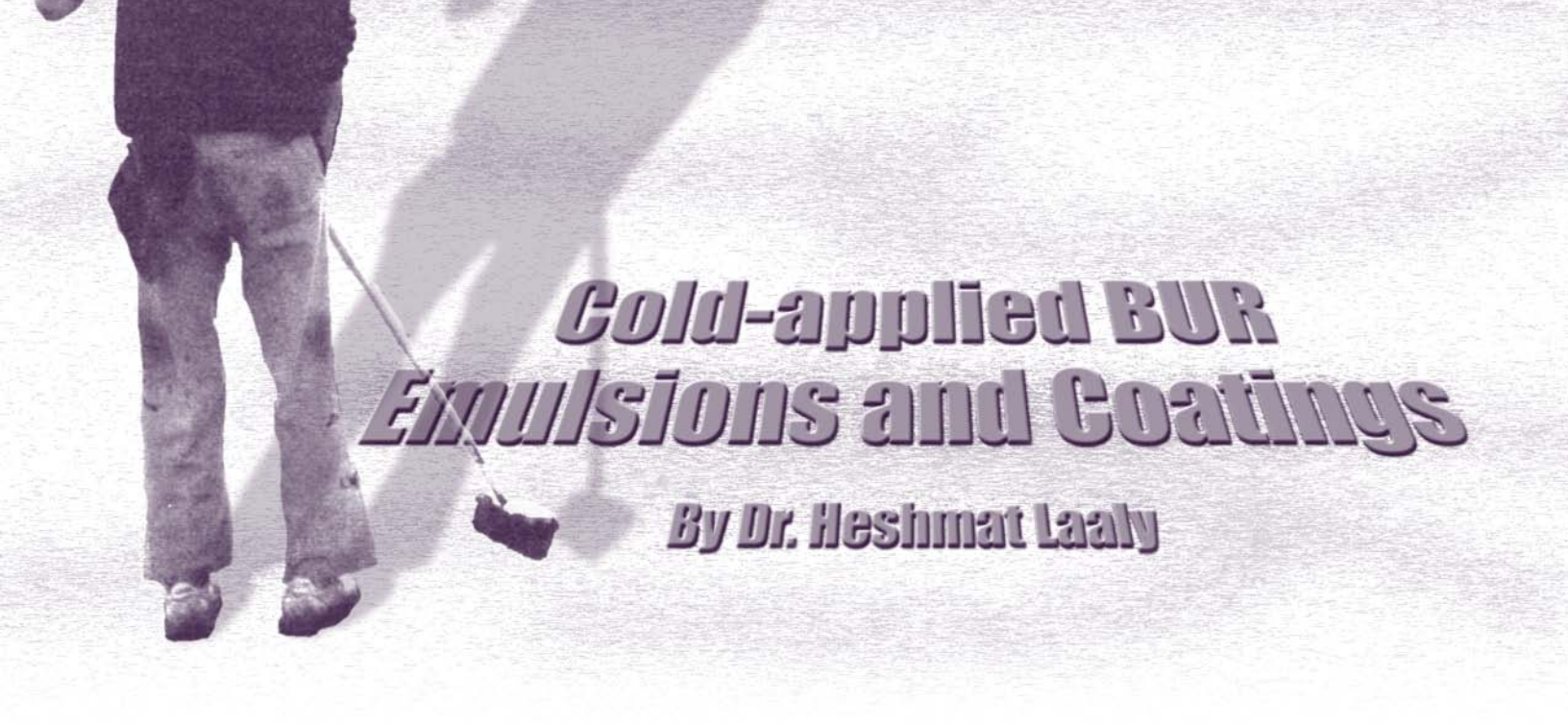

Cold-applied BUR Emulsions and Coatings

By Dr. Heshmat Laaly

Kenneth Brzozowski states[1]:

"Over the years, cold-applied roof membrane systems have proven to be excellent alternatives to the more traditional hot systems. Whether used through choice or because a job situation dictates them, cold systems have a demonstrated history of good performance and offer certain installation advantages as well."

According to the Roof Coatings Manufacturers Association (RCMA), some of the primary advantages of cold-process roofing are as follows:

- Safer application compared to hot and torch-applied systems.
- Less labor-intensive than hot-applied systems, with the contractor able to apply more squares per day with a smaller crew.
- Lightweight cold-applied materials reduce the dead load on a roof.
- Leaks and damage are easier to locate compared to ballasted roofs.
- Easily adaptable to different roof slopes and designs.
- Early morning dew and dampness does not delay application of emulsion-based coatings.
- Waterborne materials have negligible odor and do not ignite easily.

Cold-applied coatings also have some limitations. For instance, some of the solvents and other chemicals used are combustible. Closer attention must also be paid to weather and impending rain. Certain coatings have a tendency to peel under ponded water. Adequate curing time is

Fig. 1: A cold-applied system is being finished. One workman is spraying adhesive while another blows in granules to give a smooth, reflective surface. Courtesy: Contractors Guide, *August 1990.*

Fig. 2: "Stitchbonded" polyester fabric being installed. Courtesy RSI, *May 1991.*

required before roof traffic is allowed. And, like most roof systems, application in cold weather is usually more difficult than in warmer temperatures.

Brzozowski continues: "When compared to organic products, roofing membranes constructed with glass fiber materials offered more uniform physical properties in the machine and cross-machine directions, had less tendency to absorb water, and generally increased strength."

Recently, coated sheets with polyester and combination glass/polyester reinforcements have been employed in cold-applied systems. Membranes constructed with these ply sheets show improved elongation, recovery, and fatigue properties when compared to those built with organic and glass felts.

Cold adhesives typically are about 50% solids with a gallon weight of about 8 pounds. If an interply application of 2-1/2 gallons/square is used, the amount of waterproofing material remaining after evaporation of the solvent is about 10 pounds. In comparison, the average weight of hot bitumen used is 20 to 25 pounds/square. Thus, the felt must supply additional asphalt or waterproofing compared to hot ply sheets.

Application of Cold-applied BUR

Installation of coated felt membranes parallels the application of hot-applied BUR with the difference that the cold adhesive is applied by spray, brush, or squeegee. Spray usually is the most rapid and efficient application method.

One major difference between hot and cold systems can be found in the application of glass fiber felt systems. In the development of these membranes, it was discovered that although the glass felts laid well immediately after application, they tended to ridge or "mole-run" after 24 to 48 hours.

Experimentation has shown that if the glass felt is unrolled on a flat surface and left unrestrained, an increase in roll length will be observed after a few hours. This appears to support the theory that the ridging is due to the release of some tension built into the felt in the manufacturing or packing process. Of interest is the fact that the ridging phenomenon also is observed in nailed base sheets.

The formation of ridges in hot systems is reduced by the fast set of the bitumen on the roof compared to the slower adhesion development of the cold membranes. In practice, this problem is overcome by the so-called cut, spray, and lay method of installation. The glass felt is precut into 18- to 20-foot lengths, then allowed to relax for approximately 45 minutes. This step allows for the release of tension in the felt and minimizes the effect of any dimensional growth that may occur after installation. Polyester and organic felts can be rolled out full length and do not require the precutting and relaxing procedure.

Application Errors

According to the RCMA, workmanship is as important to the performance of the cold-applied system as the design and selection of materials. Some common application errors include:

- Entrapment of moisture in the insulation or membrane.
- Inadequate or excessive use of adhesives and/or top coats.
- Failure to set felts smoothly into the adhesive.
- Improper preparation of the deck or insulation substrate.
- Applying roofing in weather that is unsuitable for the materials being installed.

Cold-applied Performance

It is important to point out that, unlike hot roofs, there is a definite set time involved with cold-applied membranes. Although these roofs are waterproof immediately,

they remain somewhat tender to roof traffic for 15 to 20 days, depending on weather conditions and system variations.

Most common insulation materials can be employed with the cold-applied, coated felt roofing systems, provided there is no sensitivity to the adhesive solvents. Practically, fiberboard, fiberglass, and polyisocyanurates are the most commonly specified insulation materials.

Fire and wind uplift ratings can be achieved if sufficient cure time of about 30 days is allowed before testing. Wind resistance and uplift approvals for cold-applied membranes are difficult to obtain from Factory Mutual (FM) because cure time is limited in their testing criteria.

With gravel-surfaced assemblies, fire approvals can be obtained almost immediately after construction of the test panels. Almost any roof slope can be accommodated with these systems if proper techniques are employed.

From the standpoint of watertight security, perhaps the best application for these systems is as a maintenance membrane for aged, smooth-surfaced asphalt roofs. After proper repairs are made, these membranes create a new weathering and waterproofing surface that protects the existing roof and adds years of life to the system.

Cold-applied Polyester

Cold-applied, polyester-reinforced built-up roofing and repair systems have been well accepted in the field. Developed in the U.S., these cold-applied systems usually call for mats with weights of one to three ounces per square foot. These reinforcements are adhered with cold mastics, such as bitumen-based cutbacks and emulsions, as well as other adhesives. The combined advantages of the cold-process system with the physical attributes of polyester fabrics offer roofing contractors a high-performance system at a reasonable installed cost.

Polyester-reinforced roofing products offer these advantages in cold-applied systems:

- Exceptional elongation and recovery.
- Toughness and flexibility.
- Low shrinkage.
- Impressive tear strength.
- Puncture resistance.
- Resistance to moisture, mildew, rot, chemicals, and ultraviolet light.
- Light weight.
- Pliability.

Depending on the type of fabric, polyester felts used in cold-applied roof systems feature 20% to 50% elongation. This ability to stretch is one key to avoiding membrane splits and possible roof failures.

Changes in temperature, aggravated by the increased levels of insulation installed on today's roofs, force the cover membrane to expand and contract. Polyester's high elongation potential and recovery enable it to cope with this form of thermal shock. Instead of splitting, the cold-

applied polyester reinforcement is capable of bridging cracks in the existing membrane.

Eventually all roofs reach a point when they are no longer practical to maintain. At this stage, replacement is required. This can mean complete removal and replacement (re-roofing), the placement of new insulation and membrane over the original system (re-covering), or the complete redesign of the roof assembly, including possible deck modification such as the addition of slope for drainage. No matter what the situation, there are certain facts to keep in mind:

- The complete removal of the old roof and insulation is the best approach to reroofing.
- When re-covering over an existing system, be sure it is dry, sound, and well-attached. If the system is not properly adhered, reattachment will be necessary.
- When re-covering, a new layer of rigid insulation (or separator sheet), mechanically fastened through the existing system to the deck, will provide a smooth surface, ideal for receiving the new membrane.
- When practical, add slope and/or drains to poorly drained roof surfaces.
- In any reroof or re-cover application, the structure must be evaluated to determine if additional weight could be a problem. ■

Editor's Note: This article is extracted from The Science and Technology of Traditional and Modern Roofing Systems. *The two-volume book is available on CD through RCI's Publications list. Order from the form provided in the November 2002 issue of* RCItems *(inserted in this issue of* Interface*), on-line by visiting www.rci-online.org/order.htm, or call headquarters at 800-828-1902.*

1 Brzozowski, Kenneth J., "Cold-Applied Membranes Are a Viable Alternative," *Contractors Guide*, Aug. 1990, p. 22-26.

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Dr. Heshmat O. Laaly has bachelors, masters, and Ph.D degrees in chemistry from the University of Stuttgart, Germany. He is a member of APEO, ACS, RCI, ASTM, SPRI, SA, CSI, CCSB, UNIDO, ICBO, and RILEM/CIB. In 1983, he received the Certificate of Merit from the Canadian General Standards Board in recognition of his contributions to the development of standards and test procedures for roofing materials and methods of application. The following year, he left the National Research Council of Canada. In 1992 he was awarded with the World Lifetime Achievement Award of the American Biographical Institute in recognition of the book from which this article is extracted.