

## An Alternative to Roof Replacement

Source/Author: William A. Kirn

Modern roofing technology has undergone the most explosive proliferation of new technologies, alternative systems, advancements, improvements, and a plethora of "latest and greatest" in its history. With these new technologies comes the responsibility of the roofing professional to familiarize him or herself with the current state-of-the-art.

For roofing jobs on existing buildings, the question faced by the roofing professional still remains the same: should an expensive new roof be installed or is there a roof replacement alternative which will prolong the life of the existing roof? The answer may be a liquid applied roof coating over the existing aged roof.

Roofing technologies include the traditional built-up roof (BUR), plus newer systems, such as various types of single ply and modified bitumen sheets and spray-applied polyurethane foam with a protective coating.

Coatings are firmly established as an integral and required part of the urethane foam roofing system. The type of polyurethane used to make the foam is not durable if left uncoated and will begin to powder and degrade within weeks of application. Moreover, polyurethane foam is rather brittle and its skin can be cracked from impact with falling debris, heavy foot traffic, or severe hailstorms. Coatings protect the foam from these potential mishaps.

Some liquid-applied coatings have also proven their utility over other substrates, and can be used to protect, restore, and prolong the life of aged existing built-up or other conventional roofing systems. Unlike re-roofing alternatives, they are extremely lightweight, adding virtually nothing to the load on the roof deck or supporting members. In fact, roofs may be re-coated several times without contributing significantly to the load.

Because these coatings can be formulated white, they can be effectively used to impart reflectivity to the roof. This not only improves aesthetics, but also cools the roofing surface, contributing to longer service life. Since the surface of the roof is cooler, an additional benefit is a reduction in a demand for air conditioning.

The economic advantages of longer roof service life and reduced energy costs for air conditioning are the economic driving forces for reflective roof coatings. However, if aesthetics is a key objective, coatings can also be color tinted.

### **The difference about coatings**

Technically, these coatings are much more than paint. By definition, they are liquid applied, fully adhered, elastomeric functional membranes formed in-situ on the existing roof. In the sense of



being adherent to the substrate to which they are applied-in this case, the existing roof-they are paint-like. However, their elastomeric feature, which distinguishes them from paints, means they are also flexible.

This flexibility, or elasticity, must exist not only at one temperature but also over the temperature range existing in any particular building's climate. Elasticity enables the coating to tolerate a roof's movement as it responds to the stresses caused by temperature changes, settling of the foundation, weight loads caused by ice and snow. And seasonal expansion and contraction of the roofing envelope.

These coatings are normally applied at film thicknesses of 20 to 30 dry mils (.020 inch to .030 inch) using a roller, spray, or brush. By comparison, paints are applied at two to three mils, thus making these roof coatings approximately ten times thicker than traditional paints.

## **Classes of coatings**

Roof coatings can be classified into three types: solvent, water-based, and 100 percent solids. Solvent systems are those containing an organic solvent as carrier for the coating. In this case, solvent evaporation causes the coating to form the membrane on the roof. Water-based coatings employ water as this carrier. The third class, albeit less common, is the solvent-free coating where two liquid components are premixed in a specially designed airless spray unit; a chemical reaction causes some of these two-part coatings to dry almost immediately. Each of these three coating classes has specific advantages and disadvantages relating to the type and presence or absence of solvent.

## **Solvent coatings**

Coatings, which employ organic solvents, can be applied over a wide range of temperatures, including cold or marginal weather conditions. Moreover, they will dry quickly under conditions of high humidity since the rate of solvent evaporation is not related to relative humidity. These advantages are offset to some degree, however, because they contain large percentages of usually flammable, and sometimes highly toxic, organic solvents.

Additionally, many of these coatings are required to carry the D.O.T. classified "red label" associated with low flash point. This means the applicator must exercise care and prudent handling procedures when transporting, storing, and applying such coatings. Also, since these systems contain organic solvents which may soften certain asphalt and other conventional roofing materials, they may cause "bleed through" problems or, even worse, permanent damage to the old roofing substrate.

Finally, when using these materials, additional solvent is required to clean the application equipment after use.



## **Water-based coatings**

In contrast, water-based coatings eliminate the flammability and potential toxicity hazards associated with solvent systems since they use water-rather than solvent-as the carrier. Additionally, the equipment used can be easily cleaned with soap and water, and their potential for "bleed through" is significantly lower because they do not contain solvents. Since water is an inexpensive solvent, cost is usually lower than solvent based coatings.

Finally, water-based coatings possess one additional advantage: they can be applied over damp substrates without significantly affecting their performance. There is no need to wait for a roofing surface to completely dry before applying a water-based roof coating, although a wet surface is not recommended.

The chief limitation of water-based coatings is the narrower range of atmospheric conditions conducive to application. First, they should not be applied at temperatures too close to freezing because the rate of water evaporation becomes so slow they may not dry properly. Normal low cut-off point for application of these coatings is 50 degrees F. Second, they should not be applied when rain or inclement weather is imminent.

Considerable progress in narrowing this application conditions gap between solvent and water-based coatings has been made with a recent introduction to the marketplace of systems with "quick set" properties. Coatings of this type can adequately withstand heavy dew or light rain shortly after application.

## **100 percent solids coatings**

The third, less common type of roof coating consists of 100 percent solids. Since these coatings contain virtually no solvents, they do not possess the limitations of the water- or solvent-based coatings. However, they do require special application equipment and are extremely sensitive to changes in application temperature as their ability to form a durable, long-lasting membrane is dependent on proper mixing ratios of the two components and reaction temperature. If incorrect, the coating may not adequately cure or may, possibly, gel prematurely, thus preventing the protective membrane from forming properly.

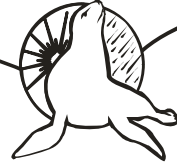
## **Four basic types**

There are four basic types of roof coatings on the market today based on different chemical technologies: Hypalon, elastomer, urethane, acrylic, and copolymers of polyvinyl acetate. None of these coating types is based on asphalt and should not be confused with resaturants or bituminous cut backs or emulsions.

Hypalon coatings are based on a material called chlorosulfonated polyethylene, and this type of coating is usually solvent-based. These coatings are normally supplied at low solids to maintain their viscosity at a level permitting application with a spray gun.

# Energy Seal Coatings

Acrylic Coatings for Roof and Wall Applications



Urethane coatings can be generally classified into two types: aromatic or aliphatic. Aromatic urethanes are not very durable and are used as base coats with the topcoat being a more durable aliphatic urethane or acrylic. Aromatic and aliphatic urethanes are usually supplied as solvent solutions and may be either one or two- component systems. The latter systems involve two separate materials, which must be mixed in a pot prior to application. The advantage of two-component coatings is their ability to cure more rapidly than their one-component counterparts. However, they require considerable skill in obtaining the correct ratio of the two components, and the quantity mixed must be used quickly before the pot life-usually several hours-has expired and the remaining product gels.

The 100 percent solids coatings are similar to the two-component urethane chemistry previously described. However, since they contain no solvents, they are not prone to the problems associated with typical solvent-based coatings. Urethane coatings are usually rather expensive relative to the other classes.

Acrylic roof coatings take advantage of the inherent durability of acrylics, and can be designed to be very elastic and flexible over a wide temperature range for a relatively modest cost. In addition, they are supplied as either water- or solvent-based products, although specialized acrylic coatings are available for roofs experiencing ponded water conditions.

Polyvinyl acetate copolymer-based coatings are also available for roofing applications. These water-based systems, usually inexpensive when compared to the other chemistries, are used where a white reflective surface over an existing roof is desired. However, because of shorter durability, they are not recommended where long-term tolerance for roof movement is required.

Liquid-applied roof coatings have proven themselves as useful tools for the roofing professional to restore and protect existing roofs. They can be extremely durable and used as the first-line of defense in the roofing envelope, offering further protection to other components below.

The coating selected should be a result of a detailed assessment of the type and condition of the roof, the desired benefit, the capabilities and prescribed uses for the coating, and the economic considerations of the individual job. Liquid-applied roof coatings provide a means of prolonging the life of an existing roof, and are often an effective alternative to reroofing.

William A. Kirm is in Chemical Specialties Research at Rohm and Haas Company, Philadelphia, PA.

## **Energy Seal Coatings**

All of our coatings are water-based, non-hazardous. They conform to all Air Quality Management Districts and Air Pollution Control Districts requirements for Volatile Organic Content in California, U.S.A.