



Assessing asphalt

Asphalt roof systems remain significant players in the industry

by Todd Ziem

Photo courtesy of GAF Materials Corp., Wayne, N.J.

During the past decade, a number of new roofing materials have entered the low-slope marketplace, providing building owners with a bewildering array of choices. Many single-ply membranes, such as EPDM, TPO and PVC, and spray polyurethane foam now cover buildings that originally had asphalt built-up roof (BUR) systems. Even “traditional” hot-applied asphalt is meeting increased competition from its own ranks. Modified bitumen membranes and cold-applied bitumen materials also compete for building owners’ attention.

In addition, during the past two years, the low-slope commercial roofing market has experienced unprecedented cost pressure relative to raw materials. Asphalt is no exception: volatility in pricing, as well as its perceived availability, have created a swell of concern as to whether hot-applied systems will remain a sound economic choice in the future. The reality is that at any time, asphalt must provide a sufficient return relative to fuels and other possible outputs. As long as this is the case, it is logical to assume refiners will continue to produce asphalt.

The good news is recent cost pressures on asphalt have had little effect on overall installed cost of these systems to building owners. Generally, the cost of asphalt remains a small percentage of total installed cost.

Despite these increased challenges, millions of square feet of commercial buildings still feature hot-applied asphalt BUR systems. There is a solid core of building owners, along with a network of roofing professionals, who continue to advocate hot-applied asphalt systems.

Some things that drive continued

demand for BUR systems include the desire by building owners for long roof system life cycles and the fact BUR systems are easy to maintain and perform well in severe weather.

Long life

An informal survey conducted in early 2006 of roof consultants and building owners commissioned by the Quality Asphalt Roofing Council (QARC) shows a high level of agreement that a well-maintained hot-mopped BUR system often lasts 20 years or more.

Of course, long life cycles appeal to building owners who have long-term interests in their roof systems. They have financial stakes in what often is a high-risk investment. If an owner can defer the replacement of a roof for 10 years or 15 years, the savings go straight to the bottom line.

The life expectancy of a BUR system, as with any roof membrane system, often depends on the commitment to routine maintenance on the part of the owner. Owners of large buildings generally employ maintenance staffs whose responsibilities include periodically inspecting roof system conditions. Maintenance staffs may enlist the services of professional roofing contractors for routine inspections and repairs. New tools now are available, including software and monitoring instruments, to simplify this task. Early detection is a key factor in roof system maintenance. Problem areas can be detected and fixed before they develop into leaks.

Inspections can reveal situations, such as a loss of gravel, which could lead to felt erosion or brittleness. Less commonly, punctures and cuts to the membrane can occur, so it is wise to remove sharp objects and debris from the roof. Clogged drains or poorly sealed flashings also present problems that are repaired easily. The effects of chemical exhausts on roofing materials should be monitored.

These and other preventive maintenance actions can help catch problems before they damage larger areas of the



For this roof system, the base sheet and ply sheets, as well as the modified bitumen cap sheet, were applied in hot asphalt. Photo courtesy of CertainTeed Corp., Valley Forge, Pa.

roof system. Inspections should be performed not only on aging roofs but also on new roofs to guard against errors in installation, design or specifications. Early detection of defects often is the key to extending roof system life.

Weather performance

Another reason building owners often opt for BUR systems is a hot-applied BUR system can offer better protection in severe weather than synthetic roof membranes.

For example, a BUR system has substantially greater mass than a single-ply system. A four-ply BUR system provides about 280 mils of waterproofing thickness whereas most single-ply systems average 60 mils or less. The multiple layers of a BUR system result in a thick, heavy membrane that can provide good protection against wind-uplift and penetration by wind-blown objects.

Also, multiple plies in a BUR system become an integral, or monolithic, membrane by virtue of the redundant layers bonded together by liquid asphalt. As a result, there are virtually no seams in a finished membrane assembly,

eliminating potential vulnerabilities in the membrane seam.

In addition, when asphalt is applied directly to a structural concrete roof deck or a hot-applied asphalt roof system is applied to an insulated roof deck, it is considered to be a fully adhered system. An important benefit of fully adhered systems is they distribute typical building stresses (such as wind load, vibration and flexing) over an entire roof membrane.

Single-ply systems that are not fully adhered have fasteners designed to hold a roof membrane in place, but events such as high winds can produce stress concentrations, or point loading, strong enough to compromise the integrity of the roof or tear apart the roof membrane.

Appropriate fasteners spaced closely together are used successfully in many roof systems. Liquid asphalt also adheres well when applied directly to certain surfaces, eliminating the need for fasteners. For example, asphalt can be applied directly to a structural concrete roof deck after priming. It often can be hot-mopped to thermal insulations though manufacturers' recommendations should



The Wichita Transit System facility houses buses and vans, as well as administrative offices. A gray color was used to enhance the appearance of the cap sheet because this facility is visible from a nearby highway that passes above it. Photo courtesy of CertainTeed Corp., Valley Forge, Pa.

be followed. Of course, liquid asphalt adheres well to the felts and base sheets used in the construction of a multiple-ply roof system.

Reports from heavily storm-damaged areas and actuarial data support the claim that BUR systems perform well in extreme weather. For example, the Roofing Industry Committee on Weather Issues (RICOWI) Inc. recently reported on investigations of wind-related damage to low-slope roofs from Hurricanes Charley and Ivan. (The complete report, titled “Hurricanes Charley and Ivan Wind Investigation Report, March 2006,” is available on RICOWI’s Web site, www.ricowi.com.)

The report includes detailed case studies and photographs of 93 low-slope roofs that experienced damage ranging from minor to extensive. Roof system types studied include standing seam, metal, single ply, modified bitumen and BUR. Case studies in the report show many instances of BUR systems withstanding severe weather. Wind speeds from Hurricane Charley, in particular, were in the 120-mph to 150-mph range, yet in

many cases BUR systems sustained only minor damage. In some cases, metal flashings were damaged but the BUR membrane remained intact.

Among other results, the report concludes: “All building envelope components are affected by weather-related aging; therefore, sufficient maintenance of buildings is important. The studies reinforce the need for secure roof edges, and codes that require secure roof edging need to be enforced. Wind-borne debris also was a major contributor to roof damage, and standards and enforcement are needed for attachment of all building envelope components (such as air-handling units) to reduce wind-borne debris.”

Although some instances of “gravel scour” caused by extreme winds were



For more information about ARMA and the Quality Asphalt Roofing Council, log on to www.professionalroofing.net.

observed on portions of gravel aggregate BUR systems, in most cases the BUR membranes remained watertight. Variables that affect a low-slope roof system’s ability to retain its aggregate surfacing include building height and geometry, parapet height, terrain surrounding the building, extreme wind conditions, climate at the building site and material application.

Several design options to remedy possible loss of aggregate are provided in the Asphalt Roofing Manufacturers Association (ARMA) technical bulletin “Aggregate Retention Enhancement for Built-Up Roofing in Extreme Wind Zones.” The bulletin recommends that the aggregate specified should conform to ASTM D1863, “Standard Specification for Mineral Aggregate Used on Built-Up Roofs.”

In addition, ARMA recommends all parapet walls and/or windscreens at the top perimeter of a building be designed to minimize rooftop aggregate loss. Another measure is to specify a double application of aggregate and pour coat with the removal of all loose aggregate following double application. Because of the additional weight of the second bitumen and aggregate surfacing layer, special consideration should be given to the structural design of the roof deck and potential for bitumen migration or slippage. In addition, mineral-impregnated modified bitumen cap sheets effectively can be used as top layers for BUR systems.

Installation

Proper training is essential to the management of a BUR system installation. The application of hot-applied asphalt requires a well-trained and skilled work force. At the same time, modern equipment is improving the quality of work, for example, by providing better control of asphalt temperature and viscosity during installation, as well as fume emissions.

Fume-recovery systems are used successfully during the application of asphalt roofing materials on schools, hospitals and other facilities where people

or specialized equipment are sensitive to fumes. But these systems are relatively new to the industry. After first appearing during the 1970s, they were reintroduced in the early 1990s after much redesign and testing. These systems either burn up the smoke and fumes or capture them on filters. There are three basic types.

The first type has an afterburner attached to a regular kettle lid. It can be retrofit to existing kettles or installed at the factory on new units. This system includes a safety device for loading. The second type has a burner that is separate from the kettle and connected to the kettle by a metal hose, which pulls the smoke and fumes into a fume-recovery unit. The third type also is separate from the kettle and connected with a metal hose. It uses a fan to pull the smoke and fumes into filters. In this case, a roofing worker periodically must dispose of the filters.

Energy efficiency

Energy efficiency is another issue building owners consider when choosing a roof system. Building owners are becoming more concerned with energy efficiency of roof systems as local and state building codes mandate higher levels of energy efficiency for building envelopes.

Even though asphalt-based roof systems traditionally have not been regarded as offering high reflectivity or emissivity, some building owners still would prefer a BUR system to another system despite the energy-efficiency issue.

In the QARC survey, reflective “cool” roof coatings did not rank high as a concern for building owners and roof consultants. A relatively small number of building owners and roof consultants agreed with the statement “Reflectance issues deter me from specifying or installing a BUR or MB system.” Most either were neutral or disagreed with this statement.

Reflectance of asphalt-based roof systems is becoming less of an issue now that reflective coatings are available for BUR systems and reflective modified



Winds of 50 mph to 100 mph are common at the Coast Guard Naval Air Station on Kodiak Island, Alaska. This facility was used to house fighter planes in the 1940s and now houses Coast Guard airplanes and helicopters. Two historic hangars with a total area of 1,480 squares are covered with a smooth-surfaced APP-modified bitumen roof membrane capped with a mineral-surfaced APP-modified bitumen cap sheet. The membranes were torch-applied. Photo courtesy of CertainTeed Corp., Valley Forge, Pa.

bitumen cap sheets can be installed over BUR systems. In fact, the reduction in roof temperatures that results from these steps only helps improve expected life cycles of BUR systems.

Although a smooth-surfaced, uncoated BUR system has a solar reflectance of about 5 percent, aggregate may be used to increase this number, but covering aggregate with a white coating can boost its reflectivity to roughly 55 percent to 60 percent.

A white coating applied to a smooth-surfaced BUR system increases the initial reflectance to about 70 percent. Reflectances for asphalt aluminum roof coatings range from 30 percent to 60 percent. An asphalt emulsion can be used to stabilize the surface for application of acrylic white coatings over smooth BUR systems, preventing slight asphalt flow, which could lead to surface cracking or bleed-through on an acrylic coating.

It is important to note reflectivity is not the only thing that contributes to an energy-efficient roof system. Insulation plays a crucial role in energy savings and can be an important component in compliance with key state-driven initiatives to optimize energy efficiency and reduce energy usage of commercial buildings

during peak months. The best way to reduce energy costs is to understand the trade-offs between insulation and reflectivity and adopt a whole-building approach. The use of adequate insulation in building design often reduces concerns about reflectivity with regard to asphalt-based roof systems.

Still strong

Every roofing project is different. A majority of low-slope commercial buildings are candidates for asphalt roof systems whether those roof systems are traditional hot-applied BUR, modified bitumen or a combination of the two.

Manufacturers of competitive roof systems may fuel speculation that BUR systems are obsolete. But multiple-layer asphalt roof membranes have great appeal to building owners and will continue to play a major role in the high-quality segment of the market where building owners demand systems that offer maximum performance and roofing contractors are willing to supply them. 🌀🌞❄️

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