

# COLD-APPLIED SYSTEMS HEATING UP BITUMINOUS ROOFING MARKET

BY TERENCE J. O'CONNOR

*Many building owners find cold-applied modified bitumen systems to be an effective alternative to traditional hot mopped BUR roofs.  
(Photos courtesy of Firestone Building Products)*

**R**ecent innovations in adhesives have made cold-applied, built-up roofing (BUR) and modified bitumen systems increasingly attractive alternatives for building owners who prefer asphalt systems but are limited by local building code restrictions. Cold-applied bituminous roofing systems include the same basic components as traditional asphalt-based systems: multiple reinforcement plies combined with a waterproofing agent. However, in cold-applied systems, a solvent-based adhesive replaces hot asphalt between the multiple reinforcement layers. A variety of high-performance, cold-applied bituminous systems is now available, from systems installed by saturating multiple plies of felt (cold BUR) to those that bond polymer-modified bitumen membranes with cold-applied adhesive.

## Forces Driving Growth

Recent commercial roofing industry studies estimate that nearly 10 percent of all BUR and modified bitumen roofing systems are cold-applied, and the market share claimed by this segment is projected to increase in coming years. Factors contributing to the rapid growth of cold-applied system installations include heightened environmental regulations, increased site accessibility, reduced liability insurance costs, lower overall system costs, and potential labor savings.

**Environmental Regulations:** More and more regions of the country are seeking to improve air quality through the reduction of fumes and volatile organic compounds (VOCs). Among the environmentally friendly asphalt roofing systems and accessory options are cold-applied BUR, SBS, and APP systems, low VOC asphalt adhesives, disposable pail liners, and recyclable adhesive totes.

**Site Access:** The equipment and materials required for a proper roof installation often prohibit the specification of traditional, hot-mopped bituminous systems on buildings with limited roof accessibility.

**Liability Insurance:** To lower liability insurance costs, contractors are often called upon to reduce risk factors. With cold-applied systems, contractors can eliminate open flames on the roof by using adhesives for the system installation and hot air welders for seaming. Cold-applied systems also remove the need to attend hot asphalt kettles or tankers, providing better and safer working conditions for the crew.

**Cost and Labor Savings:** When adhesive is purchased in volume, cold-applied bituminous roofing systems can be extremely cost efficient. Moreover, when compared to traditional asphalt systems, cold-applied systems reduce the impact of labor cost on the roofing installation.



*Workers install an SBS cap sheet and polyester-reinforced SBS smooth membrane with modified bitumen cold adhesive over an MB base sheet. Seams are heat-welded.*



## Cold-applied BUR Systems

Built-up roofing systems have been a part of the commercial roofing industry since the 1850s. Recent advancements (such as the availability of high-quality cold BUR systems) have sparked a resurgence of interest in the time-tested systems. Cold BUR systems can often be installed where hot asphalt is inappropriate. Additionally, when the waterproofing agent is sprayed, installation labor is decreased. Aside from labor cost savings, safety is increased by eliminating the risk of kettle burns and the need for crew members to lift asphalt kegs or use axes to open asphalt cartons.

Just as in traditional BUR roofs, cold-applied BUR systems consist of three or more layers of reinforcing felts embedded in waterproofing material. Felt reinforcement specifications for cold BUR system may include: glass felt plies and glass scrim, which are covered by ASTM D-2178, D-4601 (for ply and base sheets respectively), or polyester mats and polyester scrim laminates, which are covered by ASTM D-5665.

In addition to specifying high-quality reinforcing felts, choosing the correct waterproofing agent is necessary to ensure the long-term performance of a cold-applied BUR roof. The asphalt-based solvent (or "cutback") provides the bonding agent for the felts, as well as the waterproofing material for the roofing system. Asphalt-based solvents have been on the commercial roofing market for about 75 years in applications ranging from patches or quick repairs to fully engineered systems. Cutbacks consist of asphalt combined with solvents, such as mineral spirits, toluene, and xylene. While cutbacks are available with or without reinforcing fibers, cellulose, glass, and other common fibers can help add to the body and strength of the cured adhesive. Fillers, such as limestone or talc, add body and fire retardance.

When selecting a cold BUR system, specifiers should ensure

the following:

- Compatibility between the waterproofing agent and the reinforcement;
- Complete saturation of the reinforcement;
- Total solvent migration and evaporation;
- Good adhesion to various substrates; and
- Compliance with applicable fire and wind ratings.

Specifiers should also keep in mind that installations involving cutbacks typically require warm weather and time for solvent dissipation. To maximize system performance, the asphalt-based solvent must be applied consistently and allowed to flash off. And, during this flash-off period, the system cannot be walked upon. Another important specification consideration for all BUR systems (cold and hot) is redundancy. Multiple plies of felt increase the strength and critical mass of the built-up roof, which increases the durability of the system.

## Cold-applied Modified Bitumen Systems

Modified bitumen roll roofing systems encompass a wide range of reinforcements, surfacing materials, coatings, and formulations, but every system shares the same basic characteristic:

the bitumen is modified with a polymer to enhance performance characteristics. The addition of a polymer, such as synthetic rubber, further improves the performance of the bitumen by raising the softening point and improving elongation. The adhesive properties, ductility, and penetration resistance of the cutback can also be improved with the addition of a polymer.

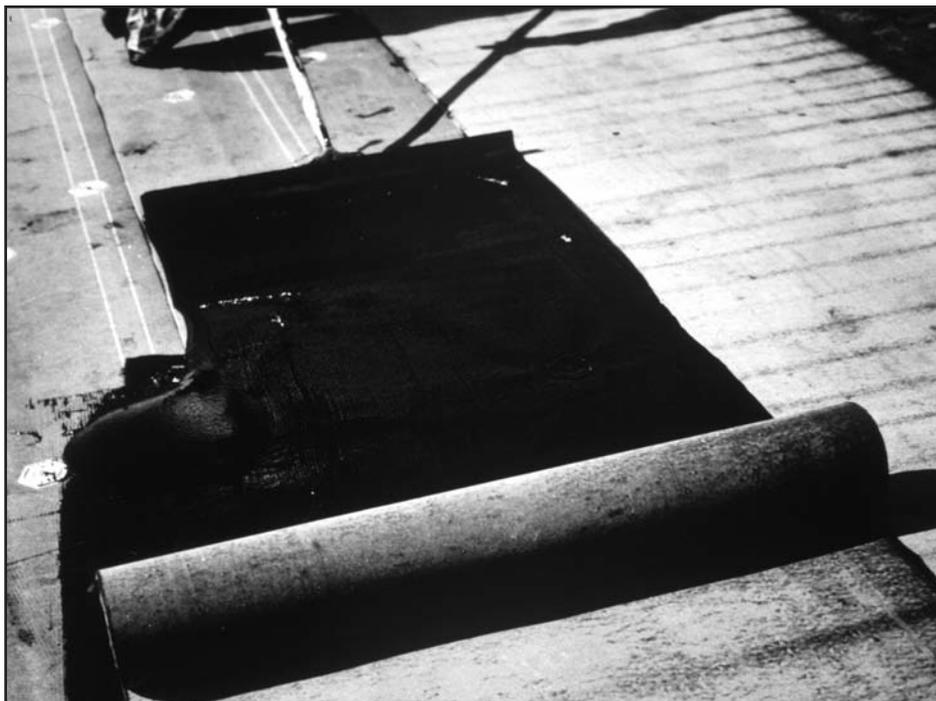
While the bituminous component of each modified system is asphalt, the most commonly used polymers are either atactic polypropylene (APP) or styrene-butadiene-styrene (SBS), both of which impart different properties to the asphalt membrane. APP and SBS modified bitumen roofing systems comprise roughly half of the total bituminous roofing systems installed in the U.S. today. Although most APP systems are torch-applied and the majority of SBS systems are hot-mopped, cold-applied systems are on the rise. Cold adhesives are now being used to install both APP and SBS modified bitumen systems but are more commonly used in conjunction with SBS.

The asphalt cutbacks used to install modified bitumen systems feature many of the same characteristics as those used for cold BUR. The cutbacks, however, may be higher in viscosity and include less solvent, as ply saturation is not a necessity for modified bitumen roll systems. Today's cold-applied modified bitumen adhesives typically contain a higher proportion of solids than in previous years and are often designed using solvents based on mineral spirits, which will not attack or disturb asphaltic SBS blends. Mineral spirits are much more compatible with SBS membranes than xylene or toluene solvents and emit fewer odors. In addition, thixotropic adhesives are preferred for cold-applied modified bitumen roll system installations. The gelatinous state of these adhesives will thin dramatically when pumped or worked. Once applied, however, the high viscosity of the thixotropic adhesive quickly returns, preventing slippage of the sheets.

Recent innovations in reinforcement technology for modified bitumen membranes, such as glass-reinforced polyester, are expected to further enhance the long-term roofing system performance of cold-applied SBS systems. For example, SBS membranes featuring a new glass-reinforced polyester fabric offer the best properties of both glass fiber and polyester, providing superior flexibility, strength, puncture resistance, and dimensional stability.

Specifiers should note that cold adhesives can only be used with sand- or talc-backed membranes. Membrane sheets with polyolefin burn-off film cannot be cold-applied. And, while cold-applied modified bitumen systems are ideal for many unusual or difficult-to-reach roof locations, cold adhesive applications should not be used on high slope roofs unless appropriate back-nailing has been implemented.

It is also important to realize that the elimination of the kettle does not diminish the role heat plays in creating watertight



*A squeegee is one method for applying cold adhesive products. Spray-applying is also appropriate.*

security for cold-applied modified bitumen systems. The dependable, long-term performance of many cold-applied modified bitumen systems still requires side laps, end laps, and flashing to be installed with heat. Depending on the specification, this can be accomplished with either a robotic hot air welder or propane torch. Local regulations or contractual agreements often prohibit the use of an open flame torch, which then gives rise to the hot air welding necessity. However, even when open flame restrictions are not in effect, the preference for robotic welders is increasing due to the cleaner, safer, and more consistent heat source the technology can provide.

In addition, new ASTM material standards covering nearly all polymer-modified bitumen membranes have been published recently. Building owners and specifiers should make sure the manufacturer they choose is in compliance with the new product and labeling standards and that the adhesives and membranes are tested and designed to complement one another.

#### **New ASTM Standards for SBS**

ASTM D-6162 (glass and polyester combination)

ASTM D-6163 (glass reinforcement)

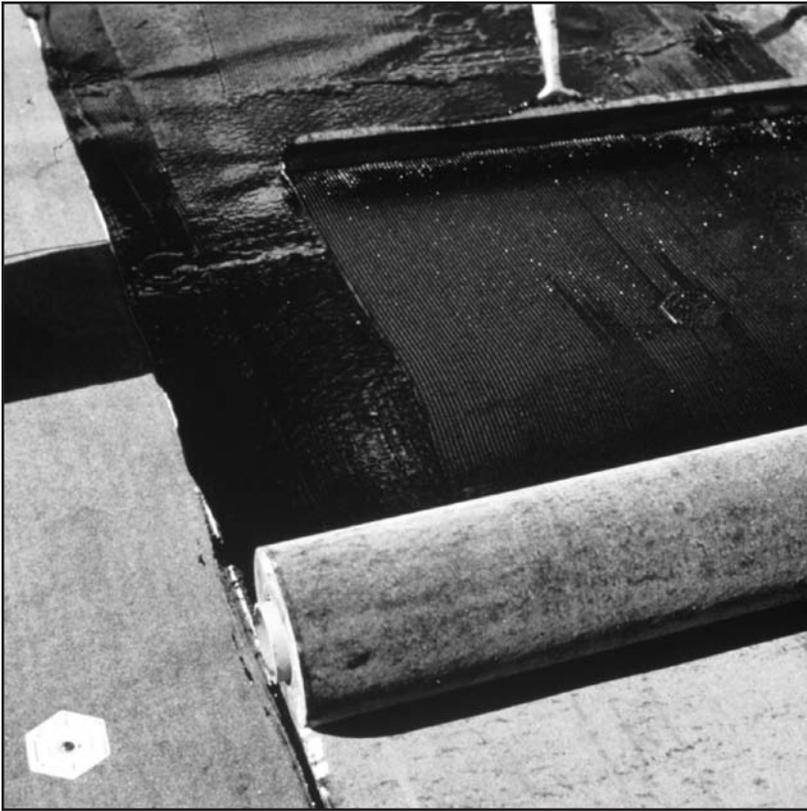
ASTM D-6164 (polyester reinforcement)

#### **New ASTM Standards for APP**

ASTM D-6222 (polyester reinforcement)

ASTM D-6223 (glass and polyester combination)

Specifiers should also note that several manufacturers offer cold-applied modified bitumen systems that meet UL Class A and FM 1-90 standards, but the system specifications vary by manufacturer. All manufacturers of UL Class A and FM 1-90 approved systems require that the membrane have no burn-off



*Cold process systems permit uniform adhesive application and even roll repositioning if necessary.*

film against the adhesive and that only sand- or talc-surfaced membranes be cold-applied. Most manufacturers market systems that are VOC compliant nationwide (<250g/liter of solvent) and offer both field and flashing grades of adhesive, which can be spread with a squeegee or sprayed. While cold-applied SBS systems are fairly prevalent in the product lines of most major manufacturers, only a few companies also offer cold-applied APP systems. Some manufacturers allow cold adhesives to be used to bond insulation to concrete and adhere laps or flashings, while others do not permit these application techniques. There are even differences in the maximum number of applications of adhesive allowed per system, but one or two applications are the most common.

## **Installation Considerations**

Cold adhesives for BUR and modified bitumen systems can be applied manually using five-gallon pails of adhesive, squeegees, seaming equipment, and lap rollers, or mechanically applied using 55-gallon drums, 300-gallon totes, or small tankers for adhesive and spraying equipment capable of pumping high viscosity adhesive.

Both application techniques have their advantages; determining which to specify depends on the parameters of the project. Manual applications require few tools and roofing crews can learn proper installation techniques quickly and easily. However, mechanical installations can be more consistent in cold weather.

Manual applications are ideal for sites offering limited access, while mechanical applications are best suited to large roofs. Compared to hot BUR installations, both manual and mechanical applications offer reduced labor costs, but mechanical applications are especially competitive, as costs can be leveraged when purchases are made in bulk.

Product innovations (such as disposable pail liners and the introduction of fully recyclable metal totes for larger installations) have enhanced the quality of adhesive applications. When the recyclable metal totes are empty, they can be sealed and returned to the adhesive manufacturer to be refilled. Spray units have also been improved, offering a more uniform application of heavier mastics. Pre-heating enables mastic to be applied at a uniform temperature and viscosity, which provides consistent



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coverage, even in cold-weather applications. A number of manufacturers now offer such spray units. They usually consist of a displacement pump and a hydraulic system. Most have heating units that heat (thermic) hot oil through which the adhesive is circulated and a dispensing hose, which may be up to 400 feet long. There may also be a gasoline generator on board, eliminating the need for electric feed.

## Total System Specification Key to Performance

More often than not, the building itself dictates the appropriate specification. The best way to begin the roofing system selection process is to evaluate the building based on: location, physical characteristics, building structure, roof attributes, and how the building is used. Building owners can maximize the long-term performance of their roof by evaluating these factors and choosing quality products specifically engineered to be integrated and installed as a complete roofing system. A manufacturer who offers one source for every roofing need can provide the most important factor of all—investment security.

Today's asphalt roofing systems merge time-tested, quality performance with the latest industry advancements in ply felts, asphalt blends, reinforcement technology, and cold-applied adhesives. For building owners and specifiers evaluating asphalt roofing systems, several key advantages of cold-applied systems should be considered:

- Reduced labor requirements for installation;



*This building has a glass-reinforced base sheet SBS with a glass-reinforced polyester SBS FR cap, applied with a cold adhesive by squeegee from five-gallon pails.*

- More consistent application of waterproofing agent;
- Preferred by professional contractors due to reduced insurance liability, labor requirements, and safety issues; and
- Provides an environmentally responsive asphalt option.

Once a cold-applied modified bitumen system is determined to be the system of choice for a given project, the system should be specified as a whole and installed by a qualified applicator. The performance of any roofing system can be optimized when all the components are selected based on how they can be integrated and installed as part of a total roofing system.

Each component of a roofing system affects the performance of the others. As a result, there is a considerable compatibility

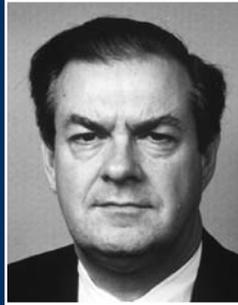


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and long-term performance advantage when the membrane, insulation, adhesives, and any other system components are manufactured by a single source. Building owners and contractors also benefit from having just one source of accountability for system performance. ■

## ABOUT THE AUTHOR

**Terence J. O'Connor** holds a bachelor of science degree in chemistry, a master of science degree in organometallic chemistry, and has pursued continued graduate studies in organometallic chemistry at British and Canadian universities. He has been involved in commercial roofing since 1976, and holds six U.S. patents for membrane reinforcement, insulation facings, and roof fastener design. O'Connor has been an active member of the American Society for Testing and Materials (ASTM) since 1979, and was active for over 13 years with the Canadian General Standards Board. He is currently a board member of the Asphalt Roofing Manufacturers Association (ARMA) and has been with Firestone Building Products as product manager for asphalt roofing systems since 1997.



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# International Code Soon To Become Reality

The widely-supported construction industry objective of a single set of comprehensive, coordinated national model construction codes will become reality in 2000 with the publication of three new International Codes and updated editions of existing International Codes.

In 1994, the three model code organizations in the U.S. responded to the challenge of one set of codes by creating the International Code Council. By February, the following code books will be available: *The International Building Code*, *International Fire Code*, *International Residential Code*, *International Plumbing Code*, *International Private Sewage Disposal Code*, *International Mechanical Code*, *International Fuel Gas Code*, *International Property Maintenance Code*, *International Energy Conservation Code*, *International Zoning Code*, and *ICC Electrical Code*.

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