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Cover boards enhance roof system performance

Recover boards are becoming more popular for hot, mod bit and single-ply roofing applications

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Need to know info

- Manufacturers recommend using recover boards over polyiso, but they are rarely required.
- Some recover boards can dramatically enhance the fire and wind performance of roofing systems.
- Recovering an existing roof with an Underwriters Laboratories "P" series classification can cancel out this important fire rating.



Dens-Deck Prime roof board is compatible with hot roofing applications, including torch-down modified bitumen. This roof is being installed by Industrial Tech Roofing of Cleveland.

(Photo courtesy of G-P Gypsum, Atlanta)

In March 2000, the National Roofing Contractors Association (NRCA) issued Technical Bulletin 2000-3, recommending the use of a cover board over polyisocyanurate roof insulation in all low-slope applications. However, what appeared to be a boon to cover board sales has actually had very little effect.

Roofing manufacturers recommend adding a cover board over polyiso, but rarely

require it, as the additional cost can make their systems non-competitive.

The good news for cover board makers is that the roofing industry is finding that there are many other uses for these products besides protecting polyiso roof insulation. Both overlayment and underlayment boards can dramatically enhance fire and wind resistance and add compressive strength to the entire roofing system. New facers and composite insulation technologies also promise to improve product performance while reducing labor costs for the contractor.

Protecting polyiso

Polyiso remains, by far, the most widely used insulation in the low-slope roofing market. In addition to its light weight and high R-value per inch, it tests positively for wind and fire in a single layer over a steel deck with just about any roofing system available today.

In its bulletin recommending a cover board over polyiso, NRCA admitted that there have been no problems with the vast majority of roof assemblies that include the product. However, the association said it had received a significant number of reports of problems, often involving large roof areas. These problems reportedly included facer delamination, edge cavitation, cupping, bowing and shrinkage—all problems that could be avoided if a cover board was used.

NRCA also expressed concern with the then-current American Society for Testing and Materials (ASTM) standard C1289 for polyiso. Among other things, no requirements for curing time was present in the standard, and uncured products are more prone to develop problems in the field. The compressive strength mandated in the standard (16 psi for Type II polyiso) was also thought not to be high enough to protect the insulation from being crushed in certain applications.

ASTM has released a revised standard (see Sept. RSI, page 11). It contains three categories of polyiso (16, 20 and 25 psf) and changes the dimensional stability requirement from 4% to 2%.

Some industry observers are still concerned that the new generation of blowing agents required by the HCFC-141b phase-out will alter the performance of polyiso. In-situ testing by polyiso suppliers of products

Rating roof cover boards

■ *The product summaries listed below were compiled from a variety of sources, including manufacturers' literature. The "five-star" rating system is purely subjective and based on interviews and research. A one-star rating can be interpreted as "poor," with five stars being superior or excellent. Any comments on these ratings should be e-mailed to mrusso@advanstar.com*

Wood Fiberboard

■ The "king" of cover boards, about two billion square feet of this product has been installed in roofing applications. Inexpensive and easy to find, wood fiberboard is a true utility board that is also used for sheathing, acoustical and interior

applications. Available since 1928, it has been used extensively with built-up roofing from the 1930s through the early 1970s. Over the years, manufacturers have attempted to improve the moisture and fire resistance of the original product, with the coated, high density version best for roofing applications.

Cost	★★★★★
Fire resistance	★★★
Moisture resistance	★★
Hail resistance	★★★
Compressive strength	★★★
Ease of handling	★★★
Hot roofing compatible	★★★★
Available tapered?	Yes

using the new blowing agents show no evidence of problems, but some feel using a cover board might be cheap insurance on larger jobs incorporating the newest polyiso products.

While contractors recognize the importance of protecting polyiso from hot asphalt, foot traffic has been less of an issue over the years. However, when foot traffic is heavy, it can affect the facer bonded to plastic foam insulations like polyiso. It is the facer that gives these insulations their strength, and foot traffic can have a negative effect on the bonding of the foam to the facer. As foot traffic increases, so does the chance of collapsing the blown foam cells in the insulation and jeopardizing the bond between the facer and foam.

It's fairly common to see older EPDM roofs laid directly over a single layer of polyiso where foot traffic has worn "paths" into the roof, particularly around rooftop ladders. This phenomenon is usually not a major performance concern and can be alleviated by using pavers. The point is that this damage occurs under normal—not excessive—rooftop traffic. When roof traffic is high, a cover board

spreads the load and protects the board.

For an architect or building owner who's paying for high R-value in a lightweight board like polyiso, it often pays to specify a cover board to protect it. From a life-cycle cost perspective, it's a small investment to make to increase the life expectancy of the roof.

Roofing system suppliers have, meanwhile, dutifully passed on NRCA's cover board recommendations in their literature, but using a cover board over polyiso is not required for a warranty. The only exceptions to this are a few long-term single-ply warranties, particularly if the membrane is fully adhered.

Roofing contractors are even less likely to follow NRCA's recommendations in the field because the extra cost of a cover board can often cost them the job in today's highly competitive market.

NRCA Bulletin 2000-3 remains a document with few, if any, teeth. According to RSI's 2001 State of the Industry Report, 56% of contractors feel it is not necessary to use a cover board over polyiso in all applications. Of those responding, 72% were NRCA members.

What makes a good cover board?

Because recovering an existing roof is a step-by-step process and the building is usually occupied, speed is often less important than maneuverability and product versatility. This means the ability to cut, fit and conform the cover board to existing slopes and substrate irregularities.

Conformability is particularly important if an existing gravel-surfaced roof has only been swept and vacuumed and not completely de-graveled. The cover board should also be compatible with hot asphalt, torches and solvents, depending on the new roof being installed.

The method of new roof attachment also impacts the choice of cover board. Fully adhered single plies require a fairly dust-free environment and a fibrous surface to bond to, so perlite might not be the best choice here. Also, cover boards with an asphalt-impregnated surface should not be used with plasticized PVC membranes, as PVC is not compatible with asphalt.

High density coated wood fiber is an ideal cover board, and the industry apparently agrees. More than two billion square feet of this product have already been installed in the U.S. roofing market. In terms of cost and availability, wood fiber is hard to beat.

Wood fiber does have its limitations. While there are no cover boards available that are immune to the effects of a roofing torch without a mopped or nailed base sheet, wood fiber would be the worst choice when torching, as it smolders. This can result in a serious after-hours fire.

A second concern with wood fiber is its sensitivity to moisture. There are usually some areas in the old roofing system that contain moisture. If this water finds its way into the new system, it helps if the cover board is able to retain or recover strength after moisture exposure. For wood fiber, this is a problem.

Perlite is an excellent cover board to use over built-up roofing, and its characteristics as part of a fire-rated system are good. High density products also offer contractors a firm surface to mop or torch to. But like wood fiber, it is moisture sensitive and tends to come apart under load. Perlite is also not hail-resistant. And as far as handling

Perlite

■ This mineral aggregate board is composed of particles of expanded perlite or vermiculite, selected cellulose binders and sizing agents. It has good fire resistant characteristics and gained a large share of the market in the middle 1960s and 1970s. It was also popular as a substrate for less fire resistant polyurethane roof insulations. There are two types of products available today: 3/4-inch and thicker roof insulation, and the 1/2-inch recover board with more cellulose for strength, but poorer moisture resistance and fire resistance. Fire resistant cants are also available for use in torch-applied flashings. Johns-Manville recently purchased a perlite plant from GAF Materials Corp. and is now the primary supplier of this product to the roofing industry.

Cost	★★★
Fire resistance	★★★★
Moisture resistance	★★
Compressive strength	★★★
Hail resistance	★★
Ease of handling	★★
Hot roofing compatible	★★★★
Available tapered?	Yes



After the previous roof membrane was removed from the five-star Broadmoor Hotel in Colorado Springs, 1/2-inch DuraBoard insulation was applied. Two plies of APP modified bitumen were then heat welded to the perlite board without the need for an additional base sheet. (Photo courtesy of Johns Manville, Denver.)

How roof boards affect fire ratings

Noncombustible roof boards like gypsum and perlite can significantly enhance the fire resistance of today's roofing systems. However, indiscriminately adding either a cover or underlayment board as part of a reroofing system can also have a negative effect on fire ratings.

Publicly-occupied buildings like schools and offices often require an Underwriters Laboratories (UL) "P" series timed fire rating. This test measures fire resistance from the inside to the outside of the building. Typically, the roof deck must maintain its structural integrity for at least one hour to allow occupants to evacuate the building. Hence, the term "one-hour rating."

Noncombustible roof boards are often placed directly over a steel deck to shield

the new roofing system from an inside fire and help meet the "P" series requirements. However, when additional insulation and roofing materials are placed over the top of the existing system when reroofing, contractors run the risk of canceling out the original "P" series rating because they are adding more "fuel to the fire" by recovering. Adding more insulation during reroofing traps the heat inside the building and can adversely affect the integrity of the steel deck.

This is why some industry observers were concerned when the National Roofing Contractors Association (NRCA) recommended a cover board be used over polyiso in all roofing applications. If the contractor isn't careful, the addition of a combustible cover board like wood fiber or fiber glass could adversely affect an existing one-hour,

timed fire rating.

In fact, UL has only a few reroofing assemblies that qualify for a "P" series number. If the existing deck is concrete, there should not be a problem when reroofing, but most school construction is steel frame. In these cases, every element of the recover system being added must be classified by UL.

In some cases, the existing roof has to be torn off down to the deck and a new "P" assembly built from scratch. Or, permission may be given to put a fire separation layer like gypsum board between the old and new roof. Typically, local building departments and codes rule on this. Finally, a sprinkler system can be added to the building, but this is often cost-prohibitive. After all, the whole point of reroofing is to save money for the building owner.—*Mike Russo*

Gypsum

- While paper-faced gypsum has seen some use in the roofing market, the Dens-Deck line from G-P Gypsum is the dominant gypsum-based board currently being used in the roofing market. Unlike other cover boards, Dens-Deck was designed specifically as an overlayment or underlayment for its fire resistant properties and superior compressive strength. It is currently available in 1/2 and 5/8 inch thicknesses—and various composites—from a variety of manufacturers. Compared to other roof boards, Dens-Deck remains a cutting edge product that will continue to evolve.

Cost	★★★
Fire resistance	★★★★★
Moisture resistance	★★★★
Compressive strength	★★★★★
Hail resistance	★★★★★
Ease of handling	★★★
Hot roofing compatible	★★★
Available tapered?	No

characteristics, it's a dusty, fragile product.

Fiber glass insulation has also been used as a cover board, mostly for hot-mop applications. Despite its low compressive strength, this product was one of RSI Contributing Editor Dick Fricklas' favorites.

"In my personal opinion, glass fiber was best," Fricklas says. "It's conformable, inorganic and fire resistant. The paper facer was also easy to work over. It held water, but dried out well."

But there are some caveats to using fiber

glass as an insulation, according to Fricklas. Among them are low compressive strength and minimal hail resistance. Fiber glass is also a poor choice when using torch-applied modified bitumen, and its weak peel resistance limits its use with single-ply systems.

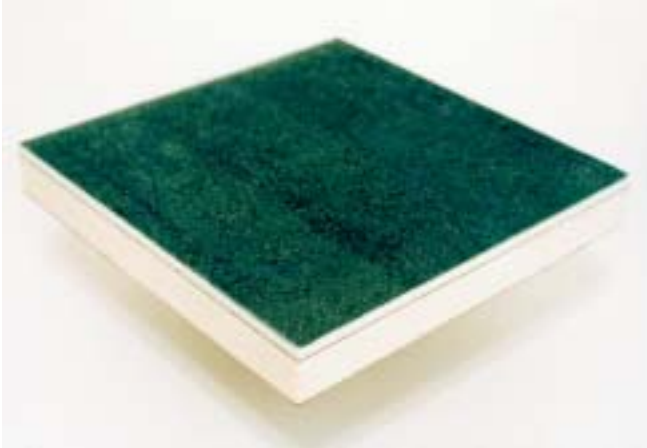
Other cover board options include rock-wool, plywood and paper-faced gypsum, but these products have only played a minor role in the reroofing market.

New products, composites

Most roofing contractors are probably familiar with the Dens-Deck line of roof boards. The original product, a 1/2 or 5/8 inch gypsum board with a glass mat surfacing, offered impressive compressive strength and moisture and fire resistance. Over the last few years Dens-Deck's supplier, G-P Gypsum, has realized the potential of this product and has made a big push in the roofing market. Currently, hundreds of millions of square feet of Dens-Deck have been installed in roofing applications.

A new product, called Dens-Deck Prime, was also recently introduced. It features a non-asphaltic, integral surface treatment for an enhanced bond and reduced fastener usage.

The strategy behind this product's introduction is to reduce labor costs for the



Isocyanurate/gypsum composites should add more strength and wind uplift resistance to today's roofing systems. Shown here is AcFoam Composite/G-B. (Photo courtesy of Atlas Roofing Corp., Atlanta, GA.)

roofing contractor. The glass fiber surfacing on the board is now encapsulated, making it easier to bond to. According to the company, adhesive use can be reduced by up to 50% when installing fully-adhered single-ply systems. The board also allows more uniform drying of the adhesive.

In modified bitumen applications, it minimizes or eliminates the need for field

applied primers and provides a stronger, more consistent bond. The new board also improves the pull-through values of fasteners, above and beyond the already prodigious performance of regular Dens-Deck. Recent testing confirmed the manufacturer's contention of the strength of the board.

Based on recent tests conducted with Factory Mutual Global, use of Dens-Deck can cut fastener usage almost in half, resulting in significant labor savings for the contractor.

For example, while a 4x8 foot wood fiber board requires 15 to 18 fasteners to achieve a 1-90 wind uplift rating, Dens-Deck only requires 11 fasteners. With Dens-Deck Prime, the fastener count is now down to eight when using modified bitumen and built-up roofing.

Recent testing conducted by the manufacturer and trade association SPRI saw Dens-Deck resisting 150-180 pounds of uplift pressure, thanks to increased fastener pull-through values and superior membrane bond and compressive strength.

Like perlite, Dens-Deck is noncombustible and contributes significantly to the fire resistance of the roofing system. When used as a cover board, the product resists topside burn through and spread of flame. When installed on the bottom side of the

// Fiber glass is conformable, inorganic and fire resistant. But compressive strength and hail resistance is low. //

Fiber glass

■ Composed of inorganic glass fibers bound by a resinous binder, fiber glass continues to be available in rigid board form exclusively through Johns Manville. These boards are surfaced with asphalt and kraft paper to provide an impact-resistant mopping surface for hot applications. Glass fiber is also dimensionally stable and able to resist warping, buckling and shrinking. However, it is not compatible with torch-applied systems and can only be mechanically attached with special fasteners. It can be a good cover board, however, as it is more conformable than other products.

Cost	★★★
Fire resistance	★★★
Moisture resistance	★★★
Compressive strength	★★
Hail resistance	*
Ease of handling	★★★
Hot roofing compatible	★★★
Available tapered?	Yes

roof assembly over the structural deck, it helps the roofing system meet Underwriters Laboratories (UL) "P" series of timed fire ratings (see box on page 24). In addition, if there are slopes on the roof that exceed the maximum allowed for a UL Class A rating, adding even 1/4-inch Dens-Deck can maintain the Class A fire rating of the roof system.

While Dens-Deck may sound like the perfect cover board, it may cost slightly more than other products. Contractors must also adhere to the manufacturer's recommendations when installing it with hot-mopped and torch-applied roofing systems.

Other new insulation products include polyiso/Dens-Deck composite boards. In addition to the obvious benefits of installing a high R-value insulation and cover board in one step, this composite features even greater strength than using gypsum alone. The composite board adds more rigidity to the entire system and is expected to achieve impressive wind uplift ratings. [RSI](#)