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Cover Boards

Across Canada and the United States, the incorporation of cover boards in low slope roofing applications is common practice. Cover boards, or overlay boards, are thin, normally homogeneous materials, formed into boards and used over roof insulation to provide protection to the insulation during installation and service and to enhance the performance of the roofing assembly. Traditional materials that have been used as cover boards are wood fibre, perlite, mineral and glass fibre. Today, however, we see a wide array of other board materials being promoted for use as cover boards. These include cementitious board, asphaltic core board, and glass-faced gypsum board. Even some of the more traditional materials now come with specially factory applied facers intended for use in torch-on membranes or to enhance adhesion under other membrane systems.

The increased use of cover boards has, to a large extent, corresponded with the increased use of cellular plastic foam roof insulations in low slope roofing. Cover boards, when applied properly, can mitigate some of the problems associated with the application of built-up, modified bitumen and other hot process roofing such as blistering and ridging of the membrane system, and crushing, melting or delamination of the facers of the underlying insulation. However, there is some evidence that even in non-traditional roofing, such as loosely laid and ballasted, mechanically attached, and cold adhesive applied systems, the use of cover boards may help avoid potential performance problems.

Benefits of Cover boards

a) During installation, and in service, the roof may be subject to a variety of loads from traffic, snow, rain, hail and wind. Depending on the properties of the insulation below the membrane, damage may occur from these loads as a result of the deformation or even crushing of the insulation. This may lead to the formation of blisters and ridges, voids and vapour traps below the membrane, membrane and facer delamination and a reduction of the insulation's thermal resistance. A cover board acts to protect the insulation from mechanical damage by distributing the loads over a wider area thereby reducing the potential for such damage.
b) Insulations such as polystyrene are susceptible to damage from the high temperatures associated with hot asphalt or torch applications. To protect such heat sensitive materials, a cover board is usually applied over the insulation prior to the application of the membrane.
c) Cover boards can also reduce the risk of performance problems associated with condensation within the roof assembly. By offsetting the joints of the cover board over the joints of the underlying insulation, the risk of condensation occurring at joints can be virtually eliminated. When adhered over insulation that is mechanically fastened to the deck, a suitable cover board can also prevent the potential of condensation at the fasteners due to thermal bridging.
d) Some insulations are adversely affected by the solvents in the adhesives used to adhere various membranes. A suitable cover board can protect the insulation below from damage due to solvent attack or chemical incompatibility (*See CRCA Technical Bulletin Volume 45, "Chemical Resistance of Single Ply Membranes*").

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e) Cover boards can act as a moisture buffer between the insulation and the membrane. It has been shown that one of the causes of blistering of built-up membranes applied over cellular foam insulations is a result of the vapour impermeability of these insulating materials. Surface moisture on the insulation can be trapped between the impermeable membrane and the relatively impermeable insulation. A porous, permeable cover board will allow this moisture, turned into steam by the heat of the asphalt, to dissipate through the cover board material, thereby reducing the vapour pressures necessary for blister formation.

f) Depending on the nature of the cover board, it may also provide a temporary moisture storage mechanism. Moisture that accumulates from the outward flow of water vapour in heated buildings due to the absence of, or flaws in the vapour retarder may be effectively stored in the cover board during the heating season and released during the summer when the vapour flow is reversed. To be effective, such materials must suffer no harmful consequences from moisture stored and the annual accumulation must not be greater than the desorption.

g) A suitable cover board may facilitate the re-covering of an existing roof when the membrane has reached the end of its useful service life. However, this is dependent upon the mechanical properties of the cover board material and the existing roofing system's configuration and design. For a more complete discussion of the topic of re-cover, please refer to CRCA Technical Bulletin Volume 48, *"Roof Re-covering - An Alternative".*

Although the benefits of cover boards are numerous, these benefits assume that there is an ideal material that can be used in all applications. Unfortunately, there is no such product and each cover board material must be looked at in the context of its own unique physical properties and how and where the board is to be used.

Although there are standards in place for the materials being promoted for use as cover boards there are, at present, no performance standards for cover boards themselves.

The following discusses some of the products available for use as cover boards, their applicable standards and their physical properties and features.

Fibreboard

In Canada, cellulosic fibreboard is the most widely used cover board material used in roofing. In North America most of the material is manufactured from wood fibre or bagassi (sugar cane). Practically any cellulosic material can be used to manufacture fibreboard. The porous nature of fibreboard, its compressive and flexural strength and its affinity for moisture have made it a satisfactory material for use as a cover board under many membrane systems. However, the last feature may also be the source of problems under some conditions. It is susceptible to absorption of moisture in the field during storage and installation. If exposed to moisture for extended periods of time, these materials can lose their mechanical strength or decay and rot. Also, excessively porous materials can absorb the asphalt or adhesives used to adhere membranes, compromising the securement of the membrane.

Fibreboard is available in a wide variety of thicknesses and board size. It is available with butt edges, and in materials with a thickness over 12.7 mm, with ship lapped (offset) edges. To enhance the moisture resistant properties of the board, the fibers are treated with emulsions of asphalt, clay or paraffin. In addition, some manufacturers produce fibreboard which is treated with fire retardants to enhance their fire resistive properties. Fibreboard also comes in a range of densities which may be

indicative of their compressive strength. To reduce absorption of asphalt during application, the boards may be coated with an asphalt emulsion. However, these coatings and emulsions may lead to compatibility problems with certain types of membranes.

In Canada, the applicable standard for fibreboard roof insulation is CAN/CSA-A247-M, "Insulating Fibreboard".[1]

Perlite Roof Board

Perlite roof insulation has been widely used in the US since the 1950's, and is finding increased usage in Canada. Perlite boards are composed of expanded perlite ore, cellulose fibres, asphalt and starch binders. Traditionally, the boards have been coated on the top side surface with an emulsion coating to inhibit excessive absorption of the mopping asphalt. In 1982, 12.7 mm boards were introduced for use as cover boards. Perlitic roof board provides a dimensionally stable and thermally resistant surface for the application of hot applied roofing membranes. It exhibits excellent flame spread characteristics, which may be important in the design and installation of some roof assemblies. It has also been demonstrated that perlitic insulation can rapidly gain and lose moisture from ambient air, similar to fibreboard.

A distinction must be made between perlite board used as roof insulation and that used as cover board. The thinner 12.7 mm board, commonly used in roofing and referred to as recover board, contains more organic or cellulosic material to provide more strength to the thinner boards. As a result, this type of insulation may, due to the higher cellulose content, retain more process moisture than regular perlite insulation and may be more susceptible to absorption of moisture in the field during installation in hot and humid weather. Insulation with higher moisture contents at the time of installation may provide a greater risk of releasing sufficient moisture to induce blistering in hot applied installations, especially if the board is to be encapsulated in hot asphalt during the application process. There have been reports of "bubbling of asphalt" during installation and blistering of the membrane after installation when thin boards have been used. For boards set in hot asphalt, the temperature of the asphalt, the ambient humidity, as well as the moisture content of the board itself, have been shown to be factors contributing to frothing of asphalt. The hotter the asphalt, the greater the potential to drive the moisture out of the boards. In addition, the greater length of time allowed for the moisture to be released (prior to covering with the membrane) the less the potential for trapping the moisture. To avoid the development of blisters, the industry recommends that the hot membrane not be applied for a minimum of 10 minutes after the perlite has been applied.

Perlitic cover board, like cellulosic fibreboard, is moisture sensitive. All materials that are susceptible to retaining moisture or that may be damaged by moisture should be stored in a dry location and protected with properly secured water resistant coverings.

There is no current Canadian standard for perlitic roof insulation. The appropriate standard for this material is ASTM C 728. It should be noted that the standard distinguishes between Type 1 perlite, used to produce both thicker and composite board material, and Type 2 perlite insulation used primarily as a cover board material.

Glass/Mineral Fibre

Glass and mineral fibre insulations are produced from fiberized glass or basalt rock bonded with resinous binders and compressed to various densities. To prevent absorption of adhesives or asphalt into the porous fibrous core, a facer is applied at the factory. Some manufacturers provide boards with special facers designed for the direct application of torched-on modified bitumen membranes. These boards are generally compressible making then unsuitable for some applications, such as mechanically fastened single ply systems.

Although generally unaffected by moisture, they will lose their structural integrity if they remain wet for long periods of time. In addition, their facers may be adversely affected from exposure to moisture. Due to the inherent absorptive nature of their bottom surfaces, they cannot be back mopped with hot asphalt for securement over heat sensitive insulations. These products are dimensionally stable and have a high degree of heat resistance. Due to their non-hygroscopic nature, they do not absorb moisture readily. Their fibrous structure allows the dispersion of moisture vapour with minimum potential for the formation of vapour traps, thereby minimizing blister potential in hot applied systems. The applicable standard for glass and mineral fibre roof insulation is CGSB CAN2-51.31-M84.

Asphaltic Core Boards

These cover boards are relatively new in roofing applications. They are typically fabricated with an asphaltic core sandwiched between glass fibre reinforcement. Designed for use primarily with hot applied asphalt membranes and torch-on systems, they are highly resistant to moisture, and obviously compatible with all asphaltic systems. However, their asphalt content renders them unsuitable for use under single ply membranes that may be adversely affected by contact with asphalt. Thinner boards (3-6 mm) due to their low thermal resistance may provide insufficient protection for use over heat sensitive insulations. The impermeability of the asphalt core may increase the potential of blister formation during the application of hot asphalt applied systems. Currently there are no national standards for these materials. Therefore, each product should be looked at on the basis of their own testing and test results.

Glass-faced Gypsum Board

Glass-faced gypsum board is a proprietary product that has recently been introduced as a cover board for roofing. This material is highly resistant to roof top traffic, having a compressive strength almost twenty times greater than that of wood fibreboard or perlite. As it contains no organic material it should not rot when subjected to moisture. Due to its non-combustibility, it is classified as a thermal barrier, which may be required under certain membrane systems to achieve specific fire resistance ratings. The product is generally resistant to attack from the solvent adhesives used to adhere many single ply membranes.

There have been reports of blister formation and frothing of asphalt when hot process roofing systems (BUR and modified bitumen) have been applied over glass-faced gypsum board. As a result, the manufacturer now recommends the priming of the surface of the board prior to application, special torching techniques, or the use of a venting base sheet as the first layer of the membrane system in hot applied or torched-on assemblies. The appropriate standard for this product is ASTM C 1177-99, “Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing”.

Cementitious Board

Fibre cement roof boards are relatively new to the industry and are being promoted as overlay boards primarily under built-up and modified bitumen membrane applications. They are non- combustible, highly moisture resistant and have a high degree of structural strength. Priming of the board surface is required prior to the application of asphaltic roof membrane systems. Currently, there is no specific standard for this class of product. Due to its limited usage to date, there is little information on field performance.

Conclusion

The inclusion of a cover board in a compact low slope roofing system may provide many benefits. It may protect the underlying insulation from mechanical damage, chemical and thermal attack. In service, it may alleviate the stress imposed from thermal, wind, seismic and traffic loads. It may also prevent the problems from condensation resulting from thermal bridging at fastener locations and joints in insulation. In addition, it may provide a moisture buffer between the membrane and the primary insulation.

However, these features are a function of the physical properties of the cover board material, the other components in the roof assembly and the roof's configuration. Performance of the roofing system may be compromised by using the wrong product for a given application. When the need for a cover board has been identified, the membrane manufacturer should be consulted with respect to identifying the appropriate product that will serve as the substrate for the membrane in a specific application and the unique characteristics required of the board.

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Footnotes:

1. The standard for Fibreboard is currently under revision. It will be issued as a new standard titled CAN/ULC-S706, *Standard for Fibreboard Uses*.

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