Feature

Cold-applied Liquid Air- and Vapour-barriers

All photos courtesy W.R. Meadows

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Since 1985, when Part 5 of the *National Building Code of Canada (NBC)* began mandating the use of air- and vapour-barriers in commercial and institutional construction, manufacturers have developed many systems to meet the requirements. Among them is a new generation of cold-applied liquid air barriers, which can benefit both building envelope performance and the construction process itself. However, deciding which of the many systems to include in a specification can be a daunting task.

Early options

Now about 20 years old, cold-applied liquid air- and vapour-barriers were among the first products of their kind to gain broad acceptance. These included solvent-based elastomeric bitumens and synthetic rubber-based mastics applied by spray or trowel. In some instances, the materials could serve as an insulation adhesive as well. Most of these early barrier products are still on the market (largely because they still appear in recycled specifications), and can perform quite effectively.

Sheet membranes

Self-adhering composite sheet membranes and torch-applied sheet membranes appeared next. These employ a primer that is either solvent- or water-based, though the solvent is often preferred by installers, since it can provide better initial adhesion, especially in cold weather.

To install a sheet membrane, one begins by applying the primer to the substrate. Next, details like changes in plane, areas around windows and doors, excessive cracks, brick ledges, construction joints, and penetrations are pretreated with strips of the sheet

membrane and/or non-solvent liquid mastic. The field membrane is then applied, being cut to fit around brick ties for the appropriate overlap with the membrane course below. The final step is to seal around all brick ties and other penetrations with asphaltic mastic to ensure envelope continuity. Insulation can now be installed.

Sheet membranes allow for ease of application and inspection—should areas be missed, or brick ties not adequately sealed, these deficiencies are easily seen. However, their primary advantage has always been factory-controlled thickness. If the specification calls for a 1-mm (40-mil) air- and vapour-barrier, a pre-manufactured sheet would always provide that thickness at least. With old-style mastics, one could not always be sure of the resulting thickness. Sheet membranes became ubiquitous because specifiers did not need to rely upon on-site fabrication for the desired product.

Revisiting cold-applied

As technology has progressed, cold-applied liquid air- and-vapour barrier membranes have made a resurgence. Advances in polymer and bituminous chemistry have allowed for liquid membranes quite different from both the sheet membranes and early mastics. When selecting one of these newer products, there are several factors to consider.

Application techniques

All detail areas must be pretreated with strips of sheet membrane before application of the field membrane. This includes doors, windows, and cracks larger than 0.64 mm (0.25 in.). While a primer

Cold-applied, liquid air- and vapour-barriers adhere well to exterior-grade sheathing boards as seen above.

Spraying on a liquid air- and vapour-barrier can achieve rapid application rates over dissimilar substrates.

(either water- or solvent-based) is required, the liquid membrane being used in the field application can sometimes act as a primer for the sheet membrane detail strips. Where windows have been installed prior to the application of the air- and vapour-barrier, they must be masked to protect from overspray.

Cold-applied liquid barriers can make application of the field membrane substantially more efficient. Most of the new liquid products can be either sprayed on or rolled on with a short nap paint-type roller. Rolled-on applications are done in two coats to build the desired thickness. While useful for certain detail areas or other places where spraying is impractical, rolling is time consuming, and not typically preferred. When spray-applied, the material is usually sprayed in a crosshatch to ensure coverage. The first coat is normally thin, with the second coat applied more heavily to build the material to the desired thickness.[1]

Water-based products are a safe choice for most applications, but require an ambient temperature at or above 0 C (32 F) to apply and cure. Where this is impossible, solvent-based products are sometimes the only solution.

Regular measurement with a wet-film gauge is critical to quality control. Measurement should be done by sprayers, although a third party inspector can be also be employed here. (While third parties are not required by manufacturers, architects and/or owners often hire them to watch over trades.) As a skilled sub-trade is required, quality can be as high or higher than sheet membrane systems applied by a mason's apprentice.

Monolithic quality

One of the main advantages of these barriers is the monolithic membrane they create on the wall. In the course of a field-membrane application, they will seal around penetrations, requiring no follow-up detailing treatments. Sheet membranes are weak at the laps, where they may not bond either to sheet membranes themselves or to the substrate. Brick ties can also be vulnerable when the slit material receives inadequate sealing with mastic. Spray application eliminates the labour-intensive task of detailing around brick ties and other penetrations to ensure continuity.

Bonding

Even well-prepared substrates can bond poorly due to weather conditions or inadequate application. Where the substrate is rough or uneven, sheet membranes can leave spaces or air gaps, allowing for air convection or collection of liquid water. Cutting and fitting sheet membranes to rough or unusually shaped substrates can also prove labour-intensive. Liquid air- and vapour-barriers adapt easily to such irregularities, and since they are flowable, they also fill gaps and void well.

Self-adhering membrane systems can be applied at a much swifter rate than torch-applied systems—typically 90 to 110 m^2 (1000 to 1200 sf) per day. Spray applications can achieve 270 to 465 m^2 (3000 to 5000 sf) per day.

Single vs. multiple components

Many of these products are single-component, meaning there is no mixing and no risk of improper component ratios adversely affecting the end product. Spray equipment for single-component products is relatively simple and easily maintained, while two-component products require more complex and expensive tools. A third variation, using a single component with a setting agent to enhance cure time, also requires more elaborate equipment.

Cure time

Water-based asphaltic emulsions reach initial cure within an hour (after which they will be unaffected by precipitation), and fully cure within two days. During this process, some water is shed and some consumed. Other products, such as acrylic-based liquid membranes, can require as long as 28 days to fully cure. In all cases, temperature, humidity, and precipitation can affect cure time.

Percentage of solids

All manufacturers publish the percentage of solids in their materials. While many believe a higher percentage of solids equals a better product, there is in fact no relationship. However, it does dictate how much cured membrane will be left on the wall relative to the amount of uncured material applied. It is important to require the proper wet film-thickness to achieve the desired dry film-thickness. Should an inadequate amount of product be applied at the uncured state, the cured membrane will be too thin.

Volatile organic compounds

Water-based products contain little or no volatile organic compounds (VOCs), meaning they are non-flammable, safe for interior or exterior use, and give off no noxious gases or smells. However, they generally require ambient temperature at or above 0 C (32 F) during application and curing time. Solvent-based products can be quick-curing, but are high in VOCs and present fire and health risks. Where environmental considerations are a priority, especially when the product is used in a public area or an

Details at corners, changes in plane, and brick ties are included during the field application process. Cold-applied liquid barriers can make the process considerably more efficient.

The percentage of solids in a vapour-barrier can vary, but contrary to popular belief, a higher solids-content does not necessarily mean a better product.

enclosed space, solvent-based products are usually not the best choice. Nevertheless, they can be the only option when schedules and weather force application in below-freezing temperatures.

Costs and efficiency

Most cold-applied liquid air- and vapour-barriers do not require a primer prior to spray application (except for the sheet membrane detail strips). While some manufacturers call for a primer over more porous substrates, most can eliminate this step and save considerable material and labour. These barriers generally cost about the same as a sheet membrane per square metre, and can be installed much faster.

A typical torch-applied membrane can be applied at a rate of 55 to 75 m^2 (600 to 800 sf) per day, depending on details. In addition, they require the use of open flame, on which insurers typically frown. A self-adhering membrane system can usually be applied at 90 to 110 m^2 (1000 to 1200 sf) per day, again depending on details. Spray applications, by contrast, can be applied at a rate of 270 to 465 m^2 (3000 to 5000 sf) per day. Naturally, an adequate amount of prepared substrate must be available to tradespeople, or efficiency rates will drop.

This new generation of cold-applied liquid air- and vapour-barriers can save valuable time and money in the construction process. They can provide flexibility in scheduling and greater efficiency to the construction process, while serving as part of a high-performance building envelope.

A well-bonded, monolithic membrane can easily be achieved on uneven surfaces. Above, a good seal was accomplished around the brick ties during the initial application process.

Notes

[1] High-rise buildings can require shrouding on the scaffolding to prevent collateral damage due to wind-borne overspray.

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