

Industry Outlook

Overviews of industry initiatives and their impact on construction today.

Spray-Applied Waterproofing:

The Ultimate Mix of Efficiency and Effectiveness

By David D. Breimeier

Business Manager – Waterproofing
Tremco Commercial Sealants & Waterproofing

Keeping a building safe from water infiltration is of critical importance to building owners, architects/designers, contractors and facility managers. The effects of water on a structure can be devastating and are second only to fire as a cause of building decay and deterioration. To effectively keep water out of a structure, one must begin at the design stage with selection of waterproofing components formulated to provide the protection, durability and continuity required to maintain watertight integrity throughout the building envelope. Protection will only be as strong as the weakest link within the system.

A range of waterproofing options are currently available and technological improvements and breakthroughs are occurring regularly. The increasing concern over maximum protection and demand for faster turnaround to respond to fast track construction schedules is creating ever-increasing challenges for today's construction industry. Spray-applied waterproofing systems are gaining increased interest as a viable solution to respond to these growing demands.

Range of Options Available

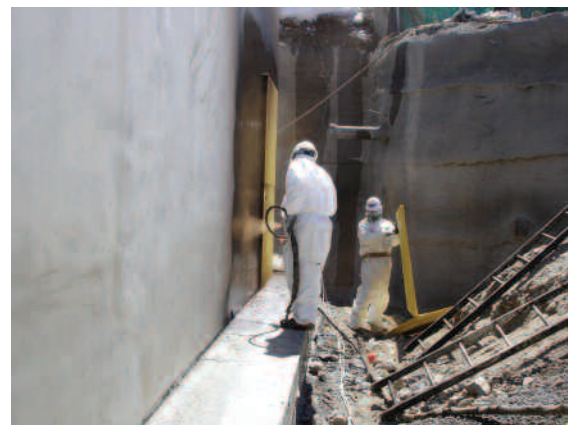
There are two general types of waterproofing membranes – sheet-type membranes and liquid membranes. Factors to consider in their selection include not only the type of construction, terminations and detailing required, durability, warranty and cost of materials, but continuity, sensitivity to moisture conditions prior to application, installation costs and flexibility or fit within the requirements of the construction schedule. This paper focuses on two of the more popular waterproofing products.

Numerous sheet membranes are available, but the most common category is **self-adhered rubberized asphalt – more commonly known as “peel-n-stick” membranes**. These peel-n-stick membranes have become the most widely used waterproofing product in the field over the years. Peel-n-stick membranes are applied to concrete (walls) after a minimum wait time of seven days after the concrete pour, though a 14-day wait is typically preferred. A solvent- or water-based primer should be applied and allowed to cure before application of the waterproofing. Applied in vertical sheets 36” to 48” wide, peel-n-stick membranes must overlap the adjacent sheet from two to five inches in order to provide adequate protection against water migration into the seam or area where the sheets have been joined. To ensure adhesion and bonding, these membranes are best applied during warmer temperatures of 40°F (5°C) and above.

Though peel-n-stick products provide a “factory-controlled” 60-mil thickness, manufacturers have always required that the numerous critical waterproofing details such as the wall-footer joint and penetrations be pretreated with liquid-applied waterproofing membranes. Due to the seams between the separate sheets of a peel-n-stick system, the potential for leaks exists. In addition, it is extremely difficult to effectively detail around penetrations or complex structural designs with a

peel-n-stick product and to be fully adhered at changes in plane. This is especially critical at locations such as wall-footer joints. Liquid membranes provide a critical backup function. Their ability to provide continuous, fully-adhered coverage provides complete protection around critical joints and prevents lateral water migration.

Liquid-applied waterproofing systems were first developed decades ago, providing seamless protection which allowed no part of the wall to be left untreated or exposed to moisture penetration even in areas with complex detailing. These liquid systems eliminate the possibility of “fishmouths” or wrinkles, areas presenting the potential for water leakage and migration or movement behind any membrane which is not fully adhered. Localizing the source of leaks in these cases becomes extremely difficult and costly. In addition, the excellent flexibility, strength and adhesive characteristics of liquid systems allow them to bridge non-structural cracks, remain flexible at low temperatures and to protect against water under hydrostatic pressure.



Spray-applied membranes provide a continuous, fully adhered film without areas of weakness such as overlaps or seams which could prove to be a potential source of water entry.

Early systems were based on urethane technology. Due to their relatively high viscosities, these liquid-applied waterproofing systems typically relied on the addition of solvents in the field to

reduce the viscosities and promote sprayability. The need to thin the materials with solvents was even more critical in colder weather as viscosity of these systems increased with lower ambient temperatures. Few specific guidelines existed, however, to ensure consistency. Spray equipment, processes and contractor knowledge varied widely. Spray results varied, especially at lower temperatures. In addition, these moisture-curing systems made cleaning out equipment and spray lines critically important as well as challenging and time-consuming.

Although the urethane technology itself as rollable liquid proved to be effective, the complexity of the spray-application of this technology became an obstacle for most contractors and widespread acceptance or usage was never gained. These liquid urethane systems are still widely used today, applied by roller or squeegee. Technology development has now produced versions which may be applied to damp, or “green”, concrete instead of requiring lengthy waiting periods following a concrete pour.

Liquid-applied systems specifically designed as **spray-applied waterproofing membranes** were commercialized in the late '70s and early '80s. Most of these systems were commercialized on a regional basis and therefore did not receive widespread recognition in the North American market until the late '90s. Some of these systems were solvent-based, polymer-modified asphalts, while others were single-component, water-based, polymer-modified asphaltic membranes. A couple of manufacturers focused on the development of these systems and, over the last several decades, have invested significant time in the improvement of the membrane technology and in the equipment and processes necessary to gain widespread acceptance within the waterproofing industry.

As significantly, these manufacturers have invested in the training and development of experienced applicator networks. These applicator

networks are characteristically long-term focused and are willing to make capital investments in specialized delivery systems. This forward-thinking outlook tends to set them apart from their waterproofing peers. Throughout the years, technology as well as equipment and process advancements



Today, the solids formulation in spray-applied waterproofing membranes maintains consistency of the sprayed product, and approved contractors will routinely gauge wet mil thickness to ensure architects' specifications are met.

have enabled those in the design and construction community to reap the benefits of what have become extremely efficient and effective systems. Technological improvements and breakthroughs are continuing to occur regularly. Ease and speed of application is generating increasing interest, particularly where fast track construction schedules are pushing contractors for faster turnarounds. Recognizing the growing demand, many other manufacturers have now entered the market, some as recently as just a few years ago.

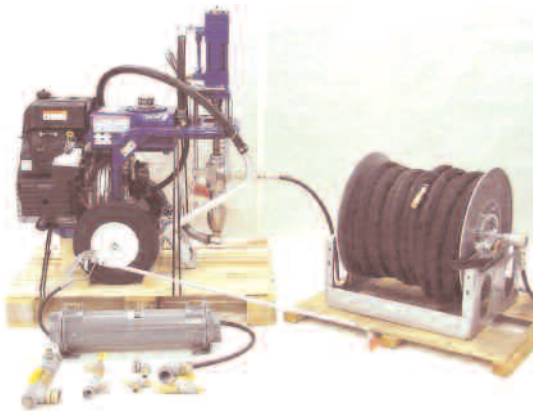
The differences in types of products and application technology, however, is significant. These differences account for significant differences in waterproofing membrane performance, the capital investment required by a contractor and the consistency and ease of application by waterproofing contractors. Some of the spray-applied waterproofing systems and the equipment required for their application is still complex, making them only feasible for larger jobs. Cold-weather (tempera-

tures under 40°F (5°C)) application technology, equipment and processes are largely yet unproven by several manufacturers. Understanding these differences will help to simplify the selection process.

Single-Component Versus Multi-Component Products

Spray-applied waterproofing membranes come in two forms – single-component and multi-component products. When evaluating these two products, it is necessary to look at both the chemistry of the products and equipment required for their application.

The **single-component products** are air-cured and are, therefore, easier to apply. Most are water-based so curing or drying results from the evaporation of their water carriers. This means that these systems will always cure. They are not dependent upon complex equipment or application procedures to create the conditions needed for curing. The cure or drying process typically takes place in a relatively short timeframe, with waterproofed walls being ready for backfill within 16 to 24 hours. At temperatures below 40°F (5°C), the curing or drying process will slow down, but walls can generally still be backfilled within two to three



Single-component waterproofing membranes, which are not reliant on metering and thorough mixing of complex equipment for proper curing, require less expensive, single-pump equipment for application. Investigation should be done however, to determine reliability, durability and track record of the equipment.

days. To keep increases in cure time to a minimum, experienced manufacturers recommend equipment which uses heat-exchangers and special cold weather application procedures proven by more than a decade of in-field performance, allowing spray application down to 20°F (-7°C). Due to the relative simplicity of these systems, contractors easily spray jobs as small as 1,000 square feet.

Most single-component product manufacturers allow for their product's cure time to be accelerated through a process commonly referred to as "co-spraying". This process calls for a special accelerant to be sprayed alongside the main product with a specialized spray gun. The accelerant mixes with the waterproofing material "in-flight" prior to reaching the wall, allowing these membranes to "set" more quickly. It is important to note, however, that the accelerant does not change the nature of these single-component products. They are still considered single-component products and will cure or dry whether accelerated (co-sprayed) or not.

Another means of expediting the time between single-component membrane application and installation of drainage, protection and insulation courses is to utilize a breathable course. One manufacturer specializes in several such products, all of which are specifically designed to accelerate the process. These breathable materials can be placed into the air-cure membranes while they are still tacky even in temperatures down to 20°F (-7°C), eliminating the need to return to the jobsite over the next several days to install other common impermeable drainage, protection and/or insulation courses.

Spray-applied single-component products are formulated with two different chemistries. The most common and typically specified materials are low-VOC, non-flammable, water-based formulations, which also provide credit toward LEED certification. The other products are typically high-VOC

formulations, some of which are highly flammable. Curing of the **multi-component product** is the result of a chemical reaction, so the membrane becomes tacky soon after spraying. Impermeable protection, drainage and/or insulation courses may then be applied directly into the waterproofing material. The equipment necessary for application of multi-component products, however, is significantly more complex and expensive. Rather than one pump, four pumps are required. Two lift the material from separate drums containing the Part A and Part B materials. Two high-pressure pumps feed a specialty plural component gun where the product is then mixed by an integrated static mixer within the gun. The benefits of a more defined chemical cure are offset by the fact that these components must be mixed properly by the spray equipment to ensure that the membrane cures properly. If the combination of components is not accurately metered and mixed thoroughly, the membrane may be slow to cure or may not cure at all. If the membrane fails to cure, it must be scraped or sandblasted off of the substrate, and the spray process must be repeated. Due to the size and the complexity of this equipment, many waterproofing contractors have determined that only projects with mobilizations of approximately 5,000 square feet are sizeable enough to warrant the use of multi-component products.

Multi-component products are generally considered “green” coatings. They are low-VOC, non-flammable coatings and are eligible for credit toward LEED certification.

Dramatically Increased Production Efficiency

With today’s spray-applied waterproofing membranes, fully adhered, seamless protection is possible in one efficient pass. The efficiency of spray application allows at least four times more area to be waterproofed than with traditional application methods in the same amount of time.

Systems are also currently available which are formulated for application to damp, or “green”, concrete, eliminating waits of two to four weeks for application. No priming or special surface preparation is required, so they may be applied to concrete as soon as the forms are removed and to masonry as soon as the mortar is dry. In some cases, protection courses may be applied the same day instead of having to specially prepare them for installation within the next couple of days.

This new efficiency is having a dramatic impact on contractor productivity, job scheduling and construction schedules. With the same teams, contractors can now take on more work or limit

	Single-component products	Multi-component products
Cure rate at 70°F (21°C)	16-24 Hrs.	16-24 Hrs.
Application of drainage, protection and/or insulation products	Same day for breathable courses. Next day for impermeable courses.	Same day
LEED-credit eligible	Yes	Yes
Optimal project size	Greater than 1,000 sq. ft.	Greater than 5,000 sq. ft.
Equipment Cost Ease of Use Reliability	\$8,000 - \$14,000 User-friendly High	\$30,000 - \$35,000 Complex Moderate

Typical waterproofing job of 10,000 square feet	Self-adhered Waterproofing (Peel-n-Stick)	Spray-applied Waterproofing
Ideal wait time after concrete has been poured and before waterproofing may begin	14 days	0 days
Time to apply waterproofing	7 days	2 days
TOTAL Installation time	21 days	2 days
Estimated job price (based on product and labor cost)	\$1.40-\$1.60/sq. ft.	\$1.30-\$1.50/sq. ft.

the resources needed on jobs. Waiting periods which complicate schedules and create problems for other trades are eliminated. General contractors can streamline and expedite production schedules.

Even with the investment in spray equipment, the payback period on this equipment is typically less than a week for single-component products. Contractors willing to make the commitment to spray-applied waterproofing are developing a competitive edge in their market which cannot be matched with traditional application methods.

The Formula for Success

Spray-applied technology has evolved over several decades. Manufacturers involved throughout this time have water-based, polymer-modified asphaltic formulations to ensure sprayability, durability, consistency and all other characteristics necessary to ensure a leak-proof barrier and consistency and ease of installation. Extensive investigation and testing has been conducted to identify high-performance equipment durable enough to withstand the daily demands of construction while being engineered for ease of use. Utilizing the best

options identified, the technology of the application process has also been fine-tuned to determine techniques required for optimal performance. Over the years, this experience and a track record with thousands of jobs every year have yielded a formula to ensure success on the job.

Newcomers to the spray-applied arena will encounter the learning curve associated with fine-tuning product formulations, application technology and equipment selection. The intricacies of spraying in cold temperatures will take that learning curve to another level. The realities of construction work and the tremendous time and expense associated with it, however, do not allow for on-the-job training.

The selection of a spray-applied waterproofing manufacturer needs to include all the elements necessary to ensure success on the job. This isn't a product that anybody could or should jump into without sufficient experience, appropriate equipment and proper training. Manufacturers ensuring the performance of their products through Select Contractor Networks have set up programs designed to provide all the elements needed for the contractors to successfully meet

architects' specifications each and every time. The programs developed for the Select Contractor Networks should include equipment selection and installation, training, on-site demonstrations, in-field technical service and follow-up support. Manufacturers not offering such support are opening the door for problems to arise. The best programs will have support provided by local company representatives knowledgeable of the product and application requirements.

The New Age of Waterproofing

The issues facing the construction industry have never been greater. Project timelines continue to get tighter. Specifications continue to call for greater product performance within ever tighter budgets. Concerns over water penetration have now broadened to include energy efficiency and indoor air quality. Today, there is little if any tolerance for water infiltration due to design or field detailing errors and products or systems are being introduced to respond to these increasing demands.

A higher standard is being created. Designers and contractors who respond are reaping the rewards. The sophistication of products and their delivery systems is generating a new level of performance and productivity.

Further Information

For assistance in the specification or application of a spray-applied waterproofing membrane and protection course designed for maximum efficiency and effectiveness, contact **David Breimeier** at **800-321-7906**.