Waterproofing
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Sweeping Plaza Deck Joints Under the Rug

By Lester Hensley

The hidden pitfalls of "buried band-aid" joint sealing solutions. Plaza deck, or waterproofed split-slab, joint sealing is serious business. Usually over occupied space, plaza decks are actually heavy-duty roofs. Until the emergence of a watertight, purpose-designed system about 20 years ago, designers were left with the ineffective option of a buried looped membrane, a "band-aid" approach to addressing those critical joints.

Buried-membrane options offered today are nothing more than a throwback to band-aid solutions for plaza and roof deck joint sealing. These out-dated solutions in no way respect an owner's desire for durability, nor do they honor the reputation of designers who research, engineer, detail and specify solutions in the long-term interest of building owners.

Purpose-designed, watertight, plaza, roof deck, and roadway joint systems do exist, and they are specifically engineered to address the shortcomings of buried sheet-membrane joint treatments. Specification of these systems results in attention to detail and quality assurance appropriate to the objective of achieving a watertight structure.

It is lack of attention on many projects that causes joints to prematurely leak, resulting in exorbitant costs of inspection, investigation, repair and replacement of buried systems. These direct costs are compounded by the costs of disruption of operations or lost lease revenue in the affected facility.

The list of criteria on which band-aid (buried-membrane products) do not match the specification for plaza deck sealing is lengthy. Fundamentally, however, the buried membrane approach does not meet split-slab design philosophy in the following ways:

1) Principle of Operation
2) Composition
3) Track Record

1) DESIGN PHILOSOPHY AND PRINCIPLE OF OPERATION:
Buried Membrane Approach vs. Static Membrane Integration with Movement Gland

Plaza and roof deck waterproofing involves a waterproofing membrane applied to a structural deck. These components are covered with some sort of topping that is porous by design, allowing water to reach the membrane on the structural slab where it is managed to drain. When plaza or roof decks require expansion joints, the joints must be waterproofed using a method and material that accommodates movement while reducing or eliminating the stresses that will cause a buried membrane to fail.

Static Membrane Integration with Movement Gland Design Philosophy

The static membrane integration with movement gland design philosophy recognizes the need for the joint system to have a static integration with the deck waterproofing membrane. In addition, the specified design recognizes the need to have a purpose-designed, heavy-duty gland to
accommodate movement at the joint that is integrated with the deck-waterproofing tie-in that is accessible for repair, if necessary, without disruption of the topping system.

**Buried Membrane Design Philosophy**

The design philosophy that characterizes the buried membrane approach involves placing a strip of reinforced membrane over joints and adhering it to the deck or to the waterproofing deck membrane. The problem with this approach is that the accumulation of water combined with freeze/thaw cycles, as well as flex fatigue from movement, compounded by abrasion between topping and buried components, often results in the inevitable rupture of the buried “band-aid,” usually at its interface with the abrupt concrete joint edge.

These conditions, when combined with jointy required to handle changes in plane and direction, exacerbate the tendency to failure. Remediation of failures of these buried systems involves nothing short of the removal of the entire surrounding topping system and all adjacent landscaping to expose the membrane. Because the location of roof and plaza decks is very-occupied, often sensitive, interior space, the disruption to tenant operations that is common in this type of remediation work usually renders the space below unusable for the duration of the repair or replacement.

**2) COMPOSITION Static Membrane Integration with Movement Gland Composition**

Static membrane integration with movement gland systems have a combination of corrosion-free, aluminum and stainless-steel mounting rail components that are mechanically secured to the structural slab to provide a positive anchoring of the waterproofing components. The metal mounting components ensure that tension, compression, torsion and other forces that result from joint movement are isolated from the critical connection of the deck waterproofing membrane to the side flashing sheets of the joint system. The waterproofing components of static membrane integration with movement gland systems are state-of-the-art thermoplastic, rubber materials. These materials can be heat-welded in the factory to produce transitions for addressing changes in plane and direction. In addition, these materials can be welded in the field using simple hot-iron tools for attaching transitions to straight runs and to address field conditions as they arise.

**Buried Membrane Composition**

In contrast, the buried membrane is usually a simple piece of EPDM, thermoplastic rubber. It contains none of the evolved mounting components of the static membrane integration with movement gland system and does not provide positive mechanical anchoring. There is no barrier between the slab and the deck membrane for separation, from the point of adhesion, of tensile stresses caused by joint movement.

The use of wood blocking to build up the system where elevation is necessary is inappropriate in several respects. Wood blocking, which eventually decays even when treated, cannot be considered a lasting construction method for this purpose. It is a validation of the need for a system that stands proud of the deck in certain application areas. In fact, the static membrane integration with movement gland mounting rail legs form an integral part of multi-layer deck composition, ensuring that water is kept away from structural joint-gaps. Given this, wood blocking is a far cry from having non-corrosive metal supports specifically designed for this purpose.

In contrast to thermoplastic rubber, thermoplastic rubber is an earlier generation of material that has been nearly totally replaced in most industrial sectors, including automotive and construction, by better-performing thermoplastic alternatives. EPDM's limitations in respect to flex fatigue resistance, abrasion resistance and chemical resistance have been understood for years. The use of EPDM lying flat on a roof as roofing material requires vastly different physical characteristics when offered for use in a dynamic structural expansion joint application.

The addition, by some manufacturers, of a fleece to the EPDM in is further recognition of the EPDM's fundamental shortcomings in respect to long-term bondability to other materials. This degradation of bond is caused by the migration of plasticizer oils to the surface of EPDM. While the fleece may provide a surface to which the membrane waterproofing can bond, it also has the effect of restricting elongation thereby increasing tensile stress at the bond line.

The need to have factory representatives execute all field splices using specialized equipment is a warning flag. It is the fundamental nature of thermoplastic rubber that it cannot be reliably joined except through vulcanization. Vulcanization is a process used to achieve a finished state of certain rubber compounds that requires specialized equipment normally confined to manufacturing facilities.

The term, "thermoset" refers to the final application of heat to a rubber compound to achieve its final, finished,
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unsuitable, solid state. It is precisely this characteristic that led to the evolution in rubber technology of thermoplastic materials. Unlike thermoplastic rubber, thermoplastic materials can be formed into almost any desired shape or form by melting and forcing the material through a die. This enables the achievement of desired shapes and forms.

The assertion by some that bonded membrane facilitates deck drainage across a joint should be considered in light of the following. Incorporating a structural expansion joint into a drainage plane, while sometimes unavoidable, is generally considered a waterproofing-design compromise. This condition can usually be addressed through attention to detail.

While it is true that static membrane integration with movement gland systems, by design, typically stand proud of the structural slab, only in extreme rare retrofit occasions might this pose an obstruction to drainage. This instance is where a joint has been located mid-span in a ramp where due to other constrains no option existed at the top of the ramp. Details are available for addressing this condition.

3) TRACK RECORD

Static membrane integration with movement gland systems have an unchallenged 20-year track record of waterproofing plaza and split slab decks, stadium concourse, garden roof, and roadway expansion joints. Specialty waterproofing contractors, under guidance of quality control technicians, have installed thousands of feet of the systems for satisfied owners. These installations have been integrated primarily with hot-applied asphaltic waterproofing membranes. The reputation for properly engineering these systems to be watertight and the workmanship of trained contractors are the cornerstones of these systems’ success.

Band-aid joint treatments were historically the only choice available to designers and therefore were widely specified in past years. The existence of a market for a purpose-designed plaza-deck joint system is the direct consequence of owners’ having to spend a fortune replacing failed bonded long looped membrane materials.

Conclusion

For many years static membrane integration with movement gland systems have set the bar for plaza and roof deck joint sealing. Owners, designers, contractors, project managers and installers nationwide have demonstrated the philosophical, technical, and craftsmanship commitment to installing this superior system thereby addressing deficiencies that typically make expansion joint leakage one of the major headaches an owner lives with during the life of a structure.

John Ruskin, a nineteenth-century commentator on architecture among other things warned: “It is unwise to pay too much, but it is worse to pay too little. When you pay too much you lose a little money—that is all. When you pay too little you sometimes lose everything, because the thing that you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot. It can’t be done. If you deal with the lowest bidder, it is well to add something for the risk you run, and if you do that, you will have enough to pay for something better.”

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