

# Traffic-Bearing Coatings and Proper Design in Today's Market

By Mosby W. Lawrence IV

*Completed urethane traffic system.*

**T**raffic-bearing waterproofing coating systems were first developed to protect concrete surfaces from the deleterious effects of water penetration. Materials of varying chemistry have been developed for use in protecting structures used for vehicular and pedestrian service. With so many types of materials available in today's market, it can be a challenge for anyone to determine what is best for a given application. It's advantageous to determine the intent of a coating system before selecting for specifications, as this can narrow down the coating system choices and therefore aid in developing a sound project specification.

## **DUE DILIGENCE**

The main purpose of a traffic-bearing waterproofing system is to protect an owner's investment. All parties involved in restoration and new construction work must keep this in mind when making recommendations and designing coating systems. It

is our responsibility to provide an owner with a sound, cost-effective solution to a current problem or to aid in preventing a future problem on a structure they own. In today's world, with information just a click away, we can often get caught up spending many hours on research when a good answer or solution is just a call or a simple discussion away. Too often we see specifications that simply take the approach, "It worked on the last project, so it must be okay for this project." When it comes to specifying traffic-bearing waterproofing systems, each project should be looked at individually. That is, a retail or hospital garage should be addressed differently than a residential garage (condo, apartments, etc.). The volume of traffic in a garage can certainly impact a coating system negatively if not designed properly. A client is expecting years of performance before needing to spend additional money on their structure.

## **CONSTRUCTION TYPE**

One must also consider construction

type when deciding on a coating system. Cast-in-place, post-tension and precast double tee concrete systems are common construction types. Split slabs with a buried membrane and metal pan deck construction are construction types that may present coating challenges.

Split slabs present a unique challenge that is often not thought about until after a coating system has been installed. Split slabs are used for roof decks over occupied spaces. They consist of a structural slab with a membrane, followed by a topping slab. In restoration work, these slabs often have water trapped between the membrane and the topping slab, and once a coating is applied to the topping slab, the moisture is trapped. After about three to six months, blisters due to moisture vapor transmission (MVT) begin to show in the traffic coating system, and when popped, water is present in the blister. For these types of applications, use of a moisture mitigator prior to traffic coating installation, or the use of a breathable coating system (which may or



Figure 1 – Metal pan deck construction.

Figure 2 – Metal pan deck construction.



may not meet the service needs for the application) may be required.

Metal pan deck construction (Figures 1 and 2) can also present its own set of complications. As moisture vapor cannot escape from the underside of the concrete due to the presence of the metal pan, moisture content in the concrete prior to coating application must be considered. Typically, a moisture content of  $\leq 4\%$  (read on a moisture meter) is desired. In restoration work, moisture/water may be trapped between the pan and the bottom of the concrete slab, so MVT may again become an issue. The use of a high-performing moisture mitigator or 100% solids epoxy primers may be required to block any potential MVT issues. Moisture mitigators are typically two-component, moisture-tolerant, low-viscosity, chemically enhanced epoxy-based products that reduce the passage of water vapor and moisture through slabs on or below grade.

Another issue for traffic coatings with metal pan deck construction is that this type of construction often has a great deal of flex. An incorrectly specified system may be prone to cracking due to this flexing, spring-board-type movement, and the system may have long-term difficulty with cracking.

### TRAFFIC-BEARING SYSTEMS IN TODAY'S MARKET

There are many options today for traffic-bearing coating systems. While this is good, it can also be confusing and often lead to mistakes in specifications. It is important to understand intent before specifying a traffic-bearing coating.

When it comes to selecting traffic-bearing waterproofing systems, often spec-

ifiers or contractors contact their friendly local sales representative and ask for a coating recommendation. That may be fine, but a more solid approach is to first understand what one is aiming to achieve with the application. That is, are we simply trying to improve aesthetics, attempting to provide concrete surface protection, or are we aiming to waterproof? Some products/systems can provide one or two of these functions, and some can actually provide all three. Remember, to waterproof means to provide a leak-free system, not a water-resistant one. Over the years, I have seen specifications that list systems with varying degrees of performance that are not comparable in material type or performance. A simple review of today's material offerings can assist in selection of a coating type.

### EPOXY BROADCAST SYSTEMS

Epoxy broadcast systems have been used for many years. They are easy to apply, economical, and ideal for providing concrete surface protection. They are durable, and by utilizing different aggregates—such as aluminium oxide, flint, black beauty (a coal combustion byproduct), etc.—can offer a heavy-duty-type wearing surface that can handle severe service such as loading docks, service ramps, etc. The downside is that they are rigid and are not capable of

bridging cracks. For this reason, they are not considered waterproof when used alone.

### LATEX/VINYL COPOLYMER SYSTEMS (CEMENTITIOUS)

Copolymer systems have been in place for years and offer a breathable coating system that can be used over split slabs and other locations where a breathable coating system is desired. They are nonflammable, produce no odor, and blend well with other concrete areas. An acrylic membrane liquid is used to detail cracks prior to coating installation. These coating systems are still considered rigid and not recommended as waterproofing over occupied spaces, as they will not offer a true waterproof barrier.

### POLYMETHYL METHACRYLATE (PMMA)

PMMA materials have been around for decades, though they are often considered “new technology,” as many in our industry have not been exposed to them. PMMA materials are in the acrylic family and are very durable, color-stable, and chemical-resistant coatings. They cure rapidly, can be placed at low temperatures, and can accommodate traffic within hours after application. These types of systems are ideal when very rapid turnaround is required.

PMMA materials are rigid, and for this reason, they often incorporate a reinforcement fabric in the base coat layer, followed by an additional base coat layer to fully embed the fabric. This reinforcement layer works to prevent cracks from reflecting through the subsequent layers to aid in providing a tight, impermeable coating system. PMMA systems are typically applied in a thick, dry-film thickness (DFT). They have a strong, noticeable odor during application, requiring proper ventilation and sealing of any air intakes to prevent the odor from entering a building with tenants. The odor does dissipate once the coating has cured (usually within an hour).

### POLYURETHANE METHACRYLATE (PUMA)

PUMA membranes are similar to PMMAs, though the material offers more elongation. The membrane does provide a material that can bridge cracks, though in some applications, it is still used with a reinforcement fabric. PUMA has rapid cure and can quickly be open to traffic. Odor is an issue during installation, though it does dissipate once cured.

## ELASTOMERIC POLYURETHANES

Polyurethanes have been around since the early 1970s. They have a long track record, and the performance properties vary among manufacturers. A typical layout (Figure 3) is a concrete primer followed by an elastomeric membrane, one or two wear courses, and a top coat. The industry offers two types of urethanes: single-component, solvent-based; and two-component, high solids.

Single-component urethanes were the first type introduced and are generally 75% solids by volume, have an odor, cure by reaction with atmospheric moisture, and require 72 hours cure before exposure to vehicular traffic. Due to the odor, interior garage work requires the use of fans to circulate fresh air and for the work to be scheduled on off hours to limit the public being exposed to fumes. In addition, a phased area of the garage requires the area to be shut down for about seven to ten days. This allows time for surface preparation work, installation of the multi-layered system, and sufficient cure time before opening to service.

Two-component, high-solids urethanes came about in the late 1990s and actually changed the way many people addressed coating work. These materials are high solids, considered zero-VOC and no-odor, and are fast curing. Due to the fast cure of the liquid, two or more steps of the multi-layered system can be installed in a single day, requiring only 24-36 hours (depending on temperatures) before opening to vehicular traffic. No-to-low odor and near-zero VOC means interior work can be conducted

in a manner safer to the workers and general public and, very importantly, an owner can reduce the amount of downtime for his garage, thus limiting the loss of parking revenue. Today many of these installations for restoration work are completed over a weekend, allowing an owner to have full use of the garage during the week with little to no loss of revenue.

## DESIGN

The key with urethane systems is proper design. Manufacturers have installation procedures for high-wear areas, such as ramps and turn areas (Figure 4) in a garage. These high-wear areas call for additional layers of coating, and while this procedure does help with durability, sometimes that just isn't enough to provide for extended service. The use of hybrid systems can offer extra durability. Hybrid systems are urethane base coats with an epoxy wear coat,



Figure 4 – Worn coating in high-wear turn area. These are areas that should be properly addressed during system design.

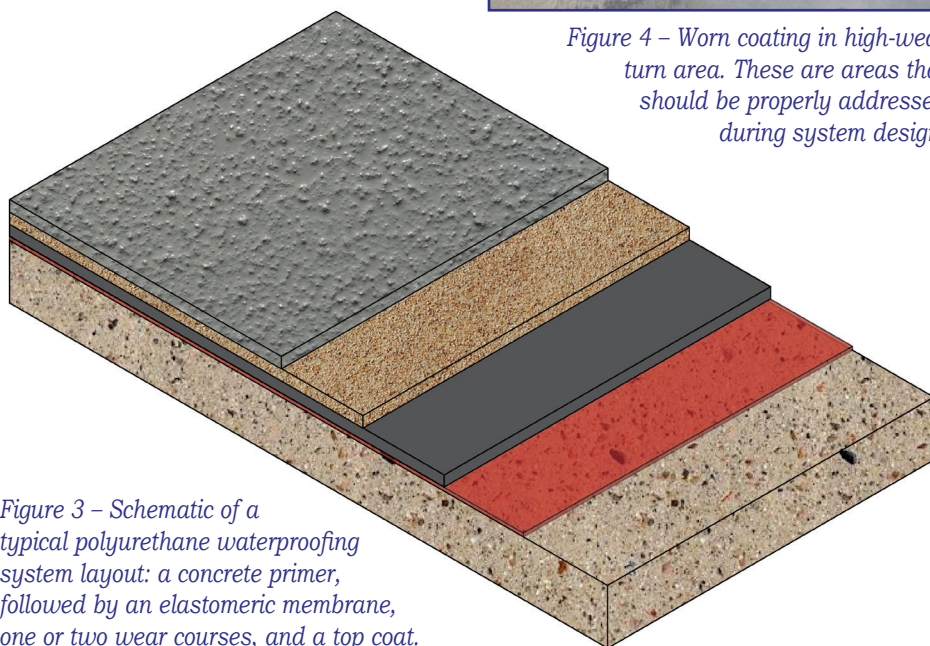


Figure 3 – Schematic of a typical polyurethane waterproofing system layout: a concrete primer, followed by an elastomeric membrane, one or two wear courses, and a top coat.

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Figure 5 – Completed urethane coating application in the Atlanta area.

followed by a urethane top coat. The wear coat is the layer that receives and holds the aggregate that provides traction. The epoxy offers increased durability, as it will hold the aggregate better than a urethane; and by utilizing harder aggregates, such as aluminium oxide or flint, the overall durability will be increased on those locations. Please note all materials have their intended application, and the use of a single-type system over all construction types and services may

(Figure 5). It is important to understand that while physical properties of a coating are important, the best indicator of future performance is past performance. Each project should be considered individually and a system(s) selected and designed to accommodate the service. Concrete restoration and traffic-bearing systems are costly, and a client is expecting long-term service and should realize the true benefit of having a traffic-bearing waterproofing sys-

tem installed on his or her project. Take the time to consult with manufacturers, discuss the project, and let them aid you in selecting the best system for the application. Due diligence: It's what is best for the client. 

#### SUMMARY

There are many traffic-bearing coating options available today for use in protecting concrete structures. Proper due diligence must be used in order to select the best, most appropriate system(s) for a given application

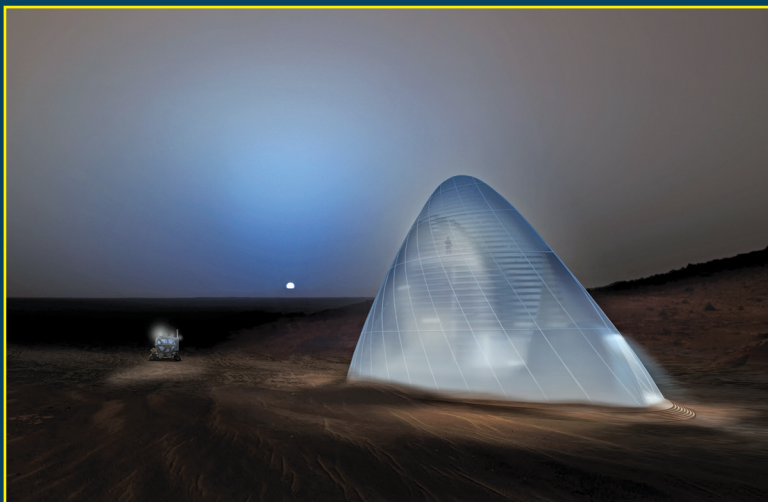


Mosby Lawrence

*Mosby Lawrence is the waterproofing segment manager for Neogard, where he has been employed for 22 years. With over 35 years of experience in the concrete, concrete repair, and waterproofing traffic coating industry, Lawrence is an active member of the International Concrete Repair Institute (ICRI) and the Sealant, Waterproofing, and Restoration Institute (SWR Institute), where he recently completed a three-year term on the board of directors. He has made numerous presentations at RCI and ICRI chapter meetings and national ICRI and SWRI conferences.*

## 3D-Printed Mars Habitat Design Challenge

NASA awarded three teams a total of \$40,000 in the first stage of the 3-D Printed Habitat Challenge Design Competition at the New York Maker Faire on September 27. The design competition challenged participants to develop architectural concepts that take advantage of the unique capabilities 3-D printing offers to imagine what habitats on Mars might look like using this technology and in-situ resources.



*The first-place award of \$25,000 went to Team Space Exploration Architecture and Clouds Architecture Office of New York, New York, for their design, Mars Ice House.*

Teams were judged on many factors, including architectural concept, design approach, habitability, innovation, functionality, Mars site selection, and 3-D print constructability. The design competition is the first milestone of the 3-D Printed Habitat Challenge, which seeks to foster the development of new technologies necessary to additively manufacture a habitat using local indigenous materials, with or without recyclable materials, in space and on Earth.

More than 165 submissions were received, and the 30 highest-scoring entries were judged, displayed at the Maker Faire event. The first-place award of \$25,000 went to Team Space Exploration Architecture and Clouds Architecture Office for their design, Mars Ice House.

The top 30 submissions can be viewed at <http://3dpchallenge.tumblr.com>.

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