Understanding Plaza Decks and Their Role in Waterproofing the Building Envelope

By Tom Stuewe

When describing the components that comprise the building envelope, are plaza decks a part of that conversation? Or do they get lost in the shadow of the more attractive, seemingly "more important" components such as the foundation, walls and roof? Although not often considered a key component to the building envelope, plaza decks should be designed, installed and maintained with the same precision as other elements of the building envelope. A plaza deck is any structurally supported slab that functions as both a floor and a roof. And since the plaza deck functions as a roof, it is critical that the surface is properly waterproofed to protect the occupied space below.

Plaza decks are subject to some of the most harsh deterioration and distress of any building envelope system. They are exposed to weathering, moisture, thermal effects and physical abuse from pedestrians and/or traffic. All of these factors can significantly reduce the system's service life. The key to ensuring plaza decks provide lasting performance begins before the system is even installed. It starts with designing a proper specification, which includes proper analysis and surface preparation. A properly prepared surface, including thorough repair of all splits and cracks, will largely determine the future performance of the plaza deck system.

In this article, we will explore:

- Basic function of plaza decks
- How they differ from traditional roofing systems
- Benefits of plaza decks
- Application techniques
- Extending the life of plaza deck systems
- A case study

What is a plaza deck?

In the simplest of terms, a plaza deck is any structurally supported slab that functions as both a floor and a roof and provides green-scape, tree planters and/or vehicles and pedestrians movement over occupied space.[1] The most common examples of plaza decks include parking garages, walkway bridges, stadium bleachers, high-rise balconies and walking decks. Other examples include green roofs and planter boxes.

[1] Whole Building Design Guide, *Building Envelope Design Guide - Plaza Decks*, December 2012 (http://www.wbdg.org/design/env_bg_plaza.php)

For the purpose of this article, we will focus on the restoration or repair of existing plaza decks, assuming that the original structure was engineered to be structurally sound and designed to include proper drainage, substrate slope and effective waterproofing beneath the concrete substrate.

A traditional plaza deck system consists of four layers, including a primer, base coat, wear coat with non-slip aggregate and a top coat. The primer is the initial layer of the system and is designed to seal in moisture and improve the adhesion of the plaza deck system to the substrate. The base coat serves as the primary waterproofing layer while the wear coat adds strength, durability and slip-resistance to the system. The aggregate used can be anything from silica sand to crushed walnut shells or quartz. Two layers of wear coat and aggregate are typically used in vehicular systems. Lastly, the top coat – which can either be clear or pigmented – seals in the aggregate and provides additional waterproofing protection.

Plaza decks are often exposed to heavy vehicular and pedestrian traffic as well as environmental elements. Located at or above the surface grade, plaza decks become an important part of the aesthetic appeal of any structure, and; therefore, need to be properly maintained to minimize water damage to the underlying concrete surface and ensure continued watertight performance.

Plaza Decks vs. Roofing Systems

Although plaza decks are elevated spaces with occupied spaces below, they should not be confused with traditional roofing systems. Roof systems are designed to protect the building from the elements and to support various HVAC and other mechanical equipment. With the exception of repairs or routine maintenance, roof systems are not designed to support pedestrian traffic. However, plaza deck systems are engineered specifically for heavy use by pedestrians and/or vehicles.

It is also easy and relatively common to confuse plaza decks with flooring systems. The danger in that is most flooring products are not designed to provide UV and waterproofing protection, which is critical in the proper design and installation of plaza deck systems. Floor coatings, which are designed for interior spaces, are very hard and rigid, while plaza deck systems provide more durability and resilience to provide protection from the elements. For example, if you were to drop a hammer on a floor coating, it would likely crack or chip the coating. Drop that same hammer on a plaza deck system, and it will bounce. That flexibility is key to the long-term performance of plaza deck systems, enabling them to withstand constant abuse from pedestrians, traffic and the elements.

Unlike flooring, which is protected from overhead structures, plaza decks are left without reprieve from the elements, creating a significant need for slip-resistant walking and driving surfaces. Additionally, aesthetics in a plaza deck system are very important due to their high visibility and frequent use. While aesthetics are somewhat important when it comes to roofing systems, they are not nearly

as visible (in most cases) as plaza deck systems. As such, imperfections in plaza deck systems are very noticeable and can quickly become problem areas that are more susceptible to wear and tear.

Benefits of Plaza Deck Systems

The most important characteristic of plaza deck systems is its ability to provide waterproofing protection and to help extend the life of concrete. The integrity, strength and performance of concrete are determined largely by the concrete itself and its reinforcing steel components. The failure of either, in most cases caused by moisture penetration, can lead to failure or loss of strength in the structure.

Moisture penetration of concrete will eventually lead to corrosion of the reinforcing steel, which will then lead to delamination or fractures of the concrete that occur below and parallel to the surface. Degradation can also occur as a result of extreme temperature variations, impact loading conditions and corrosion due to chemicals, such as de-icing materials. [2]

Plaza deck systems are typically one or two-component polyurethane, liquid-applied waterproofing membranes that will protect the concrete surfaces from absorbing or leaking water. The redundancy of the systems provides durability and superior waterproofing protection by sealing all cracks, joints and imperfections. These systems are also flexible enough to accommodate building movement and still provide a waterproof system. Polyurethane plaza deck coatings also provide UV stability, meaning they won't yellow or crack as a result of constant exposure to the elements.

Liquid-applied systems are beneficial for many reasons, but in the case of plaza decks, they are great for waterproofing around unusual details like columns, parking blocks, windows, and railings. The liquid-applied installation also allows for a smooth and consistent application, key to the aesthetic component of the systems.

Application Techniques

More so than other building envelope systems, proper surface preparation is critical to the overall performance of plaza deck systems. Any and all imperfections in the surface will be visible through the coating, which could impact the system's overall performance and aesthetics. Therefore, specifications that explicitly outline how to properly prepare specific details are key. Contractor selection also largely contributes to the project's overall success. Since plaza deck installation is a specialty application, contractors who have experience installing liquid-applied waterproofing systems should be recommended. Their level of experience when it comes to preparing the substrate should also be considered. As noted above, surface preparation is a critical determinant in the success or failure of a project. Having a design professional or building envelope expert create the specification can also ensure the project is headed in the right direction.

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[2] Zurich Canada Risk Services, *Concrete Parking Garage Degradation – Risk Engineering*, 2012 (http://tinyurl.com/ncw2lck)

When preparing a concrete surface, ample time and effort should be spent repairing cracks and joints to ensure the finished system is smooth, consistent and free of imperfections. Cracks should be diamond cut out, ground at a 45-degree angle and backer rod should be removed. The crack should be blown out, a new backer rod should be installed and the crack should then be filled with high-performance sealant. Similar techniques are applied to perimeter joints and joints around penetrations. After the cracks and joints have been prepped, a base coating is applied and then fabric is installed over top.

The concrete should then be cleaned and all curing agents removed by shot blasting the surface, making sure to pay special attention to high points and protrusions. Any existing coatings should be completely removed. If that is not possible, an adhesion test should be performed prior to application of the new plaza deck system.

Before applying the primer, tape off walls and any unusual details like columns or parking blocks for a clean edge. Each of the layers of the plaza deck should be applied by a squeegee to fill in any defects that may exist in the surface. Then, backroll the coating to pull out any air bubbles. Typical project turnaround is between three and four days, depending on the size of the job and installation crew.

Extending the Life of Plaza Deck Systems

As with any building envelope system, the most effective method to extending its service life is to monitor performance and conduct bi-annual inspections. Regularly cleaning the surface also helps remove oil, grease or other contaminants that can accelerate the deterioration of the coating. During inspections, it is recommended to look out for the following:

- Cuts, tears or delamination of the coating
- Flashing at curbs, walls, penetrations and drains
- Areas of heavy wear exposing the substrate
- Spalling or structural damage to the substrate
- Delamination of defective plywood
- Leaking joints with split sealants

Once a plaza deck system is installed, it is relatively easy to restore and maintain. Address problem areas, flash penetrations and joints, and then install a new wear coat. If an existing system is beginning to wear, the surface should be cleaned and lightly sanded to prepare it for another application. To add additional service life or added strength to an existing system, simply apply more layers of the topcoat.

A Case Study

For several years, water had been leaking into a south Florida municipality from its multi-level parking garage. The problem had been a constant annoyance, with water damaging ceiling tiles and forming puddles in hallways. The parking garage is heavily used throughout the year by the municipality's more than 700 personnel. Maintenance personnel tried making repairs various times, but the problem persisted.

The city has a diligent preventive maintenance program that requires buildings to be inspected yearly. As a part of that maintenance program, a building envelope and structural analysis was conducted. It was determined that the parking garage's horizontal and perimeter joints were failing, allowing water to enter the building. Additionally, the waterproofing for the vehicle impound area had completely worn away or failed in many areas.

As a matter of a solution, the old, damaged joints were removed and new backer rod was installed. The joints were then resealed with a high-performance adhesive sealant, and an elastomeric waterproofing plaza deck system was installed, providing renewed waterproofing protection.

Summary

Plaza deck systems are key components in the overall building envelope system, providing waterproofing protection to the occupied spaces below. As evidenced by the case study referenced above, failure of the plaza deck system can lead to water penetration into a building. Rather than considering plaza deck systems an afterthought, they should be treated with the same amount of attention and detail as other components of the building envelope system.

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