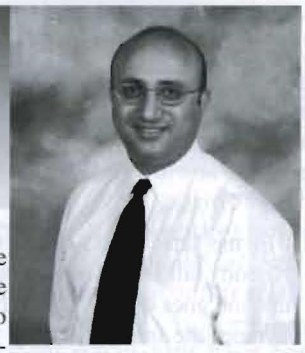
Plaza, Deck, Roofing and Garden Roof Assemblies What is the Difference?

By Kami Farahmandpour, PE, RRC, RWC, CCS, CCCA



Introduction

Plaza decks, and garden (green) roof assemblies are designed very differently than roofing systems. Plaza deck surfaces will often need to accommodate continuous traffic and abuse. For that reason, designers try to separate the waterproofing membrane from the wearing surface. The presence of a wearing surface results in membrane configuration that is unlike most conventional roofs.

Garden roofs are also different than conventional roof membrane assemblies. While a garden roofing assembly is similar to a plaza deck assembly, it faces its own set of unique challenges.

Conventional and IRMA Roofing Systems

In the majority of the roofing systems, the membrane is placed on top of the roofing assembly. A typical conventional roofing assembly in the Midwest region consists of a vapor retarder placed over the roof deck, thermal insulation (often tapered to provide drainage slope for the roof surface), and the roof membrane. In such applications, the roof membrane is exposed to the environment resulting in exposure to significant thermal changes and UV radiation. While thermal changes and UV radiation can both accelerate the rate of deterioration for a roof membrane, an exposed roof membrane has the advantage of being able to dry out. As such, most roof membranes are not continuously subjected to moisture.

One type of roofing system that is an exception is an inverted roof membrane assembly (IRMA). In an IRMA system, the roof membrane acts much like a waterproofing membrane. The membrane is placed directly on the roof deck (typically a cast-in-place deck), then overlaid with thermal insulation, filter fabric and ballast. Water passes trough the ballast, filter fabric and insulation and reaches the membrane where it is directed towards the drains. In recent years, the use of a drainage composite or insulation panels with drainage channels has become far more popular to facilitate water drainage at the membrane plane. IRMA systems protect the roof membrane from thermal changes, UV radiation and traffic. However, they pose two significant down sides:

1. Although moisture can drain towards the drains, moisture cannot readily evaporate from the top surface of the membrane. As such the roof/waterproofing membrane will continuously be subjected to moisture. This will impact the longevity of most materials.
2. Diagnosing and repairing problems in and IRMNA system is far more difficult since the roof overlaying materials will have to be removed to diagnose or repair the membrane.

Plaza Deck Assemblies

Plaza deck assemblies are similar to IRMA systems. However, their wearing surfaces are design to accommodate traffic and provide for better aesthetics. There are currently two types of plaza deck assemblies: I typically refer to them as "open joint systems" and "closed joint systems." The closed joints systems are the most traditional types of plaza assemblies.

In the "closed joint systems", a vast majority of the storm water drains onto the plaza wearing surface, necessitating the use of a two-tier deck drain assembly. The wearing surface is typically constructed of cast-in-place concrete or mortar-set pavers. The pavers can be stone, brick, or precast concrete. The joints between the pavers (or the control joints in the cast-in-place concrete wearing slab) will then be sealed with sealant or mortar. These joints will inevitably crack or deteriorate over time. The waterproofing system in a closed joint system is placed below the wearing surface (i.e. the mortar setting bed or concrete wearing slab). In the older days, no drainage composite was typically provided over the waterproofing membrane. However, more recently, closed joint systems typically include a drainage composite over the waterproofing membrane to facilitate drainage. Another advantage of placing a drainage composite over the waterproofing membrane is that it reduces the potential for critical saturation of the mortar setting bed or the concrete wearing slab. In cold climates, critical saturation of the mortar setting bed or the concrete wearing slab can lead to freeze-thaw damage and deterioration. For this reason, closed joint systems should be selected for cold regions with caution. Careful attention to the selection of the mortar or concrete mix, and quality control will be needed. Another consideration is that the salts and lime from the concrete or mortar setting bed will tend to be washed out and clog the drainage composite or its filter fabric. Application of deicing salts can also lead to damage to the mortar setting beds and concrete surfaces due to crystallization pressure.

Recently, "open joint systems" have gained more acceptance since they offer many advantages. These systems are also commonly referred to as "pedestal paver systems". In open joint systems, the vast majority of the storm water is drained through the wearing surface open joints down to the waterproofing membrane level. As such, primary waterproofing is provided by the waterproofing membrane. In many cases, the use of a drainage composite is not required since the wearing surface pavers are typically supported on pedestals or shims. This creates an open cavity below the pavers that facilitates good drainage. Another advantage offered by open joint systems is that the wearing surface can be constructed level for improved aesthetics. There is typically no need for the use of surface drains. Therefore, deck drains can also be concealed below the pavers. However, like any other alternative, open joint systems have their disadvantages. Without careful installation, the pavers can rock, crack or get displaced. Typically, the perimeter confinement of the pavers should be carefully designed to minimize the potential for paver shifting.

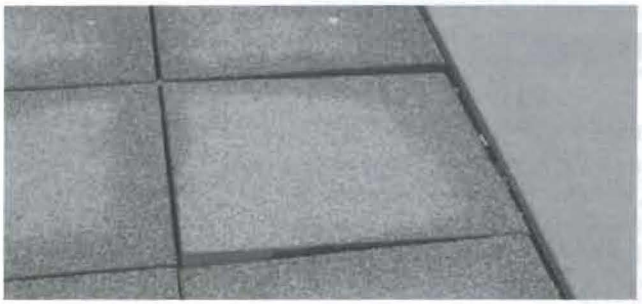
Garden Roofs

Garden roofs are designed similarly to IRMA and plaza decks. However, they pose several challenges. In a plaza assembly of IRMA system, water that reaches the waterproofing membrane is drained away from the membrane as quickly as possible. However, in a garden roof, some water retention is needed for vegetation growth. As such, garden roof assemblies typically include a water retaining layer to retain the rain water in the system for vegetation growth. The water retaining layers are typically made of plastic materials shaped in cops and molded into a sheet. Once placed over the waterproofing membrane, they will retain water in their cup-shaped containers. The size and thickness of these water retaining layers are different from one manufacturer to another manufacturer, and depending on whether they are placed in an extensive or intensive garden roof.

In addition to from facing the same challenges a plaza deck or IRMA assembly face, garden roof have the added disadvantage of having to withstand the destructive force of vegetation root growth and microbial growth. For this reason, many waterproofing membranes used in garden roof assemblies have roof inhibiting chemicals incorporated into them.

Roofing Challenges:

Extensive deterioration of a plaza deck mortar setting bed in a closed joint system. The plaza is located in a cold region.



Shifting and rocking of pedestal supported pavers

A conventional roof membrane is typically exposed to the environ ment. Granules or coatings are usually used to UV exposure.

About the Author

Kami Farahmandpour is a Licensed Professional Engineer, Registered Roof Consultant, Registered Waterproofing Consultant, Certified Construction Specifier, and Certified Construction Contract Administrator. He has over 22 years of experience in the evaluation and repairs of construction materials with an emphasis on building envelope, roofing and waterproofing issues. He is an active members of several organizations including RCI, Inc., SWR Institute, ASTM, and CSI. He has received several awards from RCI, Inc. for his service to the organization, design of a roofing system, and authorship of technical articles. He has published numerous articles and lectured to various professional groups on the topics related to his expertise. He routinely provides expert services on construction and design deficiencies related to building envelope systems.

Kami Farahmandpour is the Principal and Founder of Building Technology Consultants, PC (BTC) in Arlington Heights, Illinois. BTC is a specialized consulting firm with extensive expertise in the forensic evaluation of building envelope and structural problems, and development of innovative repairs to resolve those problems.