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Subject: **Learning from Forensics – Tips**

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Successful Balconies, Courtyards, Patios, Plaza Decks, Roofs, Exterior Walking Surfaces and Swimming Pools Decks

Flat balconies, landings, and roof decks which are constructed without any slope often leak over occupiable spaces, destroying property and resulting in the decomposition of surfaces and framing members of the building. Ponding water supports bioorganic growth, shaling and deterioration of stone installations, and creates slippery walking conditions.

To prevent ponding water, positive drainage must be included in design and installation. The following components make for successful balconies, courtyards, patios, plaza decks, and roofs, walking surfaces including swimming pool surrounds:

1. Surfaces and membranes are sloped minimum $\frac{1}{4}$ inch per foot to drain, to drain all water, dew, and etc. to drains, scuppers or to outfall.
2. All drains have weep holes with the waterproof membrane wrapping into the clamping ring of the drain assembly. A secondary overflow drain is supplied to accommodate water when the primary drain gets clogged up with leaves, etc. that may prevent proper drainage. All moisture above membrane systems in mortar beds are drained through the weep holes at the drains.
3. All surfaces drain away from the building structure.
4. Correct expansion joints including isolation joints at perimeter walls. An ideal condition for a swimming pool deck area is to have drains on a 12-foot grid apart, starting at 6 feet from the swimming pool coping expansion joint. Have all surfaces slope toward the drain at least $\frac{1}{4}$ inch per foot. Have the expansion joint locations on a 12-foot grid apart at the highest mid point elevation between the drains, and have a minimum 1/2-inch width expansion joint.

Remember the caulking/sealant at the expansion joint needs to be a minimum shores "A" hardness of 35 or greater in traffic areas.

5. Flashing at all perimeter walls. Moisture in adjacent wall assemblies are required to drain to the tile and stone surface, including weep screeds for stucco wall assemblies. A drainage layer allows for moisture easy egress to the drain, scupper or outfall.
6. Tile and stone installations are installed in accordance with ANSI minimum standards. ANSI A108.1 for mortar method and ANSI A108.5 for thin-set

method. Use Marble Institute of America Design Manual requirements for anchored stone.

7. Membrane systems comply with AC39 requirements or are tile industry approved materials for a given installation. Acceptance Criteria 39 of the International Conference of Building Officials has minimum requirements for walking deck surfaces.

Any tile or stone bonded to a membrane, the membrane must meet the ANSI A118.10 requirements.

8. In addition to flashing perimeter walls, tops of parapet walls are required to have either sheet metal flashing or waterproof membranes to protect all horizontal framing. Tops of parapet walls are recommended to be sloped 1" for positive drainage. Penetrations in decks like handrails are required to be properly sealed at penetrations. Fifteen-pound asphalt saturated felt is approved for vertical applications only, and is not approved for usage on the horizontal cap of parapet walls unless covered with an approved waterproof membrane.
9. Rain gutters from roofs are recommended to be tied into drains to exit the structure. Rainwater egress is not permitted to flow across public walkways.
10. Vertical offset is necessary at door thresholds to properly flash, waterproof, and have sufficient height to drain all water away from the building structure.
11. Plaza decks are acceptable using pedestal-type systems. These are designed for severe weather conditions with the same requirements as above.
12. Walking surfaces should meet 0.60 minimum coefficient of friction
13. Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. Roof drains shall be sized and discharged in accordance with the Uniform Plumbing Code. Overflow drains shall be connected to drain lines independent from the roof drain lines.
14. In areas subject to freeze thaw conditions, do not install tile or stone subject to failure from freeze thaw conditions.
15. Ceramic tile and stone installed in swimming pools, spas, and fountains require adequate cure time of the setting materials. If a latex Portland cement mortar or latex based waterproof membrane is used as part of the swimming pool or spa, or fountain, the soap and surfactants in the latex that assist in the curing process must also dry out prior to the introduction of water. Water introduced too soon, can cause the surfactant to re-liquefy and lose bond to the substrate.
16. Adjacent landscaping should have adequate drainage to accommodate high usage water flow. Lack of drainage can contribute to ground saturation and earth movement.
17. Slip trip and fall hazards should be eliminated wherever possible. Where a single stair can be made into a ramp, use the ramp. Handrails are required at all stairs.

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18. The property owners should plan maintenance on a regular basis.