Weeps
Why, Where and When

By John H. Koester

The MTI article "Weep Now or Weep Later" addressed the function (or in many cases the "dysfunction") of various types of weep materials and devices. This article addresses the "why, where and when" of weeping masonry walls.

The why part is easy; it's just a good standard practice to follow and not that expensive. The where part should be obvious – at the lowest point of a cavity or core – where the water is! The when part takes a little more thought. A general rule to follow is, "If there is a relatively open vertical void in the interior or the back side of a veneer (rainscreen) and it has a bottom, it needs to be weeped.

In reality most weeps are installed or not installed, and the masons don't know (or care) why! Where the weeps are installed has virtually no reasoning, scientific or otherwise. And the when part seems to be "just as little as possible."

So why is it that an inexpensive, relatively easy process that can lead to such serious consequences if not included in the exterior building envelope is so often done incorrectly or completely overlooked? The answer may be that it is so inexpensive and insignificant in appearance that it is easily omitted.

- So inexpensive that no one spends much, if any, time talking about their importance.

- So inexpensive that no one invests any time edu cating and training the industry on correct design and installation.

- So inexpensive that no one has a vested financial incentive to explain their function and defend them in any forensic investigation of a pre mature failure of an exterior building envelope involving entrapped moisture.

In many cases involving premature failure of the exterior building envelope, where entrapped moisture was identified as the main contributing factor, the forensic investigator's conclusions are "just plain wrong!" In too many of these cases, the failure of waterproofing components (roofing membrane, flashing system, waterproof coating, etc.) is incorrectly identified as the main contributing factor. However, the real culprit is often a poorly designed and/or incorrectly installed drainage system. Waterproofing systems exposed to long-term ponding water will not produce a positive outcome.

"Detailing" the Solution

The focus of this article is weeps and weep systems and the waterproofing materials that are used with them to create an effective moisture management (drainage) system for the exterior building envelope. It's inconceivable that including an effective weep and flashing system can break the budget for a masonry wall, yet it happens all the time. So the explanation for the industry's repeated failure to include them or to accept such poor design and materials must be found elsewhere.

The answer, at least in part, is that the industry just doesn't know or understand how moisture impacts exterior building envelopes and the veneers that adorn them. If the industry doesn't know the potential cost of neglecting this detail, why would they budget and pay for it? Another possible reason for reoccurring problems with weep details (or the lack thereof) is insufficient oversight; no one is watching! It is time for the weep issue to come to the forefront in the quest for more sustainable buildings. This issue is too important to the long-term viability of the building envelope to simply be an act of happenstance.

Creating a Moisture Management Plan

Any good moisture management design starts with a good plan of attack. This plan should start once there is a preliminary design. This is the first opportunity to understand the concept of moisture management "risk zones." It's also early enough in the design process to modify the design to avoid unmanageable "risk zones."

Moisture management "risk zones" are determined by a variety of factors.

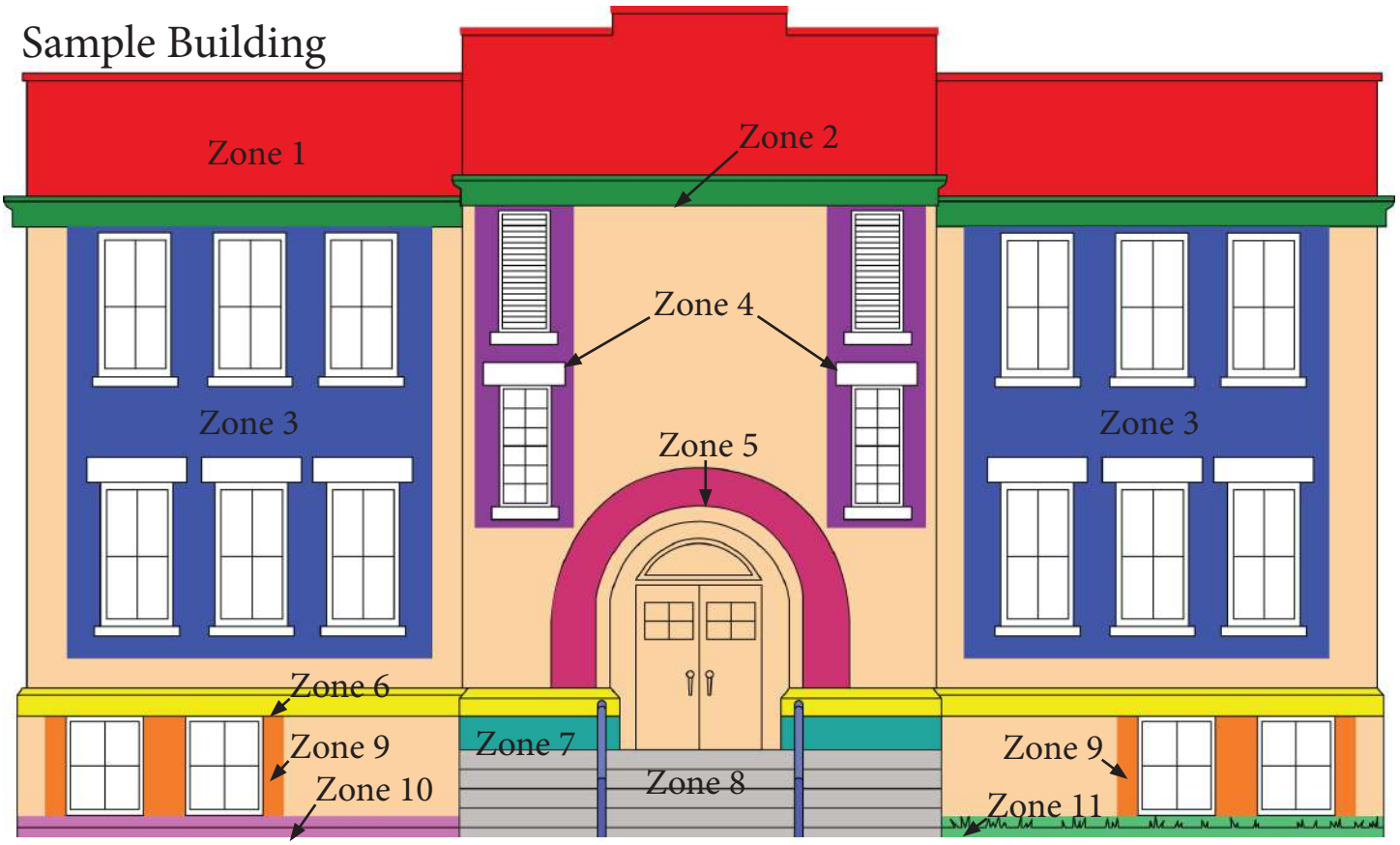
- The building site
- Climate of site location
- The structures orientation on the building site
- The structure itself (multistory, low and sprawl ing, etc.)
- Materials used in the exterior building envelope
- Veneer materials (brick, stone, manmade, etc.)
- Number of openings in the veneer and external building envelope (windows, doors, etc.)

All of these factors must be considered both separately, and collectively, to properly determine the moisture management "risk zones." The details then need to be designed to manage or reduce the identified risks.

What constitutes a moisture management "risk zone?" It is a section of the exterior building envelope that has a specific, unique exposure to moisture. (see Sample Building) The moisture management risk can vary in intensity from very low to extremely high. One of the main reasons for identifying the various "risk zones," and the degree of moisture management risk they represent, is to design the appropriate risk management detail. A second reason for this process is to understand and outline the boundaries of the risk zones to design details in a way that separates them from one another.

There are many examples of premature failure of the exterior building envelope that illustrate entrapped moisture has migrated from one location (zone) to another. This migration, along with the costs associated with premature failure, can be prevented with the appropriate detailing.

The process of determining moisture management "risk zones" can start at any part of the exterior building envelope. In most cases since moisture moves from a high point of entry to a low point in the exterior building envelope, starting at the top just makes sense. Although this article concentrates on the wall portion of the exterior building envelope, it is important to know that many serious wall moisture management problems are actually caused by roof leaks, both low-sloped and high-sloped; however, because of space issues that subject will be addressed in another article.



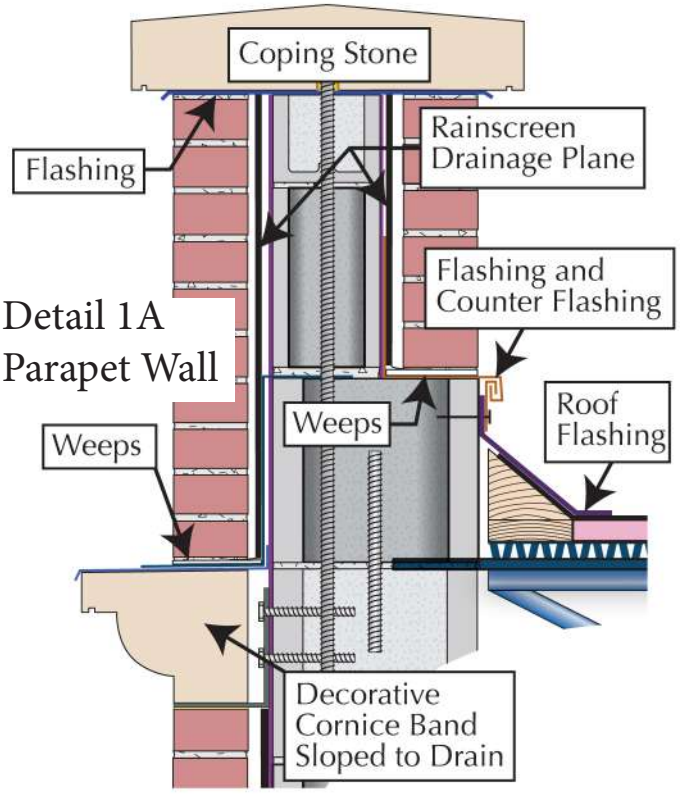
In some cases the determination process may be a two-step procedure: a determination of a "general risk zone" and a second determination of "associated moisture management risk zones" within the original identified "risk zones." Examples of this two-step determination process include parapet walls and window openings. The sample building is an example of assessing moisture management "risk zones" for the purpose of designing the appropriate flashing and weep detail to help modify the moisture management risk.

The sample building has numerous identified moisture management "risk zones" on and in its exterior building envelope.

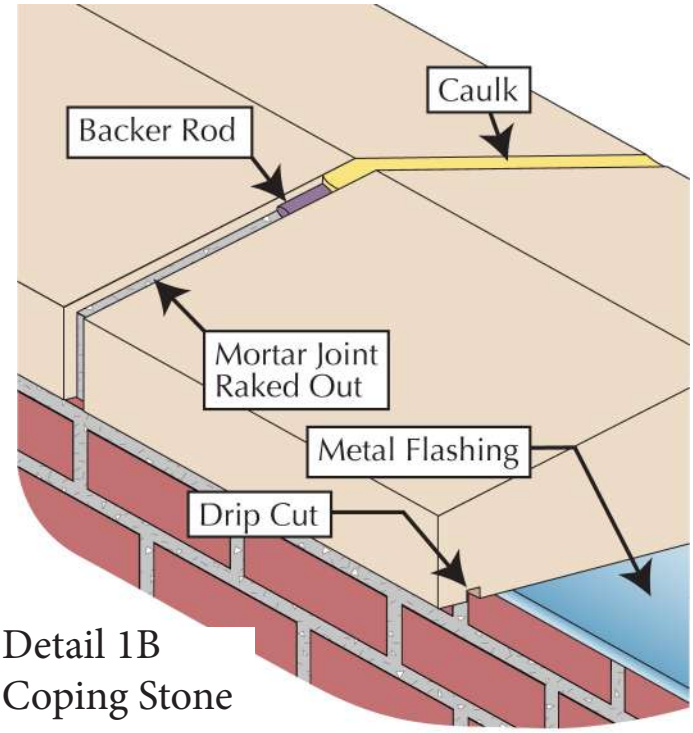
- Parapet wall
- A decorative cornice belt
- Window openings
- Door openings
- Louver openings
- Intersection of a top of a non-frost affected concrete stoop and masonry wall
- Intersection at grade of a masonry wall and frost affected sidewalk
- Intersection at grade of a masonry wall and landscaping

Risk Zone #1 is an example of a parapet wall "risk zone" (See Sample Building and Detail 1A) with multiple associated moisture management details.

1. Coping
2. Roof flashing and counter flashing
3. Transition point from bottom of parapet wall to top of exterior building envelope that encloses the interior spaces – "the decorative stone cornice band"

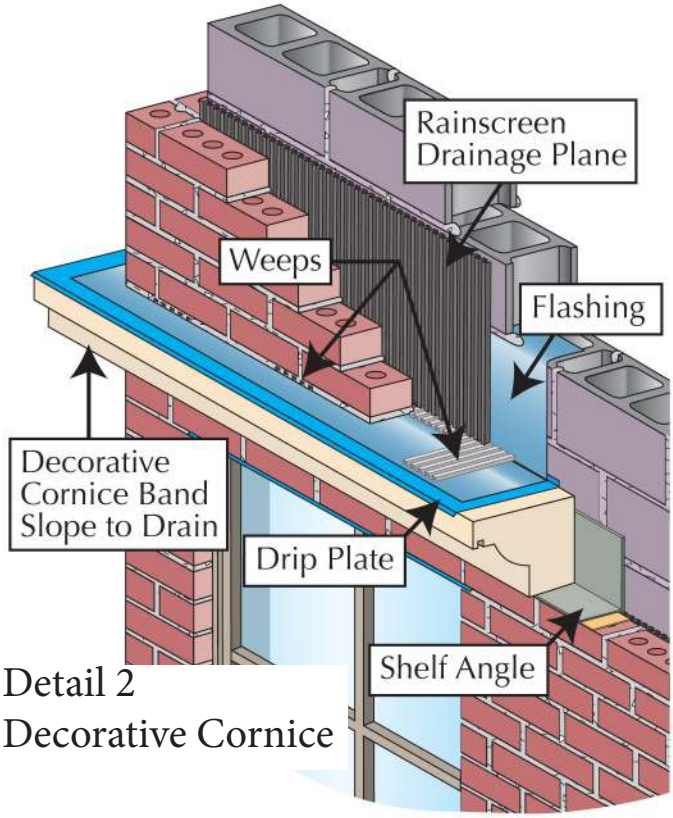


The coping on the parapet wall is the roof of the parapet and must be waterproofed. (See Detail 1B) Coping stones are one of a number of exterior building envelope details that has numerous responsibilities and are positioned, in many cases, virtually out-of-sight and out-of-mind. The intersection of the roof and parapet on the bottom back side of the parapet is another moisture management detail with numerous responsibilities. The roof flashing and the parapet wall counter flashing must be designed to be both a waterproof detail and a movement absorbing detail that can accommodate expansion and contraction of the roof assembly. (See Detail 1A)



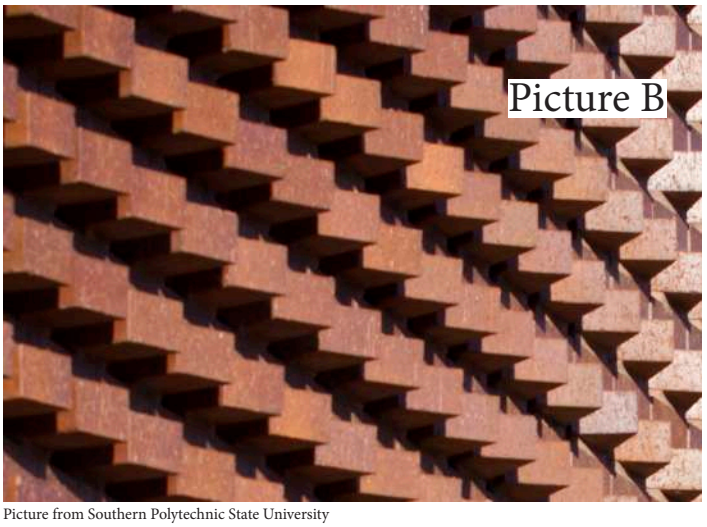
Detail 1B
Coping Stone

The point where the bottom of the parapet wall ends and the top of the exterior building envelope that encloses the interior spaces of the building begins is sometimes unclear. Risk Zone #2 is the top of the decorative stone cornice band. (See Sample Building and Detail 2) Do not be mislead by the term "decorative." It is also a moisture diverting detail and a wall "roof" for the wall and windows below it. (See Detail 2)



Detail 2
Decorative Cornice

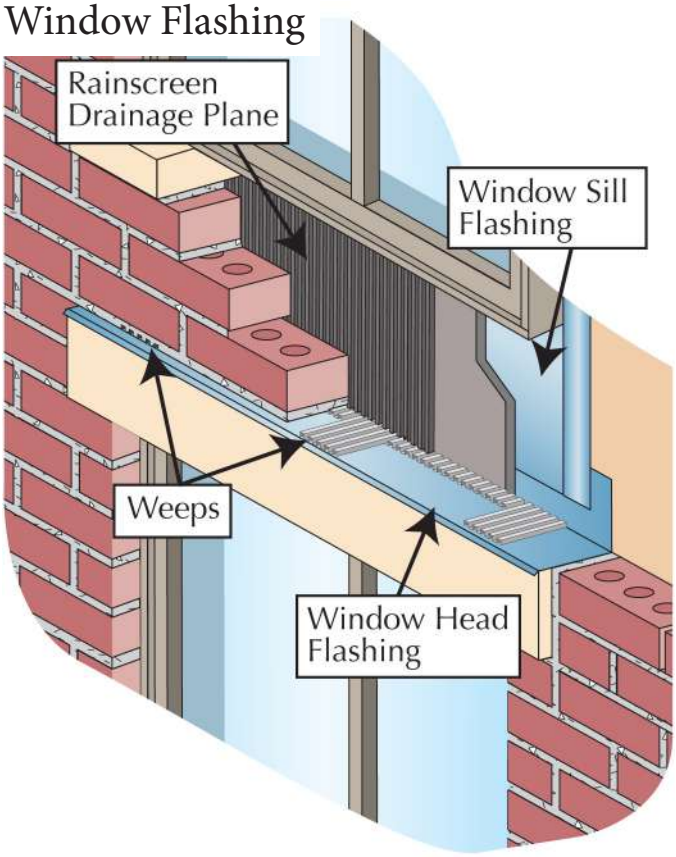
There is an industry-wide misconception that patterns on the exterior of the building envelope veneers (stucco, wood, brick, stone, etc.) are simply decorative. In truth their primary function is protection. They direct moisture away from sensitive details such as windows and doors. (Picture A) In the past the construction industry understood this multipurpose concept and had the sense to make them both functional and aesthetically appealing. The current trend seems to concentrate solely on the aesthetic aspect. The unintended consequence of this singular focus is the creation of surface patterns (or details) that actually cause moisture management problems. (See Picture B)



Picture from Southern Polytechnic State University

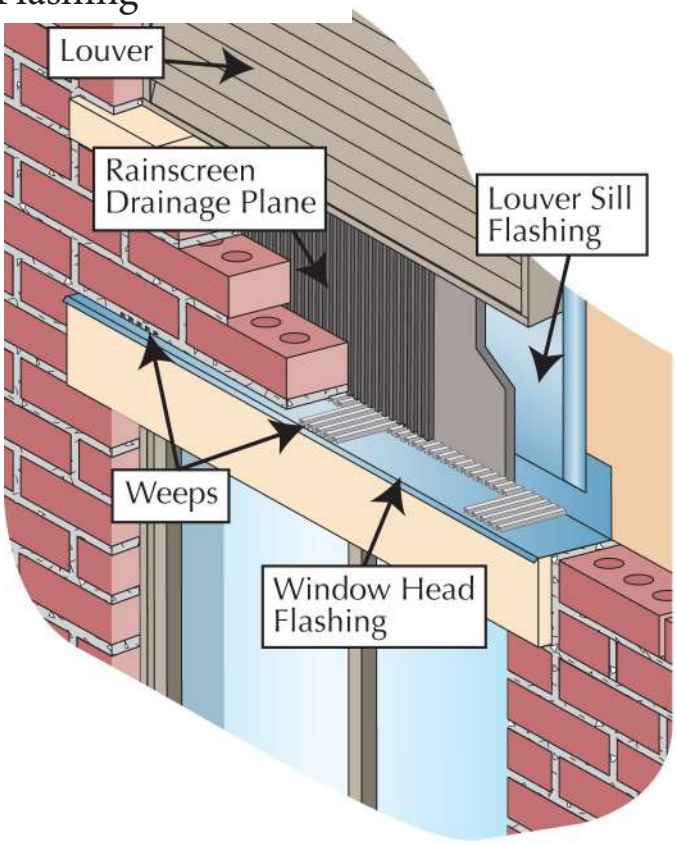
Risk Zone #3 is the group of six windows on the second and first floors on the right and left sides of the exterior building envelope. (See Sample Building and Detail 3) In many cases windows or numbers of windows should be grouped into one "risk zone" because their moisture management details are so interconnected and interdependent; one moisture management risk zone with multiple, associated moisture management details! (See Detail 3)

Detail 3
Window Flashing



Risk Zone #4 is the pair of louvers and windows on each side of the entryway. (See Sample Building and Detail 4) Obviously, louvers and windows are different, but the moisture management detail is virtually the same, and their proximity to one another joins them into one moisture management "risk zone." In many circumstances the wall opening that is directly above another wall opening will have an impact on the wall opening detail below it even though they may be of different types. The explanation is obvious – "water runs downhill!" (See Detail 4)

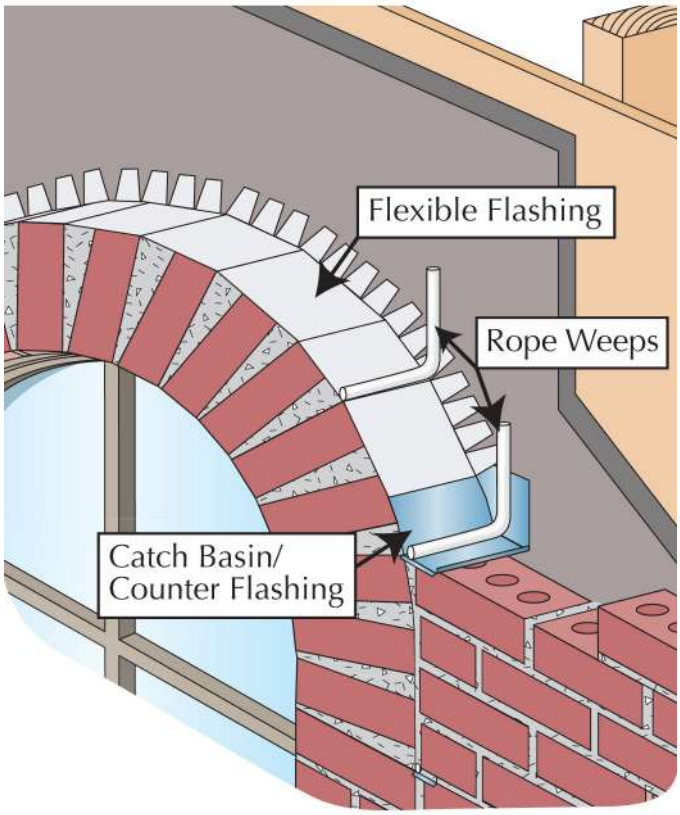
Detail 4
Louver and Window Flashing



Risk Zone #5 is the arch above the front entry. (See Sample Building and Detail 5) The arch is probably the most misunderstood moisture management detail of all the wall-opening details. When I see weeps protruding from the radius of an arch, it is so ridiculous it almost makes me smile. However, there is nothing humorous about the construction industry's lack of understanding when it comes to moisture management! (See Picture C)

If the weeps installed on the radius were to be functional at all, there would need to be an upturned stop flashing at that point of the arch flashing to stop moisture, and the weep would need to be installed at the bottom of the valley in the flashing. It would also have to have the same elevation in the masonry joint. (see Detail 5) The skill to execute this type of detail is difficult, if not virtually impossible, to find.

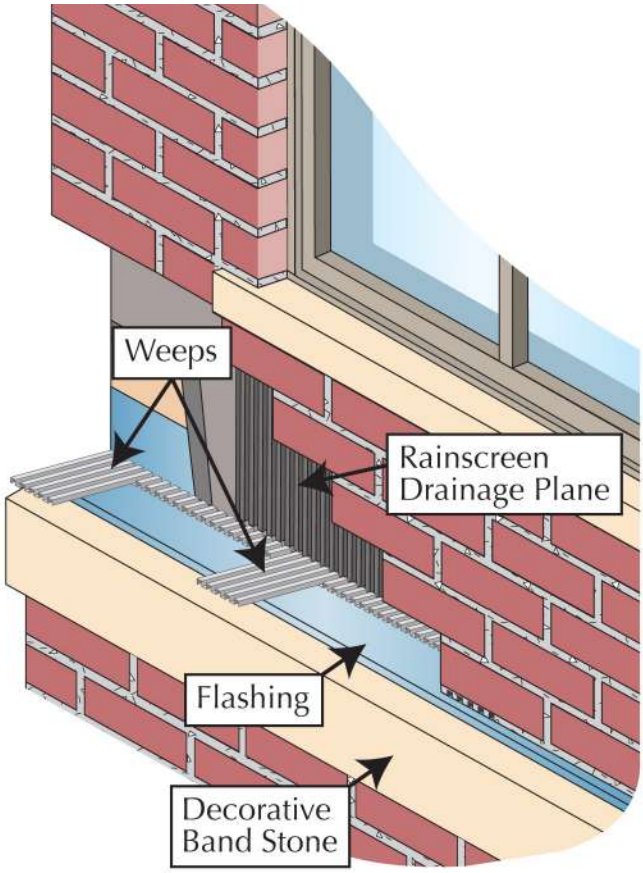
Detail 5
Arch



Like many good practices and details in the construction industry, the moisture management detailing for arches has been lost to history. Arches have been in common use since the time of the Romans, and so has the moisture management detailing required to preserve them; however, most people today simply pass it off as decoration. The gaping mouths in the heads of animals and gargoyles that serve as column caps supporting arches on ancient and medieval structures are actually the weep exits (holes) for the arches' moisture management system. (See Picture D)

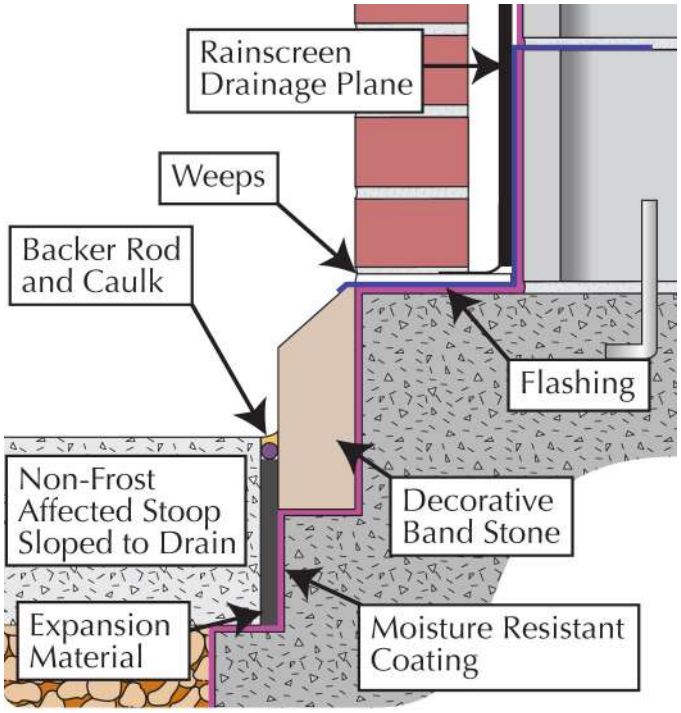
Risk Zone #6 is the decorative band stone that separates the bottom of the first floor exterior building envelope from the garden level exterior building envelope. (See Sample Building and Detail 6) This veneer detail has a number of responsibilities. It is a moisture diversion detail that diverts moisture out, over and away from the windows and wall below it. (See Detail 6) This decorative band stone also has an aesthetic appearance aspect.

Detail 6
Decorative Band Stone



Risk Zone #7 is the intersection of the vertical wall and the top surface of the non-frost affected stoop platform. (See Sample Building and Detail 7) This vertical wall veneer surface will be subject to water splash back from the top surface of the platform of the stoop. Also, various types of ice control chemicals (salts, deicers, etc.) may contaminate it, and snow removal tools (shovels, scrapers, etc.) may contract it. This wall detail needs to be durable, aesthetically pleasing and backed by a waterproofing system because it is an exterior wall system with an interior living space behind it. (see Detail 7)

Detail 7
Decorative Band Stone

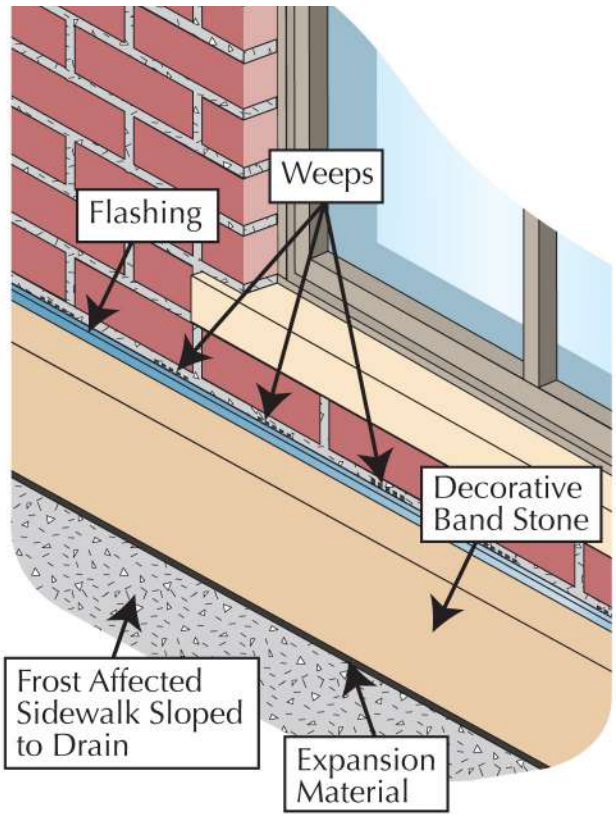


Risk Zone #8 is the front stoop steps and stoop platform. (See Sample Building) The 7th and 8th risk zones are the perfect example of the interdependence of moisture management systems. In the case of the stoop platform and steps, the slope-to-drain of the surfaces and their ability to resist moisture penetration is absolutely critical. A detail that will allow for replacement of the stoop platform and steps without major impact on the veneer wall system is the appropriate design. (see Detail 7) This is an example of how a comprehensive understanding of moisture management risk zones influence the original building design and its detailing to allow for future maintenance, repair and replacement of the exterior building envelope components with the least amount of interruption to adjoining details.

In this instance the stoop platform is the construction detail that has the most exposure to moisture and will, in all likelihood, need to be repaired or replaced before the other adjoining details. The band of stone at the bottom of the vertical brick wall should be more durable than the brick. It separates the edges of the top surface of the stoop platform from the brick veneer and diverts water away from the intersection of this moisture sensitive detail. (see Detail 7)

Risk Zone #9 is the set of two garden level windows on each side of the front entryway stoop. (See Sample Building and Detail 8) Window openings at this elevation on an exterior building envelope have a number of unique moisture management concerns. Their proximity to grade level and the moisture that may accumulate there is of real concern. The potential for splash up moisture is an additional negative. Designing/detailing the grade surface that adjoins these types of grade level windows is a very important factor that will play out in the day-to-day maintenance and their long-term sustainability. The other obvious concern with windows in this location is security. A damaged window is also not very waterproof. (see Detail 8)

Detail 8
Garden Level Window

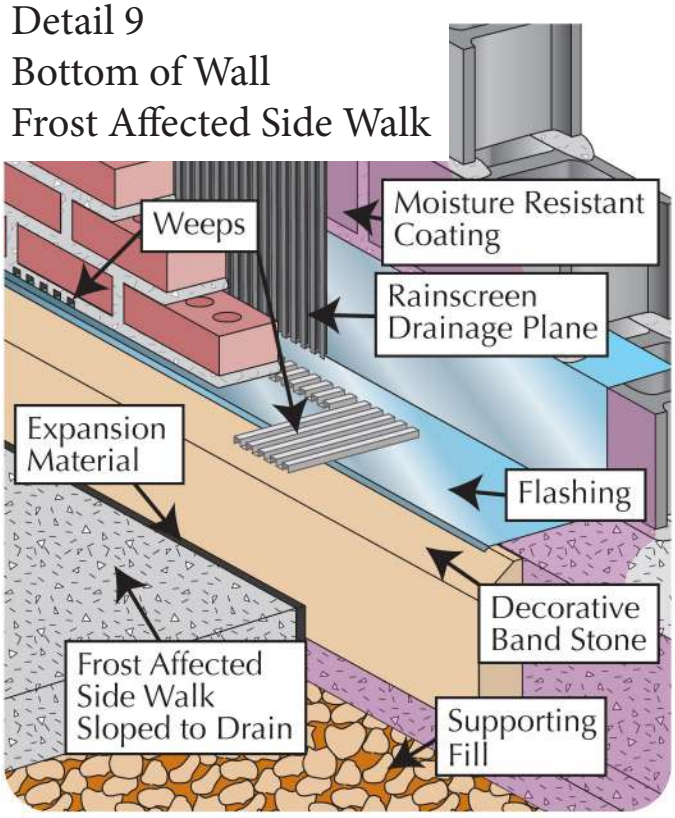


Risk Zones #9 and #10 are the two on-grade details that contact the bottom perimeter of the building on each side of the front stoop. (See Sample Building and Details 9 and 10) The grade surface on Detail 9 is a frost-affected sidewalk; the grade surface on Detail 10 is landscaping stone.

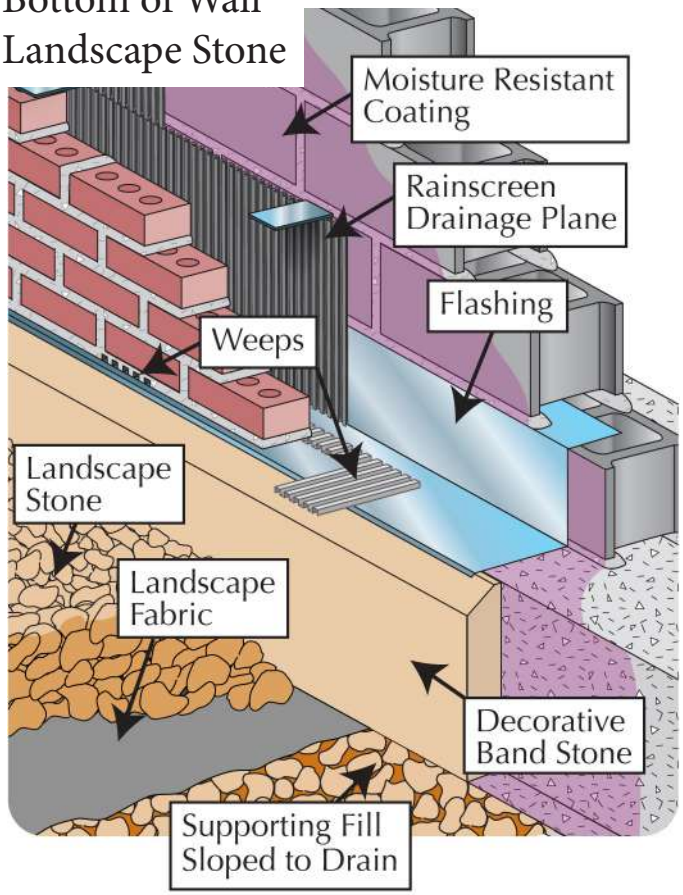
These two very different "on grade" materials need to follow many of the same rules of good moisture management.

- They both need to maintain good slope-to-drain away from the structure they contact
- Their top surface elevation must not interfere with the drainage "weeps" of other exterior build ing envelope components (these risk zones) and their movement up or down in elevation due to expansion or contraction of soils that support them (because of the wetting or drying of support ing fill material, or because of the freeze-thaw cycle in supporting fill material, or because of the characteristics of expansive soils that may be sup porting) must be taken into consideration. (See Details 9 and 10)
- These details cannot at any time, or for any reason, become attached to the structure they abut. The attachment and potential movement of these details will result in severe damage to the structure and the "at grade" details. (See Details 9 and 10)

Detail 9
Bottom of Wall
Frost Affected Side Walk



Detail 10
Bottom of Wall
Landscape Stone



Conclusion

The importance of identifying unique moisture management risk zones on and in the exterior building envelope is key to creating and maintaining a sustainable building. However, though these moisture management risk zones can be identified as separate and unique for the purpose of designing and detailing, they are not and cannot be disconnected from each other when it comes to moisture management. From top to bottom and from bottom to top, they all interconnect and impact each other. No good wall system can survive a bad roof and no good roof can survive a bad wall system; they support and protect one another. This is what holistic, sustainable building is all about – knowing that nothing is separate, all things are connected and nothing stands alone.