The Three-Part Rule for Moisture Management
by
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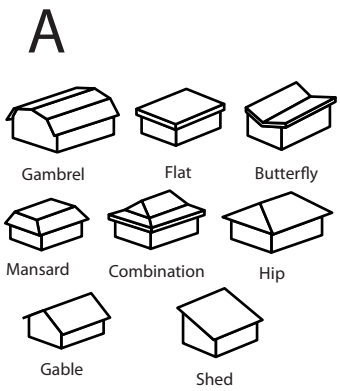
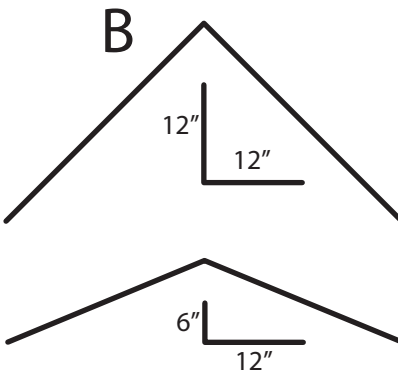
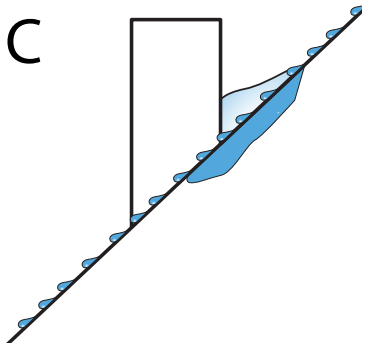
The three-part rule of moisture management is "Get moisture off of, out of and away from a construction detail as quickly as possible!" However, we are left with the nagging questions: Off of to where? Out of to where? Away from to where? Answering these three questions is the really difficult part of the rule. Only a fraction of the liquid water involved will evaporate into thin air, and in some cases even then it still can have a negative impact on the construction detail.

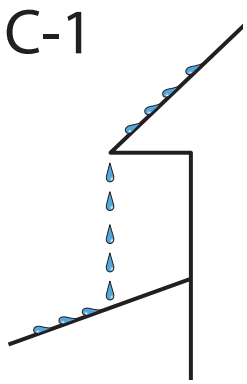
Off of a Construction Details



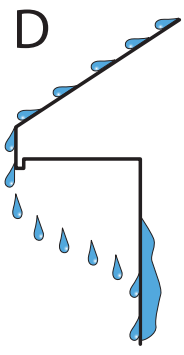


Let's start with getting the water "off of" a construction detail. Obviously, there are hundreds and hundreds of details this applies to; however, let's start with roofs. Roofs can be sloped to drain in many directions. (**A**) The roof style depends on numerous factors including architectural style, distance to be covered, budget, etc. Generally, for moisture management purposes, the more slope the better. The greater the slope (pitch) on a roof, the faster liquid water can run off. (**B**) This is important because the less time liquid water is on a construction detail (roof) the less the likelihood it will absorb into that construction detail.

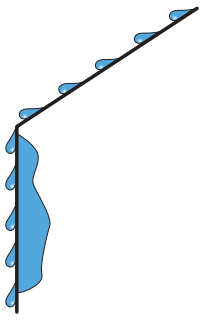


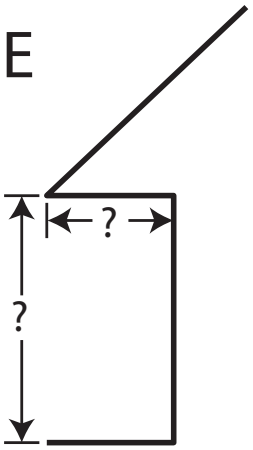


We should also reduce the number of projections or obstructions that are in the path of this draining liquid water. Anything that slows the flow of liquid water off of a construction detail such as chimneys or vent stacks increases the amount of time that liquid water will spend on the construction detail. (**C**)



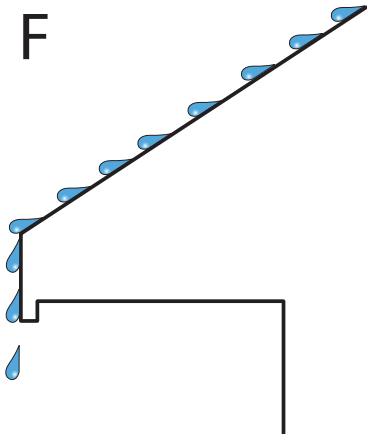
Once the water reaches the roof perimeter, where does it go? (**C-1**) A good rule to follow is to not allow it to come back into contact with the building or any other construction detail. (**D**) There should be a relationship between the depth of the overhang (eve) and the height of the wall from eve to grade. (**E**) This ratio is valid only up to a certain height.

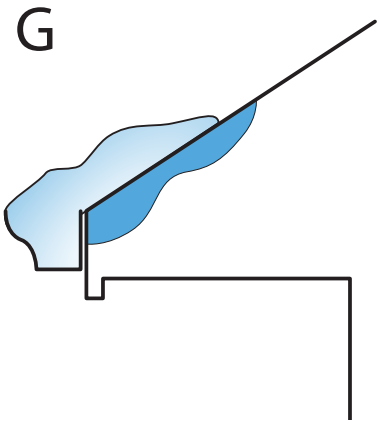




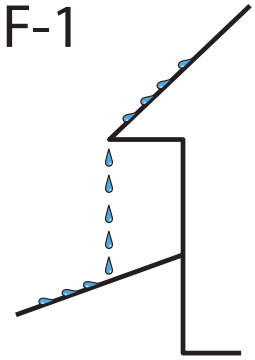
Multi-storied buildings have other concerns with moisture on their exterior building envelope that deal with the variation of surface pressures on the exterior building envelopes of high-rise buildings. This eve detail is the most straight forward of

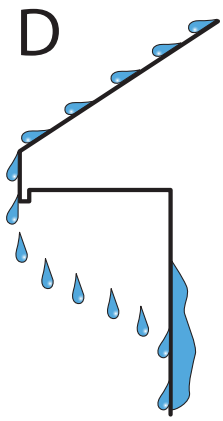
all perimeter roof details. (**F**) Perimeter roof details that involve a gutter and downspout add many concerns; they complicate the detail and must be designed, installed and maintained correctly. Gutters and downspouts can easily trap debris, ice and snow; these obstructions slow down and even dam up liquid water. (**G**) These debris and ice dams have caused building owners and insurance companies hundreds of millions of dollars over the years.

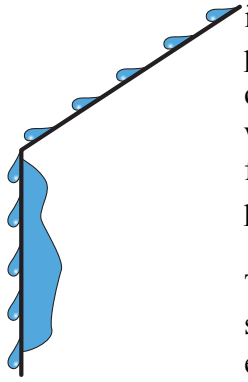


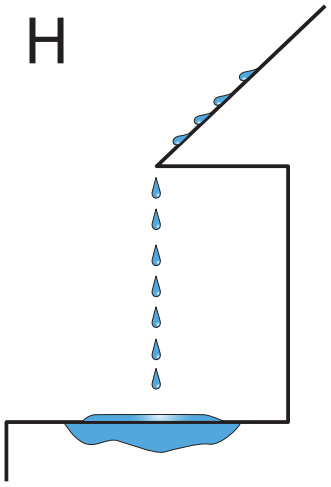


The best scenario for liquid water once it is off of a roof perimeter detail and headed downward is directly to a designed grade. (**F-1**) If it comes in contact with the surface of the building's exterior wall or lands on another construction detail, there is more work to be done. (**D**) The construction details we are concerned with include other lower roofs and roof pitches, tops of doors, tops of windows, tops of walls, etc. The roof run off water from a higher roof adds a whole new dimension to the moisture management equation because it can be a very concentrated flow. When it lands on a lower surface, it can, over time, erode the lower construction detail. The roof run-off water from a higher roof delivered in a slow "drip, drip" fashion, creates a perpetually wet condition for the lower construction detail. This perpetually wet state is extremely undesirable from a moisture management standpoint. (**H** & **I**)

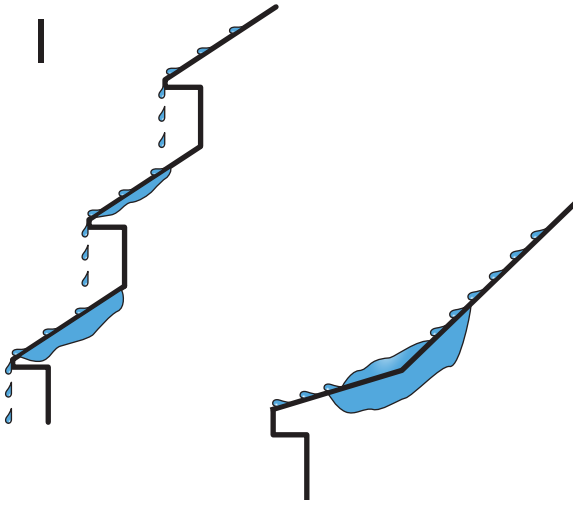








Though the amount of water may be small, the unchecked, constant delivery allows all the water to be absorbed into the construction detail. If liquid water flows from one roof to another and then another, moisture management becomes extremely difficult if not impossible. (**I**)



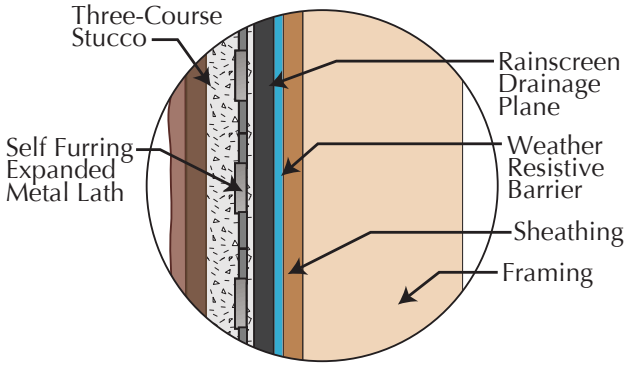
Out of a Construction Detail

The amount of water entering a construction detail is certainly of concern; however, the amount of "time" that even a small amount of water is in a construction detail is also of concern. The extended "time" factor will allow moisture to absorb more and more deeply into the detail. Amount and time are negatives because they extend the drying cycle, possibly even into the next wetting cycle allowing the construction detail to be in a perpetually wet condition. This extended wet condition may also be subjected to a "freeze-thaw" cycling compounding the problem. The amount of time that moisture is in contact with a construction detail is, in many cases, even more critical than the amount of moisture involved. It can also result in the much-publicized "mold" issue. Mold is, in many ways, like corn or soybeans; it needs a consistent, steady moisture supply. A construction detail that is persistently wet and has a growth supporting material (organic) in it or on it, will probably

grow a very healthy crop of mold that is hazardous to the health of the building's occupants. Designing a construction detail that allows the moisture that enters it to have a designed way to exit it is probably a good idea. (**J** & **J-1**) In fact getting moisture "out of" a construction detail is the "Law!" (2009 IBC R703.12.1.)

J

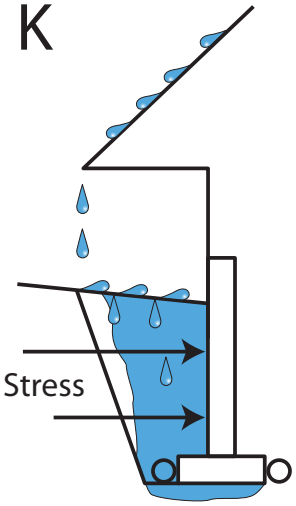
J-1



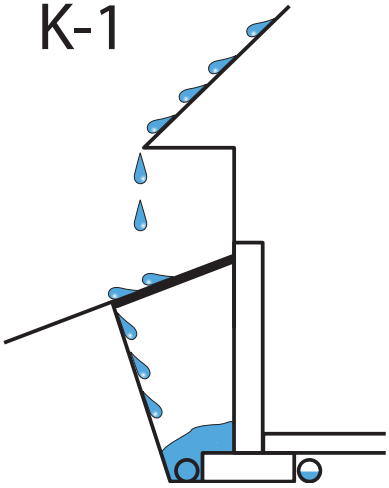
Away from a Construction Detail

Once the liquid water is on the top surface of the surrounding grade, the third element of moisture management comes into play. We need to get the moisture that we have drained "off of" and "out of" the building, "away from" any and all construction details. Building sites must have a designed drainage plan. This drainage plan should be in place from the earliest stages of the planning phase; it should be rigorously maintained during the construction phase; and it should be continued throughout the building's useful existence. Unfortunately, this is one of the most neglected aspects of good moisture management. If neglected there may be dire consequences because critical structural components of a building such as basement walls and footings, and their supporting soils may be compromised. (**K**)

K

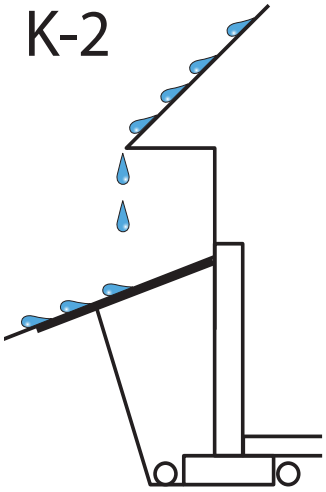


K-1



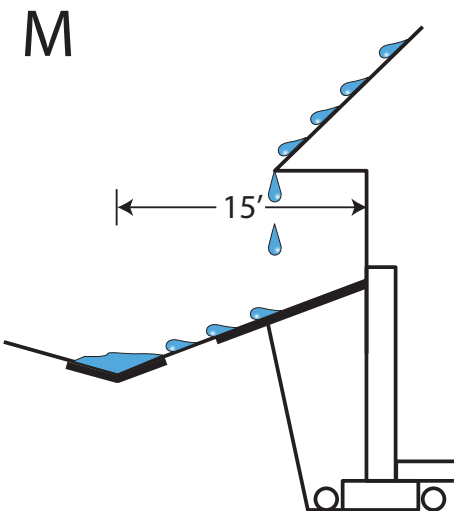
The drainage plan begins with properly poured footings and correctly constructed and waterproofed foundation walls. A drain tile system should also be included. Once these items are in place, continual monitoring and maintenance is critical. Backfill and foundation support soils that are subjected to constant moisture will put unwanted stress on below-grade construction details. In areas where expansive soils exist, or where very deep frost can occur, this variation in moisture content can be disastrous. (**K**)

K-2

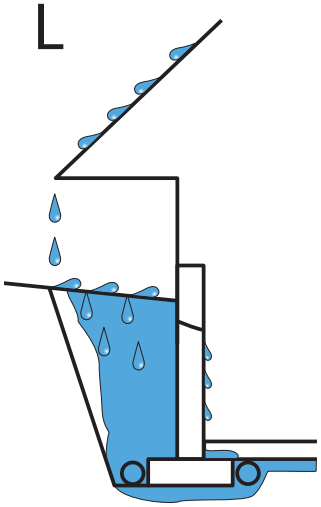


Landscaping, both hard and soft, that is immediately adjacent to buildings, must be designed to compensate for fill disturbed by foundation excavation. (**K-1** & **K-2**) If this run off water needs to be diverted around dwellings, the pathway swale needs to be a minimum of 15 feet away from dwelling and preferably hard surfaced. (**M**) Excessive moisture will also over-stress the moisture-resistant coatings and drain tile systems that should be a part of below-grade construction details. (**L**) The high moisture content of these soils will also intensify thermo-transfer characteristics of the backfill and support soils. Water and/or high moisture content materials transmit temperature better than air and dry or low moisture

M



L



content materials.

Soil temperatures 42" below grade are consistently 52^0 - 54^0 Fahrenheit. When they are nearly saturated with water, they may not be cooler, but they will be able to transmit the 52^0 - $54^{0\,F}$ temperature to the below-grade construction details more efficiently. If the ambient temperature in the below-grade construction details cannot keep basement walls and floors warmed, and if they are constantly in a cool condition, the chances are that the surface temperatures of these foundation components may be at or below the dew point and condensation will occur. When water vapor condenses on a surface, or on other air particles, liquid water droplets form, and this can, and often does, create a "wet basement!"

By now it should be apparent that by not complying with the "away from" part of the rule of good moisture-management, a lot of really bad things can and will happen. Designing and maintaining a good drainage plan for a construction site is not easy, but it is well worth it. A construction site with a designed and maintained drainage plan is more efficient for everyone involved! A site that is allowed to turn into a "swamp" will regularly impact the site including the soils and the fill surrounding the building foundation, and that may have both short term and long-term negative consequences.

Conclusion

When it comes to managing moisture, it should be obvious that there are direct connections among all moisture management conditions and components. John Donne wrote, "No man is an island, entire of itself." The same thing holds true for any construction component or detail. Very few, if any, features or factors of a construction project stand alone. There is a holistic relationship that exists, and the improper treatment or neglect of any one component will imperil the rest!