Undesired surface water that can effect a building’s integrity are most commonly caused by rainwater, surface water runoff and snow/ice melt. These precipitation-based sources cannot be eliminated so they must be controlled in order not to cause adverse impacts on a building system.

Several phases need to be followed to control surface water from impacting a building system. These phases include the following:

1. **Site Selection** – where the building will be located determines much of what needs to be done to control surface water

2. **Site Preparation** – proper site preparation has a significant impact on effectiveness of surface water control

3. **Site Drainage** – details need to be addressed so surface water drains off and away from the building on the finished site

4. **Exterior wall and roof system selection** – the selected roof and wall system, along with flashing transitions must be selected to ensure precipitation does not penetrate the exterior of the building

5. **Construction process** – attention to detail during the construction process must be done to ensure a well-designed wall and roof system is effective

The proposed site of a new building needs to be evaluated to determine not only how surface water will drain away from the site but also how much water potentially will drain onto the site.
For example, there may be excellent drainage away from the proposed site but is located where a lot of surface water from up the hill will drain down to it. In this example, the proposed building site may be located in a drainage path for a large watershed area. If so, can the proposed site be moved to some degree so that it is no longer located in the significant drainage path?

A second example of a potentially poor site selection is one that is located in a hole or depressed area where the surface water collects rather than drains away. Surface water should be able to drain away from the site at a sufficient rate so that it does not flood a building during rainfall events.

Site preparation is the phase to address any problems identified during the building site selection process. Sometimes, a new building site needs to be elevated to increase a surface water diversion capacity or to get the finished building elevation high enough so surface water can drain away. During site preparation is the time to ensure that surface water will adequately drain away from the building when construction is complete.

A building site located near the bottom of a hill will require the construction of a surface water diversion with sufficient capacity so that surface water flowing to the site will flow around the new building site. Sometimes the building site elevation needs to be increased to ensure enough diversion capacity can be constructed. A site with naturally slow or poorly draining soils needs to use a similar clay type soil fill to increase the elevation under the building. This will prevent surface water from infiltrating into the fill and collecting under the building. A granular material like gravel or sand can be used to elevate the building base to a higher finished elevation. Figure 1 graphically shows how low permeability fill should be placed to ensure infiltrated surface water does not collect under the new building base.

If the building fill base was all granular material, surface water in the diversion will infiltrate the fill base under the building, which can result in significant subsurface water problems. In this case, the source of the water is infiltrated surface water rather than a subsurface water source.

If the building example shown in Figure 1 had a basement with the floor below the elevation of the bottom of the surface water diversion, and the fill material was all...
granular, a good chance exists that the basement could have moisture problems during wet weather periods.

The roof and exterior wall materials protect a building from precipitation of all kinds and types. Proper selection of materials, and the design of transitions between different roof and exterior wall surface components are critical to ensure the building is protected from liquid water throughout all temperatures the building is likely to experience.

The building owner may be most concerned about esthetics and maintenance; however, the reliability of the chosen system over time also needs to be considered. A capillary break, which minimizes the movement of moisture from outside into the building structure, must be incorporated into the building system. A “Pen Test” can help determine if the chosen design will protect the building from rainwater moisture penetration. An example of this pen test is shown in Figure 2. This illustration has been taken from “Moisture Control Guidance for Building Design, Construction and Maintenance” found at https://www.epa.gov/sites/production/files/2014-08/documents/moisture-control.pdf.

The construction process for a new building is the implementation of the material selection and transition design phase. Attention to detail is critical. The success from selecting best materials and developing sound transition designs will occur only if the building is built according to the design.