Moisture Management for Masonry

Design Changes for Lasting Adhered Masonry Veneer Performance

By Steven Fechino

In the late-1950s and early-1960s, adhered veneers began filling the need for alternative veneers. With origins, for the most part, in California, concrete units were available for use as accents on buildings that were typically clad with stucco or aluminum siding. In dryer environments where originally installed, long lifespans were achieved, and performance of the materials was aesthetically pleasing.

As the demand for the product grew, markets expanded into geographical locations that endured many different weather conditions. The growth required the section details and installation practices to be modified to maintain durability and high performance in wetter and colder areas.

In simplified terms, adhered masonry veneer relies on a detail where the metal lath is attached directly to the substrate, a scratch coat is applied, and the thin veneer is bonded directly to the scratch coat using setting mortar. In dry arid climates, this detail will function well. However, the humid subtropical climates will fall short of desired performance. Several necessary design elements will eliminate the passage of moisture directly into the structure and help dry the veneer.

When an adhered masonry veneer endures a weather event during which water enters and saturates parts of the veneer, the veneer should have a method to allow for normal drying. The saturation of the veneer is not the issue, though. The concern is in the path that moisture must follow to escape the veneer to allow for an acceptable rate of drying without direct contact with the building substrate.

A commonly designed cavity wall includes a cavity that provides an area where air, water vapor and liquid water can follow a nearly unobstructed path to weeps at either the top or bottom of the wall. The cavity creates a gap between the substrate and the veneer that is large enough to prevent direct passage of liquid water between the surfaces. With this as a design, the veneer can encounter different rates of saturation, different changes in cavity pressure and different temperatures without concern about water damage to the occupied space.

Current building science uses a standard design across the country for most of the adhered masonry veneer systems that uses similar individual components. The components will vary by manufacturer, and code compliance can be met, but this design results in wall performance with a slow drying rate of the adhered veneer.

The weep screed is the beginning of a good attempt at removing moisture that finds its way to the bottom of the veneer. Functioning only to remove moisture and not actually a weep, this metal or polymer modified material has holes that will move any accumulated moisture at the base of the veneer away from the face of the building. Weep screeds also are a wise aesthetic choice, because they can offer neat, clean architectural lines and enhance the overall appearance of the veneer.

Weather resistant barriers (WRBs) and air barriers are often properly installed and do not increase or decrease the rate of veneer drying. The choice of barrier is completely dependent on the geographical location of the project and the insulating components details. In this article, WRBs will be treated as a component, not as a specific product. WRBs generally are purchased as a roll good that is applied on most projects in a two-step process. The framers install the first layer when the walls are sheathed to protect the framing from wind-driven rain until the veneer is installed.

The veneer installer installs the second layer of WRB. There are three commonly accepted reasons for this additional layer of WRB. One of the main purposes of the second WRB layer is to ensure that the liquid water is shed away from the substrate. Another purpose of the second layer is to create an air space between the two layers, allowing for enhanced drying of materials. A third purpose is to keep the substrate dry during the application of the wet scratch coat. The two-layer system for WRB makes sense, no matter what part of the discussion you follow. Moisture will find its way into a substrate given any opportunity.

Expanded metal lath, extruded wire, or fiberglass mesh is used as a basis for scratch coat reinforcing. Following strict guidelines for attachment to the substrate, the lath must be encapsulated completely with mortar when the scratch coat is applied. The scratch coat is typically a minimum of ¾ inch deep and comes in direct contact with the second installed layer of WRB.

The moisture in the mortar scratch coat contacting the WRB during installation is not the only time moisture can pass directly from the scratch coat to the substrate. Each time the veneer experiences an event during which substantial rates of saturation occur, the moisture will find its way into the plane between the WRB and the inside face of the scratch coat. A repeated occurrence of wetting events will eventually put enough water into the scratch coat that it will be absorbed through the WRB, and saturation, even in limited form, of the sheathing will become an issue. This type of detail is the type of detail whereby the scratch coat touches the WRB and does not allow air, and water vapor or liquid water to have a path – other than evaporation through the saturated adhered veneer – to the outside of the façade.

Veneer units comprise the final components in the adhered veneer system. Though there are many products available, the differences in wall performance between a thin natural stone product and a man-made concrete product will not eliminate the need for a solution to the problem of continuous veneer saturation. Choosing the actual veneer product should be made based on the overall appearance of the façade and the durability that is desired by the individual manufacturers' products.

Different types of joints, such as dry stack or mortared joints, will contribute slightly to the amounts of water that enter the adhered veneer. However, water amounts are only slightly greater with the open joints when units are installed correctly. Building science has developed options for the design and construction of a better wall system. Installing a drainage plane between the outer layer of WRB and the lath is recommended. A drainage plane for adhered veneer simply takes the cavity wall concept of creating a space for air, water vapor and liquid water a way to find a nearly unobstructed path to a weep that will carry moisture away from the facade. The drainage plane follows the basic principles of a rainscreen system. A rainscreen as a component to a section detail moves moisture-laden air out of the plane. This movement of moisture becomes important long term, because it helps mitigate potential water damage.

The drainage plane can be constructed using a variety of materials, such as formed battens, textured sheet materials or polymeric mesh materials. Most commonly used are polymeric mesh rolls, typically either polypropylene or polyester. The mesh is formed in a three-dimensional pattern, either entangled or in a high loft, non-woven pattern. The mesh has little surface energy, which allows the moisture that enters the plane to meet little resistance as it moves to the bottom of the wall. Adding a drainage plane reduces drying times and allows complete drying from both sides of the adhered veneer. The drainage plane also replaces the second layer of WRB, nearly offsetting any additional costs that would be associated with its addition to the design.

The concept of a drainage plane is supported by the industry with ASTM International Standard E2925-14, Standard Specification for Manufactured Polymeric Drainage and Ventilation Materials Used to Provide Rainscreen Function. When approved, the standard will be viewed the same as an International Code Compliance evaluation service (ICC-ES) approval and will become allowable in any jurisdiction following the International Residential Code (IRC) and the International Energy Conservation Code (IECC).

The Masonry Veneer Manufacturers Association (MVMA) defines the drainage plane as an optional rainscreen drainage plane system. The benefits are listed in the association's published

Design Manual 5th Edition for Designer Consideration at the beginning of the specification. Four different wall section details are published for designer review. The MVMA is operated by the National Concrete Masonry Association. This 5th edition is available for download directly from the MVMA. The Building Enclosure Moisture Management Institute (BEMMI) has been organized to educate the building community about the principals of moisture management. BEMMI also educates design professionals on the benefits of a fully functioning rainscreen systems as related to performance, durability and function of envelope veneers.