



# Designing an Adhered Masonry Veneer

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Walls today offer better technology and water protection than in years past. Adhered masonry veneers are better designed and perform more efficiently when the entire wall system is considered before and during installations. Many of the improvements are a result of changes in materials, improvements based on testing, higher performance by design and installation improvements. Here, we look at products commonly found in adhered masonry wall sections

and how they individually can affect thin veneer walls.

## **Adhered masonry veneers**

Today's adhered masonry veneers offer a wider range of aesthetics than in previous years. Pre-made; slip and fit patterns; more color choices and overall quality of the products have increased, bringing big improvements from years past. Increased durability and overall performance of an adhered masonry veneer can be achieved when the design begins with the substrate and works to the face of the veneer.

In this article, we examine the differences between a cavity wall and an adhered masonry veneer, covering basic materials used in residential and light commercial construction of a stud constructed structural substrate.

## **Parts and pieces of the adhered veneer wall**



Available thin veneers can be thin natural stone, thin brick, thin cultured stone or stucco and synthetic veneer systems. Thin veneers can range from 3 to 25 pounds per square foot (psf) when applied to the wall, a wide range that must be considered when sizing the dimensional framing members. The weight of the veneer can usually be obtained from the material supplier so the design professional can properly



size structural wall components. When the designer requires an adhered veneer and rigid insulation, this can be accomplished when section details are considered.

Unlike a cavity wall masonry veneer, where loading is placed on a brick shelf or a support lintel, the adhered masonry veneers and stuccos are supported by attachment between the lath system and the structural substrate and the bond to the thin veneer material. Adhered masonry veneers do not place the load on a foundation or weep screed.

### **Starting at the structural substrate wall and working outward**

The system begins with the selected metal wire lath fully attached to the substrate using anchors to support the lath system to the structural support studs or concrete masonry units (CMU) of the wall assembly. To properly design the system, the designer must know the weight of the thin veneer. The veneer creates an eccentric load based on 3 to 5 inches extending from the wall, in pounds per square foot; the rigid insulation thickness; and the dimensional framing of the structure, whether it is metal, wood stud or CMU. Proper screw anchor or fastening pin diameter and length together with the use of galvanized lath washers and plastic insulation washers will all be keys to successfully holding the veneer in place. Screw anchor sizing can be obtained from engineered charts distributed by many of the anchor suppliers.

### **Comparing the function of a cavity wall veneer to an adhered masonry veneer**

Cavity wall construction in residential construction has made many big advances in the last 40 years, but it has also held tight to a few strong traditions that need to be evaluated.

Since the mid-1970s and the energy crisis, the need for more efficient homes created a basic design template for many homes built from then until the early-2000s.

Masonry veneer cavity wall sections in a majority of the country included – from the inside out – sheet rock; polyethylene plastic; fiberglass batt insulation placed in between studs; one of several choices of sheathing; bituminous board sheathing; plywood; gypsum board or, more recently, Oriented Strand Board (OSB); thin layer of rigid insulation, an air space; and a brick veneer. The wall section described functioned well in most geographical locations within North America in part due to the air space or cavity between the veneer and the structural wall.

The air space in a masonry cavity wall serves many functions. Most important, it allows air, water and water vapor to collect within the cavity, creating an opportunity for air movement, evaporation and the passage of water to the exterior of the veneer through weeps placed at flashing levels and vents placed at the soffits. Other functional benefits of the cavity include restricting the ability of moisture to pass from the veneer to the substrate by direct contact.



Adhered masonry veneer wall designs can benefit from the lessons learned from cavity wall designs by adding a drainage plane to the sectional detail of adhered masonry veneers. The drainage plane is not typically as large as in a masonry veneer cavity, but it still allows drainage and air movement between the substrate and the exterior wall veneer system while maintaining properly anchored cladding.

## **Components of a substrate wall**

### **Polyethylene**

Air and the water vapor it carries always moves from the warmer side of the wall to the cooler side. Polyethylene has been used as a vapor barrier for many years as a way to stop moisture-filled warm air from crossing through the wall structure to the cooler climate side where moisture can form as condensation. The rule of thumb was to place the polyethylene on the interior room side of the wood or metal studs prior to placing the drywall, because the inside of the structure generally exhibited higher temperatures than the exterior during the winter months and this would control the air penetration and vapor transmission. However, many moisture-related problems exist with this application. Cooler air always finds its way into a wall, condensing once met by the vapor barrier and allowing water droplets to saturate the adjacent batt insulation causing the moisture to remain in the walls much longer than planned. This condition occurs mainly in climate zones that exhibit higher humidity and cooler temperatures.

In parts of the southwestern United States, the layer of polyethylene will not create these issues because of the low humidity.

Today, the use of polyethylene on the inner face of the drywall is not as common and is usually only installed when un-faced batt insulation is used. Otherwise it is not recommended nor typically necessary when a weather resistant barrier (WRB) or air and vapor barrier is placed on the outside of the sheathing layer.

### **Roll or batt insulation placed within a stud wall**

R-values typically dominate the conversation when discussing fiberglass insulation. Heat always passes from a higher temperature to a lower temperature and R- values refer to the thermal resistance of heat passing through an insulating material. Since R-values are based on a set temperature, they can vary within the same materials when the temperature variance differs due to a wider difference in outside and inside temperatures. R-values are used as part of a calculation that computes British Thermal Units (BTU) required for sizing your heating and ventilating system. Insulation rated values ranging from a common R-11 to R-38 are common in products from multiple manufacturers with similar thicknesses of materials ranging from 3 ½ inches to 12 inches of fiberglass.





Fiberglass insulation is a proven insulator in many types of wall systems, and it has advantages when installed properly but large efficiency losses when installed poorly. It should be installed with properly sized batts filling the all openings between the studs and around vents, doors and windows without gaps. In areas where small gaps are present, scraps of insulation should be tucked into the gaps, making sure to not over-compress the fiberglass material since that will reduce efficiency. It is permitted to trim batts directly adjacent to junction and outlet boxes as well as to separate the batt when crossing horizontal wall wires placed between studs. Installing batts properly is vital because up to a 25 percent reduction in efficiency exists when uninsulated air spaces are in the wall.

### **OSB, plywood, gypsum and bituminous sheathing**

Oriented Strand Board (OSB) was invented in 1963 as a competitor to plywood. It is made by compressing wood chips, moisture resistant wax and resin-based adhesives into a dimensionally stable engineered wood component. Beginning as a competitor to commonly known plywood, OSB is now found in many of the larger structural wood framing members available today at many commercial and residential lumberyards. OSB has a low perm rating. A “perm” is a term used to describe the moisture vapor permeance of a material or the ability of a material to allow moisture vapor to pass through it. The higher the perm rating, the faster moisture will pass through it from one humidity level to another. OSB’s low perm rating means it can take a long time to dry, so keeping it dry is an important construction consideration.

Plywood initially was invented in the early-1900s, but became more functional after World War II when the adhesive resins used to laminate the different grains of wood were improved so the product performed to the satisfaction of the building industry. OSB and plywood are equivalent in performance and are typically described in the codes with similar verbiage. Plywood or OSB for exterior wall sheathing can generally be used interchangeably, but the amount and specific locations of each sheathing can depend on local codes. Other competitive sheathing products include gypsum-based or bituminous wallboard sheathing.

Assuming the substrate walls are completely framed in plywood or OSB, the focus becomes keeping the sheathing dry during construction and for the life of the structure. First, during the framing of the walls, the carpenter installs one layer of Weather Resistant Barrier (WRB) or an air and/or vapor permeable or impermeable membrane on the sheathing. The WRB is found on the exposed sheathing to shed water off the walls until the veneer is installed. Since the water vapor from humidity, wind driven rain and incomplete construction allows moisture to directly come in contact with the sheathing, it is important to understand what it will take for the sheathing to perform a drying cycle. Here is where the WRB or air barrier selection can provide important information. If the sheathing shows indications of moisture after the veneer is installed



or was damaged prior to the installation of the veneer, as the installer of the adhered masonry veneer, you are the one that will be blamed.

Moisture can sometimes be observed from the inside of the wall before the batt insulation and drywall are installed. With the knowledge that the perm rating of the sheathing is a minimum of 5 and the WRB layer, for example, is number 15 felt – which also has 5 perm rating – you can better defend your work by understanding a full wall design with a reference to how each component is affected by the others. A building wrap that continuously and repeatedly becomes saturated will deteriorate, reducing its main functions and ability to shed water from the substrate walls. Five is a low perm rating and will dry slowly; there is not a way to determine how fast a wall will dry based on perm ratings due to varying temperatures and humidity levels within the United States. However, this knowledge can help a contractor base a decision to “hold off” on installing of the veneer over wet sheathing. Waiting it out can eliminate blame later.

Gypsum board stock sheathing is fastened directly to the exterior side of the substrate framing using typical means such as galvanized screws, nails or staples. Standard thicknesses for residential construction is ½ inch, and 5/8 inch is commonly used for commercial applications. Some brands of 5/8-inch material can meet fire resistance standards depending on individual manufacturer. The most common board stock has an exterior sheathing surface of fiberglass facing or wax-treated water repellant paper. Exterior sheathing offers a longer exposure time than many other products, in some cases up to 12 months.

A new 5/8-inch sheathing product with the air and vapor barrier made within the board has entered the market. The manufacturer claims that the new product eliminates the need for a surface-applied air and vapor barrier, which reduces labor times and the chances for workmanship error. Perm ratings for exterior sheathing typically range in the 20s, allowing a rapid movement of vapor through the product.