Masonry Wall Airspace: Its Importance and Common Problems in Construction

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The cavity wall is considered by many to be the optimal brick design for successful masonry buildings. The wall is designed to be a water-managed, controlled-drainage wall. The airspace of the cavity intercepts moisture and diverts the excess water to the weeps or vents at the flashing line. The airspace also helps achieve thermal efficiencies by absorbing and dissipating heat and cold before reaching the inner wythe. A clean cavity is a prerequisite for ventilated rain screen wall designs and is required for traditional cavity wall assemblies to achieve the intended design performance.

A 1-1/2 to 2 inches minimum airspace is recommended to allow the mason the ability to keep the cavity mostly free of mortar. However, it has been suggested that there is not a cavity outside a laboratory setting that was free of mortar droppings ("Integrating Design and Construction", Aberdeen's Magazine of Masonry Construction, October 1997). Even with an airspace of 2 inches, it is nearly impossible to prevent mortar from falling into the cavity. Three problems are potentially created by mortar droppings: mortar accumulates on masonry ties, mortar makes contact with the backup or insulation creating a bridge between the wythes, and mortar falls to flashing locations. Each of these situations must be separately addressed; if any one or a combination of the situations occurs, the design performance will be compromised.

When mortar accumulates on masonry ties, metal ties will be subjected to almost continual moisture which will be held by the porous mortar. This potentially can lead to corrosion of the ties. Additionally, mortar can compromise the function of adjustable masonry ties, compromising the independent movement of the masonry veneer and the structural wall. This can lead to premature cracking of the veneer and general wall failure.

When mortar makes contact with the backup, a mortar bridge between the wythes is created. Water penetration or intrusion occurs and the wall is compromised. A mortar bridge will impede the flow of moisture to the flashing level. Moisture can pond at these locations; trapped water can lead to excessive efflorescence and compromise the masonry units. Further, if moisture is accumulating at locations where insulation joints are not properly sealed, moisture will have the opportunity get behind the insulation and could enter the building where interior finishes can be damaged. A mortar bridge also affects the thermal efficiencies of the wall design; a mortar bridge will act as a thermal and moisture bridge which transfers heat/cold and moisture between the wythes.

Finally, when mortar falls to flashing locations, weep function is jeopardized. An obstructed weep system will compromise both traditional cavity wall assemblies and ventilated rain screen wall designs. Pea gravel was often used at flashing locations to protect the weep system. Unfortunately, mortar would often drop to the top of the pea gravel in quantities great enough to create a solid obstruction on top of the pea gravel. There are now many products on the market classified as mortar dropping collection devices that offer improved performance over pea gravel. Yet the same problem often remains; mortar can accumulate on top of any collection device and render the weep system ineffective.

To achieve an effective drainage system, the airspace must be kept clear. Even the best design can be compromised by mortar extrusions, bridges and debris that falls and accumulates on adjustable ties throughout the cavity and at flashing locations. While levels of workmanship effect the outcome, even the most skilled mason can be challenged to construct a wall completely free of these three problems.

Energy conservation and the need to reduce life-cycle costs make clean, insulated cavities a necessity and the premier masonry wall system. Mortar obstructions that bridge the masonry ties create excessive thermal transfers and increased energy consumption. A completely clear cavity or airspace prevents this thermal transfer and thereby reduces energy costs. Eliminating mortar bridges assures independent movement of the masonry veneer and structural wall, minimizing cracking and general wall failure. Maintenance and repair costs will be substantially reduced.

Responding to this design challenge, two companies now manufacture products which are installed substantially continuous throughout the height of the airspace to assure a clean cavity: CavClear® and ThermaDrain®. These products do not allow mortar to make contact with the backup and result in a continuous drainage area. Additionally, these products make smaller cavities possible which allow increased insulation or overall wall thickness reduction. A smaller overall wall thickness results in cost-savings in the entire wall assembly from the footing, steel plates and beams, window and door frames, and the blocking and flashings. Airspace maintenance and drainage systems such as CavClear® and ThermaDrain® improve the thermal performance by allowing additional insulation within the smaller wall design, while assuring all industry standards. The added benefit of reducing mortar waste, if considered properly, may save from 25% to 50% of the direct mortar cost based on observed field conditions. This is a significant factor due to the manufacturing cost in energy and labor of the mortar component, and traditional construction estimating that accommodates this waste.

As we continue to improve our designs, increase awareness of airspace issues, and continue to develop new materials to address mortar obstruction issues, the gap between design potential and construction reality will begin to close. Together with the labor, material and energy savings, CavClear® Insulation System, CavClear® Masonry Mat, and ThermaDrain® are products that provide building owners, contractors, and design professionals successful, cost-effective project solutions to the problem of moisture intrusion and masonry wall failure. With these methods and materials the masonry cavity wall will continue to be the premier wall system for creative, aesthetic and functional considerations.

For more information about CavClear products, call Sarah Atkins at 888-436-2620, or send e-mail to satikins@cavclear.com.