

Flashing from a Masonry Perspective

by David Sovinski and Patrick J. Conway, CSI, AIA

In a masonry wall system, flashing serves several functions. These include collecting and diverting water from a cavity wall to the building exterior (or other composite or single-wythe system), preventing water entry into the masonry system itself. Flashing can also play important roles in protecting structural steel, preventing rising 'damp,' and serving as a bond break between different materials.

Flashing's location in the wall depends on the particular function it performs. For example, if its purpose is to collect and divert water, the designer should place the flashing wherever the downward flow of water is interrupted. Typical locations for this application include:

- the base of the wall;
- over doors and windows;
- over louvers;
- under windowsills;
- at mid-wall shelf angles; and
- at the transition between a low roof and a tall wall.

All images courtesy International Masonry Institute



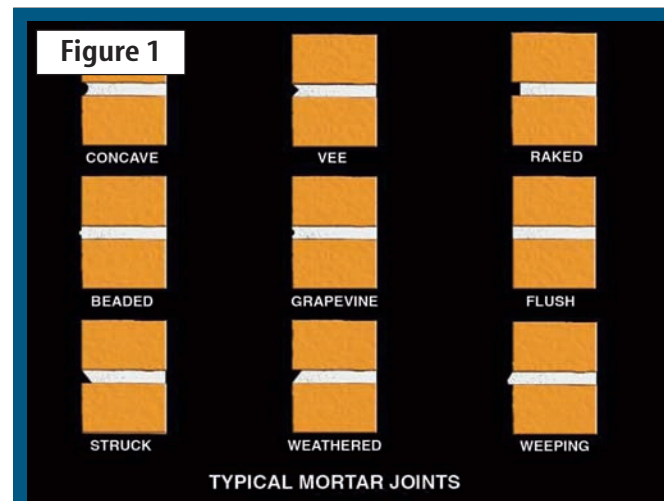
Flashing is needed because water may enter a wall system at the interface between masonry and dissimilar materials (e.g. windows, doors, and non-masonry systems). Water may also penetrate at the interface of the mortar joints and masonry units.

Specifiers should require mortar joints be 'full,' tooled, and compressed. As illustrated by Figure 1, some types of mortar joints are simply formed with the edge of a trowel or flush-cut—in other words, they are tooled, but not necessarily compressed. Others, such as a concave or V-joint, are both tooled and compressed. The compression helps physically drive cement fines into the porous brick to create a more watertight bond between the masonry and mortar. Tooling a mortar joint also compacts the mortar to make a dense, water-shedding surface.

Flashing material selection

Above all, flashing materials should be durable. They must be able to handle construction phase stresses, remain chemically stable in the presence of extreme heat and cold, and be resistant to ultraviolet (UV) light.

Since the difference between one flashing system and another may look insignificant, there can be temptation to



specify a lesser quality. For example, not all 40-mil (i.e. 1-mm) adhesive asphalt flashing products have the same proportions of layers or quality of material. Flashing is a very low percentage of the exterior wall cost and a higher grade material can easily be justified.

When selecting masonry flashing, an additional consideration is the potential for material or installation failure. On one recent project, four courses of brick veneer

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were removed—at a relief angle—to replace the deteriorated flashing membrane. The cost of this operation was more than \$200 per linear foot.

Flashing types

There are three types of thru-wall flashing for masonry walls: rigid, semi-flexible, and membrane.

Rigid

Common rigid thru-wall flashing materials are stainless steel or sheet copper. These flashings have the highest initial cost and the longest service life; consequently, they are typically specified on important projects where durability and longevity are necessary. A good corrosion-resistant stainless steel can be specified as American Iron and Steel Institute (AISI) type 304 with 2D finish (2B alternate). At least 26 gage thickness should be considered.

Rigid flashing typically comes to the job site in 2.4- or 3-m (8- or 10-ft) lengths. It is important to specify proper

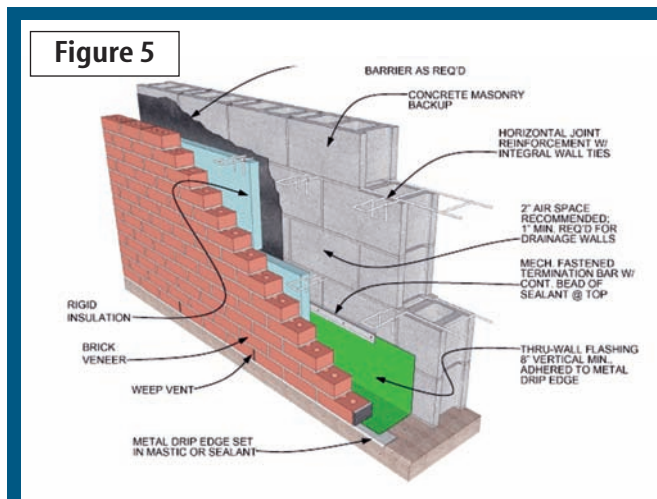
connections of flashing sections. One functional detail is to use preformed receiver flashing ends to achieve a lapped joint under the veneer and a butt joint at the exposed drip edge (Figure 2).

Semi-flexible

A commonly used semi-flexible flashing material is copper composite, which comprises thin sheets of the metal bonded to asphalt or fiberglass layers for strength. When specifying this material, a 142-g (5-oz.) weight is recommended by the authors.

Copper composites that are 198.5 g (7 oz) tend to be difficult to bend; it is also challenging to create tight seals at laps with them. On the other hand, 85-g (3-oz) copper composite flashings tend to be brittle and prone to cracking during installation.

Cutting any flashing material flush with the face of the masonry veneer may result in a ragged look and could create a safety hazard, if there are sharp edges near walkways





The above photo illustrates a flush-applied ethylene propylene diene monomer (EPDM) installation with termination bar and sealed laps. (Note: the sealant atop the termination bar has yet to be installed.)

(Figure 3). It is even more difficult to make flush-cut copper composite look good. When working with semi-flexible flashings, a better option is a hemmed metal drip edge.

Membrane

Flexible membrane flashing is common throughout the masonry industry because it offers balance between initial cost and expected service life. Examples of durable and cost-effective membrane flashings are 40-mil rubberized adhesive asphalt (*i.e.* 'peel-and-stick'), 40-mil ethylene propylene diene monomer (EPDM), and thermal plastics.

Thermal plastics are a hybrid of typical adhesive flashing membranes. One choice commonly specified is a 40-mil thick product comprising 0.6 mm (25 mil) of cross-laminated polyethylene and 0.4 mm (15 mil) of rubberized asphalt. Typical peel-and-stick flashing has 0.2 mm (8 mil) of cross-laminated polyethylene and 0.8 mm (32 mil) of rubberized asphalt. Thermal plastic flashings are durable and can be exposed to ultraviolet light with an optional factory-cut, color-coordinated integrally bonded plastic drip edge.

Specifying 40-mil EPDM is a good choice for many masonry projects; it costs roughly the same as rubberized

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Understanding Flashing

As with any critical issue, proper flashing is achieved when everyone—from the designer specifying the materials to the craftworker responsible for installation—really understands the building science (and purpose) behind it. The International Masonry Institute (IMI) provides training and technical services to all parties with this goal in mind.

For members of the International Union of Bricklayers and Allied Craftworkers (BAC), it begins at the apprentice level. Flashing basics are covered in pre-job apprentice classes, while higher level apprentices continue to learn about moisture control techniques. IMI also conducts ‘train-the-trainer’ sessions to reach journey-level workers and increase quality assurance among contractors.

IMI also delivers flashing training directly to the jobsite. In Ohio, some design firms put IMI flashing training in their specifications (along with the institute’s 1-800 number). Large contractors and managers, like Walsh Construction Co. in Chicago, take advantage of jobsite

classes, and often mandate them for their masonry installers.

Walsh likes to send newer project engineers and managers to custom IMI sessions that cover base flashing, outside and inside corners, openings, windows, columns, end dams, weep holes, and drip edges. At a recent seminar in Connecticut for architects, engineers, construction managers, mason contractors, and product manufacturers, IMI covered flashing and moisture control in an interactive setting that included skilled BAC craftworkers. When the question on how to keep cavities clean arose, the answer was simple: “Specify trained installers.”

In September 2007, IMI unveiled its new John J. Flynn BAC/IMI International Training Center, in Bowie, Maryland. There, as well as in regional training centers, IMI works with all professions—designers, contractors, and installers—to give them hands-on, real world exposure to design and construction issues, from flashing to grout and reinforced masonry to specialized products and systems. ♡

adhesive asphalt systems in most locations. It is resistant to ultraviolet light, durable during construction, and will not ooze out the wall during hot weather. At low temperatures, EPDM remains flexible and is less prone to tearing than many adhesive asphalt membranes. Therefore, contrary to most of the other adhesive flashing membranes, EPDM can be tucked into

concrete masonry unit (CMU) bed joints to hold firmly in place. As EPDM is typically easier to install than adhesive flashing on long, straight walls during hot weather, it can be used in longer lengths, resulting in fewer laps.

Costs and looks

There is a significant cost differential among various types of flashing. To a

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Figure 6

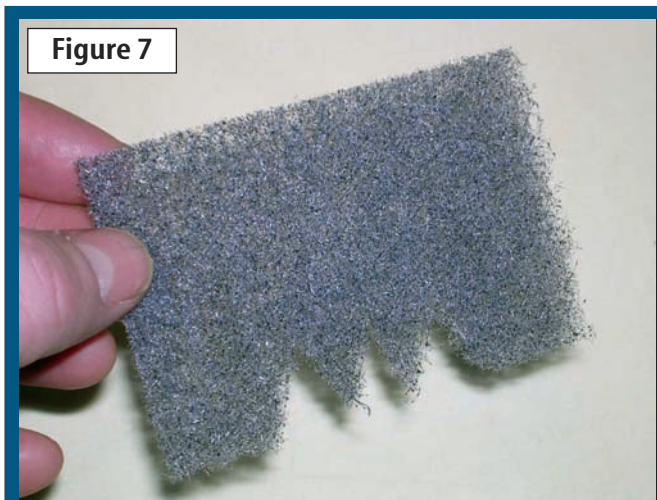


Figure 7

large extent, performance follows cost. At a minimum, all flashings designed to collect and divert water to the exterior need to actually run at least flush with the exterior side of the veneer. This may seem obvious, but the experience of International Masonry Institute (IMI) technical directors—who have worked with hundreds of architects and contractors on project troubleshooting—suggests it is not.

Designers may feel flashing's visual impact is undesirable. In some cases, this can lead to demands to hold it back from the face of the wall, leaving water to drain into the cores of the brick in the exterior face wythe (Figure 4, page 32). In other cases, it means a request to cut the flashing flush with the brick face. Depending on the flashing specified, the latter option may not produce the desired aesthetic. Further, it may not result in the type of performance expected.

IMI recommends drip edges for most flashing systems. When properly detailed and installed, drip edges look professional and attractive (Figure 5, page 32). When the value of stainless steel or copper has been overlooked,

pre-finished galvanized sheet metal can be used for metal drip edges. When a typical 40-mil adhesive flashing membrane is adhered to a metal drip edge, it is recommended the flashing membrane be held back from the hemmed edge at least 19 mm (0.75 in.). This helps ensure the heated, rubberized asphalt does not ooze out or drool onto the wall.

Detailing tips

A drainage wall system typically consists of a masonry exterior wythe, an air space, rigid insulation, and a backup wythe. However, most single-wythe walls are designed to be 'drainage walls,' that is, they should have the ability to drain and dry with the movement of air behind the veneer.

Ventilated drainage walls allow accumulated moisture—either from the exterior or interior—to dry via evaporation. To achieve vertical air circulation behind the veneer, weep vents should be specified at both the bottom and top of an enclosed cavity area. Top venting of an air space can also be achieved by providing airflow opportunities at the top of the wall (*e.g.* below or into a soffit).



Figure 8

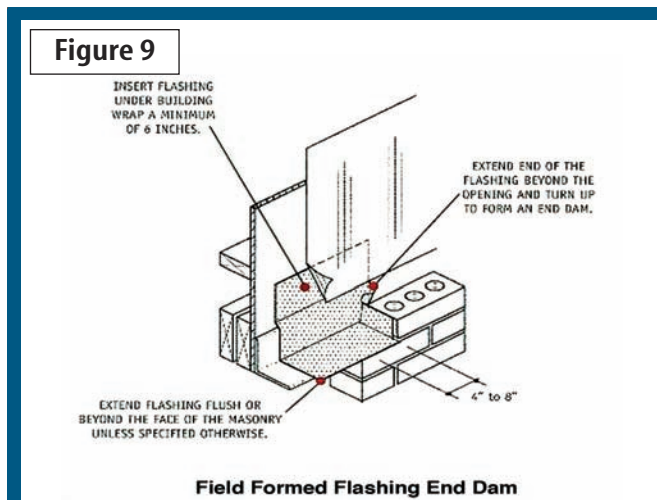


Figure 9

The movement of air inside the wall cavity can:

- help dissipate trapped moisture;
- short-circuit harmful vapor drive out the back side of a sun-heated moist brick veneer; and
- occasionally alleviate chronic staining problems (e.g. efflorescence).

Flashing in a drainage wall collects moisture and directs it to weep vents or traps it until evaporation occurs.

With this in mind, weep vents should:

- allow air to circulate in a drainage wall system;
- drain water;
- be aesthetically pleasing;
- prevent insect entry and nesting; and
- not be susceptible to dirt and lawnmower-blown blockage.

In addition to a ventilated cavity wall concept, some designers prefer the principle of the 'pressure-equalized rainscreen.' This relies on barriers (e.g. rigid insulation or vertical metal fins) to create isolated confined sections of a wall cavity, along with adequate ventilation to ensure elimination of a harmful pressure differential across the veneer, which could otherwise draw moisture through the masonry. Figure 6 shows these barriers.

There is a range of options available to specify a good weep vent material. All good weep vents start as open head joints and are then filled with an insert or cover. Figure 7 shows an excellent example in the form of a polymer mesh weep vent insert. This cost-effective product comes in many colors to blend into the veneer.

Weep vents should be spaced closer than the code minimum of 838 mm (33 in.) on center (oc). The authors recommend weep vents be even more closely spaced when putting masonry veneer over a metal stud backup system—406 to 610 mm (16 to 24 in.) is preferable.

Supporting flashing's horizontal leg Flexible flashing materials need support when spanning an air

space (Figure 8). Unsupported flashing can result in sagging, which causes stress at flashing laps and, ultimately, tears and fails. This support can be created with a mortar wash, built-up insulation, thin plastic or metal supports, or other blocking. Beveling of the horizontal flashing leg will help drain water to the exterior, but when done to excess, it can interfere with insulation installation.



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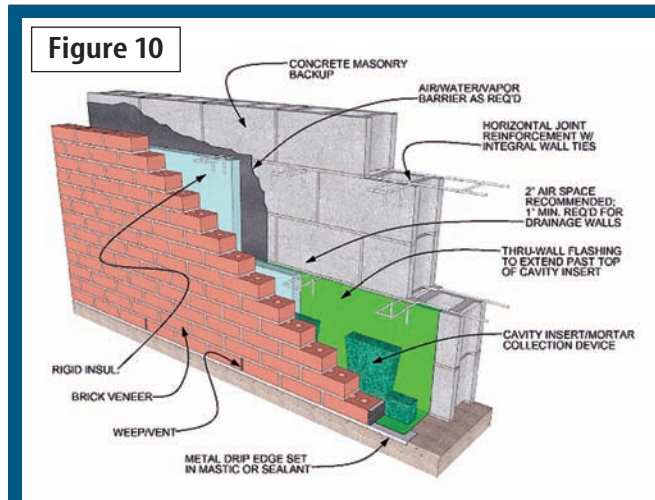
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Flashing, of course, does not come in endless sections. Where separate sections meet, they must be properly lapped and sealed. “Laps are leakers,” is a common IMI refrain. A good recommendation is to lap flashing a minimum of 102 to 152 mm (4 to 6 in.) and use compatible sealant at the joint.



Where flashing is discontinuous (e.g. over doors and window openings), end dams should be specified (Figure 9, page 36). It is odd practice to take every opportunity to contain water instead of letting it run off the end of one flashing to be picked up by another further down the wall. End dams should rise a minimum of 25 mm (1 in.) to redirect moisture to properly spaced weep vents. The vertical leg of end dams can be concealed.



Located on Rhode Island, Lincoln Middle School is an exemplary case of fine masonry construction. Such brickwork requires careful consideration for flashing systems to ensure moisture and water are kept away from the building interior.

The top edge of flashing must be secured by either tucking it into a horizontal masonry joint or using a termination bar. The latter option allows flashing to be installed later in the construction sequencing, minimizing possible construction phase damage and ultraviolet light exposure. The top edge of the termination bar should be sealed (with a bead of sealant) and lapped under the primary water-resistive barrier and/or air barrier.

Leaving space and holding caps

Flashing will not drain water to the exterior if moisture cannot get to it. Therefore, a properly specified and installed air space allows for the downward flow of water and the upward flow of air. Air spaces should be nominally 25 mm (1 in.) wide in masonry cavity walls, but 51 mm (2 in.) is preferable given construction tolerances and brick detailing (e.g. recesses). In any case, 51 mm is the minimum for brick veneer over a metal stud system.

Since it is important to keep wall cavities relatively clear of mortar droppings to ensure moisture and airflow, one option is to consider a base-of-wall (or full-height) mortar-management accessory. Produced by various manufacturers, these inserts hold mortar droppings at various heights (Figure 10), or maintain a full-height air space and allow both water movement to weep vents and air ventilation within the wall system. Cavity inserts and drainage mats are not a code requirement. Further, properly trained craftworkers are taught to minimize mortar droppings by the methods they lay their mortar and fill their head joints.

Flashing at parapet caps is an example of preventing water entry.¹ Special care in detailing and installation is essential, as the flashing creates a bond break between the wall and the cap (which should be cast stone, precast, or stone and overhang the wall by a minimum of 38 mm [1.5 in.]).

To hold the cap in place, a mechanical anchor is needed. However, it is important to specify appropriate sealant at these anchors, as flashing membrane penetration is likely. Without such a safeguard, the flashing can actually become a channel for water to enter the top of wall.

At the ground level, sharp corners on metal drip edges can be hazardous to building users (Figure 11). Care should be taken to detail the flashing drip edge at corners. Field cutting

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Also pictured on page 30, Manchester High School in Connecticut showcases modern masonry cavity wall construction. Material selection is crucial in ensuring a moisture management system that achieves the desired performance.

of metal drip edges often results in sharp corners, so specifying prefabricated outside corners, rounded corners, wrapped corners, or other solutions is appropriate.

The International Masonry Institute receives thousands of calls each year for technical service—by far, the most frequent requests relate to flashing and water penetration. Proper attention to design and detailing for the architect/designer and training of the craftworker maximizes the potential of

project success. It is always best to solve a problem during design with an eraser, instead of during construction with a sledgehammer. ♥

Notes

¹ Other details are available for parapets and the top of wall by visiting www.imiweb.org and viewing the Masonry Detailing Series.

Additional Information

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Abstract

Modern cavity wall construction involves a drainage plane, which requires a durable and functional thru-wall flashing

system. Flashing also serves many functions beyond drainage. This article covers proper detailing, material selection, and installation of flashing systems.

