Brick Masonry Takes on Water

So What's New?

By Lyle Hogan, PE, RRC

Inset: Figure 1—Many instances of water invasion are unrelated to the roof. Investigation may reveal that the brick masonry veneer is the culprit.

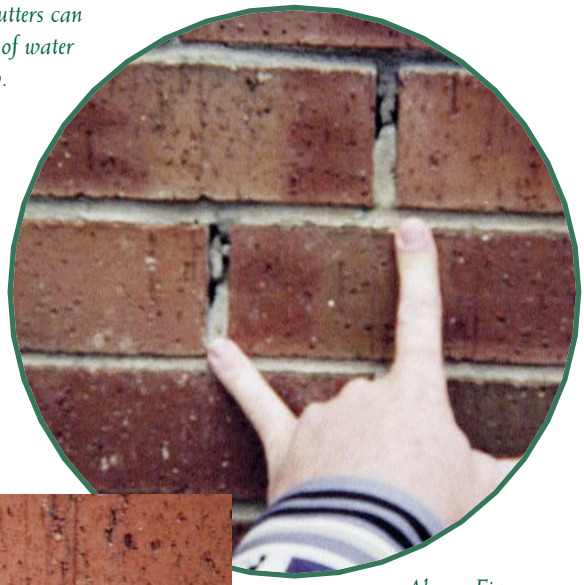
Above: Figure 2—Leaking gutters can supply a substantial amount of water for a masonry wall to absorb.

Introduction

It is common to hear complaints of water entry into a building or structure. The natural reaction is to blame the roof; however, many instances of water invasion are unrelated to the roof. Investigation may reveal that the brick masonry veneer is the culprit (*Figure 1*). Water's influence on brick masonry construction is well documented, yet the misunderstanding of its entry is so pervasive it merits discussion.

Brick construction will take on water. With or without a coating, and irrespective of the builder's talent, four inches of brick masonry will not stop wind-driven rain[1]. Blowing rain can bypass eave overhangs and influence areas of a wall that do not routinely experience wetting. Leaking gutters (*Figure 2*) also supply a substantial amount of water for a masonry wall to absorb.

Improperly tooled joints will admit significant amounts of water (*Figure 3*). Inadequately filled head joints are a common observation. Wire reinforcing within mortar joints is sometimes arranged too close to the outside face (*Figure* This causes the thin mortar cover to break away, resulting in yet



Above: Figure 3—Improperly filled mortar joints will admit significant amounts of water.

Figure 4—Wire reinforcing within mortar joints is sometimes arranged too close to the outside This causes the thin mortar to break away, resulting in more avenues for water entry.

Figure 5—One method for determining the rate of water absorption into brick masonry construction is the RILEM tube test. Unfortunately, the test results are often misunderstood or misapplied. While quite valid for evaluating water-repellent treatments, the test is often meaningless for evaluating a chronically leaking wall.

more avenues for water entry. Simply leak testing a wall assembly can pinpoint water entry stemming from haphazard workmanship

One method for determining the rate of water absorption into brick masonry construction is the RILEM[2] tube test (*Figure 5*). Unfortunately, the test results are often misunderstood or misconstrued. Since, as stated earlier, brick masonry is known to absorb water, confirmation of such behavior by testing is of marginal utility. Absorption rates on the brick surface are different than within the mortar joint region. Head joints will absorb at a different rate than bed joints, and head joint absorption rate will vary top to bottom. The test is quite valid for evaluating whether a wall has been treated with a dampproofing agent (water-repellent treatment). However, the test is often meaningless for evaluating a chronically leaking wall.

Brick masonry should be considered a "drainage wall," anticipating that water will enter. Traditional claddings such as wood, brick, and stucco contemplate water penetration and incorporate secondary water barriers[3]. The water absorbed is of no great consequence if thru-wall flashing has been provided along with avenues for draining the wall cavity. Cavities clogged with mortar are not functional avenues for water removal (*Figure 6*).

Figure 6—Cavities clogged with mortar are not functional avenues for water removal.

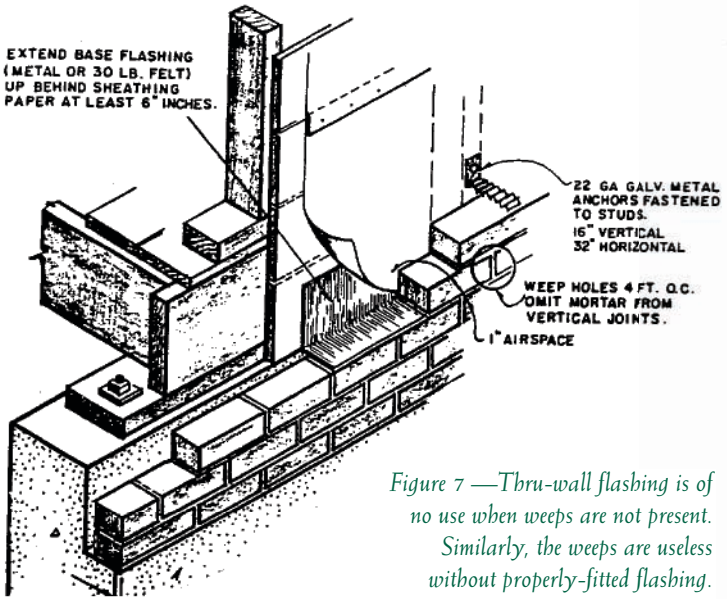


Figure 7 —Thru-wall flashing is of no use when weeps are not present. Similarly, the weeps are useless without properly-fitted flashing.

Dewatering Avenues

Thru-wall flashings are integrated into masonry to induce removal of entrapped water. The thru-wall flashing is of no use when weeps are not present. Similarly, the weeps are useless without a properly configured flashing (*Figure 7*).

De-watering provision is needed along several regions of a wall. Standard plates published by SMACNA (the Sheet Metal & Air Conditioning Contractors' National Association)[4] illustrate the multiple locations where thru-wall flashing may be needed. As a minimum, flashing is needed over all openings, under sills, and (most importantly) at the bottom of the cavity wall just above ground level. This can be accomplished by one of two methods.

- Open head joints are provided at regular intervals, both horizontally and vertically.
- Alternatively, weep tubes can be provided at similar intervals. Open weep holes provide the best

drainage, but rope wicks can also be used to attract water from the cavity[5] (*Figure 8*).

Presumably, the spacing intervals desired would be stated in the construction documents.

When functional flashing is present in brick masonry construction, infiltration water will be diverted from the wall cavi- is important to note that re-roofing in a manner that causes masonry flashing fea- to be covered will invite behind, below, or into roof flashing (*Figure 9*). related malady may arise renovating old masonry buildings and retrofitting them air conditioning sys- The inward direc- of moisvapor (now prompted by conditioning) produce condensation on surfaces the wall that were cold beforehand.[6] Absent thru-wall flashing, water accumulation within the cavity may become problematic.

Above: Figure 8—Weep holes may be detailed with rope to attract water from the cavity of this wall.

Left: Figure 9—Re-roofing in a manner that causes masonry flashing features to be covered will invite water behind, below, or into new roof flashing. Photo courtesy of Don Kilpatrick.

Variations of Thru-Wall Flashing Products

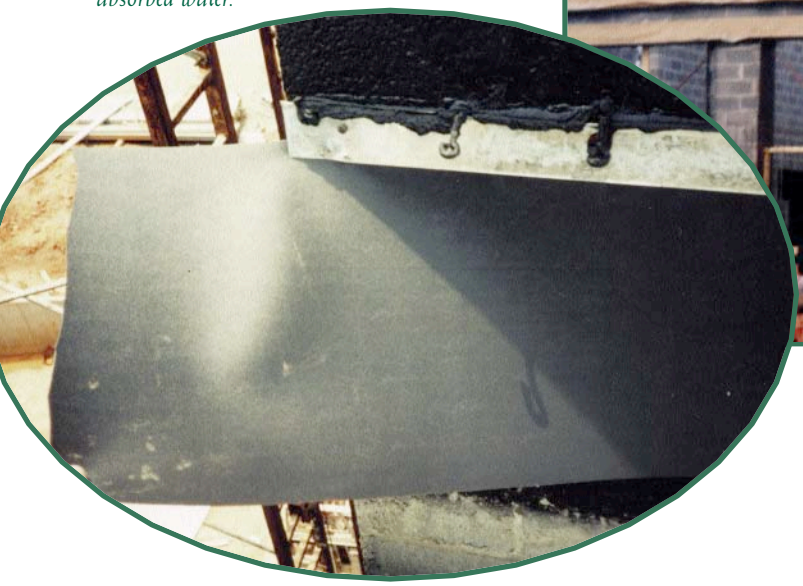
Historically, copper was the product of choice to direct water from a cavity (*Figure 10*). The material is easy to form and work. Joint work (miters, corners, laps, etc.) could be effectively closed with block tin solder.

Polymeric membrane products have been successfully substituted for conventional thru-wall metals (*Figure 11*). These membranes are usually PVC (polyvinyl chloride), although long-term durability in such application has been questioned. Asphalt-coated copper is also in wide use as a thru-wall component (*Figure 12*). It is easy to shape and can offer functional diversion of water.

Please note that all standard details from the publications referenced in this article provide for "continuous" flashings. That is,

Figure 10—Historically, copper was the product of choice as flashing. The material is easy to form and joints can be closed with block tin solder.

Below: Figure 11—Polymeric membrane products have been successfully substituted for conventional thru-wall metals (such as copper). Seaming along laps is still necessary for absolute removal of absorbed water.



joints must be seamed in order to "turn water." Failure to join the thru-wall materials in a continuous fashion may result in leakage. The difficulty in locating the actual leak culprit will be arduous once the masonry units are installed. It is far better to do it right the first time.

Figure 12—Asphalt-coated copper is now in wide use as the thru-wall flashing. It is easy to shape and can offer functional diversion of water when formed as a continuous component.

Summary Comments

To be fair, most wall construction assemblies will absorb water, but few are as forgiving as brick masonry. Masonry walls incorporating thru-wall flashing complemented with avenues for de-watering will perform as intended. Failure to provide these features will likely result in problematic construction. ■

REFERENCES

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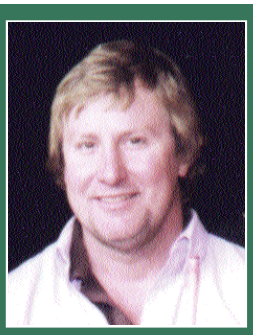

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