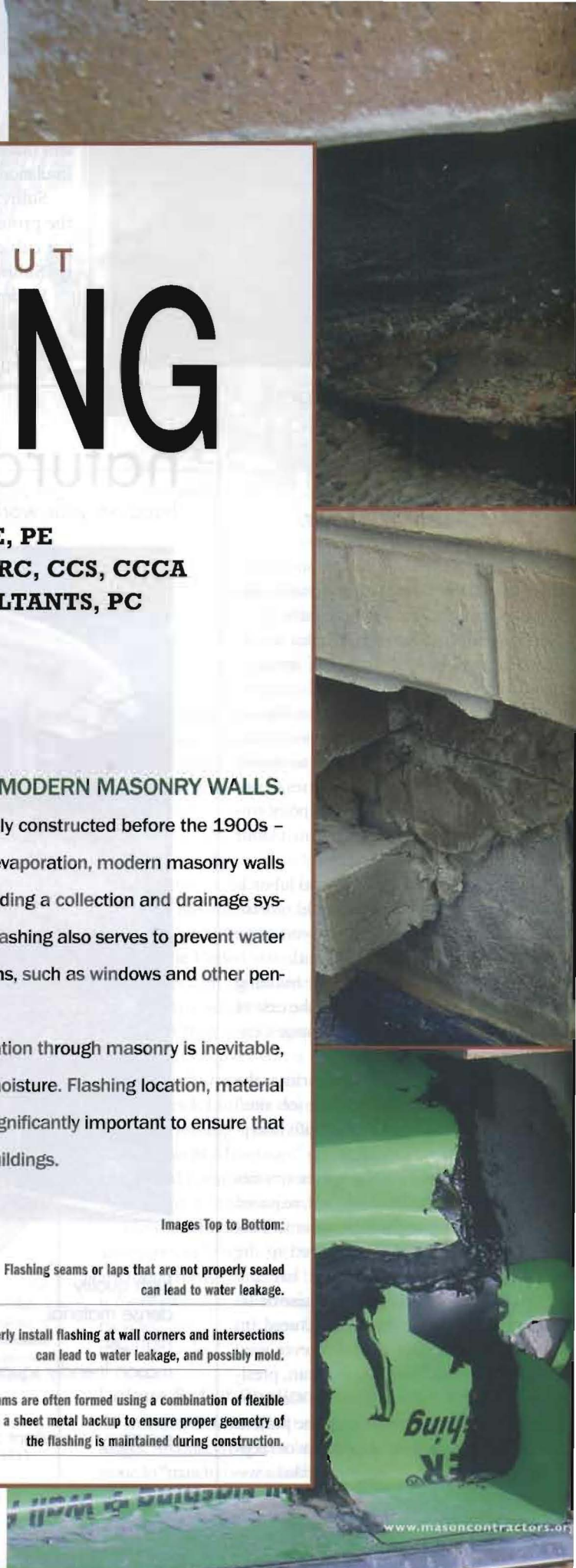
FLUSHING OUT FLASHING BASICS

BY JOSHUA J. SUMMERS, SE, PE
AND KAMI FARAHMANDPOUR, PE, RRC, CCS, CCCA
BUILDING TECHNOLOGY CONSULTANTS, PC

FLASHING IS A CRUCIAL COMPONENT IN MODERN MASONRY WALLS. Whereas solid, multi-wythe masonry walls – mostly constructed before the 1900s – manage water infiltration through absorption and evaporation, modern masonry walls must accommodate moisture penetration by providing a collection and drainage system. This system consists of flashing and weeps. Flashing also serves to prevent water penetration at interfaces with other building systems, such as windows and other penetrations.

Cavity wall design recognizes that water penetration through masonry is inevitable, and it provides the necessary means to manage moisture. Flashing location, material selection, detailing and proper installation are all significantly important to ensure that water does not penetrate to the interior areas of buildings.

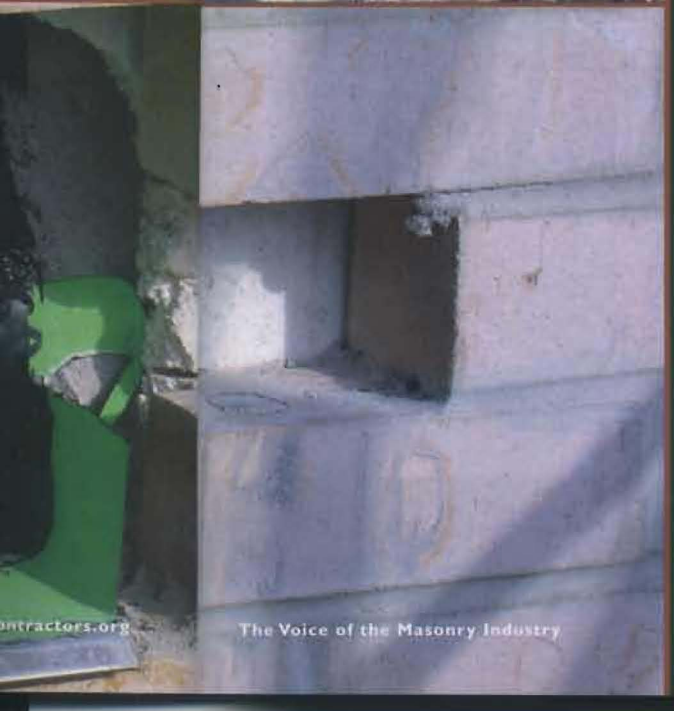


Images Top to Bottom:

Flashing seams or laps that are not properly sealed can lead to water leakage.

Failure to properly install flashing at wall corners and intersections can lead to water leakage, and possibly mold.

End dams are often formed using a combination of flexible flashing with a sheet metal backup to ensure proper geometry of the flashing is maintained during construction.



Flashing Choices

When one looks at a masonry wall, there is a certain uniformity to the entire system. Although there are variations, for the most part one block or brick goes on another in a very consistent way, and the products are fairly uniform in their design.

This holds true for the entire masonry wall, until you reach the flashing and drainage system, where the possibilities and product selection seem endless. From plastic sheeting, tar paper and peel and sticks, to stainless steel, copper and the newest "all-in-one" products, each item offers different installation techniques, benefits and warranties.

We recently asked several flashing manufacturer representatives why there were so many different flashing and drainage products out on the market today. While initial cost seems to be a main factor, they pinpointed four other reasons for the wide selection of products available in this particular niche of the market.

Longevity

"If it's so important to build with masonry, and these brick people are talking about how long their bricks last, it really comes down to longevity. That's the important word," said Dick Lolley, CEO and president of Advanced Building Products Inc., which offers laminated copper and other flashing and drainage materials. "If I were the owner of that building, I would want the flashing to last as long as the brick lasts. That's what it's there for: to protect the cavity and protect that wall."

One way to seek out a long-lasting flashing and drainage product is through standardized tests.

"They should be using products that are tested by reputable labs and that have withstood the test of time – products that architects can specify year after year that haven't had any failures," said Earl Bickett, general manager for Mortar Net USA Ltd., which offers the new TotalFlash all-in-one product.

Another way to seek out such products is to research the warranty available through the manufacturer.

"Check the warranty – the warranty will always tell you about how long that product will perform to its specifications and, unfortunately, when you might begin to see problems," said Jeremy Douglas of Sandell Manufacturing, which offers copper flashing and other drainage products.

Ease of Installation

One of the main selling points for Mortar Net's TotalFlash and Victory Bear's Tri-Technology Flashing – both "all-in-one" type flashing systems that include the flashing, mortar deflection, weeps and other items in one handy system – is they claim to provide a quicker installation than traditional flashing and drainage systems, allowing contractors to save time and labor costs.

"What's driving this product early on are the mason contractors because they're seeing the benefit of getting all of the pieces at once, the benefit of the cost savings, and the simplicity of it," Bickett said. "If they were to buy all of the items separately, they would save a little bit of money by doing that, but it would cost them twice as much in the installation process. The installation and the reliability of the system are the true savings."

Mark Brown, national sales and marketing manager for the Victory Bear Tri-Technology Flashing, an "all-in-one" PVC flashing and drainage product, agreed. "It's a very easy-to-install system," he said. "If you're comparing apples to apples, for example for a two-inch [cavity], for weeps, vents, flashing, termination bar and everything else, we come in $2 to $3 under, installed. A lot of the price difference is installation."

Building Codes

Brown went on to explain that building codes are also a reason for the broad array of different flashing and drainage types.

"You have a variety of building codes," Brown said. "Schools, for example: In most areas, schools use copper because copper is forever. There are a lot of areas, simply due to the codes, that require stainless steel drip edges or stainless steel termination bars. I don't set the policies for building codes, but that is why most products are developed: to fit a niche in the building code.

"What we're facing, marketing wise, is we're changing the concepts and changing the mindsets out there," Brown continued. "It's not necessarily going to be me or my product that are going to change the mindset. What's going to happen in the future is you're going to see building codes are going to change the mindset of the people. And then products like mine will fall into place."

Specifications

Brown also cited preferences and designer specifications as a final factor. "Architects are really the ones that have to be sold on [a product]," Brown said. "If they're going to hang their hat on it out the field that's really where it all starts."

Flashing material often is selected based on cost and suitability, but service life also should be considered.

Flashing Locations

LOCATING FLASHING is a fairly straightforward task, provided water flow and the limitations of the building wall components are well understood. Masonry walls are porous, often including paths for water penetration, such as cracks and poorly bonded mortar joints; even if properly installed, window perimeter and coping stone sealant degrades over time. Also, through-wall penetrations at pipes, conduit, vents and air conditioning sleeves obviously breach the skin of a building. Each of these locations provides the opportunity for water penetration.

Once moisture has penetrated through the exterior veneer of the masonry wall, it will begin flowing down the interior face of the veneer. Where the vertical flow of water is interrupted by a horizontal surface, water has the potential to penetrate to the interior areas of a building. Such interruptions typically occur at wall bases, shelf angles, lintels, slab edges, through-wall penetrations and windowsills. These are the primary locations where flashing is necessary to manage water.

Flashing also is used at other locations to prevent moisture penetration, more so than managing water after penetration. This is typically the case at coping stones on parapet walls and at the head and jambs of windows.

It should be noted that most model building codes, including the 2000, 2003 and 2006 versions of the International Building Code (IBC), require installation of flashing at various areas of masonry walls. The specific locations where flashing is required in each version of the IBC have changed slightly over the years; however, the intent remains the same.

Materials

FLASHING MATERIALS must be resistant to punctures during construction, they must be corrosion resistant, they must not absorb moisture, and they should be fairly easy to install. More importantly, all flashing materials should be able to provide their intended waterproofing function. Flashing material often is selected based on cost and suitability, but service life also should be considered. Failure of the flashing prior to the end of the useful life of a building will require expensive repairs; therefore, only highly durable materials should be used in masonry construction.

The most durable flashing materials are sheet metals – typically copper and stainless steel. These materials are resistant to punctures, corrosion and water absorption. However, installation is somewhat more difficult than for flexible materials, since they require shop or field bending prior to installation. Another factor is the sealing of laps and joints, which normally is accomplished by soldering

Victory Bear

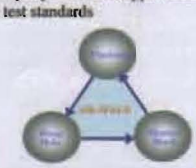
Tri-Tec Flashing

Brick Drainage System

Victory Bear introduces Tri-Tec Flashing, a state-of-the-art weep hole/flashing system for brick veneer construction. Commercial and residential owners alike want the peace of mind that comes with a well-protected building. Tri-Tec Flashing not only keeps your property dry, it also eliminates water that collects behind brick veneer exteriors faster than conventional weep hole systems.

Features

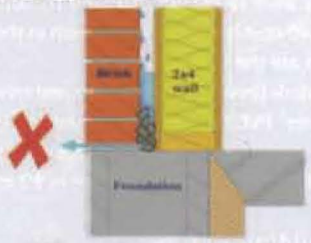
- Made from durable PVC
- Built-in weepholes ensure reliable drainage
- Mortar Stopper prevents mortar from blocking water flow to the weepholes
- Quick connects ensure ease and quality of installaton
- Reduces building costs with its ease of installation
- Built-in brick stop ensures that the product meets code requirements for airspace
- Score lines allow easy size adjustment
- Third party tested and approved to exceed ASTM 514 test standards



Tri-Tec Flashing

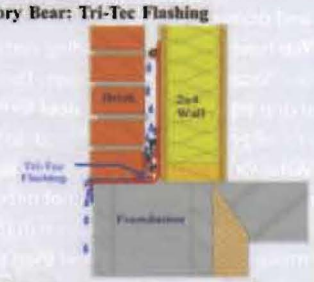
Brick Drainage System

Current construction process



Water which is trapped between brick and wall can cause serious damage.

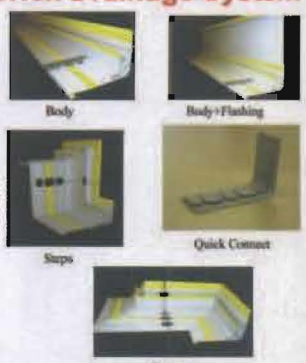
Victory Bear: Tri-Tec Flashing



Mortar stopper prevents excess mortar from blocking weep holes.

Tri-Tec Flashing

Brick Drainage System



*Product style and appearance may vary from those pictured.

Fukuvi USA, Inc

7631 Progress Court, CenterPoint 70 Commerce Park

Huber Heights, OH 45424

Product Inquiries: Mark Brown – National Sales Manager

Phone: (937)236-7288 ext.232

E-mail: mbrown@fukuvi-usa.com

FAX: (937)236-7289

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the sheet metal sections together. Sheet metals also tend to be the most expensive flashing materials.

One of the most common materials used for flashing is rubberized asphalt. It typically comes in variable width sheets and is self-adhesive. The sheets are manufactured through careful blending of rubberizing agents with asphalt (typically SBS or SEBS). The rubberized asphalt then is laminated with a backing material, usually high-density polyethylene. These products are usually 40 mils thick, are flexible, easy to install, non-corrosive, and will not absorb water. They are a somewhat less durable than sheet metal since they are more susceptible to punctures. However, since this type of flashing often is fully adhered to the substrate, a puncture will not necessarily result in a leak. Nonetheless, punctures should not be tolerated in any kind of flashing installation. Laps and joints in rubberized asphalt flashing materials are sealed through the self-adhesive properties of the material.

Thin – approximately 20 mils thick or less – polyethylene sheeting (plastic) also is being used as flashing. However, this is not a durable material. In such thicknesses, polyethylene has nearly no puncture resistance and will degrade over short periods of time. Additionally, sealing joints and laps in thin polyethylene or other types of plastic sheets is difficult.

There are many other types of through-wall flashing products such as laminated copper sheets. Before specifying any flashing materials, they should be evaluated for their durability and installation practicality.

Flashing accessories such as termination bars, drip edges, solder, primers, adhesives and sealants must also be durable and compatible with flashing and other wall materials. Metal components must be non-corrosive and sealants must remain soft and flexible. No material should adversely affect any other material within the wall system.

Masonry Detailing Series Offers New Design Tools

The new web-based Masonry Detailing Series from the International Masonry Institute (IMI) gives building designers easy-to-use, practical solutions for their masonry projects. The interactive, multimedia format includes drawings, images, narratives, animated details and more. To view the series, go to www.imiweb.org/masonrydetails/index.htm.

IMI also offers custom, project-specific advice through its regional Technical Service offices, which can be reached at (800) IMI-0988, or www.imiweb.org.

IMI offers free technical assistance to the design and construction communities, professional education for masonry contractors, and skilled training for craftworkers. IMI is a strategic alliance between the International Union of Bricklayers and Allied Craftworkers (BAC) and their signatory contractors to promote quality masonry construction.

For more information on IMI, please visit www.imiweb.org.

Detailing

ALTHOUGH QUALITY mason contractors should fully understand the purpose of flashing and installation requirements, flashing systems should be thoroughly detailed on the construction drawings. These details should provide direction to the contractor in forming end dams and corners, installing termination bars and drip edges, sealing seams, providing expansion joints, and installing proper flashing support.

Detailing flashing to collect and divert water from the interior cavity wall surfaces to the exterior should consider the following:

1) End dams must be used at the ends of each length of non-continuous flashing to force water to the exterior of the masonry cavity walls. The most common location for end dams is at the ends of window lintels and windowsills. Without them, water will flow along and off of the end of the lintel into the wall cavity (path of least resistance). However, since the window lintel spans the full width of the wall cavity, water can spill into the cavity at or near the interior walls, exposing them to potential water penetration.
2) Proper detailing at corners is necessary to ensure moisture does not penetrate through the flashing system. Details for corners must indicate locations for seams and laps. Corner details may include the use of preformed sheet metal, even if rubberized asphalt flashing is used.

Flashing cannot serve its intended purpose if the wall cavity is too narrow and not kept clean during construction.

3) Flashing must extend through the full thickness of the wall and terminate beyond the face of the wall with a drip edge. Terminating flashing within the exterior wythe of masonry could allow water to travel back beneath the flashing, into the cavity, and possibly back to the interior wythe of the wall system. Use of self-adhesive rubberized asphalt flashing should include separate, stainless steel drip edges adhered directly to lintels and shelf angles, beneath the self-adhesive flashing. This is because rubberized asphalts will degrade with UV exposure. Therefore, when used with a stainless steel drip edge, the rubberized asphalt does not need to extend beyond the face of the exterior wall.
4) The interior vertical leg of flashing should extend up a minimum of eight inches. The top edge of the flashing must be terminated properly. The two most common termination methods are embedment in a bed joint of the masonry backup or with a termination bar. Termination bars should be fairly stiff to provide a uniform clamping force between the fasteners and resist bending during installation. A "[" shape often is best for this purpose. Termination bars should also be corrosion resistant.
5) Details of seams should include a minimum lap length of four inches. Although metal flashing often is soldered at the seams, sometimes it is better to adhere the lapped areas with flexible sealant. This will accommodate thermal expansion and contraction where soldered seams will not.
6) Flexible flashing must be fully supported across the full width of the wall cavity below. At shelf angles and lintels this is always the case. However, flexible flashing placed at floor lines without shelf angles will form a trough over the width of the cavity if supplemental support is not provided. This trough will retain water and can cause large leaks where there are any small imperfections in the flashing seams. Water will then flow through the seams, into the cavity space below and possibly down the face of the interior wythe, exposing interior areas of a building to water penetration. Supplemental support typically is provided through installation of a sheet metal angle attached to the masonry backup wythe and spanning across the full width of the cavity.
7) Penetrations through flashing materials, such as at coping stone anchors, must be detailed to ensure the penetration is watertight. Most often, this is accomplished with a flexible sealant or mastic.
8) Weeps must be placed in the mortar joint immediately above the flashing at a maximum of 24 inches on center. In general, the larger the weeps, the better. Cell vents installed in head joints, typically the same size as a head joint, will quickly remove more water than cotton rope or small plastic tube weeps.

Flashing details are often best presented in isometric views. In particular, details at corners and end dams are difficult to show clearly in traditional, two-dimensional details.

Although not specifically the topic of this article, it is important to note that flashing cannot serve its intended purpose if the wall cavity is too narrow and not kept clean during construction. For cavity walls to function as intended, they must be designed with a minimum inch-inch wide cavity. This dimension is considered the minimum width necessary, as recommended by the Brick Industry Association, to prevent the cavity from being bridged by mortar or other materials and to allow water to cross over to the interior wythe. Narrower cavities are far more difficult to keep clear during construction. However, it should be noted that mortar bridging can still occur with a wider cavity if the masons do not exercise care to keep the cavity clear during construction.

In addition, be aware that a weather-resistive barrier (WRB) is required by all three versions of the IBC. A WRB also can serve as a vapor retarder and/or an air barrier depending on its properties. Design and installation of flashing for masonry cavity walls will require close coordination between WRB installers and flashing installation crews as these two components will serve as parts of the moisture management system within the

wall assembly. Proper placement of the air barrier, WRB or a vapor retarder within the wall assembly deserves a long discussion, worthy of its own article.

Installation

THE FINAL STEP to achieving a fully functioning flashing system is ensuring good workmanship during installation. Properly designed and detailed, flashing systems with carefully specified materials still will be subject to poor performance or failure if good workmanship is not provided during installation. The key considerations during installation include the following:

1) Materials must be supplied and installed as specified by the design professional. Use of poor-quality materials cannot be allowed.
2) All seams, joints and corners must be lapped and sealed thoroughly.
3) Full support for flexible flashing must be installed.
4) When using self-adhesive flashing, all surfaces to which the flashing will be adhered must be cleaned and primed. During cold weather, heat guns may be required to ensure proper adhesion.
5) Flashing installation should be sequenced to avoid damage until it is fully protected within the wall cavity. Flashing often is installed in the bed joints of CMU backup materials and left hanging for several months until the exterior brick is installed. This practice leaves the flashing highly susceptible to damage from wind and construction activities, and should be avoided.
6) The wall cavity must be kept clean of mortar and other materials that will bridge the gap between the exterior and interior masonry wythes and clog weeps. Without a clean cavity and clean weeps, the flashing system will not be able to serve its intended purpose.

A quality control program provided by the contractor is essential to ensuring proper installation of flashing systems.

Conclusion

ALTHOUGH FLASHING systems are considered secondary lines of defense against interior water penetration, they are no less important since all masonry walls are susceptible to water entry. Ensuring these systems work properly starts with understanding the limitations of masonry walls and the flow of water, once it breaches the exterior skin of a building. The best practice in detailing flashing systems is to assume the veneer will not be present and the flashing, along with a properly installed WRB, will be the primary line of defense against moisture infiltration.

Joshua J. Summers *is a principal structural engineer at Building Technology Consultants, PC. Summers has evaluated and developed repair designs for numerous masonry building components. These projects have included both solid- and cavity wall construction with brick, CMU, terra cotta, limestone and clay tile materials.*

Kami Farahmandpour *is the principal of Building Technology Consultants, PC. His expertise is concentrated in the evaluation and repair of building envelopes, including various types of exterior walls, waterproofing systems and roofs. Among his many professional activities, he is currently serving a three-year term as an associate director of the Sealant, Waterproofing and Restoration (SWR) Institute. He also is the co-author of "A Practical Guide to Weatherproofing of Exterior Walls," which was developed by SWR Institute.*

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