

# Buildable Masonry Details

Photo courtesy International Masonry Institute. Photo: Jim Tetto Photography.

by Richard Filloramo

*At the Masonry Variations exhibit at the National Building Museum in Washington, D.C., craftworker J. Keith Behrens and architect Carlos Jiménez demonstrate brick's lightness through rotating post-tensioned piers.*

Some masonry details look good in concept, but are difficult—or even impossible—to actually build. This article looks at cost-effective details that perform, offering designers and specifiers practical advice on coordinating details with the building's unique elements. However, it is important to note details may vary based on geographical requirements and area practice. Masonry walls and elements are composed of individual units, and these construction details must be adapted for each specific project. While there may be some 'typical' details, it is always important for the designer, engineer, and specifier to carefully coordinate each detail with the unique elements of the building. This coordination and precision are required to make the details 'buildable.'

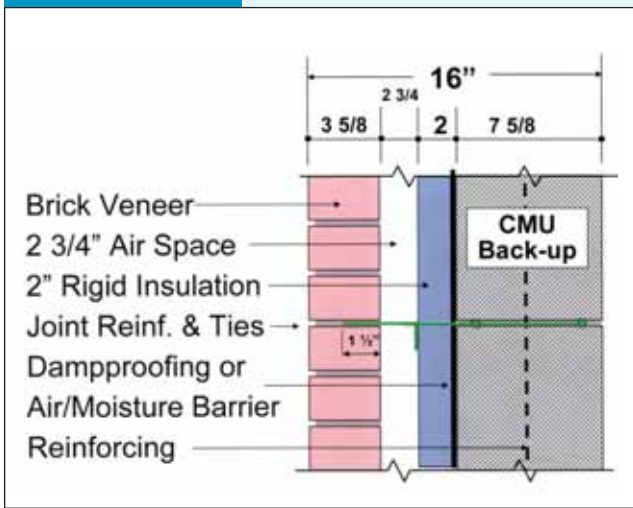
## Brick veneer/CMU backup drainage wall

The brick veneer and concrete masonry unit (CMU) backup drainage wall (also referred to as a cavity wall) is a superior masonry wall system. It affords the designer an infinite array of aesthetic choices and provides weather protection, water penetration resistance, thermal efficiency, fire protection, and durability.

Detail 1 and Figure 1 illustrate a brick veneer and backup drainage wall. The exterior brick cladding is a veneer and does not contribute to the wall's structural attributes. This veneer system complies with Chapter 6 of the Masonry Standards Joint Committee (MSJC), while the brick material conforms to ASTM International C 216, *Standard Specification for Facing Brick (Solid Masonry Units Made*

All figures and details courtesy International Masonry Institute

**Detail 1**



*Detail of brick veneer/concrete masonry unit (CMU) backup drainage wall.*

**Figure 1**



*Elements of a brick veneer/CMU backup drainage wall.*

from Clay or Shale), for standard brick.<sup>1</sup> Industry standards require a 51-mm (2-in.) air space for drainage. The actual air space in Detail 1 is 70-mm (2.75-in.), allowing for the

actual size of the units. Air/drainage spaces less than 2 in. may be prone to mortar clogging and mortar bridging, making the wall detail difficult to build. A 2.75-in. air space

FILLING DOORWAYS WITH QUALITY FOR OVER 50 YEARS.



SCP-8

Eliason® Corporation



**Easy Swing®**



HCP-10

SOLD FACTORY DIRECT

- Restaurants • Fast Food • Deli's
- Bakeries • Specialty Stores
- Hotels & Motels

- Supermarkets • Department Stores
- Retail Outlets • Factories
- Home Centers

Visit us at the CSI Show, booth # 2137 and the AIA Show, booth # 4161

California 800-828-2655

[www.eliasoncorp.com](http://www.eliasoncorp.com)

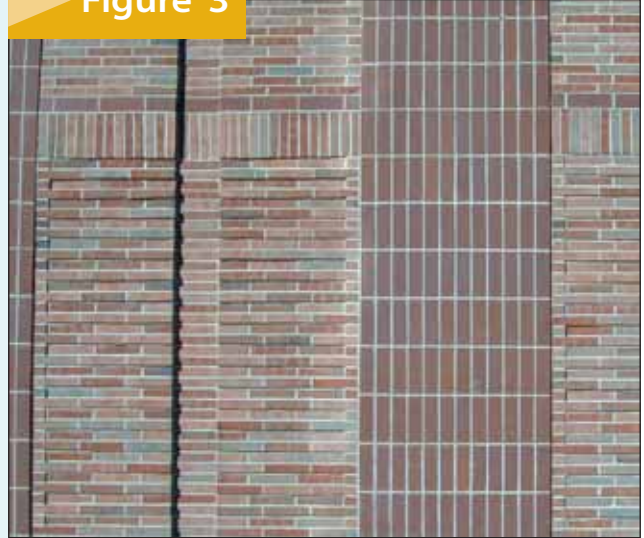
Michigan 800-828-3655

Free info at [www.constructionspecifier.com](http://www.constructionspecifier.com) Click on LinkPath

▶ Figure 2



▶ Figure 3



*Recessed brick veneer units add relief and interest to a building's façade.*

allows recessed veneer units (described below) and other fenestrations to be incorporated into the wall design without compromising the drainage space.

The 406-mm (16-in.) drainage wall example uses 2-in. rigid insulation (accommodating up to 2.75 in.) while still

maintaining a 2-in. air space. Dampproofing, or an air and moisture barrier, is applied to the block backup. (Moisture barrier requirements vary based on geographical and area practice.) There are various types of brick veneer-to-CMU anchorage systems—the most common is adjustable eye wire-joint reinforcing and pintles (*i.e.* ties), the latter of which must engage the brick veneer at least 38 mm (1.5 in.). Joint reinforcing is not required in the brick veneer unless the building will be subject to severe seismic activity or uses a stack bond. The CMU backup conforms to ASTM C 90, *Standard Specification for Load-bearing Concrete Masonry Units*, and the mortar conforms to ASTM C 270, *Standard Specification for Mortar for Unit Masonry*.

The drainage wall should adhere to the guidelines noted to make it buildable, efficient, and most important, flexible. Some value engineering efforts decrease the air space only to find it complicates the wall system by forcing the elimination of recess units, creating pattern bond problems with the backup and interfering with door and window anchorage to masonry.

### Recessed veneer units

Recessed brick or other masonry veneer units add relief and interest to a building's façade (Figures 2 & 3). A recess of 9.5 to 13 mm (0.375 to 0.5 in.) is recommended when using cored brick units in moderate and severe weather climates as shown in Detail 2 (page 30). Deeper recesses are prone to water accumulation and the units or mortar joints at these recesses can become damaged from freeze-thaw cycles or deterioration from moisture exposure. Brick coring varies with manufacturers, but cores are about 25 mm (1 in.) in from the exterior face of the unit. Recessing more than

**With Mortar Net<sup>®</sup>  
There is NO  
"or equal"**

Mortar Net is *the only*\* device that breaks up mortar on two levels. Its patented dovetail shape ensures a clear path for water to migrate out of the wall.

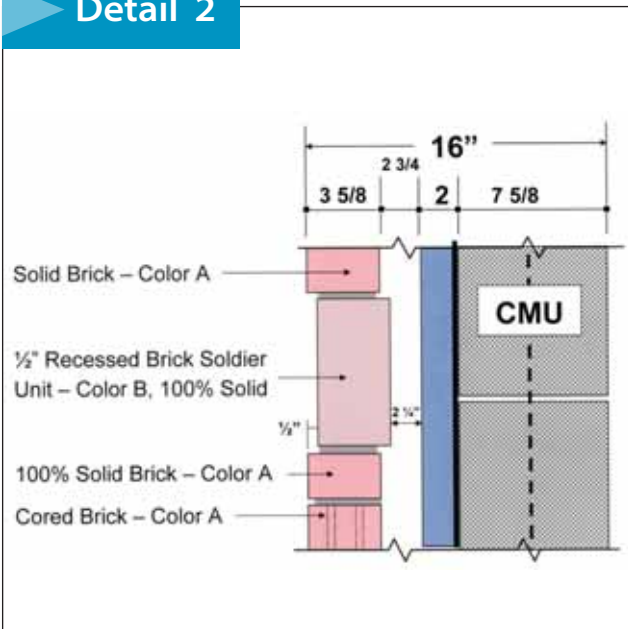
**FIND OUT MORE**  
800-664-6638  
www.mortarnet.com/cs

\*Source: United States Patent and Trademark Office

**Mortar Net<sup>®</sup>**  
USA LTD.

Free info at [www.constructionspecifier.com](http://www.constructionspecifier.com) Click on LinkPath

## Detail 2



*Detail at recessed brick soldier.*

0.5 in. places the cores too close to the weather and extreme damage can occur. For superior protection, 100 percent solid units can be used above, below, and at the recess.

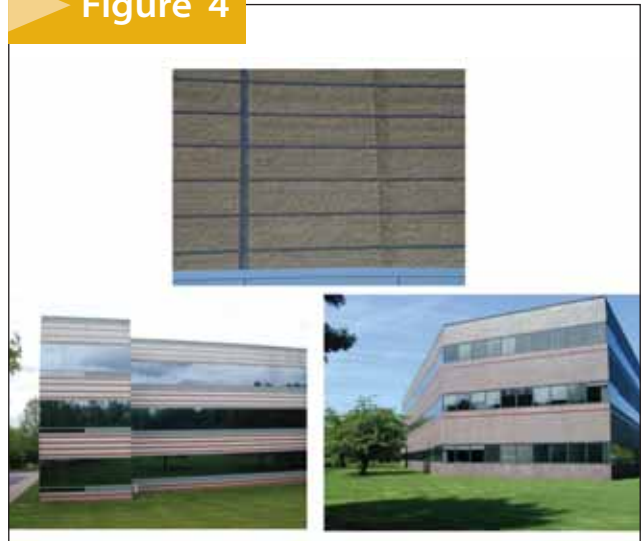
When the designer desires a deeper reveal, a 19-mm (0.75-in.) recess can be employed only if 100 percent solid brick or other 100 percent solid masonry veneer units are used to avoid exposed cores (Detail 3). The solid units should be very dense, strong, durable, and at the low range of absorption. For example, a brick specification may read:

Brick shall conform to ASTM C 216 with a minimum compressive strength of [55,158 kPa] 8000 psi and a maximum water absorption by five-hour boiling of seven percent. If available, a [76-mm] 3-in.-wide brick special (instead of the modular [91-mm] 3.625-in. brick) can be used at the recess course.

This makes the wall system buildable and keeps the back of the brick in line, maintaining a consistent air/drainage space. When solid units are used above, below, and at the recess course, the manufacturer should be consulted to ensure there is color consistency with the cored units in the remaining field of the wall. (Solid brick units may burn differently than cored units.) When variations are possible, the entire project should be specified as 100 percent solids.

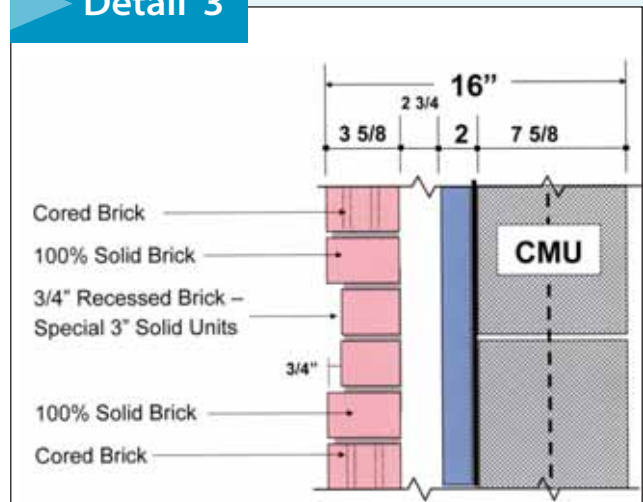
Even when using solid brick, 0.75-in. recesses are still prone to damage in severe weather climates. The designer may choose to use 0.375-in. recesses with an accent color or soldier brick to achieve the same relief and avoid using deeper recesses (See Detail 2 and Figure 4).

## Figure 4



*Examples of using different colored or accent brick and 0.375-in. recess to express relief and avoid deeper recesses.*

## Detail 3

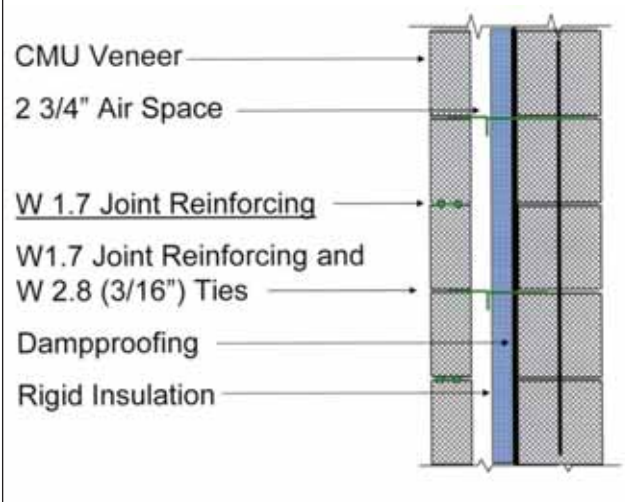


*Detail at recessed brick.*

### Block veneer/CMU backup drainage wall

The CMU (block) veneer/CMU backup drainage wall affords similar advantages and attributes as the brick veneer system at a lower cost (Detail 4, page 32). However, there are several very important design and specification requirements. Some common types of veneer block (available in various sizes) are regular smooth, split face (Figure 5, page 32), split rib, and ground face. The CMU veneer complies with ASTM C 90 and the units should also contain an integral water repellent and/or an applied water-repellent coating. The medium to normal weight units should be high strength (20,684 kPa [3000 psi]), and the aggregate composition should be durable. Lightweight

## Detail 4



CMU veneer/CMU backup drainage wall.

units can be used when a tight aggregate matrix is achieved and the water-repellent additive is effective with the lightweight aggregate. The block mix varies depending on the severity of the climatic conditions.

## Figure 5



Split-face and smooth-face CMU veneer.

The remaining components of the detail are the same as with brick veneer, except joint reinforcing is required in courses alternating with the veneer ties. Generally, control joint spacing for CMU veneers is 4.9 to 6.1 m (16 to 20 ft), as compared to expansion joint spacing for brick veneers of 7.6 to 9 m (25 to 30 ft).

### Base flashing at drainage walls

An essential part of the drainage wall system is its ability to release moisture to the exterior before it can penetrate the building interior. The wall flashing shown in Detail 5 (page 34) may be a membrane, self-adhering membrane, copper composite, or metal. The drip edge, although shown as optional, provides added protection, directs water away from the wall, prevents wicking of dirt and water from finished grade, and blocks water from entering under the flashing. The drip edge is most often a durable metal (e.g. stainless steel) because most membranes and asphaltic flashings cannot be exposed to ultraviolet (UV) light. When using a drip edge, it is essential the detail and specifications indicate the metal flashing is adhered and sealed to the foundation, while the flashing must be adhered and sealed to the metal drip edge. Membrane flashings should be held back about 13 to 19 mm (0.5 to 0.75 in.) to prevent oozing or drooling (asphalt and membrane melts when too close to the exterior, as depicted in Figure 6, page 34). Some new flashings are resistant to this effect.

Weep vents provide an escape path for water and moisture and also allow airflow in the air space. Tube and rope type weep hole inserts are not recommended as they are prone to clogging and do not permit air to enter the air

**Madewell® Permaseal™ System**

# Eliminate

## Concrete Moisture Emission




*Ten year warranty includes flooring installed over the Permaseal System*

*Guaranteed to reduce water vapor emission to less than 2 pounds per 1,000ft<sup>2</sup> of concrete surface area per 24 hrs. when tested in accordance with the calcium chloride method per ASTM F 1869*

*No limit on concrete moisture emission prior to installation*

*Two coat application can be installed in one day*

*Product cost as low as \$1.25 per ft<sup>2</sup> for most applications*

**Avoid Moisture Related Flooring Failures  
Prevent Mold and Mildew Growth**

Madewell Products Corporation has over 35 years experience manufacturing low permeability corrosion barrier coatings for concrete.  
See our website at [www.madewell.com/permaseal](http://www.madewell.com/permaseal) for complete details

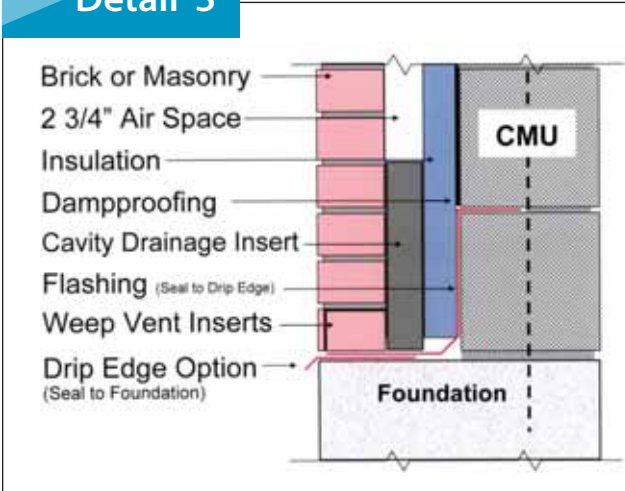


**Madewell**  
"THE NAME SAYS IT ALL"

**Madewell Products Corporation**  
7561A Industrial Court • Alpharetta, GA 30004  
800-741-8199 • 770-475-8199 • Fax 770-475-8167  
[www.madewell.com](http://www.madewell.com) • [sales@madewell.com](mailto:sales@madewell.com)

Free info at [www.constructionspecifier.com](http://www.constructionspecifier.com) Click on LinkPath

## Detail 5



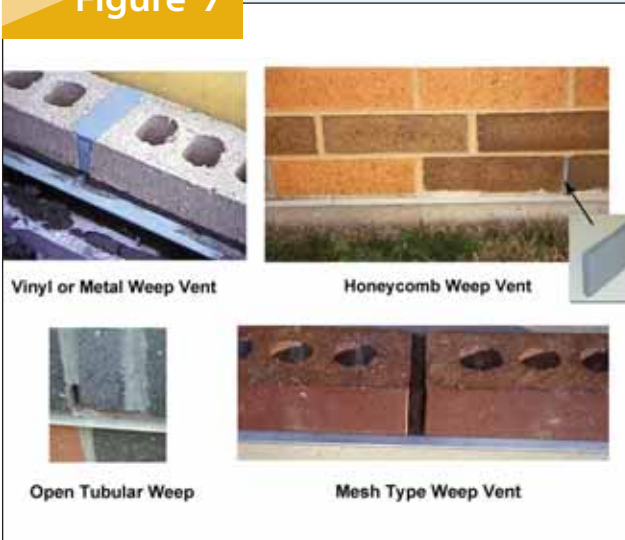
Base flashing.

## Figure 6



Flashing drool.

## Figure 7



Various weep vents.

## Figure 8



Cavity drainage inserts.

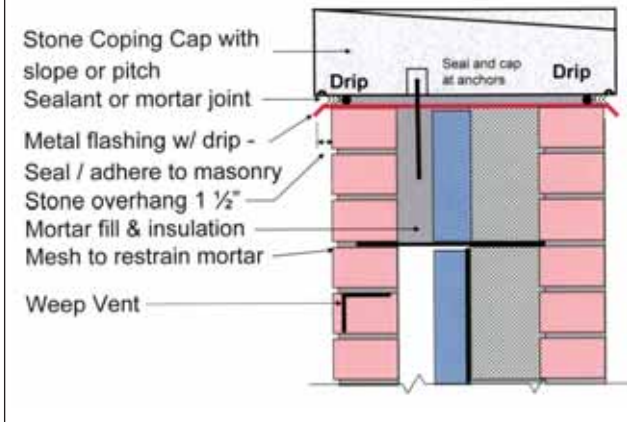
space. Weep vented inserts, honeycomb styles, open tubular types, and mesh-type weep vents (Figure 7) are very effective and are available in various colors to blend in with the masonry. Weep vents should be placed at the bottom and top of the wall to provide airflow within the air space.

Another component of the base flashing detail is the cavity drainage insert. Introduced in 2000, this product is effective in preventing the wall base and weep vents from clogging due to mortar accumulation. The dovetailed type and egg carton style are shown in Figure 8. The inserts should be specified to match the size of the air space—a 25-mm (1-in.) thick base wall cavity insert is not effective in a 51-mm (2-in.) space. Pea stone is no longer recommended as a base for wall drainage material as it

### Top of wall—stone coping

Proper detailing, coordination, and workmanship at the top of a masonry wall are essential since water penetration at this location can compromise the entire system. Precast stone or natural stone coping and caps (Figure 9, page 36) are preferred over brick caps, as the latter's many joints are susceptible to water damage and deterioration (Figure 10, page 37). Stone copings should be sloped at 0.25 to 0.5 in. per foot. The coping should overhang the wall by at least 38 mm (1.5 in.) to provide space for a drip, allowing water to shed away from the wall. When the stone is flush with the wall, there is the potential for lipping and water can eventually penetrate the joint (Figure 11, page 37). For example, a 406-mm (16-in.) wall requiring a 16-in. stone

## Detail 6



Top of wall.

## Figure 9



Precast and stone copings.

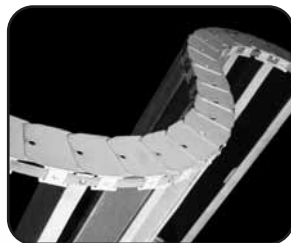
coping can, by code, vary 6.4 mm in 3.1 m (0.25 in. in 10 ft), while the brick face may also vary. If the final wall was 394 mm (15.5 in.) in a certain area, there could be a 13-mm (0.5-in.) lip at the top of the wall.

Stone joints and stone-to-brick/veneer interface should be caulked. In some areas, the bed joint under the coping is jointed with mortar and not caulked. Heavy-gauge metal flashing should be installed under the stone coping and form a drip (Detail 6). This flashing should be sealed and adhered to the masonry below. Anchors are required to secure the stone coping in place and these penetrations should be capped and sealed.

## Do your curves measure up?

FLEX-C TRAC IS  
**ICC**  
 COMPLIANT

Curves are feature elements in architecture. Why cut corners? The next time you specify curves, turn to the only curve framing product that is covered by ICC. See ICC-ES evaluation ER-6003 at [www.icc-es.org](http://www.icc-es.org). For a superior outcome, always use Flex-C Trac by Flex-Ability Concepts.



Visit [www.flexc.com](http://www.flexc.com) or call 405.715.1799

**FLEX-C TRAC**<sup>®</sup>  
 BY FLEX-ABILITY CONCEPTS

AEC Daily - Free Continuing Education Course at:  
[www.aecdaily.com/en/271535](http://www.aecdaily.com/en/271535)

### Top of wall—metal fascia

Many buildings are designed with metal fascia at the top of the masonry wall and roof interface. Industry recommendations on the length of the fascia vary based on area wind speeds and common practice. The fascia should lap the masonry at least 102 to 152 mm (4 to 6 in.) and the joint at the bottom of the fascia should be caulked. The fascia should cover at least one brick joint (as shown in Detail 7), while the top of wall air/weep vent would be located one or two brick courses below the fascia.

### Top of wall—metal fascia with CMU Veneer

The top course should be an exterior-grade smooth faced unit when a CMU split-face, ribbed unit, or other irregular faced unit is used (Detail 8). This top course can be full height 203 mm (8 in.) and be incorporated into the design or be cut to  $\pm 152$  mm (6 in.) to allow the fascia to start just above the CMU veneer.

### Column details

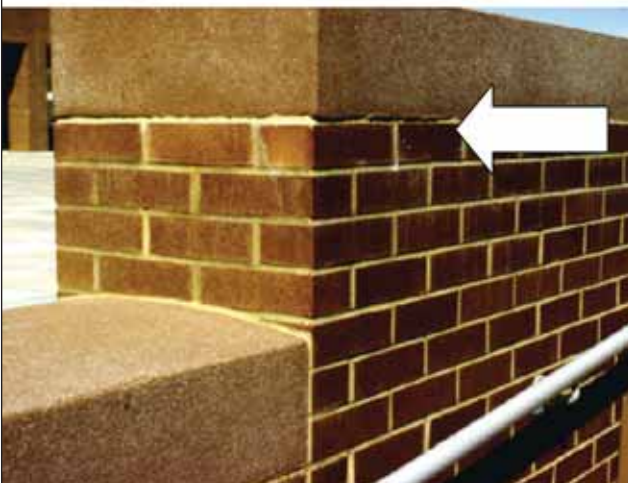
The location of structural steel columns can interfere with adjacent masonry wall construction. As such, providing a water-resistant or waterproof barrier at columns

Figure 10



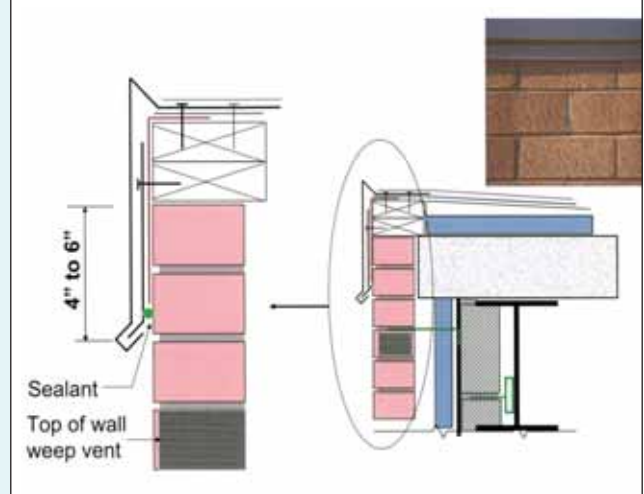
Brick caps are prone to deterioration.

Figure 11



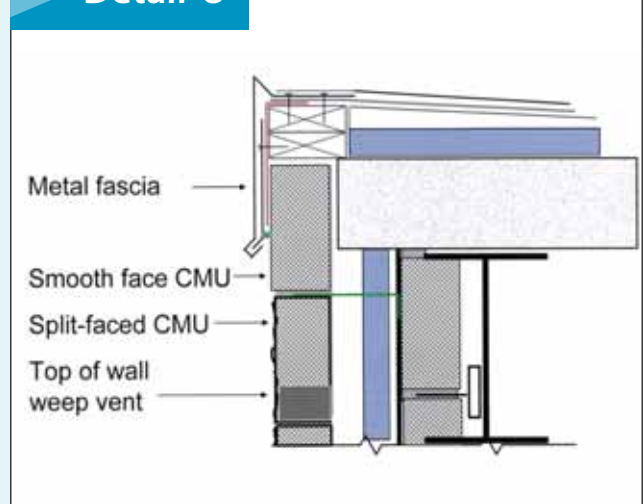
Precast stone flush with the brick veneer is prone to lipping and deterioration.

Detail 7



Top of wall at metal fascia.

Detail 8



Top of wall at fascia with CMU veneer.

penetrating into the masonry cavity is a common problem. New energy codes requiring air barriers and vapor retarders can further complicate these conditions, which demand special coordination between the architect and structural engineer to develop buildable details.

Figures 12 and 13 (page 40) and Detail 9 (page 41) illustrate the placement of full-height flashing membrane over an exterior column projecting into the cavity of an exterior CMU backup wall. In this condition, the membrane is adhered to the column and onto the adjacent CMU. This protects the column, as well as the space between it and the CMU backup, from air leakage and water penetration. Specifiers should

always follow the manufacturer's recommendations for wall preparation, primers, adhesives, and laps.

Adjustable veneer ties should be located within 51 or 102 mm (2 or 4 in.) of the columns. The flashing membrane must not be pierced with anchors from the steel column or the potential for water penetration and air leakage is greatly increased. Ties are not required at the column when the adjustable ties are maintained at the required horizontal spacing. Although many projects specify ties 406 mm (16 in.) vertically and horizontally, the *MSJC Code* permits 406 x 610 mm (16 x 24 in.) for masonry veneers. It is best to leave the spacing 16 x 24 in. to allow for tolerances and field

Figure 12



At left, there is no protection at the column. Fillers and sealants are difficult to use as spaces are large and irregular. Base flashing at column is difficult to seal. At right, self-adhering membrane flashing protects column and spaces at adjacent CMU. It also laps over the base flashing to complete the waterproofing system.

Figure 13



Self-adhering flashing protects a corner column.

conditions, but to accept 24-in. spacing at columns and other locations when necessary. The specifier should always check local codes for anchor and tie requirements. When the distance between adjustable ties exceeds 24 in. or the required design distance, additional detailing is required. (Organizations such as the International Masonry Institute [IMI] should be consulted for additional information.)

Insulation with a thickness of 25 or 38 mm (1 or 1.5 in.) can be installed over the column membrane to provide a continuous thermal break. This is another example of the versatility of the 406-mm (16-in.) drainage wall with the 70-mm (2.75-in.) air space. The 1.5-in. insulation still fits and leaves a 51-mm (2-in.) air space. Compressible fillers or mineral wool can be placed between the column and the CMU to further insulate the area.

Column ties to CMU backup are only required when the wall is spanning horizontally. Most exterior walls span vertically and are attached to the structure above as shown in Detail 10. These ties, if not required, only interfere with column wraps, insulation and other construction, making the detail difficult to build.

#### Structural steel beams

The position, size, and location of structural steel beams affect the moisture-control systems with adjacent masonry construction. Detail 11 and Figure 14 (page 42) illustrate how the lack of water-resistant protection can lead to air leakage and water penetration within the building. It is best to maintain a continuous wall plane for CMU backup at beams as shown in Detail 10. To make the detail buildable,

**When you need the job done,  
in DAYS, not weeks...**

**Tremco has the answer.**

More often than not, there isn't time for lengthy curing or multiple coats. Or even for the concrete to dry.

New **TREMproof® 250 GC Elastomeric Waterproofing Membrane** can be applied to "green" concrete in a single lift up to 120 mils. And it cures in up to four hours. Without pinholes or gassing. TREMproof 250 GC is also VOC-compliant, making it ideal for odor-sensitive applications.

If **you need better performance** with a fraction of the time and labor, **call Tremco at 800-852-5774**. We've built a reputation for developing better ways to get the job done.

***Taking Performance to New Levels.***



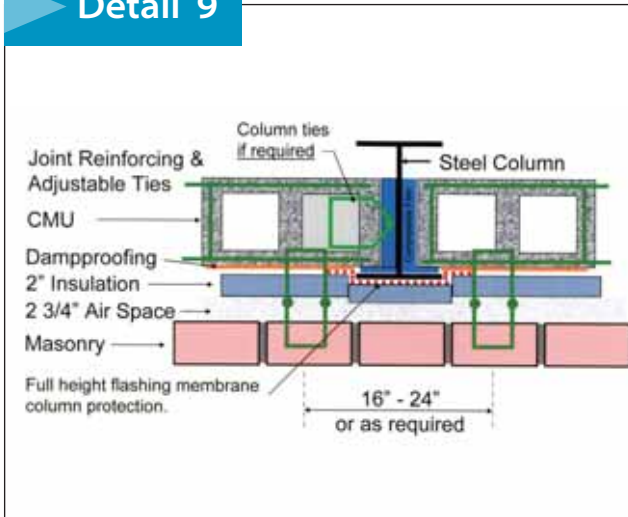
An **RPM** Company

**TREMCO®**

3735 Green Road • Beachwood, OH 44122  
[www.tremcosealants.com](http://www.tremcosealants.com)

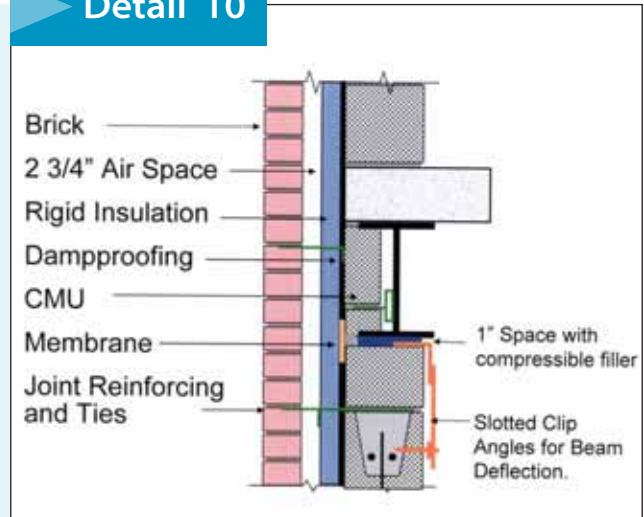
Free info at [www.constructionspecifier.com](http://www.constructionspecifier.com) Click on LinkPath

## Detail 9



Detail at columns penetrating the wall cavity.

## Detail 10



Good detail at steel beams.

there must be sufficient space within the beam web to install the CMU filler. (When there is insufficient beam space to provide support for CMU backup, an alternate detail should be used.) It is important to note the bond beam is located one course below the beam to provide installation space to pour the grout.

In most CMU details, a clear space (usually about 25 mm [1 in.]) is left open between the bottom of the beam and the top course of CMU for deflection (Detail 12, page 42). The resulting space in all details must be covered with a flexible water-resistant barrier. A compressible filler with a facing can be used when compatible with the dampproofing on the CMU. Mortar is sometimes used when the CMU extends beyond the beam and does not contact the beam and movement can be compensated within the beam.

### Conclusion

Masonry details have evolved to meet new and more complex code requirements as well as new architectural design concepts. To ensure masonry details are efficient

and buildable, specifiers should keep certain considerations in mind along with the above guidelines:

1. Special meetings should be held with the project designer, detailer,

specifier, structural engineer, and masonry consultant to review masonry details.

2. Enlarged masonry details and sections should be provided on the drawings.

**SOUND CONTROL SO GOOD,  
IT LEAVES EVERYONE SPEECHLESS.**



**Regupol-QT™** IMPACT SOUND INSULATION The truth is Regupol-QT™ has been outperforming the competition in over 90 independent laboratories and in the field with some of the best IIC rated systems in the industry. Examine the real facts about Regupol-QTscu and Regupol-QTrbm at Regupol's members-only site for architects and engineers at [www.myregupolqt.com](http://www.myregupolqt.com).  
Contact Paul Downey at 416-440-1094, or [pcd@regupol.com](mailto:pcd@regupol.com) for your password.

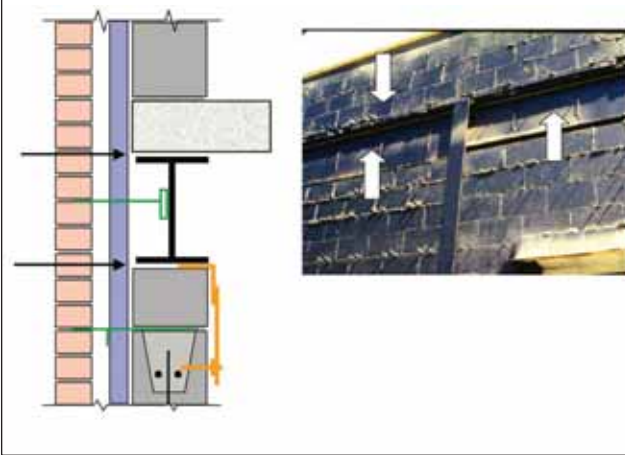


**DODGE-REGUPOL**  
INCORPORATED  
Leaders in recycled products technology

Free info at [www.constructionspecifier.com](http://www.constructionspecifier.com) Click on LinkPath

## Detail 11

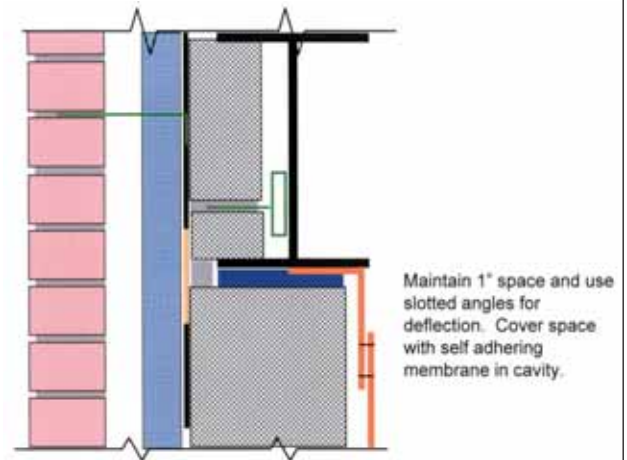
## Figure 14



Poor detail at steel beams. A lack of water-resistant protection leads to water penetration.

3. Project specifications should include requirements for sample panels of unique masonry building elements such as sills, rowlocks, and column and beam enclosures.
4. Designers, specifiers, and structural engineers should incorporate 3-D CAD images into drawings of complex building elements and details.
5. The mason installers must be verified as skilled and experienced with the type of construction on the project, meeting the project qualification requirements. ♥

## Detail 12



Good detail at steel beams.

### Notes

<sup>1</sup> For more information, see MSJC's *Building Code Requirements for Masonry Structures* (American Concrete Institute [ACI] 530-02/American Society of Civil Engineers [ASCE] 5-02/The Masonry Society [TMS] 402-02). Also see ACI 530.1-02/ASCE 6-02/TMS 602-02, *Specifications for Masonry Structures* (and commentaries).

## Additional Information

### Author

Richard Filloramo is area director of market development and technical services for the International Masonry Institute (IMI) New England Region's Connecticut office. He has more than 28 years of masonry experience and has been involved with the design, construction, and inspection of over 5000 building projects. Filloramo serves

on the Masonry Standards Joint Committee (MSJC) and has been a member of various national organizations, including the American Concrete Institute (ACI), ASTM International, American Institute of Architects (AIA), and the Construction Specifications Institute (CSI). He can be contacted via e-mail at [rfilloramo@imiweb.org](mailto:rfilloramo@imiweb.org).

### MasterFormat No.

04 05 00—Common Work Results for Masonry  
 04 21 00—Clay Unit Masonry  
 04 22 00—Concrete Unit Masonry  
 04 27 00—Multiple-wythe Unit Masonry  
 04 28 00—Concrete Form Masonry Units

### UniFormat No.

B2010—Exterior Wall  
 Exterior Skin  
 B2010—Exterior Wall  
 Construction

### Key words

Division 04  
 ASTM International  
 International Masonry Institute  
 Masonry details  
 Masonry Standards Joint Committee

### Abstract

While some aesthetically pleasing masonry details look good in concept, they can be impossible to actually construct. This article selects 10 common details that are

cost-effective and 'buildable,' offering designers and specifiers advice on coordinating details with the building's unique elements.