MCAA
MASON CONTRACTORS ASSOCIATION OF AMERICA

UPSTATE NEW YORK MCAA CHAPTER

Upstate NY MCAA Installation Bulletin #5
Clay Brick Veneer Checklist - The Top 5

Important Details to Consider

Upstate NY MCAA's Installation Bulletins are meant to be brief reminders on various aspects of masonry construction. They aren't intended to be a complete discussion of the topic. At the end of each Installation Bulletin are references that you can follow up for a broader understanding.

Masonry is a mature industry where the design details that contribute to attractive, great performing buildings are understood. This is a list of five design considerations that, if followed, will significantly help protect your project from moisture damage and unsightly stains. While this list does not include all of the "Code" and "Best Practice" considerations you'll need to design your building, in our experience these are some of the most important details. If your plans and specifications currently don't include them, we recommend that you consider adding them.

This document is specifically for cavity walls with anchored veneers of clay brick veneer.

Essential Details addressed in this document:

1. Cavity drainage, flashing and weeps
2. Movement joints for crack control
3. Veneer anchors
4. Units not laid in running bond.
5. Efflorescence, cleaning and sample panels

The basis of these design recommendations are listed below:
The "Code", TMS 402/602, *Building Code Requirements and Specifications for Masonry Structures*
The "MDG", The Masonry Society, *Masonry Designers Guide-2016* helps designers apply the provisions of TMS 402/602
"BIA Technical Note" Technical Publications from the Brick Industry Association (BIA)
"Upstate MCAA" Educational material from the Upstate New York Mason Contractors Association of America
At the end of this document are links and references that we recommend you read and consider to achieve the best understanding of the checklist information provided. Where specific versions of standards are given, please consult the latest version.

1. Cavity Drainage, Flashing and Weeps

Anchored veneers are generally part of cavity walls and detailed such that any water that penetrates the veneer is collected and diverted back to the exterior. The TMS Masonry Designers' Guide states, "Flashing should collect water that penetrates the outside wythe of masonry. The specified flashing and weep systems shall be installed to direct that water to the exterior of the wall without allowing it to flow behind or under the flashing and into the building interior. The weeps should provide a conduit for that collected water to travel to the exterior. Typically flashing is installed at all interruptions in the vertical plane of a masonry drainage wall, such as tops of the foundation, above shelf angles, over

openings and above bond beams." Flashing is essential at the base of wall, at shelf angles, at lintels above openings, under sills, caps, and rowlocks, at beam pockets and wall penetrations. Industry "best practices" recommends a 2-inch drainage cavity while the code minimum is 1 inch.

Incorrect design, detailing and construction of flashing, weeps and drip edges are arguably the most common cause of problems with masonry veneers.

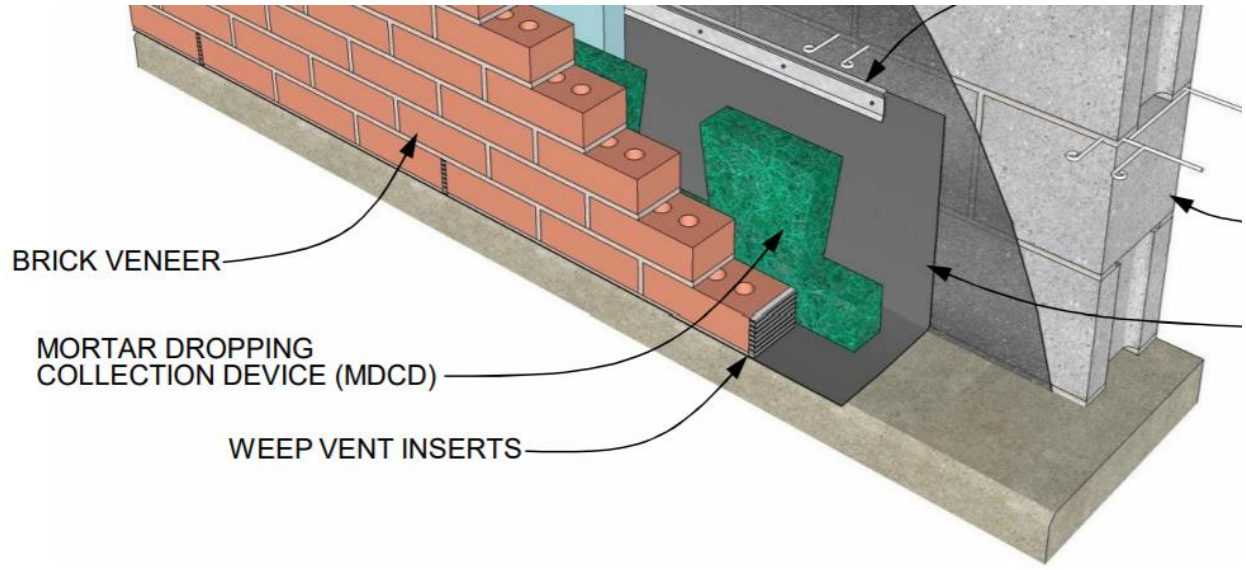
For clay brick veneers, BIA Technical Note 7, *Water Penetration Resistance – Design and Detailing* offers excellent advice. Every designer of clay brick veneers should review this technical note with each project.

Under Through-Wall Flashing Installation, the Technical Note recommends:

- Extending flashing to exterior wall face is required.
- Extending flashing beyond the exterior wall face is recommended.
- For UV-sensitive flashing, use a drip edge.

Upstate MCAA recommends the use of asphalt free flashing material.

The industry recommendation is to extend the flashing beyond the wall face. A (stainless steel) drip edge is commonly used. Some architects may object to seeing the exposed drip edge and detail the flashing to terminate within the veneer. The following detail is provided by the International Masonry Institute (Sketchup 3D Warehouse). They clearly state that while the detail is code compliant without a drip, it does not represent "best practices".



While a drip may seem excessive at the top of the foundation, it provides much greater protection to water penetration at above shelf angles, over openings and above bond beams.

2. Movement (Expansion) Joints for Crack Control

Clay masonry can expand approximately 1 inch per 100 linear feet. To avoid cracking, movement joints (also called expansion joints) are recommended both horizontally and vertically.

The "Code" requires the design professional to indicate movement joint locations on the plans. When the "Code" and industry best practices are followed, cracks will be controlled (minimized) and have no negative effect on the structural performance of the veneer.

Vertical Expansion Joints (EJ)

BIA Technical Note 18A, *Accommodating Expansion of Brickwork* is a must read for each brick veneer project. It includes:

Recommended expansion joint spacing and layout:

- *For brickwork without openings, space no more than 25 ft. o.c.*
- *For brickwork with multiple openings, consider symmetrical placement of expansion joints and reduced spacing of no more than 20 ft.o.c.*
- *When spacing vertical expansion joints in parapets is more than 15 ft, make expansion joints wider or place additional expansion joints halfway between full-height joints.*
- *Place joints as follows:*
    - *At or near corners.*
    - *At offsets and setbacks.*
    - *At wall intersections.*
    - *At changes in wall height.*
    - *Where wall backing changes.*
    - *Where wall function or climatic exposure changes.*

It is preferable to dimension the spacing of joints using the modularity of the brick specified to avoid having to cut the brick. There is BIM software that assists the designer in dimensioning joint spacing (see Masonry IQ, https://3diqinc.com/).

Corners: Vertical expansion joints should be placed within approximately 10 feet of corners. The reference is BIA Technical Note 18A, Figure 4.

Openings:

Vertical expansion joints can be installed in the center of piers between openings. BIA recommends the pier be at least 4 foot wide. BIA Technical Note 18A addresses joints at the jambs of openings but consider the effects on the window anchorage.

Horizontal Expansion Joints at Shelf Angles:

Horizontal movement joints are necessary at shelf angles. Reference BIA Technical Note 18A, Figure 9 for expansion joint details recommended by the BIA.

- *Locate joints immediately below shelf angles.*
- *Minimum ¼ in. space or compressible material recommended below shelf angle.*
- *For brick infill, place between the top of brickwork and structural frame.*

Joint Size and Sealants for Movement Joints:

Movement joints are generally filled with sealant. The choice of sealant material affects the maximum joint spacing and the minimum joint thickness.

the joint size and the sealant selection are critical for proper performance. Each sealant has an acceptable extension and compression capacity that should be compared to the anticipated movement. For example, a sealant with 50%

extensibility used in a 3/8-inch movement joint would provide for 0.38 inch brick expansion between joints. If greater movement is required, a different sealant or a larger joint width is needed.

BIA Technical Note 18A provides a formula for determining the allowable joint spacing

$$S_e = (w_j e_j)/0.09$$ where:

S_e = spacing between expansion joints, in. (mm)

w_j = width of expansion joint, typically the mortar joint width, in. (mm)

e_j = percent extensibility of expansion joint material

From the previous example of a 3/8-inch brick expansion joint with 25% extension capacity, the maximum joint spacing would be $S_e = (w_j e_j)/0.09$ = (0.375 x 50)/0.09 = 104 inches = 17'-4". To achieve a 24 ft. joint spacing would require an approximately ½-inch joint.

Movement joints are a critical part of your design and required by code. Understanding BIA Technical Note 18A, *Accommodating Expansion of Brickwork* and NCMA TEK 10-04, *Crack Control for Concrete Brick and Other Concrete Masonry Veneers* is important. Check your sealant selection to provide sufficient capacity to accommodate the expected movement.

3. Veneer Anchors

TMS 402, *Building Code Requirements for Masonry Structures* provides options for veneer anchors. The available anchors are essentially the same for both clay brick and CMU veneers. Of the code-acceptable anchors, adjustable ones are recommended for maximum flexibility of installation. Except for high wind or high seismic regions, the anchor spacing would translate to 16 inches horizontally and 16 inches vertically.

Corrosion resistance is an important factor to consider for veneer anchors. Anchors can be galvanized, stainless steel or even epoxy. Galvanizing is sufficient for all instances except for very corrosive instances.

BIA Tech Note 44B, *Wall Ties for Brick Masonry* provides a good overview of adjustable anchors.

When adjustable anchors are specified, the code limits the maximum distance between the inside face of the veneer and the outside face of the backing to 6-5/8 inches.

4. Units Not Laid in Running Bond

Per the "Code", running bond is created whereby the head joints in successive courses are offset by at least ¼ of the unit length. Stack bonded masonry is the extreme of "not laid in running bond" since all the head joints align.

When brick is "not laid in running bond", there are some extra considerations. The first is that the "Code" requires horizontal joint reinforcement be used in masonry in general, including brick veneer. Standard 9-gage ladder type reinforcement meets the "Code" requirement.

A second concern includes the classification of the brick. For aesthetic purposes, facing brick meeting ASTM C216 are classified as FBS or FBX. FBS meets standard brick tolerances and FBX provides slightly tighter tolerances (see ASTM C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale). FBX is recommended when masonry is "not laid in running bond" and particularly stackbonded veneer to so joints align to achieve the optimum aesthetic appearance.

5. Cleaning Brick Veneer, Efflorescence, Sample Panels.

BIA Technical Note 20, Cleaning Brickwork is a must read for each brick veneer project.

Cleaning:

- *Follow the brick manufacturers recommended cleaning procedure.*
- *When manufacturer recommendations are not provided, refer to Table 1 in BIA Tech Note 20 for recommended cleaning methods for various brick categories.*
- *Do not use unbuffered muriatic or hydrofluoric acid.*
- *Clean new masonry as soon as possible.*
- *Protect adjacent materials that may be damaged by the brick cleaning process.*
- *Pre-wet the area to be cleaned, apply cleaner at recommended dosages, keep area wet while cleaning, rinse area cleaned and the area below following cleaning.*

Efflorescence*:*

Efflorescence (new building bloom) is a particular staining associated with clay brick. It results from salts from the ground or veneer materials including brick, mortar, cement, lime, sand, aggregate, and admixtures. These salts become a problem when combined with a source of water in the wall system. Ideally, designers should make every attempt in the design to prevent efflorescence including:

Considerations:

- *Allow one year of weathering to naturally remove new-building bloom.*
- *Remove light efflorescence by dry-brushing with a stiff fiber brush and water.*
- *Before attempting to clean recurring efflorescence, identify and correct the source of water penetration and allow brickwork to dry.*
- *Remove stubborn accumulations with a proprietary cleaning product according to the manufacturer's instructions.*
- *Material selection*
  - *Choose clay brick that is has been tested per ASTM C67 and found to be "not effloresced". This is especially important if the designer has not used the proposed brick previously.*
- *Details*
  - *Flashing is required to prevent wall infiltration into the veneer.*
  - *Any details such as eaves and overhangs that push roof runoff away from the walls are effective in minimizing water entry or splash back on the wall.*
  - *Avoid ledges and details that might hold water and increase the chance for water infiltration.*
  - *Avoid raked joints because they are more susceptible to leaks.*
  - *A moisture barrier that prevents capillary rise from the foundation or ground will prevent both water entry and salt absorption.*
  - *Drainage around the building must channel water away from the building to avoid salt absorption from the ground.*
- *Landscaping – keep plantings away from the wall and set water sprinklers to not wet the wall.*
- *Specifications*
  - *Don't allow ground storage of materials to avoid possible salt intrusion from the ground.*
  - *Require waterproof coverings over stored materials.*
  - *Full mortar joints are essential. Tool to provide dense joint.*
  - *Evaluate efflorescence removal on the sample panel.*
  - *Once cleaning is complete, apply a clear breathable sealer to further prevent absorption of water from rain and snow.*

If efflorescence persists after cleaning, the source of water infiltration must be identified and corrected before the efflorescence is corrected.

Sample Panels:

Article 3.8 - Cleaning of TMS 602, *Specifications for Masonry Struc*tures,

> "Clean exposed masonry surfaces of stains, efflorescence, mortar and grout droppings and debris using methods that do not damage the masonry."

Given there has never been a masonry wall completed without some significant stains left on the wall, what is the meaning of "clean" and how is it decided if the wall is clean enough? The answer is the sample panel.

Article 1.6D - Sample Panels of TMS 602, *Specifications for Masonry Structures* states,

> "The acceptable standard for the work is established by the accepted panel."

Sample panels are a particular type of submittal with one of its functions being verification of aesthetics. The sample panel establishes the acceptable standard of quality for the project and as such defines what clean means.

Suggested specification for Sample Panels for aesthetics and cleaning

The sample panel will be used to determine the acceptable standard for the masonry work. All individual product submittals should be approved before the sample panel is constructed.

Build a freestanding sample panel at a location where the future masonry walls and the sample panel can be viewed together. The sample panel is to be built by the mason contractor awarded the job, from the masonry units manufactured for this specific project.

The sample panel should contain a reasonable representation of the full range of unit and mortar color and texture. Each procedure including cleaning and application of coatings should be demonstrated on the sample panel.

The size of this sample panel should be a minimum 4-feetlong x 4-feet high, the actual size and details should be specified by the architect and incorporate the masonry in the bond and color pattern specified. The sample panel shall contain flashing/weeps where specified.

Clean one-half of the exposed face of the panel using the same means and methods that will be used to clean the exposed masonry walls of stains, efflorescence, mortar, grout dropping, and debris, without damage to the masonry. Apply the specified clear post-applied water-repellents to the half of the sample panel that has been cleaned and allowed to dry.

Notify the architect at least one week in advance of the date when the sample panel will be completed and the mortar has dried to its final color. Build the sample far enough in advance of actual construction so there is time to make any final adjustments that the architect chooses. After the sample panel is approved for quality and allowable tolerances in writing by the architect, the construction of the project masonry can begin. Disputes over quality or tolerances during construction should refer to the sample panel.

Note: To this specification, add other criteria to be confirmed by the sample panel. This could include, joint sizes, tooling, reinforcement placement, grouting, opening details, flashing, weeps, etc. Adjust the size of the sample panel appropriately to accommodate the features being demonstrated.

References

Understanding these details is very important for the design of a masonry structure. Please review the following references and contact us with any questions you have or if you'd like additional information:

Flashing and Weeps

The Masonry Society, *Masonry Designers' Guide 2016*
https://masonrysociety.org/

Upstate New York Mason Contractors Association of America, Flashing for Masonry Parts 1 through 3
http://www.upstatenymcaa.com/flashing-for-masonry-part-1

BIA Technical Note 7, *Water Penetration Resistance – Design and Detailing*
http://www.gobrick.com/docs/default-source/read-research-documents/technicalnotes/7-water-penetration-resistance-design.pdf?sfvrsn=0

Movement Joints for Crack Control

BIA TECHNICAL NOTE 18A, *Accommodating Expansion of Brickwork*
http://www.gobrick.com/docs/default-source/read-research-documents/technicalnotes/18a-accommodating-expansion-of-brickwork.pdf?sfvrsn=0

Veneer Anchors

BIA Tech Note 44B, *Wall Ties for Brick Masonry*
http://www.gobrick.com/docs/default-source/read-research-documents/technicalnotes/44b-wall-ties-for-brick-masonry.pdf?sfvrsn=0

Efflorescence, Cleaning and Sample Panels

TMS 602, *Specifications for Masonry Structures*
BIA Tech Note 20 Cleaning Brick

There are always design considerations on projects that would cause a change in recommendations, so please consider these as general guidelines. If you would like additional information, please do not hesitate to contact the Upstate New York Mason Contractors Association of America MCAA**.**

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