



UPSTATE NEW YORK MCAA CHAPTER

Upstate NY MCAA Installation Bulletin #2

Mortar Joints - Full Bed and Head Joints

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.

Full bed and head mortar joints are important, but why?

The simplest answer is because if you don't have them, you are not in compliance with the Building Code!

But a deficiency in joints can also lead to longer-term problems that will not go away; increased water infiltration, cracking and an array of other problems that can present themselves months or years after a project has been completed. If there are head or bed joints that are not full of mortar, the fault will follow the mason regardless of time. A contractor may be liable for repairs to damaged walls many years after the project is completed.

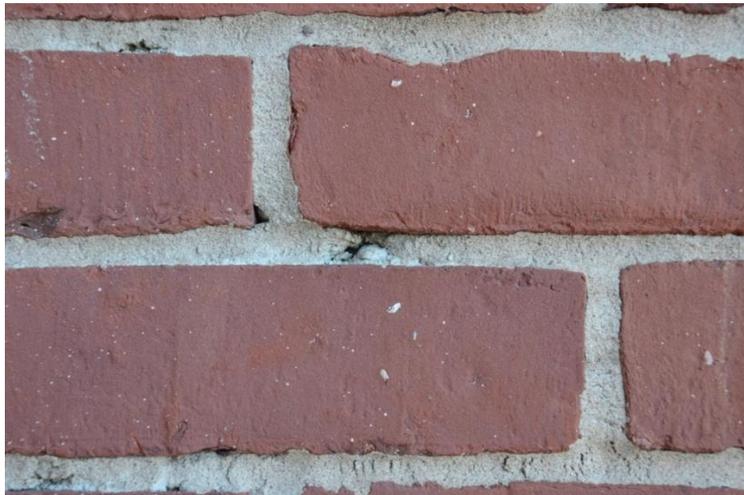


Figure 1 – Unacceptable joints

So, what is a full head or bed joint supposed to look like?

The definition of full joints is based upon whether solid or hollow units are being installed.

Solid Units:

Any unit that is more than 75% solid in its longitudinal cross-section is considered “solid” and must have both bed and head joints that are 100% full. There are no exceptions to this. While most clay brick and CMU veneer units will meet this criterion, it’s best to determine whether the unit is “solid” before installation. Note: a “solid” unit does not have to be 100% solid unless the project specifications so indicate.

For “solid” units, the mortar coverage must be the full length and depth of the bed joint, and the full width and height of the head joint (Figure 2).



Figure 2 – “Solid” brick unit laid in a full bed joint with a full head (end) joint

Hollow Units:

Any unit that is less than 75% solid in its longitudinal cross-section is considered “hollow”. This is common with CMU units and structural clay units, but it also applies to both clay brick and CMU veneer units.

For “hollow” units, the mortar coverage for the head and bed joints must be the full depth of the face shell as seen in Figure 3A.



Figure 3A – “Hollow” CMU unit laid in a full bed joint with a full head (end) joint

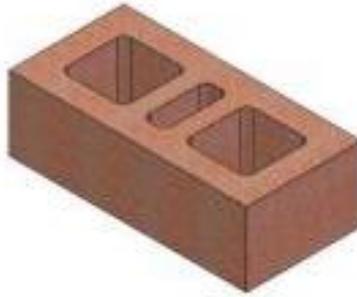


Figure 3B – “Hollow” clay unit that would be laid similar to Figure 3A
(courtesy of interstate Brick)

Harmful consequences of joints that are not full:

Water tightness:

For veneers and single-wythe masonry, full mortar joints are the primary means to reduce water infiltration. Leaking veneers can create abnormal amounts of moisture in the cavity. Bad head joints are the most prone to leaking which can result in wall damage such as discoloration, efflorescence, increased joint cracking, or damage to the interior structure and finishes. Figure 4 shows bad and good head joints in solid veneer units.

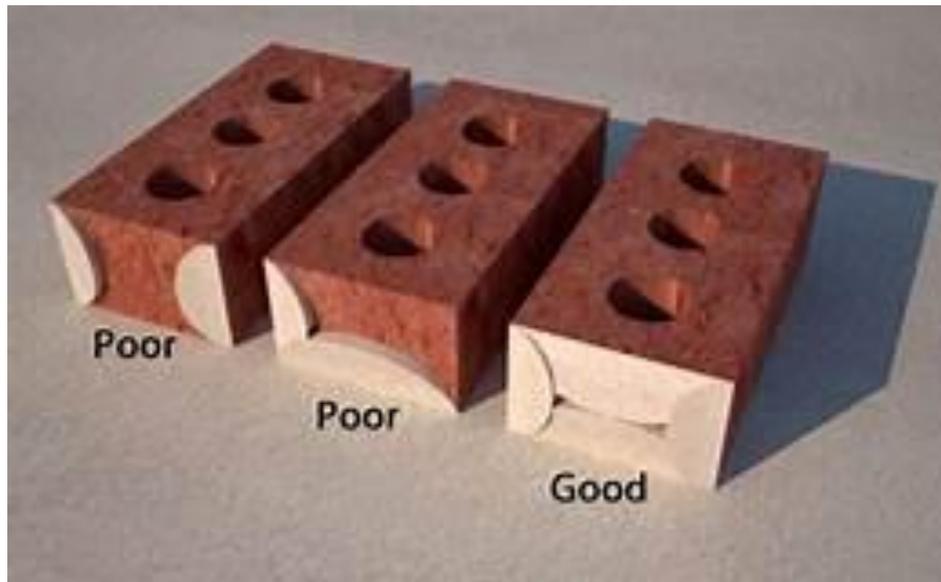


Figure 4 – Veneer head joints
(courtesy of blogspot.com)

Anchorage:

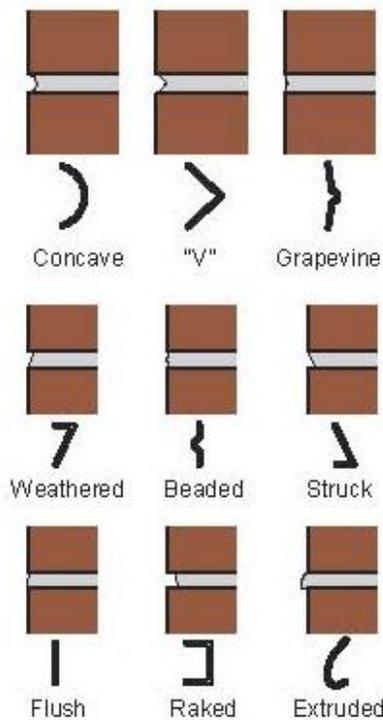
Full bed joints in the veneer and backup are also essential to provide anchorage for the veneer ties. Insufficient mortar or tie embedment can cause veneer bulging or failures. We can adversely affect the safety of anyone passing our builds if the veneer ties are inadequate due to insufficient mortar joints.

From NCMA TEK 12-01B, “The required embedment of unit ties in hollow masonry is such that the tie must extend completely across the hollow units. Proper embedment can be easily attained with the use of prefabricated assemblies of joint reinforcement and unit ties. Because of the magnitude of loads on anchors, it is recommended that they be embedded in filled cores of hollow units. See TEK 3-06C for more detailed information.”

Mortar Joint Compaction

Tooling and compaction are the final ingredients for good mortar joints. Tightly tooled joints bond better with the units and densify the surface against water infiltration. For high-quality mortar joints, tooling and compaction are essential. Figure 5 comes from the Brick Industry Association and shows typical mortar joint profiles; these can also apply to CMU.

All exposed joints can be tooled tightly except for extruded joints, even if a special tool needs to be made for the joint. While some architects prefer rake joints, they can be leakers. If you must use raked joints, try to minimize the raked depth and be sure to tool them flat and tight.



**Figure 5 –Typical Mortar Joints
(courtesy of BIA)**

Figure 6 shows a well-tooled CMU wall with no voids or pockets.



Figure 6 – Sound bed and end joints in “hollow” CMU

Summary

Full head and bed joints are a code and specification requirement and if they are not mortared full, the installer is at fault. As masons, we must ensure full head and bed joints in our work otherwise problems can occur years later and be incredibly costly to fix for our members, often resulting in long, expensive litigation.

In the real world, it is easy to overlook small imperfections in mortar joint installation, but when the workmanship is questioned and investigated, even minor imperfections such as a partial head or bed joints may be the reason a wall will need to be torn down and rebuilt; even in a completed, occupied building! It has happened in Upstate NY several times!

For a better understanding of the critical role of mortar and bed and head joints in masonry construction, please refer to the following technical resources:

Google Upstate New York MCAA and click into the “Education” section at the top of the page. “Above Grade – Code Based Masonry Training” and “Mortar for Masonry”

TMS 602, Specifications for Masonry Structures, The Masonry Society
[JNX-clusives: Filling Mortar Joints \(jnxclusives.blogspot.com\)](http://jnxclusives.blogspot.com) by Larry D. Jenks

The Brick Industry Association Technical Notes can be accessed through BIA’s website:
<https://www.gobrick.com/read-research/technical-notes>

Technical Note 7B: Water Penetration Resistance – Construction and Workmanship
Technical Note 8: Mortars for Brickwork
Technical Note 28D: Brick Veneer/Concrete Masonry Walls
Technical Note 41: Hollow Brick Masonry

The following National Concrete Masonry Association TEK Notes can be accessed through NCMA’s resource center: <https://ncma.org/resources/tek-solutions-center/> Click on TEK Notes.

TEK 03-06C: Concrete Masonry Veneers
TEK 03-08A: Concrete Masonry Construction
TEK 09-01A: Mortars for Concrete Masonry
TEK 12-01B: Anchors and Ties for Masonry