MCAA
MASON CONTRACTORS ASSOCIATION OF AMERICA

UPSTATE NEW YORK MCAA CHAPTER

Upstate NY MCAA Installation Bulletin

Masonry Cost Savings Ideas for Designers - 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 lower the cost of masonry and improve the quality of your buildings. 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 masonry cost savings ideas for designers.

Essential Details addressed in this document:

1. Bond & Coursing for Masonry
2. Material Selection
3. Masonry Details
4. Drawings & Specifications
5. Patterns and Corbelling

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
"NCMA Tech Notes" Technical Publications from the National Concrete Masonry Association (NCMA)
"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. Bond, Coursing and Dimensioning for Masonry:

Bond: For this Top 5, bond refers to the modular, horizontal layout of masonry units. The standard modular layout for bond with masonry units uses 4-in. and 8-in. increments.

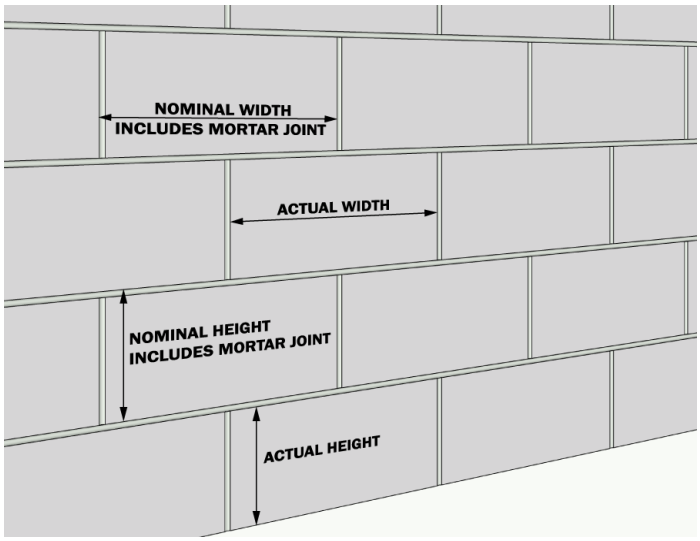
Coursing: For this Top 5, coursing refers to the horizontal rows (layers) of stacked units that create height in masonry. Standard modular layout for coursing with masonry units can be, 4, 8, 12 or 16-in. depending on the type of masonry unit used. The increments can relate to a single course or the total sum of multiple courses. Examples of this is would be (1) 8" high (nominal) unit plus a 3/8-in. mortar joint equals 8-in. or (3) modular brick plus (3) 3/8-in. mortar joints equals 8-in.

Dimensioning Recommendations for Bond & Coursing:

- Dimensioning of masonry elements should always use the modularity of length and height based on the size of the unit being used.
- The locations of openings within a masonry element should be placed to work in bond and coursing. (This including pipes, ductwork, chases and conduit)
- The length and width of openings should also work in bond and coursing.
- Control joints should be placed to work in bond. (Note: CMU control joints do not have to correspond to the control joint locations in brick.)
- A good practice for brickwork is to show vertical dimensioning along with the number of courses. Remember to include the courses + (1) mortar joint.
- Masonry openings should incorporate bond + 1 mortar joint
- Columns between openings should subtract the width of 1 mortar joint(because openings are 1 mortar joint bigger)

Additional costs related to masonry elements that are not dimensioned using modularity:

- Amount of time required to do layout.
- Additional saw cutting time.
- Added costs to use nonstandard size units.
- Increased time to place reinforcing and grout.
- Loss of production due to non-bonded or coursed masonry.



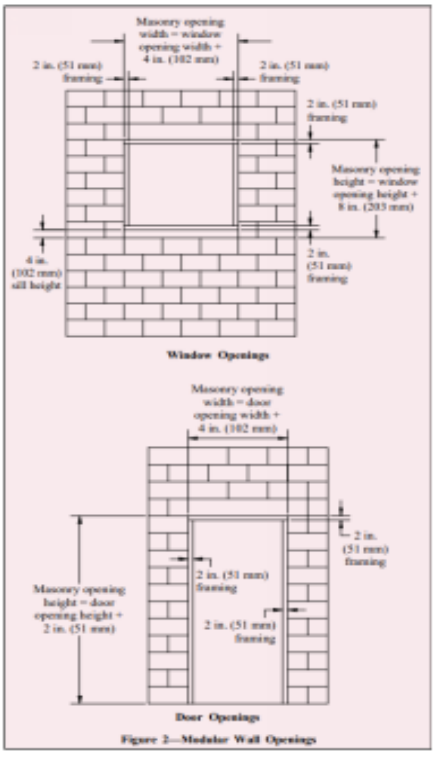


Figure 2—Modular Wall Openings

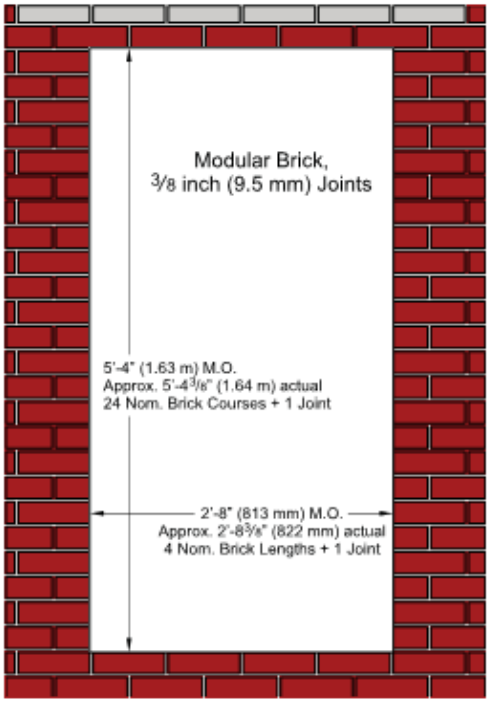
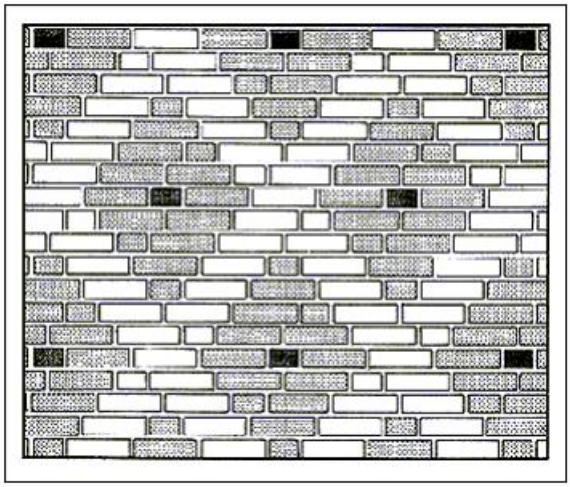


Figure 4
Example of Determining Dimensions for a Masonry Opening



Garden Wall Bond with Units in Dovetail Fashion

FIG. 5

When dimensioning plans, a good rule of thumb is to use nominal dimensions for wall lengths of more than 4 units and actual dimensions for lengths of less than 4 units. When nominal dimensions are used on drawings but are not intended for construction, note plans accordingly.

2. Materials Selection:

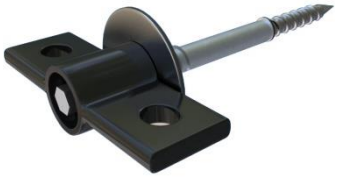
- **Sourcing**
  - Masonry materials that are sourced close to where they are fabricated or manufactured and then installed are much less expensive than materials produced from other regions of the country. A wide range of brick, CMU, architectural CMU, pre-cast and natural stone products are all produced within 500 miles from Central New York. Using these locally produced materials will lessen environmental impacts, save manufacturing costs, transportation costs and shorten delivery time.

- **Color**
  - The specified color of masonry materials will affect the cost of the material. Darker and lighter colored masonry units can be more expensive to manufacture due to the types of aggregate and/or pigments required. Natural colored units that are produced using more traditional aggregates and pigments are less expensive. When possible, always consult the manufacturer to determine the standard color range for the masonry units being specified on a project.

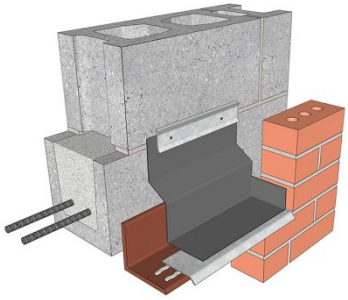
- **Reinforcement and Anchorage**
  - The type, size, finish and installation method of reinforcement and anchors will impact the cost of masonry projects. The over design of reinforcement and anchors are a major factor causing higher construction costs for masonry. Un-needed or over designed reinforcing can add up to $6.00/sq. ft. to the cost of masonry partitions.

- When specifying reinforcing for masonry, designers should always consider using the minimum size and spacing required to meet the structural design requirements.
    - Mason contractors point to the over design in reinforcing bars as the leading cause for higher costs in masonry. The over design of reinforcing causes issues with lap splicing, congestion inside CMU cores, and lost productivity installing CMU and grout. The code recommends that the area of vertical reinforcement should not exceed 6% of the grout space area, *(about .84 in.^{2}, 1.21 in.^{2}, or 1.61 in.^{2} of vertical reinforcement for 8 – 10 & 12 in. concrete masonry units, respectively.)*
    - Use 9ga, wire reinforcing in lieu of 3/16" wire whenever possible. 3/16" wire reinforcing is costly to purchase, will slow down production and, affect quality, especially when hot-dip galvanizing is applied as the finish. 3/16" wire should only be used when seismic or shear loading is an issue. 3/16" wire also affects the minimum joint thickness, and will reduce the ability of the mason to adjust for given heights such as door and window heads.
    - The installation of seismic wire in masonry veneers will slow down production and can also impact quality. Verify the seismic zone of the project location and only use seismic wire where required by code.
- Specified finish requirements for reinforcement and anchors should be based on the environment the material is placed in. Doing so will save on material and installation costs.
    - Interior reinforcement not exposed to the exterior can be specified with a mil-galvanized finish.
    - Reinforcement exposed to the environment can be specified with a hot-dip galvanized finish.
    - Only reinforcement that is placed in extreme or caustic environments should be epoxy coated or made out of stainless steel.

- The installation of reinforcing and anchors is often an overlooked factor when designing anchors.
    - Veneer anchors come in a number of configurations. Whenever possible, always chose the anchor that requires the least effort and number of steps to install. Anchors that are easier to install may be more expensive to purchase, but the cost savings in installation will outweigh the additional material cost.
    - The type and installation method of top of wall anchors is a major source of higher costs. Whenever possible, use top of wall anchors that are made by reinforcing manufacturers. Custom made anchors can be extremely expensive to purchase and install.



- **Flashings:**
    - There is a large variation in the costs to purchase and install flashings for masonry. Sheet metal flashing, stainless steel, copper fabric, membrane flashing and pan type flashings (for single-Wythe masonry), ALL work equally well to divert the flow of water out of masonry systems. More important than the type of material used, is the proper installation of flashing in the field. Flashing materials that are easier to work with, require fewer steps to install, and tolerate building tolerances should always be considered. Generally, these are fabric and membrane type flashings that can be can be up to $20/ lin. ft. less costly to purchase and install.



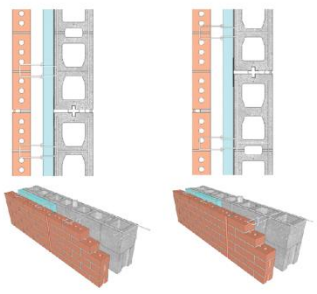
- **Unit Size & Weight:**
    - Unit size and weight play a major factor in the cost of masonry components.
        - Increasing the size of masonry units will decrease the number of units purchased and installed. Although larger units are more costly, the reduction in labor costs will generally outweigh the added material costs.
        - Light weight masonry units meet code and require less effort and cause less fatigue to install. This higher, maintained lay rate reduces labor costs by as much as 30% and can lessen the chance of excessive, repetitive over-use type injuries.
- **Textures:**
    - A great feature of masonry units is that they can be produced in a number of different textures. Ground face, smooth face, sand blasted and glazed are just a few of the many options. Highly finished units like glazed block and brick or ground face block are more expensive to manufacture and install. Designers can reduce costs simply by choosing a different textured unit. Suppliers and mason contractors can help determine what level of finish will fit a projects budget.

3. Details:

Masonry details are the driving force of costs on a masonry project. Good detailing will speed up construction, improve quality and reduce the amount of clarifications needed on a project.

Detailing Recommendation for Masonry Projects:

- Top of Wall Detailing:
  - Call out specific locations, type of anchor, and spacing for top of wall anchors.
  - Use standard top of wall anchors whenever possible.
  - Be specific about who is required to install the anchors.
- Bond Beam Locations:
  - Only use bond beams where required. General note requirements lead can to over design and additional costs.
  - On non-bearing walls, consider placing bond beams below the top course of block. Particularly in areas where a deck or slab above the wall will be in place prior to wall installation.
- Column Wraps:
  - Column wraps should be designed to work in bond with the unit size.
  - Leave space to accommodate building tolerances.
  - Provide adequate space to install MEP equipment.
- Structural and Architectural Details:
  - Architectural details should be coordinated with the structural drawings to eliminate discrepancies and over design.
  - Structural details and tables for reinforcement size and spacing should be consistent and project specific.
  - Consider the use of larger sized masonry units to reduce CMU core congestion.
  - Details that don't pertain to a project are often found in bid documents. This can cause the inclusion of costs for work that is not required.
  - Details often contradict each other or contradict work required by Tables or drawing Keys. These contradictions lead to higher costs for the inclusion of work that is not required, costly errors in the field and mistrust among project partners.
- Cavity wall air space:
  - The air space provided from the back of the veneer unit to the face of insulation or substrate can have a major impact on production and thereby cost.
  - Code requires a minimum 1" air space but masons will tell you that a 2" air space is preferred. A 2" air space provides room to install veneer units faster. There is also less chance for mortar to bridge across the air space. A 2" air space will also allow for variations in the substrate.



4. Specifications:

Masonry specifications are another important factor in reducing the costs of construction. Appropriate specifications will provide the contractor with a complete guide and scope of work for a project. Ambiguities within the specification will lead to wrong products being estimated and submitted, errors in structural requirements, quality requirements and gaps or overlaps in the work actually required.

Specification Recommendations for Masonry Projects:

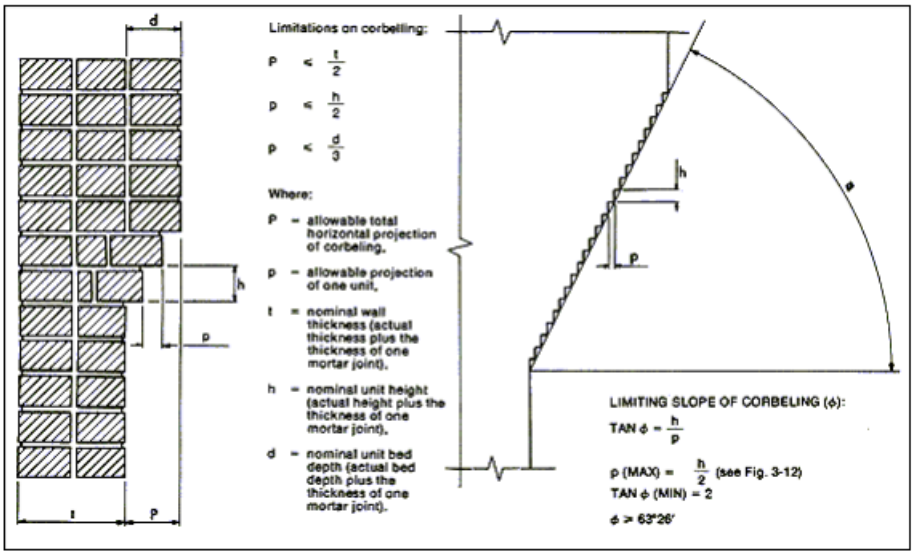
- Use up to date code standards.
  - New code changes have made masonry easier and less costly to design with. Make certain you are designing with the new standards.
  - Plans and specifications often contradict each other and can lead to costly errors in the field. Review plans and specs for inconsistencies and correct them.
  - Different specification sections often specify the same materials found in other sections but indicate different requirements for the same use. This creates confusion and higher bid costs.
  - Generic material specifications require contractors to price the most expensive product to protect against losses once a product is selected.
    - Always try to specify manufactures, colors or color groups for masonry units to be used on a project.
    - Only specify materials that are used on the project.

5. Patterns & Corbelling:

The remarkable diversity of masonry products allows designers to create aesthetically pleasing patterns that use different orientations, sizes, colors, textures and different types of masonry units. However, these patterns need to be designed to meet code requirements and importantly, to work in bond and coursing so they can be efficiently installed. Patterns or corbelling that doesn't meet code can create maintenance issues in the future or even failures in worst case scenarios. Patterning that doesn't account for bond or coursing will create additional costs in installation, added waste costs and even quality issues.

Recommendations for Patterns & Corbelling:

- Designers should reference code requirements when designing corbelling or racking on a project. Codes limit the distance units can be projected from the face of wall per course and overall for multiple coursed corbelling. Reference BIA Tech Note 36A – Brick masonry Details, Caps and Copings, Corbels and Racking and TEK-14-08A - Empirical Design of Concrete Masonry Walls for information.
- ***BIA Tech Note 10 – Dimensioning and Estimating Brick Masonry*** *and* ***Tech Note 30 – Bonds and Patterns in Brickwork*** can help create designs for brickwork that are cost effective and easier to install.
- When different types of material are used to create patterns, consideration and design details that deal with differences in the coefficient of expansion and contraction should be considered. Refer to BIA Tech Note - 18a-Accommodating-Expansion-of-Brickwork for information.



Limitations on Corbeling

FIG. 8

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:

Brick Institute of America (BIA):

Tech Note 10 – Dimensioning and Estimating Brick Masonry
https://www.gobrick.com/media/file/10-dimensioning-and-estimating-brick-masonry.pdf

Tech Note 18a – Accommodating Expansion of Brickwork
https://www.gobrick.com/media/file/18a-tn18a.pdfTech Note 30 – Bonds and Patterns in Brickwork

Tech Note 36a – Brick Masonry Details Caps and Copings, Corbels and Racking
https://www.gobrick.com/media/file/36a-brick-masonry-details-caps-and-copings-corbels-and-racking.pdf

National Concrete Masonry Association (NCMA):

TEK 01-03A Architectural Concrete Masonry Units

TEK 04-01A Productivity and Modular Coordination in Concrete Masonry

TEK 05-07A Floor and Roof Connections to Concrete Masonry Walls

TEK 05-12 Modular Layout of Concrete Masonry

TEK 12-04D Steel Reinforcement for Concrete Masonry

TEK 14-08A Empirical Design of Concrete Masonry

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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