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## **Choosing the Right Masonry System for your Budget**

### **What is the expected Life Span of your building?**

Not all buildings are created equal. It is true. I give radically different advice to someone building a cathedral than to someone designing a 7-11. Some retail and hospitality buildings are torn down and remodeled every twenty years just so that they will look trendy. It doesn't really matter how you build these structures because they will never outlive their warranties. If, on the other hand, you are building a school or a hospital or a church, you need to be more conservative because these structures traditionally have relatively long life expectancies.

The buildings at DU (University of Denver) are designed with an expectation of 100-300 years of usable life. The University has figured out that if a good parapet cap can extend the life of a wall, it is a good investment for them. While this "build it for the ages" approach is not right for every owner, we developed this seminar to help long-term owners make wise cost-cutting decisions. We are already assuming that you will choose masonry for its long life and low maintenance. The information in this seminar will help you choose one type of masonry over another and will help you understand the possible ramifications of your choices. In order of longevity, your choices are:

#### **1a. Brick Veneer over a Reinforced Brick Bearing Wall.**

This system gives you a tough, beautiful brick surface on both the inside and the outside of the building. You can run rebar in the core holes of the inner wythe of brick, install rigid insulation in the airspace and clad the exterior face of the building in a final layer of brick. This system delivers excellent aesthetics, great design flexibility, the lowest maintenance and the longest life of any system we know. It also has excellent R-value and heat capacity. As you might expect, it is also the most expensive system listed here. But 100 years from now when the building is still in good shape, that price will seem like a bargain.

#### **1b. Brick Veneer over a Concrete Block Bearing Wall.**

While almost as rugged as the brick over brick cavity wall, the brick over concrete block wall is slightly cheaper. A CMU structural wall is less flexible, less prone to rust and rot than a steel stud back-up wall. It is inherently fireproof. And you have the added advantage of having one trade erect both the skin and the structural layer of the wall.

##### Don't forget:

- Brick grows as it ages and concrete block shrinks. Make sure your details account for this slight differential movement.
- Do not forget to put control joints in the interior wythe as well as the outside skin of the building

## **2a. Brick Veneer over a Steel Stud Structural Wall.**

This system gives you the same long-wearing exterior skin and the same appearance as a brick-on-block cavity wall but it usually costs less. If any water gets past the brick skin, the cavity will harmlessly direct the moisture down the air gap, past the flashing and out the weep holes. The system will shed water before it can penetrate to the interior of the building or damage the structural layer of the wall.

### Don't forget:

- The steel stud structural wall is much more flexible than the brick veneer. On a multi-story building you need relieving angles to allow the brick to move without cracking.
- Be sure you have at least a ¾" overlap between the window and doorjamb and the depth of the brick. Install backer rod and sealant around all openings.
- Use flashing at the base of the wall and over any lintels and window heads.
- Use building paper over the sheathing to seal the cracks between sheets of sheathing.
- Use two-piece adjustable brick ties to attach the veneer to the structural studs. Do not use corrugated strip ties. They cannot transfer the wind load from the veneer to the structural studs. Use corrosion-resistant screws at the brick ties.
- Always attach windows to the structural studs, not to the brick veneer.

## **2b. Concrete Block Veneer over a Steel Stud Structural System.**

A concrete block veneer over a structural steel back-up wall is an attractive and cost effective choice. You still have a tough, non-combustible skin and an efficient cavity to direct water away from the structural wall. Concrete block is more porous than brick and it is also more likely to crack because it shrinks as it ages.

### In addition to the items listed for brick over steel studs you need to remember:

- You need to install horizontal reinforcing in the CMU veneer to control cracking. These thin ladder ties should be installed at 16" on center vertically.
- Since block is more prone to cracking than brick, you will need more control joints in a CMU veneer than in a brick one. Consult NCMA technical notes for spacing of control joints.
- Although brick is often used as a rowlock sill, concrete block is too porous for a sill or a coping. Use precast concrete or metal sills and copings.

## **3a. Brick Veneer over a Wood Stud Structural Wall.**

This system gives you many of the advantages of more expensive systems with a lower cost. You still have a tough, beautiful skin and a weather-shedding cavity. However, Building Codes will not allow you to install relieving angles attached to a combustible structural system so this wall assembly cannot be used for walls over 30 feet in height.

### Don't forget:

- Be careful with window sills, flashings and weep systems. If water penetrates past the sheathing it can rot the wood studs.
- The lintels over windows must bear on the brick veneer because it is non-combustible. They cannot be attached to the studs. This sometimes limits the size of the windows.

## **3b. Concrete Block Veneer over a Wood Stud Structural System.**

This wall is similar to the brick over wood stud system except that concrete block is more porous than brick and it is also more likely to crack because it shrinks as it ages.

### In addition to the items listed for brick over wood studs you need to remember:

- You need to install horizontal reinforcing in the CMU veneer to control cracking. These thin ladder ties should be installed at 16" on center vertically.
- Since block is more prone to cracking than brick, you will need more control joints in a CMU veneer than in a brick one. Consult NCMA technical notes for spacing of control joints.

- Although brick is often used as a rowlock sill, concrete block is too porous for a sill or a coping. Use precast concrete or metal sills and copings.

#### **4a. Brick Single-Wythe Bearing Wall**

A single-wythe wall is very efficient and cost-effective because the brick provides both the skin and the structural layer of the building. You can eliminate the perimeter columns. Be forewarned. A single-wythe wall does not have the redundancy of a cavity wall and if you want it to last a long time, you need to be very careful with your detailing and with the construction. Single wythe walls are not as forgiving as cavity walls.

Don't forget:

- Be cautious about detailing and installing sills and copings. Horizontal ledges are the most likely places to leak. I prefer metal or precast sills and copings.
- You *must* use a flashing or weep system at the base of the wall and over bond beams. If any water gets into the wall, it will trickle down the open core holes and must be flushed to the outside at the base of the wall. I recommend Cavity Vent by Masonry Technologies, Inc. because it is fast and easy to install. When you save time, you save money. See [www.masonrytechnology.com](http://www.masonrytechnology.com) for info.
- Do not use batt insulation behind a single-wythe wall. Eventually the wall will leak and the backside of the batt will get wet. Wet insulation has little or no R-value. Even more distressing, damp batts can invite mold, a significant health risk. You are much wiser to install rigid insulation that can tolerate occasional leaks without problem.
- Although you do not usually need to apply a water repellent coating over brick, a single-wythe brick wall needs water repellent to protect the mortar joints. I recommend a breathable silane or siloxane-based product.

#### **4b. Concrete Block Single-Wythe Bearing Wall**

Single-wythe concrete block walls are the most economical masonry walls we know. They are, however, not particularly water tight. Historically, this type of construction has been used for warehouses and industrial buildings where budget was more important than finesse or longevity. Careful attention to design and construction can still give birth to a great building at a reasonable cost.

In addition to the warnings about single-wythe brick, add:

- Because concrete block shrinks, it needs more control joints than brick. A cavity wall can accommodate hairline cracks without problem but a crack in a single-wythe wall can be much more problematic.
- Normal-weight concrete block is considerably more water resistant than lightweight block. If you must use lightweight block, specify expanded shale or scoria as the aggregate of choice. Pumice, a common lightweight aggregate is prone to shrinkage (and cracks) and is nearly impossible to protect with a spray-applied coating. Unfortunately, pumice is white and is used to make most of the pale-colored blocks that are in vogue today. In my opinion, pumice is too big a risk factor for single-wythe walls. If you want light colored blocks, use white Portland cement or marble chips to achieve your desired color. (These substitutions will raise the price).
- Do not clean your wall with sandblasting. Sandblasting can enlarge a harmless, invisible crack to an alarming size. Sandblasting is OK for a CMU cavity wall but not for single-wythe construction.
- Do not forget to include good sills, good caps and flashing or weeps at the bottom of the wall.

## **A Word About Stone and Longevity**

Stone veneer is rarely mentioned in an article about cost cutting because stone is usually an expensive masonry choice. If you are designing a building you want to last more than 30 years, I would advise you to use natural stone. Manufactured stone has a painted finish applied to lightweight concrete which is then glued to the wall. If the painted finish is damaged, the scar is visible. Thirty years of abuse might make your building look worn out before its time. The damage is likely to be concentrated near the entryway—right where you want to make a good impression.

If you are using real stone, pay attention to the absorbency of the stone. Denser, more water repellent stones last longer than soft or thirsty ones do and a 4” thick veneer will outlive a 2” layer of stone. Also, an anchored veneer will last longer than an adhered veneer installation.