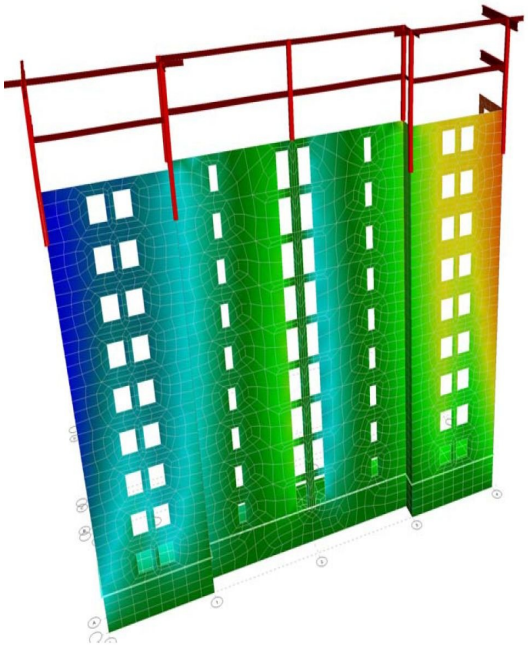
MASONRY INSIGHTS

written in conjunction with International Masonry Institute

What are the options for supporting veneers?

Veneer and Backup Wall Systems



Masonry veneer walls are typically non-load bearing walls that serve as the exterior facade for a building envelope. It is common in low-rise construction to see clay brick veneer walls anchored to backup walls constructed in concrete masonry, steel stud, wood framed, or even cast-in-place concrete material. There are several items to consider when designing support for veneer walls - 1) the weight of the veneer wall, 2) lateral loading imposed onto the veneer wall, and 3) anticipated movement of the veneer wall, the structural backup wall, and structural floor framing that may be supporting the veneer. Controlling movement between the veneer and its structural backup is essential in order to minimize the potential for visible cracking and failures in the unreinforced masonry veneer. Since controlling this movement between the veneer and its backup is critical, the backup wall material chosen for a project plays a significant factor in designing an efficient veneer support system.

Concrete and concrete masonry serve as rigid backup walls with similar material and thermal properties to clay brick masonry veneer. Although clay veneer expands and a concrete backup wall shrinks over time, the differential movement that results between these two cementitious materials is less significant than the differential movement that would occur between clay masonry and wood/steel backup walls. Prescriptive criteria in the TMS Code Section 12.2 does not limit the height of clay veneer walls backed by concrete or masonry, nor does it require intermediate supports for the veneer. However, the Code does require prescriptive intermediate support or alternate design methods for veneer backed by wood or steel stud walls. Therefore, choosing concrete or concrete masonry backup walls results in a more design efficient and cost effective choice to support veneer walls.

When intermediate veneer supports are required (typically with wood or steel backup walls), the veneer wall can be vertically supported by steel shelf angles. The shelf angles are designed to transfer the weight of the veneer wall to the base structural building system - typically connecting to the floor slab or beams.

A horizontal expansion joint is provided below shelf angles to allow for vertical expansion of the clay veneer. Along with vertical supports, the veneer wall also needs to transfer lateral loading to the backup wall or framing system. Out-of-plane lateral loading imposed onto the veneer walls are transferred via veneer ties between the veneer and backup walls.

Veneer Support Options

Below is a summary of the design options for supporting masonry veneer walls for vertical (gravity) and lateral (wind/seismic) loads per TMS 402-13 Code, Section 12.2.

Option 1 - based on TMS 402, section 12.2.1 – Alternative design can be used, and shelf angles could potentially be eliminated for wood/steel backup systems. This requires an analysis of the differential movement between the veneer and the backup walls, and generally flexible veneer ties or connectors would be needed for the upper floors.

Option 2 - based on TMS 402, section 12.2.1 – Alternative design can be used, and shelf angles reduced to every other or every third floor for wood/steel backup systems. In this case, standard veneer ties could be used, but a stronger shelf angle to support multi-story veneer to the back-up system (masonry wall) would be necessary.

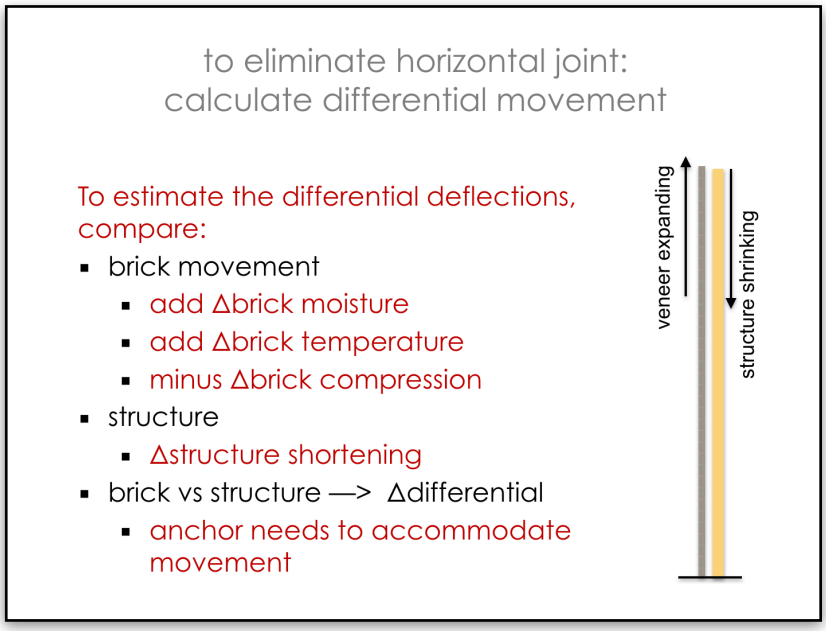


Figure 1 : Options 1 and 2 - Estimating differential movement between veneer wall and base structure

Option 3 - A structural load-bearing brick veneer could be designed to resist vertical and lateral loading, and no shelf angles would be needed. The structural veneer wall would only need lateral support at floors.

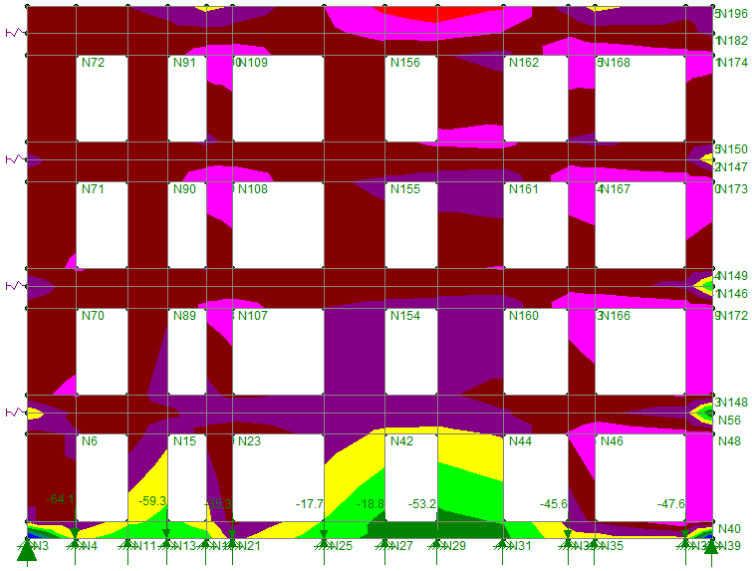


Figure 2 : Option 3 - Sample analysis of structural brick veneer wall to transfer self-weight and out-of-plane lateral loading

Option 4- based on TMS 402, section 12.2.2 – Prescriptive requirements can be used. For wood or metal stud backup systems, shelf angles are necessary 30ft above grade and at every floor above that per prescriptive requirements. Shelf angles are not required with a rigid structural backup (concrete or concrete masonry backup walls) per TMS 402 Section 12.2.2, however, they are often provided. Using shelf angles with rigid backup walls add significant initial cost and long term cost, but are the simplest to design.

There are other options as well for brick veneer support/design, but this list is a starting point to considering options for veneer support in a building with multiple floors. It also highlights that the use of concrete or concrete masonry backup walls result in a more efficient veneer support system that minimizes the need for shelf angles. In a future article, we will dive deeper into Options 1 and 2, the Alternative Design Method to supporting brick veneer, to discuss design and detailing considerations.