SE INSIGHTS

FOR MASONRY DESIGN

Key Points Regarding Masonry as an Excellent Choice for Structural Systems

Masonry has the opportunity to be used more, and in better ways in structural engineering:

1. Increase the understanding of **actual masonry design strength (f'm)**, designers should be using a default of 2500 psi (NOT 1500 psi) - see the following website: www.FORSEI.com/cmudata

   A. Designs strengths should start at **f'm= 2,500 psi**, verify with test results from manufacturer.

   - Design strengths can be specified higher, up to 4,000 psi.
   - More efficient design w/ higher f'm in each of the following areas:
     - walls (bearing walls, non-bearing walls, shear walls)
     - lintels (when designed as masonry)
     - column/pilasters
     - lap lengths, much shorter
     - connections to masonry (bearing plates, embed plates and post-installed anchors)

2. Create an awareness of the **availability of masonry design software.**
   - Many engineers are still using spreadsheets for masonry design.
   - Much more sophisticated tools such as finite element analysis software, gives engineers the ability to solve complex analysis problems and helps to create an efficient solution.
3. Be aware **engineers must locate CJ for structural masonry walls**. Check that control joints (CJs) are located on plans:
   - CJs in unreinforced masonry walls, regularly in walls, corners, edge of openings, etc.
     - at common wall locations, per Figure 1 per NCMA TEK 10-2C (2010)
     - at openings per NCMA TEK 10-2C (2010), Figure 2a or Figure 2b (page 3)
   - **CJs in reinforced structural walls, NOT at openings**
     - at common wall locations, per NCMA TEK 10-2C (2010) or TEK 10-3
     - not at opening edges per NCMA TEK 10-2C (2010), Figure 2c or Figure 2d (page 3)

4. Learn about the **benefits of masonry lintels**, over other materials that could be used for lintels.
    - Masonry lintels create the potential for increase shear wall capacity (see number 4), and better overall performance of wall elements. FEA tools can increase the engineers understanding of lintels.
    - Masonry lintels can be designed with significant capacity by:
        - correct f'm (see number 1), utilizing more depth, using top and bottom bars, and using stirrups.
    - Other materials used in masonry walls for lintels often require additional CJ to be used, and need to be designed for much higher loads.
5. Increase engineers knowledge of the **capacity of masonry shear walls**
    - CJ locations are critical to shear wall capacity.
        - Perforated shear walls are much, much stronger than adding CJ at every opening (unfortunately common practice and not needed).
    - All CJ should be a minimum of 24" away from edge of opening in structural masonry wall (CJ should only be at opening edges in brick veneer or other unreinforced walls).
    - Boxed wall groups (stair and elevator shafts), CJ should be eliminated, and additional horizontal steel added as required to significantly increase lateral shear wall capacity.
6. Educate engineers about masonry shear walls when used in **hybrid frame** - steel building or concrete building with masonry infill

    Why use masonry in a hybrid frame design?
    - Masonry adds building shear resistance to building frames without diagonal braces.
    - Masonry gives designers flexibility to add openings, and perforated masonry shear walls maintain significant capacity.
7. Create an awareness of the **lack of restrictions for masonry due to energy code requirements**
    - Single wythe is still acceptable; it is *not* an *unacceptable* condition.
    - Whole building analysis required, only with simplified energy methods is continuous insulation required.