MASONRY INSIGHTS

written in conjunction with International Masonry Institute

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. Design 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 with 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, give engineers the ability to solve complex analysis problems and help create an efficient solution

3. Be aware **engineers must locate Control Joints for structural masonry walls**. Check that control joints (CJs) are located on plans:
   - CJs in unreinforced masonry walls: corners, edges 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.
    - masonry lintels can be designed with significant capacity by:
        - Using correct f'm (see number 1)
        - Utilizing more depth
        - Using top and bottom bars
        - Using stirrups
        - Using FEA software can increase the engineers understanding of lintels
    - other materials used in masonry walls for lintels often require additional control joints to be used and need to be designed for much higher loads due to not being able to use arching action.
5. Increase engineers' knowledge of the **capacity of masonry shear walls**
    - control joint locations are critical to shear wall capacity
        - perforated shear walls are much, much stronger than adding CJ at every opening (which though it is unfortunately common practice, it is not needed)
    - all control joints should be a minimum of 24" away from edges of openings in structural masonry walls (CJ should only be at opening edges in brick veneer or other unreinforced walls)
    - in 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 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 acceptable for energy code requests
    - whole building analysis is required; only with simplified energy methods is continuous insulation required

Underlying Message - Why use Structural Masonry

by: Pat Conway

The above reasons are all related to structural engineering. Of course we all need to remember the underlying message to architects of why to use masonry.

- **safe & secure**: does not burn, blast-resistant, weather-resistant
- **durable**: water-resistant, abuse-resistant, low maintenance
- **healthy**: low VOC, mold-resistant, CO_2 absorbing
- **energy efficient**: local, thermal mass, low embodied energy
- **cost effective**: high resale value, low insurance cost, competitive initial cost, low maintenance cost
- **comfortable**: quiet, efficient space use, constant temperature
- **adaptable**: modular, easy to modify, design flexibility
- **aesthetic**: solid, colorful, human scale