Masonry Analysis Structural Systems Version 2.0
List of Changes

National Masonry Design Programs

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The biggest feature that is new to MASS Version 2.0 is the Shearline module. It allows users to draw an elevation with openings and movement joints, distribute loads around them, and then designs individual pier elements as shear walls. For a full explanation of the shearline module, refer to Section 6 within the Help Files. In addition to this, multiple changes have been made to the existing MASS™ software components.

Existing MASS™ Modules

1. **Slender cantilever walls design provisions**
   Walls with fixed base support and no top support (cantilever) that are classified as slender reinforced walls (kh/t greater than 30) can now be successfully designed in MASS Version 2.0, provided that all other design criteria are met. Previously, all slender reinforced walls needed to have pinned supports at the top and bottom of the wall, in accordance with CSA 304.1-04: 10.7.4.6.3. The intent of 10.7.4.6.3 is fixed base end condition is taken into account by using the k=2 factor.

2. **Horizontal reinforcement limits for seismic shear walls**
   Shear walls with a seismic hazard index greater than or equal to 0.35 now use the product of the wall thickness and height when calculating the gross cross-sectional area of masonry, A_g, used in calculating the horizontal reinforcement limits. Previously, A_g, was calculated using the horizontal cross section and used for both vertical and horizontal reinforcement limits which resulted in excessive horizontal reinforcement for squat shear walls and insufficient horizontal reinforcement for non-squat walls.

3. **Masonry unit web % values adjusted for block size**
   MASS now uses the correct % values from A165.1 Table 3 when calculating the width of masonry used for the factored out of plane shear resistance. Previously, all masonry unit sizes incorrectly used the same % value.

4. **Correction to out of plane shear resistance equation for partially grouted walls**
   The out-of-plane factored shear resistance equation has been modified to exclude masonry unit's webs that do not lie within the compression zone for partially grouted walls where the reinforcement spacing exceeds 4 times the wall thickness.

5. **Shear wall simplified results display of cell-by-cell results**
   The Simplified Moment Results tab now shows cell-by-cell results after the shear design stage has been performed. Previously, cell-by-cell results would be cleared and never restored for shear walls if the design was governed by shear.

6. **Moment arm reduction for low aspect ratio (squat) shear walls**
   Shear walls with height-to-length ratios less than 1.0 now use the total height when calculating the moment arm reduction between the compression zone and the tensile reinforcement. Previously, the height of the shear wall element rather than the total height of the wall was used when calculating this reduction.

7. **Shear Walls failing in sliding shear display an updated message**
   A new failure message reading: "*Design fails: The factored shear exceeds the sliding shear resistance because it has insufficient vertical reinforcement area. To increase the sliding shear strength, increase the vertical steel in the moment design using larger bars or reduced spacings. Refer to CSA S304.1-04: 10.10.4.2*" This was added to alert the user that increasing horizontal steel does not address sliding shear failure and is specifically triggered when a vertically reinforced shear wall passes diagonal shear and fails sliding shear.