MASONRY INSIGHTS

written in conjunction with International Masonry Institute

Masonry Checklist: Reviewing Structural Plans

This Masonry Checklist is intended to assist in the development of structural masonry design documents with the goals of increasing efficiency in masonry design and improving performance of the masonry structure. It can be used during any phase of masonry design, during peer review of masonry structures, or in value engineering efforts on masonry structures. Please customize as required to meet the needs of specific projects.

- ☐ f'_m (masonry assembly strength) for structural concrete or clay masonry is 2,000 psi or greater
  - ☐ concrete masonry f'_m = 2,500psi most common in Midwest, likely can be greater
  - ☐ clay masonry f'_m = commonly in the range of 3,000psi to 4,000psi
  - ☐ strengths between up to 4,000 psi are permitted in current codes for strength design[1]
- ☐ Check that all components of masonry are specified:
  - ☐ Block strength: check masonry.forsei.com/masonry/cmudata/ to verify based on location
  - ☐ Mortar type (mortar strength need not be listed)
    - ☐ Recommend Type S for structural walls
    - ☐ Recommend Type N for non-structural walls (veneer and possibly partition walls)
  - ☐ Grout strength
    - ☐ Should be at least 2,000 psi, and equal to or greater than f'_m
  - ☐ Reinforcement specified in schedule
    - ☐ Typical walls have reinforcement bars of #4 thru #6, and no bars larger than #9
    - ☐ Lap lengths are specified for correct f'_m and based on current TMS 402 code[1]
  - ☐ Bond beam and joint reinforcement specified and coordinated with control joint (CJ) locations

- [ ] Verify that movement joints (MJs) are located - control joints (CJs) are common for structural concrete masonry and expansion joints (EJs) are common for structural clay masonry. General nomenclature is to use either MJ for both, or CJ (control joint for concrete masonry) and EJ (expansion joint for clay masonry).
    - [ ] CJs or EJs for structural walls must be located on structural elevations or plans[1]
    - [ ] CJs or EJs in reinforced structural walls, locate:
        - [ ] At common wall locations [2]: generally at 25 ft spacing or less, change of wall height, building corners
        - [ ] At a distance (recommend 2 ft) away from opening edges[3], not at opening edges
    - [ ] CJs or MJs in unreinforced non-structural masonry walls, locate:
        - [ ] At common wall locations [2]
        - [ ] At openings and edges [4]
    - [ ] CJs or MJs not needed when sufficient horizontal reinforcement [5] is provided
- [ ] Review lintels, and prefer masonry lintels over other material types
    - [ ] Masonry lintels are considered for ALL openings, other materials as optional
        - [ ] Openings 8” or less do not need a lintel
        - [ ] Openings 4’-0” or less could be a single-course masonry lintel with minimal reinforcement, and jamb could be one cell with common wall reinforcement
        - [ ] Openings more than 4’-0”
            - [ ] Still consider masonry lintel as the first option
            - ◆ Consider multi-course masonry lintels
            - ◆ Consider stirrups in masonry lintels when deeper lintels are not possible
            - [ ] Consider prefab masonry lintel (contractor option)
    - [ ] Consider the following for steel lintels:
        - [ ] Vertical reinforcement location- generally needs to be one or more cells away from opening
        - [ ] Torsional effects, especially with wide flanges with virtually no torsional capacity
        - [ ] For bearing plates, compatibility with block shapes used
        - [ ] Thermal bridging- architectural challenge with building insulation envelope

- [ ] Thermal bridging- structural challenge with differential thermal movement between steel and masonry
  - ◆ Differential movement between steel and masonry, even after building is insulated and occupied, will cause very large forces unless steel is allowed to move relative to masonry.
  - ◆ One method for accommodating thermal movement is to use control joints at one or both ends, which reduces wall and lintel effectiveness, but is necessary for differentially moving material.
  - [ ] Consider the masonry soaps (thin masonry shells) used to cover the steel
    - [ ] Able to be cut to fit the steel section? (or steel section with bottom plate)
    - [ ] Durable to building use conditions?
    - [ ] No connections are allowed on masonry soaps
- [ ] Review bearing plate details
  - [ ] Masonry bearing plates should not impede upon masonry face shell in most cases
  - [ ] Masonry bearing plates should not be exposed (never extend to face of masonry)
- [ ] Conflicts between steel columns and masonry
  - [ ] Does steel column fit into masonry?
    - [ ] Was masonry pier considered?
    - [ ] Consider a CJ at these locations of steel columns used within masonry
  - [ ] Consider the masonry remaining to cover the steel
    - [ ] Is the masonry required to be cut to fit the steel section?
    - [ ] Is remaining masonry durable to building use conditions?
  - [ ] Steel sections should not be encased in grout within masonry, gap should be provided
- [ ] Review partition wall designs and connections
  - [ ] In SDC A and B, many partition walls can still be unreinforced, with minimal connections
  - [ ] For higher seismic areas, min reinforcement: SDC-C (#4@120”o.c.), SDC-D (#4@48”o.c.)
  - ◆ Consider: the code prohibits partitions from serving a structural function for the building and therefore can have minimal reinforcement - see imiweb.org for partition wall program.

REFERENCES

[1] - current masonry code is TMS 402/602-16

[2] - based on NCMA TEK 10-2D (2019) or TEK 10-3

[3] - based on NCMA TEK 10-2D (2019), Figure 2c or Figure 2d (page 3)

[4] - based on NCMA TEK 10-2D (2019), Figure 2a or Figure 2b (page 3)

[5] - based on NCMA TEK 10-3