SUPPLEMENTAL PLAN CHECK CORRECTION SHEET FOR MASONRY WALL DESIGN
(2020 LABC)

Plan Review Date: _____

Plan Check #: _____ Permit Application Number: _____

Job Address: _____

Plan Check Engineer: _____ Phone: _____ Email: _____

This is a supplemental correction sheet. Please see the master correction sheet for instructions and additional information.

Unless noted otherwise, all sections of code referenced in italics within this article refer to the 2020 Los Angeles Building Code (2020 LABC)

REFERENCE DOCUMENTS:

- ☐ ASCE 7-16 - The Minimum Design Loads for Buildings and Other Structures; excluding Chapter 14 and Appendix 11A
- ☐ TMS 402-16 - Building Code Requirements for Masonry Structures
- ☐ TMS 602-16 - Specification for Masonry Structures Impact Hazard Glazing: PC/STR/Aff.19
- ☐ LABC - 2020 City of Los Angeles Building Code, Jan 2020

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PART I: GENERAL/BUILDING CODE REQUIREMENTS

A. PLAN DETAILS

1. Masonry shear walls in Seismic Design Category (SDC) D, E or F shall be designed for the requirements of special reinforced masonry shear walls per 7.3.2.6 and Table 12.2-1 of ASCE-7. Intermediate and ordinary masonry shear walls not permitted in SDC D, E and F.
2. Vertical reinforcement in masonry walls that are part of the seismic-force-resisting system shall comply with the following:
   a. At least 0.20-in2 in cross sectional area shall be provided: *7.3.2.3.1*
      i. at corners,
      ii. within 16-in. of each side of openings,
      iii. within 8-in. of the ends of walls or movement joints,
      iv. at a maximum spacing of 120 inches on center
   b. Maximum spacing shall not exceed 1/3 the length of the shear wall, 1/3 the height of the shear wall, or 48-in for masonry laid in running bond and 24-in for masonry laid in other than running bond. *7.3.2.6 (a)*
   c. The minimum cross-sectional area shall be of 1/3 of the required shear reinforcement. *7.3.2.6 (c)*
   d. Walls not laid in running bond shall be fully grouted and shall be constructed of hollow open-end units or two wythes of solid units. *7.3.2.6 (f)*
3. Horizontal reinforcement in masonry walls that are part of the seismic-force-resisting system shall comply with the following:
   a. Maximum spacing shall not exceed 1/3 the length of the shear wall, 1/3 the height of the shear wall, 48-in. for masonry laid in running bond and 24-in. for masonry laid in other than running bond. (7.3.2.6 (b))
   b. Located at the bottom and top of wall openings and shall extend minimum 24-in., or 40 bar diameters past the opening, whichever is greater. (7.3.2.3.1)
   c. Continuous horizontal reinforcement shall be provided at structurally connected roof and floor levels and be provided within 16-in. of the top of walls. (7.3.2.3.1)
4. Shear reinforcement shall be anchored around vertical reinforcing bars with a standard hook. *7.3.2.6 (d)*
5. Provide minimum reinforcement for masonry walls as follows:
   a. The sum of horizontal and vertical reinforcement shall not be less than 0.002 times the gross cross-sectional area of the wall. *7.3.2.6 (c)*
   b. For masonry laid in running bond, both of the horizontal and vertical reinforcement shall not be less than 0.0007 times the gross cross-sectional area of the wall. *7.3.2.6 (c) 1*
   c. For masonry laid in other than running bond, vertical reinforcement shall not be less than 0.0007 times the gross cross-sectional area of the wall, and horizontal reinforcement shall not be less than 0.0015 times the gross cross-sectional area of the wall. *7.3.2.6 (c) 2*
6. Only Type S or type M cement-lime mortar, masonry cement mortar, or mortar cement mortar shall be used as part of fully grouted lateral force resisting systems. *7.4.4.2.2*
7. Masonry partition walls, screen walls and other elements that are not designed to resist vertical or lateral loads shall be isolated from the structure in accordance with 7.3.1. Isolation joints and connectors between these elements and the structure shall be designed to accommodate the design story drift. *7.3.1*
8. Masonry columns shall comply with the following:
   a. The distance between lateral supports of a column shall not exceed 99 multiplied by the least radius of gyration, r. (h/r < 99, 2h/r < 99 for cantilever elements) *5.3.1.1(a)*
   b. Columns shall have a minimum side dimension of 8-in. nominal. *5.3.1.1 (b)*
   c. Columns shall be designed to resist loads with a minimum eccentricity equal to 0.1 times each side dimension, considering each axis independently. *8.3.4.3*
   d. Vertical column reinforcement shall not be less than $0.0025A_n$ nor exceed $0.04A_n$. Minimum number of

vertical bars shall be four. *5.3.1.3*

e. Vertical reinforcement shall be enclosed by lateral ties at least 1/4-in. diameter with spacing not exceeding, 16 longitudinal bar diameters, 48 lateral tie diameters, least cross-sectional dimension of the member. *5.3.1.4 (a) & (b)*

f. Lateral ties shall be arranged so that every corner and alternate longitudinal bar shall have lateral support provided by the corner of a lateral tie with an included angle of not more than 135 degrees. *5.3.1.4 (c)*

g. Lateral ties shall be located vertically not more than one-half lateral tie spacing above the top of footing or slab in any story and not more than one-half lateral tie spacing below the lowest horizontal reinforcement in beam, girder, slab, or drop panel above. *5.3.1.4 (d)*

9. Additional ties shall be provided around anchor bolts which are set in the top of columns. Such ties shall enclose both the vertical bars in the column and the anchor bolts. There shall be a minimum of two No. 4 lateral ties provided in the top 5 in. of the column. *7.4.3.2.1*
10. Beams supporting reactions from discontinuous walls or frames shall have transverse reinforcement spaced no more than one-half of the nominal depth of the beam. Transverse reinforcement ratio shall not be less than 0.0015. *7.4.3.2.5*
11. Columns and Piers used to resist seismic load and to support reactions from discontinuous stiff elements shall comply with:
    a. Seismic response modification factor, R, is no greater than 1.5. *7.4.3.2.4*
    b. Transverse reinforcement shall meet the requirements of 7.4.3.2.5.
    c. For ASD, the bar diameter shall not exceed 1/8 of the nominal wall thickness and shall not exceed 1/4 of the least dimension of the cell, course or collar joint in which is placed, nor be larger than No. 9 in size. *2107.4 of 2020 LABC*
12. The registered design professional in responsible charge shall include a "Statement of Special Inspections" onto the plans per 1705 of 2020 LABC.

B. CALCULATIONS

1. Provide structural calculations and details of reinforcement for piers, columns, beams, and for the distribution of concentrated vertical loads at walls.
2. The design of masonry structures shall comply with the allowable stress design provisions of Section 2107, or the strength design provisions of Section 2108, and with the General Design and Construction Requirements of Section 2101 through 2104, and 2106. All design calculations shall be based on specified dimensions. *2020 LABC*
3. Special reinforced masonry shear walls shall be designed with increased design value in accordance with 7.3.2.6.1.1 for strength design or 7.3.2.6.1.2 for allowable stress design.
4. In the design of shear walls, only the net area of hollow masonry units shall be used. *4.3.1.1*
5. Provide structural calculations for the design of masonry columns and walls considering the effects of combined axial and bending stresses due to eccentricity and lateral loading. *8.3.4, 8.3.5 and 9.3.5*

6. For Allowable Stress Design:

a. Allowable compressive force due to axial load shall be in accordance with the formulas in Sec. 8.3.4.2.1.

b. Allowable flexural compressive stresses or flexural compressive stresses with axial load shall not exceed Fb = 0.45f'm, provided that the calculated compressive stress due to axial load component, fa, does not exceed the allowable stress, Fa, in Section 8.2.4.1. (8.4.2.2)

c. Allowable shear stress in shear walls (Fv) shall not exceed values specified in Sec. 8.3.5.1.2:

$F_v \leq (F_{vm} + F_{vs})\gamma_g$ *Eq. 8-22*

$F_v \leq \left(3\sqrt{f'_m}\right)\gamma_g$ for $M/Vd_v \leq 0.25$ *Eq. 8-23*

$F_v \leq \left(2\sqrt{f'_m}\right)\gamma_g$ for $M/Vd_v \geq 1.0$ *Eq. 8-24*

Where allowable shear stress resisted by masonry for special reinforced masonry shear walls:

$$F_{vm} = \frac{1}{4}\left[\left(4.0 - 1.75\left(\frac{M}{Vd_v}\right)\right)\sqrt{f'_m}\right] + 0.25\frac{P}{A_n} \geq 0$$ *Eq. 8-25*

Where allowable shear stress resisted by masonry for other walls:

$$F_{vm} = \frac{1}{2}\left[\left(4.0 - 1.75\left(\frac{M}{Vd_v}\right)\right)\sqrt{f'_m}\right] + 0.25\frac{P}{A_n} \geq 0$$ where $M/Vd_v \leq 1.0$ *Eq. 8-26*

Where allowable shear stress resisted by the steel reinforcement:

$$F_{vs} = 0.5\left(\frac{A_v F_s d_v}{A_{nv} s}\right)$$ *Eq. 8-30*

d. Allowable stresses in reinforcement shall conform to Sec. 8.3.3.1.

e. Reinforcement in shear walls with M/Vd_v equal to or greater than 1.0 and having an axial load greater than $0.05(f'_m)(A_n)$ shall not exceed the maximum reinforcement ratio determined by equation 8-23. The reinforcement ratio is not applicable for the out-of-plane direction. *8.3.4.4*

f. Development length of reinforcing bars in tension or compression shall be determined in accordance with equation 8-12, but not less than 12-in. *8.1.6.3*

g. Lap splices of reinforcing steel shall be determined in accordance with equation 21-1 of 2020 LABC. Reinforcement larger than no. 9 bar shall be by approved mechanical connections in accordance with 8.1.6.7.3. *2107.2.1 and 2107.3 of 2020 LABC*

7. For Strength Design:

a. The design strength is the nominal strength multiplied by the strength reduction factor N as specified in Section 9.1.4.

b. Walls shall be designed for out of plane loads in accordance with Sec. 9.3.5:
    i. Factored axial stress shall not exceed $0.20(f'_m)$. *9.3.5.4.2*
    ii. When slenderness ratio exceeds 30, factored axial stress shall not exceed $0.05(f'_m)$. *9.3.5.4.2*
    iii. Calculate the mid-height, out-of-plane wall deflection for service lateral and vertical load (without load factors) and limit it to 0.007h. *9.3.5.5*
    iv. Check stresses at mid height of wall in accordance with Section 9.3.5.4.2.

c. Wall shall be design for in-plane loads in accordance with Sec. 9.3.6:
    i. Reinforcement shall be provided perpendicular to the shear reinforcement and shall be at least equal to one-third of the cross-sectional area of shear reinforcement, Av. (9.3.6.2)
    ii. Nominal flexural and axial strength shall be determined in accordance with Sec. 9.3.4.1.1.
    iii. Nominal shear strength shall be determined in accordance with Sec. 9.3.4.1.2;
    iv. The maximum reinforcement requirements of Section 9.3.3.5 shall not apply if a shear is designed to satisfy the requirements of Section 9.3.6.5.1 through Section 9.3.6.5.5; (9.3.6.5)

d. Development length of reinforcing bars in tension or compression shall be determined in accordance with equation 9-16, but not less than 12-in. and need not be greater than 72db. *9.3.3.3 and 2108.2*

e. Splices of reinforcement shall meet the requirements of 9.3.3.4 and 2108.3 of 2020 LABC.

8. Provide calculations for design of anchor bolts in masonry considering edge distance and effective embedment depth in accordance with 8.1.3 for allowable stress design or 9.1.6 for strength design.

C. NOTES ON PLANS

1. Provide material specification for ☐ block, ☐ grout, ☐ mortar, and ☐ reinforcing steel per section 2103 of 2020 LABC.
2. Construction shall comply with Part 3 of TMS 602-16.
   a. Reinforcement shall be supported to prevent displacements beyond the tolerances prior to grouting. *3.4B of TMS 602-16*
   b. Cleanouts shall be provided for all grout pours over 5'-4". *3.2 F of TMS 602-16*
   c. Grout lift height shall not exceed 12'-8" when the masonry has cured for 4-hrs., the grout slump is maintained between 10 and 11 in., and no intermediate reinforced bond beams are placed between the top and bottom of the pour height. Otherwise, grout lift height shall not exceed 5'-4". *3.5 D of TMS 602-16*
   d. All cells and spaces containing reinforcement shall be filled with grout.
3. Quality assurance measures shall comply with LABC Sec. 2105 and Tables 3.1.1, 3.1.2 and 3.1.3 of TMS 402-16.
4. Pipes and conduits embedded in masonry shall not reduce the required strength. *3.2.2*
5. Joint reinforcement used in masonry exposed to earth or weather shall be stainless steel or protected from corrosion by mill galvanized, hot-dip galvanized, or epoxy coating. *6.4.2 and 6.4.3*
6. Deputy inspection is required for masonry construction. *1704 of 2020 LABC*

ADDITIONAL CORRECTIONS: