GENERAL PROJECT INFORMATION

PLAN CHECK NO. _____ DISTRICT NO _____

JOB ADDRESS _____ CITY _____ ZIP _____

NOTE: Numbers in the parenthesis ( ) refer to sections of the 2008 edition of the Los Angeles County Building Code, Table (T), Plumbing Code (PC), Mechanical Code (MC), Electrical Code (EC), Fire Code (FC), Building Code Manual (BCM), 2005 National Design Specifications (NDS), 2005 Minimum Design Loads for Buildings and Other Structures including Supplement No. 1 (ASCE7), Building Code Requirements for Masonry Structures (ACI530). ACI Building Code Requirements for Structural Concrete (ACI318)

INSTRUCTIONS

- Corrections with circled item numbers apply to this plan check.
- In the left-hand margin of the circled corrections, please indicate the sheet number and detail or note number on the plans where the corrections are made. Resubmit marked original plans and two corrected sets of plans, calculations and this plan review list.
- Incomplete, unclear, or faded drawings or calculations will not be accepted.
- Incorporate all comments as marked on checked set of plans and calculations and these correction sheets.

STRUCTURAL CALCULATION

GENERAL

1. Design forces shall be in accordance with the Factored Load and Combinations specified in 1605.2 or Allowable Stress Design Specified in 1605.3.
2. Provide structural calculations and details of reinforcement for piers, columns, beams, and for the distribution of concentrated vertical loads at walls.
3. 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. (ACI530 2.3.3)
4. Provide calculations for design of anchor bolts in masonry considering edge distance and effective embedment depth in accordance with ACI530 § 2.1.4.2 for allowable stress design or ACI530 § 3.1.6 for strength design.
5. Only the net area of hollow masonry units shall be used in the design of shear walls. (ACI530 1.9.1)
6. The design of masonry structures shall comply with the working stress design provisions of 2107, or strength design provisions of 2108, and with the "General Design and Construction Requirements" of 2101 through 2104, and 2106. (2101.2)

WORKING STRESS DESIGN (ASD)

7. Shear walls shall be designed to resist 1.5 times the forces required by 1613. The 1.5 multiplier need not be applied to the overturning moment. (2106.5.1)
8. Allowable axial compressive stresses shall be in accordance with the formulas in ACI530 § 2.3.3.2.1.
9. Allowable flexural compressive stresses or flexural compressive stresses with axial load shall not exceed $F_b = 0.33\ f'_m$, per ACI530 § 2.3.3.2.2.
10. Allowable shear stress in shear walls (F_v) shall not exceed values specified in ACI530 § 2.3.5.2.2:

    $M/V_d<1$, $F_v=(1/3)[4-(M/V_d)](f'_m)^{1/2}$, 80-45($M/V_d$) psi max.
    $M/V_d > 1$, $F_v = (f'_m)^{1/2}$, 35 psi max.

    Where reinforcement is designed to take all shear:

    $M/V_d<1$, $F_v=(1/2)[4-(M/V_d)](f'_m)^{1/2}$, 120-45($M/V_d$) psi max.
    $M/V_d > 1$, $F_v = 1.5(f'_m)^{1/2}$, 75 psi max
11. Allowable stresses in reinforcement shall conform to ACI530 § 2.3.2.1.
12. The min. area of shear reinforcement shall not be less than $A_v = V_s/F_s d$.
13. Reinforcement in special reinforced masonry shear walls with M/V_d equal to or greater than 1 and having an axial load greater than $0.05(f'_m)(A_n)$ shall not exceed the max. reinforcement ratio determined by Equation (21-3). The reinforcement ratio is not applicable for the out-of-plane direction.
14. Development length of reinforcing bars in tension or compression shall be determined in accordance with ACI530 Equation (2-9), but not less than 12".
15. Lap splices of reinforcing steel shall be determined in accordance with Equation (21-2). Reinforcement larger than No. 9 bar shall be by approved mechanical connections in accordance with ACI530 § 2.1.10.7.3. (2107.6)

STRENGTH DESIGN (LRFD)

16. The design strength is the nominal strength multiplied by the strength reduction φ as specified in ACI530 § 3.1.4.

17. Walls shall be designed for out of plane loads in accordance with ACI530 § 3.3.5:
    a. Factored axial stress shall not exceed 0.20(f'_m)
    b. When slenderness ratio exceeds 30, factored axial stress shall not exceed 0.05(f'_m).
    c. Calculate the mid-height, out-of-plane wall deflection for service lateral and vertical load (without load factors) and limit it to 0.007 *h*. (ACI530 3.3.5.5)
    d. Check stress at mid height of wall in accordance with ACI530 § 3.3.5.4.
    e. The factored moment and axial force at the mid-height of the wall shall be computed using ACI530 Equations (3-24) and (3-25).
    f. The nominal moment shall be calculated using ACI530 Equations (3-27) and (3-28) if the reinforcing steel is placed in the center of the wall.
    g. The design strength shall satisfy ACI530 Equation (3-26) as follows: $M_u \le \phi M_n$
18. Wall shall be design for in-plane loads in accordance with ACI530 § 3.3.6.5:
    a. Amount of vertical reinforcement shall not be less than 1/2 the horizontal reinforcement.
    b. Nominal flexural and axial strength shall be determined in accordance with ACI530 § 3.3.4.1.1.
    c. Nominal shear strength shall be determined in accordance with § 2106.5.2 & ACI530 § 3.3.4.1.2.
    d. Shear walls shall meet the requirements of ACI530 § 3.3.3.5 or § 3.3.6.6 through 3.3.10.
19. Development length of reinforcing bars in tension or compression shall be determined in accordance with ACI530 Equation (3-15), but not less than 12".
20. Splices of reinforcement shall be determined by ACI530 Equation (3-15) and shall not be less than 12". (ACI530 3.3.3.4)

OUT-OF-PLANE WALL ANCHORAGE

21. Provide calculations and details on the plans for the sub-diaphragm and continuous cross-tie system required for all wood diaphragms providing lateral support to masonry walls. The spacing of continuous ties shall not exceed 40'. (1614.1.5)
22. Provide details, properly referenced, of the anchorage system between the wood roof and floor diaphragms to the masonry walls per ASCE7 § 12.11.
23. Provide calculations and details on the plans for the sub-diaphragm and continuous cross tie system required for all wood diaphragms, providing lateral support to masonry walls: (1604.8)
    a. The wall anchorage shall provide a positive direct connection between the wall and floor or roof construction, capable of resisting the horizontal force specified in 1604.8 & ASCE7 § 12.11.2. In addition, a diaphragm to wall anchorage using embedded straps shall have the straps attached to or hooked around the reinforcing steel or otherwise terminated to effectively transfer forces to the reinforcing steel.
    b. Elements of the wall anchorage system shall be designed for the forces specified in 1604.8. The value of F_p used for the design of the elements of the wall anchorage system shall not be less than 280 plf of wall substituted for E.
    c. When elements of the wall anchorage system are not loaded concentrically or are not perpendicular to the wall, the system shall be designed to resist all components of the forces induced by the eccentricity.
    d. When pilasters are present in the wall, the anchorage force at the pilasters shall be calculated considering the additional load transferred from the wall panels to the pilasters. However, the min. anchorage force at a floor or roof shall be that specified in "b" above. (ASCE7 12.11.2.2.7)
    e. The strength design forces for steel elements of the wall anchorage system shall be 1.4 times the forces otherwise required above. (ASCE7 12.11.2.2.2)
    f. Floor and roof diaphragms shall be designed to resist the forces per ASCE7 § 12.10.1. Max. aspect ratio of 3:1 for unblocked diaphragms.
    g. The max. diaphragm shear used to determine the depth of the sub-diaphragm shall not exceed 75% of the diaphragm shear. (1614.1.5)
    h. The max. length-to-width ratio of the wood structural sub-diaphragm shall be 2.5:1 per ASCE7 § 12.11.2.2.1.
    i. The wall anchorage shall not be accomplished by use of toenails or nails subject to withdrawal. Wood ledgers or framing shall not be used in cross-grain bending or cross-grain tension.
    j. Connection of a diaphragm to the vertical elements in structures having vertical irregularities identified in ASCE7 T-12.3-2 shall be designed per the section referenced for the seismic design category specified in the table.
    k. Structures having a horizontal structural irregularity of Type 2 in ASCE7 T-12.3-1 for diaphragm chords and drag members shall be designed considering independent movement of the projecting wings of the structure. Each of these diaphragm elements shall be designed for the more severe of the following two assumptions:
        i. Motion of the projecting wings in the same direction.
        ii. Motion of the projection wings in opposing directions.

l. When designing the diaphragm to comply with the requirements stated above, the return walls, and fins/canopies at entrances shall be considered. Seismic compatibility with the diaphragm by either seismically isolating the element or by attaching the element and integrating its load into the diaphragm.

STRUCTURAL DETAIL

REINFORCEMENT

24. Vertical reinforcement in masonry walls shall comply with the following: (ACI530 1.14.2.2.2.1 & 1.14.2.2.5)
    a. Provide at least 0.20 sq. in. in area at:
        i. Corners.
        ii. Within 16" of each side of an opening.
        iii. Within 8" of the ends of walls or movement joints.
        iv. Spacing shall not exceed 1/3 the length of the shear wall, 1/3 the height of the shear wall, nor 48".
    b. A min. area of 1/3 of the required shear reinforcement.
25. Horizontal reinforcement in masonry walls shall comply with the following: (ACI530 1.14.2.2.2.1 & 1.14.2.2.5)
    a. Provide at least 0.2 sq. in. in area spaced no more than 48" O.C.
    b. Spacing of horizontal reinforcement shall not exceed 1/3 the length of the shear wall, 1/3 the height of the shear wall, nor 48".
    c. Located at the bottom and top of wall openings and shall extend min. 24" or 40 bar diameters past the opening, whichever is greater.
    d. Continuous horizontal reinforcement shall be provided at structurally connected roof and floor levels and be provided within 16" of the top of walls.
26. Shear reinforcement shall be anchored around vertical reinforcing bars with a standard hook complying with ACI530 § 1.13.5.
27. Provide min. reinforcement for masonry walls as follows: (ACI530 1.14.6.3)
    a. The sum of horizontal and vertical reinforcement shall not be less than 0.002 times the gross cross-sectional area of the wall.
    b. Minimum reinforcement in each direction shall not be less than 0.0007 times the gross cross sectional area of the wall.
28. Beams supporting reactions from discontinuous walls or frames shall have transverse reinforcement spaced no more than 1/2 of the nominal depth of the beam. Transverse reinforcement ratio shall not be less than 0.0015. (2106.4.1)
29. 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. (2107.7)

WALLS AND COLUMNS

30. 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 1.14.5.2.2. Isolation joints and connectors between these elements and the structure shall be designed to accommodate the design story drift. (2106.1, ACI530 1.14.5.2.2)
31. Masonry shear walls in Seismic Design Category D, E or F shall be designed for the requirements of special reinforced masonry shear walls per ACI530 § 1.14.2.2.5 and ASCE7 T-12.2-1. Other masonry shear wall types are not permitted in seismic design category D , E or F.
32. Masonry columns shall comply with the following: (ACI530 2.1.6 & 1.14.6.5)
    a. The nominal width of a column shall not be less than 8".
    b. Ratio of effective column height to least nominal dimension shall not exceed 25.
    c. Columns shall be designed to resist loads with a min. eccentricity equal to 0.1 times each side dimension, considering each axis independently.
    d. Vertical column reinforcement shall not be less than 0.0025 A_n nor exceed 0.04 A_n. Min. number of vertical bars shall be 4.
    e. Longitudinal reinforcement shall be enclosed by lateral ties at least 3/8" Ø spaced no more than:
        i. 16 longitudinal bar Ø
        ii. 48 lateral tie Ø
        iii. Least cross-sectional dimension of the member, or
        iv. 8".
    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.
    g. Lateral ties shall be located vertically not more than 1/2 lateral tie spacing above the top of footing or slab in any story and not more than 1/2 lateral tie spacing below the lowest horizontal reinforcement in beam, girder, slab, or drop panel above.
33. Masonry columns and piers meeting the following requirements may be used to resist seismic load:
    a. Seismic response modification factor, R, not greater than 1.5.
    b. Transverse reinforcement shall meet the requirements of 2106.4.
34. 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 min. of two No. 4 lateral ties provided in the top 5" of the column. (ACI530 1.14.5.3.1)

STRUCTURAL NOTES

GENERAL NOTES

The following general structural notes shall be made part of the construction documents.

35. Identify the following masonry material specifications and add as notes to the structural plans: (2103)
    a. Concrete masonry units – ASTM C90
    b. Mortar – ASTM C270. Specify mortar proportions per T-2103.8(1) or the mortar properties per T-2103.8(2).
    c. Grout – ASTM C476. Specify grout proportions per T-2103.12 or conform to ASTM C476.
    d. Compressive strength. Specify strength per T-2105.2.2.1.2.
36. Continuous Special Inspection by a registered deputy inspector is required for (engineered masonry) (high-lift grouting). (1704.5)
37. (Continuous) (Periodic) Special Inspection is required for masonry construction per T-1704.5.1 & T-1704.5.3. (1704.5.2 & ACI530 2.3)
38. Where special inspection or testing is required, the registered design professional in responsible charge shall include a "Statement of Special Inspections" on the plans. (1705)
39. Quality assurance measures shall comply with 2105 and ACI530 T-1.15.1, T-1.15.2 and T-1.15.3.
40. Type N mortar or masonry cement shall not be used as part of the lateral force resisting system. (ACI530 1.14.6.6)
41. Cleanouts shall be provided for all grout pours over 5' high.
42. Grout lifts shall not exceed 12.67' when the masonry has cured for 4-hrs., the grout slump is maintained between 10" and 11", and no intermediate reinforced bond beams are placed between the top and bottom of the pour height. Otherwise lifts shall not exceed 5'.
43. All cells and spaces containing reinforcement shall be filled with grout.
44. Pipes and conduits embedded in masonry shall not reduce the required strength. (ACI530 1.16.2)
45. Reinforcement shall be supported and fastened together to prevent displacements beyond the tolerances allowed by ACI530 § 3.4.1 prior to grouting.
46. Joint reinforcement used in masonry exposed to earth or weather shall be stainless steel, protected from corrosion by hot dipped galvanized coating, or epoxy grouting. (ACI530 1.13.4.2)

ADDITIONAL COMMENTS