



## STRUCTURAL DESIGN PLAN REVIEW CHECKLIST

<b>INFORMATION</b>	PLAN CHECK NO.:	EXPIRATION DATE:	STATUS:	
	PROJECT ADDRESS:			
	WORK DESCRIPTION:			
	APPLICANT'S NAME:	TEL. NO.:		
	ADDRESS:	EMAIL:		
<b>INSTRUCTIONS</b>	<p>Your application for a permit, together with plans and specifications, has been examined and you are advised that the issuance of a permit is withheld for the reasons hereinafter set forth. The approval of plans and specifications does not permit the violation of any sections of the Building Code or other local ordinances or state laws.</p> <p>In an effort to streamline the plan review process, please follow the steps outlined below to ensure that there is no delay in processing your application and reviewing your responses to these plan check comments.</p> <ul style="list-style-type: none"> <li>• Comments with circled item numbers apply to this plan check.</li> <li>• Revised plans and calculations shall incorporate or address all comments marked on the original checked set of plans, calculations, and this plan review checklist. Provide a written response to each comment and show where and how it has been addressed. Identify the sheet number and detail or reference note on the revised plans where the corrections are made. Time spent searching for the corrected items on the revised plans or calculations will delay the review and approval process. Once all comments on the plans, calculations, and this checklist have been addressed, contact the plan check staff to schedule an appointment to review the changes made.</li> </ul> <p style="margin-left: 40px;">PLAN REVIEWER: _____ TEL. NO.: <u>(310) 285-</u></p> <p style="margin-left: 40px;">ADDRESS: <u>455 N Rexford Drive, 1<sup>st</sup> Floor</u>  <u>Beverly Hills, CA 90210</u></p> <p style="margin-left: 40px;">EMAIL: _____@beverlyhills.org WEBSITE: <u>www.beverlyhills.org</u></p> <p>Should you have any questions or need clarification pertaining to the comments made on your project, you may contact the plan check staff by telephone from _____ to _____ M T W TH F.</p> <ul style="list-style-type: none"> <li>• Bring the original checked set of plans and calculations along with this checklist to the meeting. Do not schedule an appointment meeting with the plan check staff until all comments have been addressed.</li> <li>• Incomplete, indefinite or faded drawings or calculations will not be accepted.</li> </ul>			
	<b>NOTE</b>	Numbers within the parenthesis ( ) refer to the section of the applicable code. 2007 Edition of the California Building Code (CBC). Table (T). Los Angeles Regional Uniform Code Program (LARUCP). ASCE Minimum Design Loads for Buildings and Other Structures, Includes Supplement No. 1 and Errata (ASCE-7). AISC Seismic Provisions for Structural Steel Buildings dated 3-9-05 and Supplement No. 1 dated 11-16-05 (AISC-341). AISC Specification for Structural Steel Buildings dated 3-9-05 (AISC 360). ACI Building Code Requirements for Structural Concrete (ACI-318). National Design Specification for Wood Construction with 2005 Supplement (NDS-05).		



## CHAPTER 16 STRUCTURAL DESIGN

### A. GENERAL

1. The following design loads and other information pertinent to the structural design required by CBC 1603.1.1 through 1603.1.8 shall be indicated on the construction documents: (CBC 1603.1)
  - a. Floor dead load and live load.
  - b. Roof dead load and live load.
  - c. Wind design data:
    - i. Basic wind speed in M.P.H.
    - ii. Wind importance factor,  $I$ , and occupancy category.
    - iii. Wind exposure.
    - iv. Internal pressure coefficient.
  - d. Earthquake design data:
    - i. Seismic importance factor,  $I$ , and occupancy category.
    - ii. Mapped spectral response accelerations,  $S_S$  and  $S_1$ .
    - iii. Site class.
    - iv. Spectral response coefficients,  $S_{DS}$  and  $S_{D1}$ .
    - v. Seismic design category.
    - vi. Basic seismic-force-resisting system(s).
    - vii. Design base shear.
    - viii. Seismic response coefficient(s),  $C_s$ .
    - ix. Response modification factor(s),  $R$ .
    - x. Analysis procedure used.
    - xi. Redundancy factor used.
  - e. Special loads.
  - f. System or components requiring special inspections for seismic resistance.
2. Designate on the plans a registered design professional in responsible charge. The jurisdiction having authority shall be notified in writing of any changes. The registered design professional shall review and coordinate all submitted documents prepared by others, including deferred submittal items. The registered design professional shall submit deferred documents to the jurisdiction having authority in a timely manner. The owner shall notify the Building Official in writing if the registered design professional in responsible charge is changed.
3. Deferred submittal documents shall be listed on the plans and shall have prior approval of the Building Official.

4. When submitted by the registered design professional in responsible charge, deferred documents shall bear a notation indicating the documents have been reviewed by the registered design professional and have been found to be in general conformance with the design of the building. This statement should be made adjacent to where the deferred item or item submitted "by others" is noted on the plans.
5. Provide details of anchorage of roof and ceiling mounted mechanical, electrical and plumbing equipment as applicable. Include the weight in the calculations as necessary. (CBC 1603.1, ASCE-7 Section 13.1)

### B. VERTICAL LOADS

1. Floor live load must include a min. 15 psf partition load, in addition to other loads per CBC 1607.5.
2. Exit facilities must be designed for a 100 psf live load. (CBC T-1607.1)
3. Floors supporting vehicles accommodating less than 9 passengers shall be designed for either a live load of 40 psf or a 3,000 lb concentrated load acting on a 4.5" by 4.5" area, whichever produces the greater load effect per CBC T-1607.1. Concrete slabs supporting fire trucks shall be designed per CBC 1607.6.
4. The (uniform) (concentrated) (special) loads must be used in accordance with CBC T-1607.1.
5. Balconies must be designed for 100 psf (60 psf if balcony is < 100 sq. ft. for one- and two-family residence). (CBC T-1607.1)
6. Ceiling joists shall be designed for 20 psf live load. Attic without storage and less than 42" of headroom may be designed for 10 psf live load. (CBC T-1607.1 Item 28)
7. Suspended ceilings shall be designed per ASCE-7 Section 13.5.6. Provide details.
8. The live loads used in the design of buildings and other structures shall be the max. load expected by the intended use or occupancy but shall in no case be less than the min. uniformly distributed unit loads required by CBC T-1607.1.



9. Where the min. 1/4" per foot roof or deck slope for drainage is not provided, a design to support accumulated water per CBC 1611.3 is required.
10. Provide connection details of guards and/or handrail, including connections of posts or panels to deck or floor framing, capable of withstanding a load of at least 200 lbs applied in any direction at any point of the rail. Assemblies and guards, including connection of posts or panels to deck framing, shall be designed to resist a load of 50 plf applied in any direction and intermediate rails shall be designed to withstand a horizontally applied normal load of 50 psf. Provide calculations to verify the above. (CBC 1607.7.1)

### C. LATERAL LOADS

1. Seismic Design Category (SDC) shall be based on CBC T-1613.5.6(1) and T-1613.5.6(2). When  $S_1$  is greater than or equal to 0.75, the building shall be assigned to SDC E for Occupancy Category I, II, or III and assigned to SDC F for Occupancy Category IV.
2. The value of R used for design in a specific direction shall not exceed the lowest value of R for any of the lateral force resisting systems utilized in that same direction per ASCE-7 Section 12.2.3.1 and 12.2.3.2. (Not applicable to 1 & 2 family dwellings constructed of light frame construction ASCE-7 Section 12.2.3.1 and 12.2.3.2.)
3. Provide calculations and details to show that collector elements, splices, and connections to resisting elements have the strength to resist the combined loads resulting from the special seismic load of ASCE-7-05 Section 12.14.7.3 & 12.14.3.2.2. (CBC 1605.2 & 1605.3)
4. Calculate seismic drift based on deflections of each level with  $C_d$  and I factors using strength level forces in accordance with ASCE-7 Section 12.8.6.
5. Provide separation from property line or adjacent building(s) of not less than the building drift in accordance with LARUCP 16-10. (ASCE-7 Section 12.12.3 amended)
6. Cantilevered column systems resisting seismic forces shall be designed with an R and  $C_d$  factor per ASCE-7 T-12.2-1 and shall be limited to a max. inelastic response displacement per ASCE-7 T-12.12-1. Foundation and other

elements used to provide overturning resistance at the base of cantilever column elements shall have the strength to resist the load combinations with over strength factor of ASCE-7 Section 12.4.3.2. Use an effective length factor  $K = 2.1$ .

7. Submit structural calculations and connection details for the structural members that provide support for the seismic forces generated by elevators. The seismic forces must be determined in accordance with ASCE-7 Section 13.3. The calculations and details provided must show the complete load path from the rail supports to the building's lateral-force-resisting system. (ASCE-7 Section 12.10 & CBC 1607.8.1)
8. The lateral design shall be based on the most restrictive of either the wind or seismic forces per CBC 1609 and 1613 respectively.
9. Wind analysis that does not comply with the conditions of simplified procedure of ASCE-7 Section 6.4 shall comply with the analytical procedure of ASCE-7 Section 6.5.
10. Seismic analysis that does not comply with the conditions of simplified base shear design of ASCE-7 Section 12.14 must comply with equivalent lateral force procedure as set forth in ASCE-7 Section 12.8.
11. Provide mapped spectral acceleration for short periods  $S_s = \underline{\hspace{1cm}}$  and at one second  $S_1 = \underline{\hspace{1cm}}$ , as determined in accordance with ASCE-7 Section 11.4.
12. The site coefficients are  $F_a = \underline{\hspace{1cm}}$  and  $F_v = \underline{\hspace{1cm}}$  per ASCE-7 T-11.4-1 & T-11.4-2.
13. The redundancy factor, p, shall be 1.3, except where the conditions of ASCE-7 Section 12.3.4.2 are met.
14. Provide detail to show that the interior shear walls are connected to the roof diaphragm.
15. Check the shear wall overturning reactions on the beams/columns per CBC 1605.4 for the special seismic load combinations. Also see ASCE-7 Section 12.4.3.
16. Wood elements designed primarily as flexural members shall be provided with lateral bracing or solid blocking at



each end and at connection location(s) of the discontinuous system.

17. Where applicable, provide pre-engineered wall manufacturer's detail sheets on the plan. (CBC 1603.1)
18. Provide calculations for wind loading on the building showing compliance with ASCE-7 Chapter 6. Indicate in the calculations which method is being used. (CBC 1609.1.1)
19. When determining the max. uplift force for hold-down design, multiply the dead load resisting moment by 0.9 for seismic or wind forces for LRFD combination. For ASD load combinations, 0.6 shall be used for basic load combination per CBC 1605.3.1, or 0.9 shall be used for alternate load combination per CBC 1605.3.2. (CBC 1605.2 & 1605.3)
20. The  $C_s$  factor can be limited to 1.5 on regular buildings only. (ASCE-7 Section 12.8.1.3)
21. Basement, foundation, and retaining walls shall be designed for soil lateral loads per CBC 1610.

#### **D. HORIZONTAL DIAPHRAGM**

1. Provide a diaphragm analysis to show diaphragm adequacy per ASCE-7 Section 12.10.
  2. 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 or concrete walls. The spacing of continuous ties shall not exceed 40' (LARUCP 16-09)
  3. Provide details, properly referenced, of the anchorage system between the wood roof and floor diaphragms to the concrete or masonry walls per ASCE-7 Section 12.11.
  4. 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 or concrete walls. (CBC 1604.8)
    - a. The wall anchorage shall provide a positive direction connection between the wall and floor or roof construction, capable of resisting a horizontal force specified in CBC 1604.8 & ASCE-7 Section 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 CBC 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. (ASCE-7 Section 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. (ASCE-7 Section 12.11.2.2.2)
  - f. Floor and roof diaphragms shall be designed to resist the forces per ASCE-7 Section 12.10.1. Max. aspect ratio of 3:1 for unblocked diaphragm.
  - g. The max. diaphragm shears used to determine the depth of the sub-diaphragm shall not exceed 75% of the diaphragm shear. (LARUCP 16-09)
  - h. The max. length-to-width ratio of the wood structural sub-diaphragm shall be 2.5:1 per ASCE-7 Section 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 ASCE-7 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 ASCE-7 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.
1. 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.
5. Provide deflection calculations for all horizontal gravity members and walls to show compliance with CBC T-1604.3 and CBC 1604.3.2 through 1604.3.5 for the more restrictive limitations. (CBC 1604.3)
  6. Provide a rigid diaphragm analysis if the building does not meet the conditional criteria under which a diaphragm can be idealized as flexible. (CBC 1613.6.1 or ASCE-7 Section 12.3.1.1)

## CHAPTER 17 STRUCTURAL TESTS AND SPECIAL INSPECTIONS

### E. STRUCTURAL OBSERVATION

1. Structural Observation is required per CBC 1709.2 & 1709.3. Photocopy/blueprint the attached Structural Observation Program form on the plans.
2. Structural observations for seismic resistance: Structural observations shall be provided for those structures included in Seismic Design Category D, E or F, as determined in CBC 1613, where one or more of the following conditions exist: (LARUCP 17-04)
  - a. The structure is classified as Occupancy Category III or IV in accordance with CBC 1604.5.
  - b. The height of the structure is greater than 75' above the base.
  - c. The structure is classified as Occupancy Category I or II in accordance with CBC 1604.5 and a lateral design is required for the structure or portion there of. Exception: One-story wood framed Group R-3 and Group U Occupancies less than 2000 square feet in area, provided the adjacent grade is not steeper than 1

unit vertical in 10 units horizontal (10% sloped), assigned to Seismic Design Category D.

- d. When so designated by the registered design professional in responsible charge of the design.
  - e. When such observation is specifically required by the Building Official.
- ### F. SPECIAL INSPECTION
1. Where special inspection or testing is required, the registered design professional in responsible charge shall include a "Statement of Special Inspections" on the plans. (CBC 1705)
  2. (Continuous) (Periodic) Special Inspection is required for \_\_\_\_\_ per CBC 1704. (CBC T-1704.3 steel, T-1704.4 concrete, T-1704.5.1 & T-1704.5.3 masonry, T-1704.7 soils, T-1704.8 pile foundations, T-1704.9 pier foundations, or T-1706.6.1 high-load diaphragm).
  3. Special inspection of concrete elements in buildings and structures and concreting operations shall be as required by CBC 1704.4 and CBC T-1704.4. (CBC 1704.4 & 1901.7)
  4. Periodic Special Inspection is required for wood shear walls, shear panels, and diaphragms, including nailing, bolting, anchoring, and other fastening of components of the seismic force resisting system. Special inspection by a registered deputy inspector is not required where the fastener spacing of the sheathing is more than 4" on center. (CBC 1707.3)
  5. Add the following notes to the plans:
    - a. Contractors responsible for the construction of a wind or seismic force resisting system/component listed in the "Statement of Special Inspection" shall submit a written statement of responsibility to the Building Official and the owner prior to the commencement of work on such system or component per CBC 1706.1.
    - b. Continuous Special Inspection by a registered deputy inspector is required for field welding, concrete strength  $f'_c > 2500$  psi, high strength bolting, sprayed-on fireproofing, engineered masonry, high-lift grouting, pre-stressed concrete, high load diaphragms and special moment-resisting concrete frames. (CBC 1704 & Chapters 19, 21, and 22).



- c. Field Welding to be done by welders certified by an approved agency for (structural steel) (reinforcing steel) (light gauge steel). Continuous inspection by a registered deputy inspector is required.
  - d. Shop welds must be performed in a fabricator's shop licensed by an approved agency.
  - e. (Trusses) (Structural Steel) (Glulam Beams) (Engineered Joist) (\_\_\_\_\_) shall be made by a fabricator licensed by an approved agency.
- 2. Footings on or adjacent to slopes shall comply with CBC 1805.3.1 through 1805.3.5. (CBC 1805.3)
  - 3. Footings shall comply with CBC T-1805.4.2 for light-framed construction unless specifically designed. (CBC 1805.4.2)
  - 4. Footings and slab-on-grade founded on expansive soil shall be designed in accordance with CBC 1805.8.1 or 1805.8.2 unless special requirements at expansive soil site are met. (CBC 1805.8)

## CHAPTER 18 SOILS AND FOUNDATIONS

### G. SOIL INVESTIGATION

- 1. Provide a geological/soil investigation report to satisfy CBC 1802.2.1 through 1802.2.5. (CBC 1802.2)
  - 2. Provide soils investigation to evaluate potential hazards due to earthquake including lateral pressure on basement walls, slope instability, liquefaction and soil strength loss, surface rupture and mitigating measures. (CBC 1802.2.7)
  - 3. Soil bearing pressure is limited to 1500 lbs/sq ft unless soil is classified per CBC 1804.2, or a soils report recommends otherwise. (CBC T-1804.2)
- 5. Provide grade beam ties to interconnect individual pile caps and caissons. Ties shall be capable of resisting, in tension or compression, a min. horizontal force of 10% of the larger column vertical load multiplied by  $S_{ps}$ . (CBC 1808.2.23.1)
  - 6. The soils/geotechnical engineer shall review and approve the foundation plans and details for general conformance with the recommendations in the geotechnical/soils report, if one is provided or required, and shall bear the seal and signature of the soils/geotechnical engineer.
  - 7. Pier and pile foundations shall be designed and installed in accordance with recommendations of foundation investigation. (CBC 1808.2)

### H. EXCAVATION, GRADING AND FILL

- 1. Backfill with soil shall be free from organic material, debris, cobbles and boulders, place in lifts and compacted. (CBC 1803.2)
  - 2. Slope ground immediately adjacent to foundation away from building at a slope of not less than 1:20 (5%), or at a 2% slope when a swale is provided. (CBC 1803.3)
  - 3. The soils report requires foundation excavations to be reviewed by the soils engineer. Note on the foundation plan "Prior to requesting a foundation inspection, the soils engineer/geotechnical consultant shall inspect and approve the foundation excavations". (CBC 106.4.3)
- 8. Structure or building on hillside with slope greater than 33% shall comply with the special hillside design requirements. (LARUCP 16-03)
  - 9. Retaining wall shall be designed for a min. factor of safety of 1.5 against lateral sliding and overturning. (CBC 1806.1)
  - 10. Provide complete shoring plans for the subterranean excavation or provide plans and sections showing cut slopes as recommended per approved soils report. Before commencing the excavation, proof of notification to adjoining property owners shall be submitted. (CBC 3307)

### I. FOOTINGS AND FOUNDATIONS

- 1. Min. depth of footings below the undisturbed ground surface shall be 12". (CBC 1805.2)
- 11. Concrete and masonry foundation walls shall be designed in accordance with Chapter 19 or 21. (LARUCP 18-01)

## CHAPTER 19 CONCRETE

### J. GENERAL



1. Construction documents shall include the following information as applicable to the project:
    - a. Specified concrete compressive strength.
    - b. Specified grade of reinforcement.
    - c. Size and location of structural elements, reinforcement and anchors.
    - d. Reinforcement anchorage length, location and length of lap splice.
    - e. Type and location of mechanical and/or welded splices of reinforcement.
  2. The allowable service loads of headed bolts and headed stud anchors cast in concrete for shear and tension, including the required edge distance and spacing, shall be per CBC T-1911.2 (CBC 1911)
  3. Strength design of anchors installed in hardened concrete shall be designed in accordance with Appendix D of ACI-318. (CBC 1912.1)
  4. Connections between concrete members shall comply with ACI-318 Section 7.13 for structural integrity. (CBC 1907.13)
  5. Structural support elements of discontinuous lateral-load resisting systems (including concrete structural slabs) shall be designed to resist the special seismic load combinations of 1605.4. (CBC 1908.1.12)
  6. Provide details, properly referenced, of the anchorage system between the wood roof and floor diaphragms and the concrete or masonry walls. Min. design force shall be 280 lb/lf. (CBC 1604.8, ASCE7 12.11)
  7. Precast panels, exterior non-bearing, non-shear wall panels, or elements that are attached to or enclose the exterior shall be designed to resist the forces and connections shall be in compliance with ASCE-7 Section 12.11.5.
  8. Alternate slender wall for out-of-plane bending must satisfy deflection limitation as amended under LARUCP 19-1. (CBC 1908.1.17 amended)
1. Foundations with stem walls shall be reinforced with a min. of one No. 4 bar at the top of the wall and one No. 4 bar at the bottom of the footing. (CBC 1908.1.15, ACI-318 Section 22.10)
  2. Concrete cover for reinforcement shall comply with CBC 1907.7.1 through 1907.7.7. (CBC 1907.7)
  3. Provide min. thickness of 3-1/2" concrete on-grade slab, and identify reinforcement and moisture barrier. (CBC 1910)
  4. Slabs-on-grade with turndown footings shall be reinforced with a min. of one No. 4 bar at the top and one No. 4 bar at the bottom. (CBC 1908.1.15, ACI-318 Section 22.10)
  5. Lateral reinforcement for compression members shall comply with ACI-318 Section 7.10. (CBC 1907.10)
  6. Lateral reinforcement for compression reinforcement in flexural members shall comply with ACI-318 Section 7.11. (CBC 1907.11)
  7. Provide shrinkage and temperature reinforcement to comply with ACI-318 Section 7.12. (CBC 1907.12)
  8. Provide an analysis of all tilt up panels with openings. Show that the reinforcing in the panels, on each side of the openings is adequate for in-plane and out-of-plane forces combined with axial loads. (ACI-318 Section 21.2.1.4 and 21.7)
  9. Provide confinement reinforcement in wall piers to satisfy CBC 1908.1.8. (CBC 1908.1.8)
  10. Concrete structural wall reinforcement shall be terminated with required development length beyond the boundary reinforcing at the vertical and horizontal end faces of wall sections. (ACI-318 Section 21.7.2)

## CHAPTER 21 MASONRY

### L. GENERAL

1. Identify the following masonry material specifications and add as notes to the structural plans: (CBC 2103)
  - a. Concrete masonry units – ASTM C90

### K. DETAILS OF REINFORCEMENT



- b. Mortar – ASTM C270. Specify mortar proportions per CBC T-2103.8(1) or the mortar properties per CBC T-2103.8(2).
  - c. Grout – ASTM C476. Specify grout proportions per CBC T-2103.12 or conform to ASTM C476.
  - d. Compressive strength. Specify strength per CBC T-2105.2.2.1.2.
2. Glass unit masonry having an installed weight > 40 psf or a height > 12' shall not be permitted to be supported on wood construction. (CBC 2110.4.2.1)
3. Masonry and concrete chimneys in seismic design category D shall be anchored at each floor, ceiling or roof line more than 6' above grade. Two 3/16" x 1" straps shall be embedded a min. of 12" into the chimney. Strap shall be hooked around the outer bars and extend 6" beyond the bend. Each strap shall be fastened to a min. of 4 floor joists with two 1/2" bolts. (CBC 2111.4)
4. The use of 1/2 the allowable stress in the masonry wall design in lieu of providing special inspections required by CBC 1704.5 and T-1704.5 is not permitted. (CBC 1704.5)
5. Loads for shear walls in seismic design category D and higher designed by the working stress design method shall be designed to resist 1.5 times the seismic forces required by CBC Chapter 16. (CBC 2106.5.1)
6. Masonry shear wall shall be designed as a "special reinforced masonry shear wall" per ASCE-7 T-12.2-1. Other masonry shear wall types are not permitted in seismic design category D and higher.
7. Masonry walls, unless isolated from the seismic force-resisting system, shall be considered shear walls. (ASCE-7 Section 14.4.3)
- Grade B or C) (A501)
  - c. Pipe – ASTM A53 Grade B
  - d. Plates – ASTM (A36) (A572 Grade 50) (A588)
  - e. Bars – ASTM (A36) (A572 Grade 50)
  - f. Bolts – ASTM (A307) (A325) (A490)
  - g. Nuts – ASTM A563
  - h. Washers – ASTM F436
  - i. Anchor or threaded rods – ASTM F1554
  - j. Filler metal and flux for welding – AWS (A5.1) (A5.5)
2. Identify on the structural plans the inspection points and frequencies required for the following:
- a. Visual Welding Inspection
  - b. Nondestructive Testing (NDT) of Welds
  - c. Inspection of Bolting
  - d. Other Inspections
3. The registered design professional in responsible charge shall indicate the following QA/QC information in accordance with AISC-341 Part I Appendix Q & W on the structural plans:
- a. Referenced documents.
  - b. Material specifications.
  - c. Welding processes.
  - d. Inspection & nondestructive testing.
4. Column base plate shall be designed in accordance with AISC-341 Section 8.5 and AISC-360 Section J8.
5. Column splices when column is not part of the seismic load resisting system shall be detailed in accordance AISC-341 Part I-8.4b.
6. Beams and columns shall meet the width-thickness ratio limitations of AISC-360 T-B4.1.
7. Bolts and welds shall not be designed to share force in a joint or the same force component in a connection. (AISC-341 Section 7.2)

## CHAPTER 22 STEEL

### M. GENERAL

1. Identify the following steel material specifications and add as notes to the structural plans: (AISC-360 Section A3) (AISC-341 Section 6 & 7)
- a. Hot rolled structural shape – ASTM (A36) (A992)
  - b. Hollow structural sections (HSS) – ASTM (A500
8. The design, manufacture and use of open web steel joists and joist girders shall be as follows: (CBC 2206)
- a. The registered design professional in responsible charge shall indicate on the structural plans the steel joist and/or steel joist girder designations and indicate the requirements for joist and joist girder design, layout, end supports, anchorage, non-SJI standard bridging, bridging termination connections and



bearing connection design to resist uplift and lateral loads.

- b. Submission of the steel joist and joist girder calculations is required and shall bear the seal and signature of the registered design professional in responsible charge.
  - c. Location of steel joist placement shall be clearly identified on the structural plans including connection for joist and joist girder supports, field splices, bridging attachment and joist headers. List all applicable loads used in the design of the steel joists and joist girders.
9. Add the following notes to the plans:
- a. Individual structural members and assembled panels of cold-formed steel construction shall be protected against corrosion with an approved coat of paint, enamel or other approved protection. (CBC 2203.2)
  - b. Anchor rods shall be set accurately to the pattern and dimensions called for on the plans. The protrusion of the threaded ends through the connected material shall be sufficient to fully engage the threads of the nuts, but shall not be greater than the length of the threads on the bolts.”(CBC 2204.2)
  - c. Contractor documents shall be submitted to and reviewed by the registered design professional in responsible charge, including but not limited to, shop drawings, erection drawings, welding procedure specifications (WPS), manufacturer certificate of conformance for all electrodes, fluxes and shielding gases, and manufacturer product data sheets or catalog for SMAW, FCAW and GMAW process. (AISC-341 Section 5)
  - d. All bolts used in a seismic load force resisting system shall be pretensioned high strength bolts and shall meet the requirements for slip critical faying surfaces in accordance with AISC-360 Section J3.8 with a Class A surface. (AISC-341 Section 7.2)
  - e. All welds used in members and connections in the seismic load force resisting shall be made with a filler metal that can produce welds that have a min. Charpy V-Notch toughness of 20 ft-lb at 0 °F. (AISC-341 Section 7.3a)
  - f. Welds designated as “demand critical” shall be made of filler metal that can produce welds that have a min. Charpy V-Notch toughness of 20 ft-lb at -20 °F and 40 ft-lb at 70 °F. (AISC-341 Section 7.3b)

**N. CANTILEVERED COLUMN**

- 1. Where HSS or pipe sections are used as cantilever column, the following shall apply:
  - a. Design as an ordinary frame using an  $R = 1-1/4$  (may be used in SDC “D”). (ASCE-7 T-12.2-1)
  - b. The use of grade beam is required (i.e., flag pole formula per CBC 1805.7 is not allowed).
  - c. Extend member into grade beam (i.e., use of base plate designed as moment connection is not allowed).
  - d. Apply over-strength factor to grade beam design per ASCE-7 Section 12.2.5.2.
  - e. Limit height and weight applied to frame per ASCE-7 Section 12.2.5.7.
- 2. Where wide flange sections are used as cantilever column, the following shall apply:
  - a. Design as a special frame using an  $R = 2.5$  and comply with AISC-341 T-I-8-1.
  - b. The use of grade beam is required (i.e., flag pole formula per CBC 1805.7 is not allowed).
  - c. Extend member into grade beam (i.e., use of base plate designed as moment connection is not allowed).
  - d. Apply over-strength factor to grade beam design per ASCE-7 Section 12.2.5.2.
  - e. Max. 35’ height limit per ASCE-7 T-12.2-1.
- 3. Where light or flag poles are designed as cantilever column conforming to ASCE-7 Chapter 15, flag pole formula per CBC 1805.7 may be used.

**CHAPTER 23 WOOD**

**O. GENERAL**

- 1. The allowable values used in the structural design shall be per the 2007 CBC. \_\_\_\_\_.
- 2. Identify the following wood material specifications and add as notes to the structural plans: (CBC 2303 & NDS-05)
  - a. Sawn lumber – DOC PS 20. Specify grade and species.
  - b. Prefabricated wood I-joists – ASTM D5055.
  - c. Structural glued laminated timbers – AITC A190.1 and ASTM D3737. Specify grade and lamination species.



- d. Wood structural panels – DOC PS 1 or PS 2. Specify grade, construction and glue type.
  - e. Particleboards – ANSI A208.1. Specify grade mark.
  - f. Preservative-treated wood – AWPA Standard U1 and M4. Specify identification of treating manufacturer, type of preservative used, and min. preservative retention (pcf).
  - g. Nails and staples – ASTM F1667. Specify nail length and shank diameter; staple gage, crown width, and leg length.
3. Light-frame construction of unusual shape, size, split-level, or more than one story shall be designed to resist lateral forces. Submit calculations for the design of the lateral forces. (CBC 2308.1.1)
  4. Structural design is not in compliance with the conventional light-frame construction provisions per CBC 2308 (a.k.a. Type V sheet) shall submit calculations sealed and signed by registered design profession licensed in the State of California. (CBC 2308.1)
  5. Cross-reference all calculations for joists, beams, shear walls, etc, to the structural framing/floor plans.
  6. Submit structural calculations and or design details for the following: \_\_\_\_\_  
\_\_\_\_\_.
  7. The registered design professional in responsible charge shall be designated on the building permit application and plans.
  8. Provide a detailed schedule of “Statement of Special Inspections” on the plans in accordance with CBC 1704.1.1.
  9. Provide a framing nailing schedule on the plans meeting the requirements of CBC T-2304.9.1.
  10. Add the following notes to plans:
    - a. Foundation sills shall be naturally durable or preservative-treated wood. (CBC 2304.11.2.4)
    - b. Glulam beams must be fabricated in an approved shop. Identify grade symbol and lamination species per NDS-05 T-5-A.
- c. Provide lead hole 40% to 70% of threaded shank diameter and full diameter for smooth shank portion. (NDS-05)
  - d. All bolt holes shall be drilled 1/32” to 1/16” oversized. (NDS-05 Section 11.1.2.2)
  - e. Hold-down connector bolts into wood framing require approved plate washers; and hold-downs shall be tightened just prior to covering the wall framing. (CBC 2305.3.7.1)
  - f. Hold-down hardware must be secured in place prior to foundation inspection.
  - g. Roof diaphragm nailing to be inspected before covering. Strength axis of wood structural panel shall be perpendicular to supports. Floor diaphragms shall be tongue and groove or have blocked panel edges. Wood structural panel spans shall conform to CBC T-2304.7.
  - h. All diaphragm and shear wall nailing shall utilize common nails with full heads unless otherwise approved. (CBC 2306.2)
  - i. Fasteners in preservative treated wood or fire-retardant treated wood shall be hot dipped, galvanized steel or stainless steel. (CBC 2304.9.5)
  - j. Mechanically driven nails used in wood structural panel shear walls shall meet the same dimensions as that required for hand-driven nails, including diameter, min. length and min. head diameter. Clipped head or box nails are not acceptable. (LARUCP 23-03)
  - k. Engineered wood products such as prefabricated wood I-joists, structural glued-laminated timber, structural composite lumber and design trusses shall not be notched or drilled except where permitted by the manufacturers’ recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional in responsible charge. (CBC 2304.4 & 2308.10.7).
  - l. The quality mark shall be on the stamp or label affixed to preservative-treated wood and shall include the following information: identification of treating manufacturer, type of preservative used, min. preservative retention (pcf), end use for which the product is treated, AWPA standard to which the product was treated and identity of the accredited inspection agency. (CBC 2303.1.8.1)
  - m. Moisture content of preservative-treated wood shall be 19% or less before being covered with insulation,



- interior wall finish, and floor covering of other materials.
- n. Moisture content of fire-retardant-treated wood shall be 19% or less for lumber and 15% or less for wood structural panels before use. (CBC 2303.2.5)
- o. Sheathing nails or other approved sheathing connectors shall be driven so that their head or crown is flush with the surface of the sheathing. (CBC 2304.9.2)
- p. Weather-exposed beams or posts supporting balconies, porches shall be naturally durable or preservative-treated wood per CBC 2304.11.5.
- q. The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16" larger than the bolt diameter and a slot length not to exceed 1-3/4", provided a standard cut washer is placed between the plate washer and the nut. (CBC 2305.3.11)
- r. Fire-retardant-treated lumber and wood structural panels shall be labeled. The label shall contain the following items: the identification mark of an approved agency in accordance with CBC 1703.5, identification of the treating manufacturer, the name of the fire-retardant treatment, the species of wood treated, flame spread and smoke-developed index, method of drying after treatment, conformance with appropriate standards in accordance with CBC 2303.2.2 through 2303.2.5.
- s. Labeling for fire-treated wood exposed to weather, damp or wet locations, must include the words "no increase in the listed classification when subjected to the Standard Rain Test." (ASTM D 2898).

**P. FOUNDATION**

- 1. Call out foundation bolt size and spacing on foundation plan. The foundation bolts shall be 1/2" diameter for SDC D or 5/8" diameter for SDC E or F. Foundation bolts shall be embedded at least 7" into the concrete or masonry foundation spaced not more than 6' spacing, 2 anchors min. per section, located 4" to 12" from each end of that section, and 0.229" x 3" x 3" plate washers. (CBC 2308.6, 2308.12.9, & 2305.3.11)
- 2. Braced wall lines shall be supported by continuous foundations. (CBC 2308.3.4) (LARUCP 23-06)

- 3. Show min. 18" under floor clearance from grade to bottom of floor joists and min. 12" clearance to bottom of girders. (CBC 2304.11.2.1)
- 4. A foundation cripple wall over 14" in height shall be framed of studs having the size required for an additional story; cripple walls shall be framed and sheathed per CBC 2308.9.4. (CBC 2304.11.2.4)
- 5. Wood sill plate shall be min. 8" above adjacent grade. (CBC 2304.11.2.2)

**Q. WOOD FRAMING**

- 1. Specify the size, spacing and direction of rafters.
- 2. The \_\_\_\_\_ x \_\_\_\_\_ rafters at \_\_\_\_\_ o.c. over \_\_\_\_\_ exceed the allowable span for \_\_\_\_\_ grade. (CBC T-2308.10.3(1), T-2308.10.3(2))
- 3. The size of ridge board, valley, or hip members shall not be less than the cut end depth of the rafter. (CBC 2308.10.4)
- 4. Roof purlins shall not be smaller than the rafter they support. The max. span for 2x4 / 2x6 in. roof purlins is 4 / 6 ft. respectively. For purlin supports provide struts not smaller than 2x4 in. with an unbraced length not over 8', and not flatter than 45° from the horizontal, to bearing walls or partitions. (CBC 2308.10.5)
- 5. Provide designed ridge beams (4x min.) for open beam vaulted ceilings, or when ceiling joists or rafter ties are not provided.
- 6. Ridge / hip / valley members shall be designed as vertical load carrying members when the roof slope is less than 3:12. Provide calculations. (CBC 2308.10)
- 7. Show ceiling joist size, spacing, and direction on plans.
- 8. The \_\_\_\_\_ x \_\_\_\_\_ ceiling joists at \_\_\_\_\_ o.c. over \_\_\_\_\_ exceed the allowable span for \_\_\_\_\_ grade. (CBC T-2308.10.2 (1) or T-2308.10.2 (2))



9. Rafter ties spaced max. 4' o.c. are required immediately above ceiling joists that are not parallel to the rafters. Connections shall be in accordance with CBC T-2308.10.4.1 & 2304.9.1 or equivalent capacities shall be provided. (CBC 2308.10.4.1)
10. For wood structural panel roof diaphragms, specify thickness, grade, panel span rating, and nailing schedule. Min. 8d common nails shall be used. (CBC T-2306.3.1)
11. Show blocking at ends of rafters and trusses at exterior walls, and at supports of floor joists. (CBC 2308.10.6, 2308.8.2)
12. Show size, spacing and direction of floor joists.
13. Beams, girders, doubled joists, walls or other bearing partitions are required under parallel bearing partitions. (CBC 2308.8.4)
14. The \_\_\_\_\_ x \_\_\_\_\_ floor joists at \_\_\_\_\_ o.c. over \_\_\_\_\_ exceed the allowable span for \_\_\_\_\_ grade. (CBC T-2308.8(1), T-2308.8(2))
15. The \_\_\_\_\_ x \_\_\_\_\_ floor girder/beams at \_\_\_\_\_ o.c. over \_\_\_\_\_ exceed the allowable span for \_\_\_\_\_ grade. (NDS-05 T-4A)
16. For wood structural panel floor diaphragm specify thickness, grade, T&G edges, panel span rating, nailing schedule, and panel layout pattern. (CBC T-2306.3.1)
17. Headers shall be provided over each opening in exterior and interior bearing walls. (CBC 2308.9.5.1)
18. The \_\_\_\_\_ x \_\_\_\_\_ header at \_\_\_\_\_ o.c. over \_\_\_\_\_ exceed the allowable span for \_\_\_\_\_ grade. (NDS-05 T-4-A)
19. Detail is required for header support at the corner window(s) at \_\_\_\_\_. (CBC 2308.9.5.2)
20. Studs in bearing walls are limited to 10' in height unless an approved design is submitted. (CBC T-2308.9.1)
21. Provide shrinkage analysis for wood stud walls and bearing partitions supporting more than two floors and a roof. (CBC 2304.3.3)
22. Studs supporting two floors, ceiling, and roof must be 3x4 or 2x6 at 16" o.c. (CBC T-2308.9.1)
23. Note the use of full-length studs (balloon frame) on exterior walls of rooms with vaulted ceiling. (CBC 2308.9.1, T-2308.9.1)
24. Bracing of exterior / main cross walls of Conventional Framing shall conform to methods and locations as specified in CBC 2308.12, T-2308.12.4 and Figure 2308.9.3.
25. Call out all post sizes. Elements supporting concentrated loads which transfer forces to members below should be shown as "Post Above" on the second story framing plan and foundation plan. Call out their locations, connection hardware, and provide applicable details.
26. Provide axial plus bending column calculations to justify required number of studs/posts adjacent to windows and corners per CBC T-2306.2.1, CBC 1605, ASCE-7 Chapter 6 and NDS-05 Section 3.7. Calculations shall address elements at areas of discontinuity.
27. Detail lateral support for the top of interior non bearing walls when manufactured trusses are used. (CBC 1607.13)
28. Shear wall height shall be defined as the max. clear height from the top of the foundation to the bottom of the diaphragm framing above OR the max. clear height from the top of the diaphragm to the bottom of the diaphragm framing above. (CBC 2305.3.5)

**R. WOOD TRUSSES**

1. Provide calculations and specific details, for the proposed roof trusses, signed and stamped by the manufacturing engineer. The registered design professional in responsible charge shall review, approve and stamp truss design for loads, location, and suitability of intended use. (CBC 2303.4)
2. Panel point at bottom chord of trussed roof that occurs over uses such as manufacturing, storage warehouses and repair garages shall be designed for concentrated live load



- of 2,000 lbs. Revise plans and/or calculations to show compliance. (CBC T-1607.1)
3. Where permanent bracing is required, it shall comply with CBC 2303.4.1.5. Truss submittal package shall include the truss member permanent bracing specification. Revise truss placement diagram to show all required permanent bracings in accordance with CBC 2303.4.1.4.
  4. Revise truss submittal package to specify all required anchorage/hangers to transfer load(s); including uplift forces of each truss to the supporting structures. (CBC 2304.1.6)
  5. Revise framing and foundation plans to show load paths of all uplift forces shown at ends of designed trusses supported by bearing walls or beams. (CBC 2303.4.1.6)
  6. The justification of the transfer of loads and anchorage details of each truss to the supporting structure is the responsibility of the registered design professional in responsible charge. Justify transfer of loads at \_\_\_\_\_, provide anchorage details at \_\_\_\_\_.
- S. LATERAL DESIGN**
1. Provide a diaphragm analysis to show diaphragm adequacy. (CBC 2305.2, ASCE-7 Section 12.10)
  2. When assuming flexible horizontal diaphragms for lateral force distribution, the base shear and lateral design shall meet the requirements of CBC 1613.6 and ASCE-7 Section 12.3.1.
  3. Lumber and wood structural panel diaphragms shall not be considered as transmitting lateral forces by rotation. Open-front structures with rigid wood diaphragms and structures with rigid wood diaphragms having a torsional irregularity are not permitted. Note: CBC 2305.2.5 is not permitted. (LARUCP 23-01)
  4. Wood structural panel diaphragms and shear walls using staples as fasteners are not permitted. (LARUCP 23-04)
  5. Walls braced to resist wind and seismic forces shall not exceed the following height to width ratios: 2:1 for wood structural panels; 1.5:1 for gypsum wallboard and Portland cement plaster (stucco). 3.5:1 ratio may be used for wood structural panels provided the allowable shear values in CBC T-2306.4.1 are multiplied by 2w/h, 2:1 ratio is allowed for gypsum blocked per CBC 2306.4.5.1.2. (CBC 2305.3.4, T-2305.3.4)
  6. Wood structural panel shear walls shall meet the story drift limitation of ASCE-7 Section 12.12.1. Conformance shall be determined by testing or calculations. Calculated deflection shall be determined according to CBC 2305.3. (ASCE-7 Section 12.12.1 & T-12.12-1)
  7. Portland cement plaster (stucco), gypsum lath and gypsum wallboard shear walls are not permitted below the top level of wood construction in a multilevel building. (CBC 2306.4.5 & T-2306.4.5)
  8. The max. allowable shear for stucco is 90 plf and 30 plf for gypsum wall board. Portland cement plaster (stucco), gypsum lath and gypsum wall board shear walls are not permitted below the top level of wood construction in a multilevel building. (LARUCP 23-05)
  9. When a diaphragm and or shear wall framing is not DFL or SP, the allowable shear values shall be adjusted per footnote "a" of CBC T-2306.3.1, T-2306.3.2, or T-2306.4.1, as applicable.
  10. Stucco shear walls shall utilize furring, galvanized nails (having a min. 11 ga., 1 1/2" long, 7/16" diameter head, and furred out a min of 1/4") to attach the lath to the studs. (CBC T-2306.4.5)
  11. Provide calculation showing the overturning moments in all shear wall segments. Specify the hold-down connector model at each location on the foundation plan. (CBC 2305.3.7)
  12. The capacity of hold-down connectors that do not consider cyclic loading of the product shall be reduced to 75% of the allowable earthquake load values. (LARUCP 23-01)
  13. The following applies to all shear walls with a shear value greater than 350 plf. These walls shall be clearly identified on the plans. Provide the following: (CBC T- 2306.4.1 Footnote "i")
    - a. 3x foundation sill plates, or when the shear wall is subjected to a seismic design force not exceeding 600

