COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUILDING AND SAFETY DIVISION

STEEL MOMENT FRAME

PLAN REVIEW LIST

GENERAL PROJECT INFORMATION

PLAN CHECK NO. _____ DISTRICT NO _____

JOB ADDRESS _____ CITY _____ ZIP _____

NOTE: AISC Seismic Provisions for Structural Steel Buildings, March 9, 2005 (AISC SPSSB), AISC Steel Construction Manual, thirteenth Edition (AISC SCM), AISC Pre-qualified Connections for Special and Intermediate Steel Moment Frames Applications, December 13,2005 (AISC 358), 2005 Minimum Design Loads for Buildings and Other Structures including Supplement No. 1 (ASCE7), ACI Building Code Requirements for Structural Concrete 2005 (ACI 318-05), Special Moment Resisting Frame (SMF), Intermediate Moment resisting Frame (IMF), and Ordinary Moment Resisting Frame (OMF), Table (T).

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.

GENERAL REQUIREMENTS

GENERAL

1. Identify on the plans the type of Lateral Force Resisting System the structure is designed for. I.e. SMF, IMF or OMF.
2. "I" columns connected at weak axis (y-y) to beam is not permitted, unless qualified by cyclic testing in accordance with AISC SPSSB, Appendix S.
3. Clearly identify on the plan the location and length of the expected plastic hinging zone (protected zone). No welded, screwed, bolted, or shot-in attachment, except decking arc spot-weld is permitted within the protected zone. (AISC SPSSB Part I 7.4)
4. Beams and columns shall meet the width-thickness ratio limitations of AISC SPSSB T-I-8-1 for SMF and T-B4.1 of the AISC SCM for IMF & OMF.
5. Column web splices shall be either bolted or welded, or welded to one column and bolted to the other. In moment frames using bolted splices, plates or channels shall be used on both sides of the column web. (AISC SPSSB Part I 8.4a)
6. Column splices made with fillet welds or partial penetration groove welds shall not be located within 4-ft. nor one-half the column clear height of beam-column connections, whichever is less. Detail on the plan. (AISC SPSSB Part I 8.4a)
7. Provide a beveled transition detail where changes in thickness and width of flanges and webs occur in complete joint penetration groove welded or fillet welded column splice. (AISC SPSSB Part I 8.4a)
8. Groove welds for column splices in SMF and IMF frames shall be demand critical welds in compliance with AISC SPSSB Part I 7.3b.
9. Column splices where the column is not part of the seismic load resisting system (SLRS) shall be detailed in accordance AISC SPSSB Part I 8.4b.
10. Doubler plate connection shall be detailed on the plans as follows: (AISC SPSSB Part I 9.3c)
    a. When doubler plates are welded to the column flanges, welds shall be either a complete-joint-penetration groove welded or fillet-welded joint.
    b. When doubler plates are placed against the column web, they shall be welded across the top and bottom flanges.
    c. When doubler plates are placed away from the column web, they shall be placed symmetrically in pairs and welded to the continuity plates.
11. Continuity plates connection shall be detailed on the plans as follows: (AISC SPSSB Part I 7.5, 9.5, 10.5, 11.5)
    a. Corners of continuity plates placed in the webs of rolled shapes shall be clipped.
    b. At the end of the weld adjacent to the column web/flange juncture, weld tabs for continuity plates shall not be used.
    c. For one-sided connections, continuity plate thickness shall be at least one half of the thickness of the beam flange.
    d. For two-sided connections, continuity plate thickness shall be at least equal in thickness to the thicker of the beam flanges.
12. Weld access hole shall be detailed on the plan per Figure 11-1 of AISC SPSSB Part I 11.2a.

13. When the calculated beam-to-column moment ratio is less than or equal to 2, using Equation (9-3) the following requirements shall apply: (AISC SPSSB Part I 9.7a)
    a. Column flanges shall be laterally supported at the levels of both top and bottom beam flanges
    b. Column flanges shall be laterally supported by means of the column web or by the flanges of perpendicular beams.
14. Lateral bracing of beam flanges per AISC SPSSB Part I 9.8 & 10.8 shall be provided as follows:
    a. Both flanges of beam shall be laterally braced.
    b. The un-braced length between lateral bracings shall not exceed $0.08\ r_yE/F_y$ for SMF and $0.17\ r_yE/F_y$ for IMF lateral load resisting frames.
    c. Lateral bracings shall be placed near concentrated forces, changes in cross section and other locations where analysis indicates that a plastic hinge will form during inelastic deformations.
    d. Bracings shall meet the provisions of AISC SCM, Appendix 6 Equations A-6.7 & A-6.8. The required strength of lateral bracing shall be at least 2% of the expected required strength of the beam flange, and the required strength of lateral bracing adjacent to plastic hinges shall be at least 6% of the expected required strength of the beam flange.

SPECIAL & INTERMEDIATE MOMENT RESISTING FRAME (SMF & IMF)

15. Pre-qualified connections for SMF & IMF (RBS, BUEEP, BSEEP) shall be designed within limitations specified in AISC 358.
16. Beam–to-column connections could be qualified by cyclic testing in accordance to AISC SPSSB Appendix S. The depth of the beam, column and the weight of the beam could differ from the member sizes used in the prototype in accordance to AISC SPSSB Appendix S 5.2.
17. Any new beam-to-column connection requiring testing shall be verified and approved by the Research Section of Building and Safety Division.
18. Where groove welds are used to make column splice, they shall be complete joint penetration groove welds. Weld tabs shall be removed upon completion of weld.
19. The individual thickness of the column webs and doubler plates, if used shall not be less than AISC SPSSB Equation (9-2).

ORDINARY MOMENT RESISTING FRAME (OMF)

20. Connections in conformance with AISC SPSSB Sections 9.2b and 9.5 or Sections 10.2b and 10.5 (SMF and IMF) shall be permitted for use in OMF.
21. Beam-to-column connections shall be made with welds and/or high-strength bolts. Connections could be either fully restrained (FR) or partially restrained (PR).

FULLY RESTRAINED MOMENT CONNECTION (FR)

22. Where steel backing is used with complete joint penetration (CJP) beam flange groove, steel backing shall be removed, except the top flange backing attached to the column by a continuous fillet weld on the edge below the CJP groove weld need not be removed. (AISC SPSSB Part I 11.2a (1))
23. Clearly identify on the plan the removal of the bottom beam flange backing bar upon completion of the welded joint. Following removal of backing bar, the root pass shall be back-gouged to sound metal and back-welded with a minimum leg size of 5/16-in. reinforcing fillet weld. (AISC SPSSB Part I 11.2a (i))
24. Weld tab removal shall extend to within 1/8-in. of the base metal surface, except at continuity plates where removal to within ¼-in. of the plate edge is acceptable. (AISC SPSSB Part I 11.2a (ii))
25. Single-sided partial joint penetration groove welds and single-sided fillet welds shall not be used to resist tensile forces in the connections.

PARTIALLY RESTRAINED MOMENT CONNECTIONS (PR)

26. Design shall be based on AISC SPSSB Part I-11.2b.
27. Complete joint penetration groove welds of beam flanges, shear plates, and beam webs to columns shall be demand critical welds.
28. Continuity Plates shall be detailed on the plan as follows:
    a. For one-sided connections, minimum thickness of continuity plate shall equal at least one-half of the thickness of the beam flange.
    b. For two-sided connections the continuity plates shall be at least equal in thickness to the thicker of the beam flanges.
    c. Welded joints of the continuity plates to the column flanges shall be made with either complete joint penetration groove welds, two-sided partial-joint-penetration groove welds combined with reinforcing fillet welds, or two-sided fillet welds.

QUALITY ASSURANCE, QUALITY CONTROL (QA/QC)

Engineer of record shall indicate on the plans the following QA/QC information in accordance with Appendix Q & W of AISC SPSSB Part I.

29. Referenced Documents
30. Material Specifications
31. Welding Processes
32. Inspection & nondestructive testing
33. Contractor documents that has to be reviewed by the engineer of record including but not limited to:
    a. Shop Drawings
    b. Erection drawings
    c. Welding Procedure Specifications (WPS)
    d. Manufacturer certificate of conformance for all electrodes, fluxes and shielding gases.

e. Manufacturer product data sheets or catalog for SMAW, FCAW and GMAW process.

34. Quality Assurance Agency Documents
35. Inspection Points and Frequencies
    a. Visual Welding Inspection
    b. Nondestructive Testing (NDT) of Welds
    c. Inspection of Bolting
    d. Other Inspections

CALCULATIONS

GENERAL

36. Clearly identify in the structural calculations what type of steel moment frame system the structure is designed for.
37. The Response Modification Coefficient (R) value used for design of the steel moment frame system shall be in accordance with ASCE7 T-12.2-1.
38. Where working design is used, the nominal strength of structural steel members shall be divided by the safety factor (Ω).
39. Provide calculations to show that $P_u/\phi P_n$ for column strength is not greater than 0.4, otherwise the two requirements of AISC SPSSB Part I 8.3 must be satisfied.
40. The required shear strength, V_u, of the connection shall be determined using the gravity load shear combination V_g=1.2D+0.5L+0.2S plus the Earthquake load effect shear E=2[1.1R_yF_yZ] / [distance between plastic hinges].
41. The maximum story drift, Δ, of the frame shall not exceed the allowable story drift of ASCE7 T-12.12-1.
42. The connection of the frame to the column base shall be designed to transmit forces to the foundation. Column base elements include anchor bolts, base plate welds, and any elements that transfer shear, moment, or tension to the foundation.
    a. The seismic load to be transferred to the foundation soil interface shall be based upon the seismic load combinations of 12.4.3.1 & 12.4.3.2 of ASCE7.
    b. Design of concrete elements at the column base, including anchor rod embedment and reinforcement steel, shall be in accordance with ACI 318-05.
    c. Grade beams shall be provided with ductile detailing per ACI 318-05 Chapter 21.

SPECIAL MOMENT FRAME (SMF)

43. Members shall be sized to provide strong column/weak beam ratio more than 1 in accordance with Equation (9-3) of AISC SPSSB Part I 9.6.
44. Column splices shall comply with AISC SPSSB Part I 9.9.
45. Provide calculations to show that the required shear strength of the panel zone, R_u, is less than the design shear strength $\phi_v R_v$ (LRFD) of the panel zone. (AISC SPSSB Part I 9.3a)
46. The individual thickness, t, of the column web and doubler plates, if used, shall be $t \geq (d_z+w_z)/90$. (AISC SPSSB Part I 9.3b)

INTERMEDIATE MOMENT RESISTING FRAME (IMF)

47. The R value used in determining the base shear shall be limited to 4.5.
48. In seismic category D, intermediate moment frames are permitted to a height of 35-ft.
49. In seismic category E, intermediate moment frames are permitted to a height of 35-ft. provided neither the roof nor the floor dead load supported by and tributary to the moment frame exceeds 35-psf. The dead load of the exterior walls tributary to the moment frame shall not exceed 20-psf.
50. In seismic category F, intermediate moment frames are permitted in light-frame construction and with weight limitations of category E.
51. Single story intermediate moment resisting frame in seismic category D or E is permitted up to a height of 65-ft. where the dead load of the roof and exterior wall tributary to the moment frame and more than 35-ft. above the base does not exceed 20-psf.
52. Single story intermediate moment resisting frame in seismic category F is permitted up to a height of 65-ft. where the dead load of the roof and exterior wall tributary to the moment frame does not exceed 20-psf.
53. The required shear strength need not exceed the shear resulting from the application of appropriate load combinations using the amplified seismic load. (ASCE7 12.4.3.1 & 12.4.3.2.)
54. For panel zone, continuity plates, column splices and lateral bracing requirements of Chapter 10 of the AISC SPSSB shall be satisfied.

ORDINARY MOMENT RESISTING FRAME (OMF)

55. The R value used in determining the base shear shall be limited to 3.5.
56. Within light-frame construction ordinary moment frame in Seismic Design Category D or E is permitted when the height is limited to 35-ft. provided neither the roof nor the floor dead loads supported by and tributary to the moment frame exceeds 35-psf. The dead load of exterior walls tributary to the moment frame shall not exceed 20-psf.
57. Single story ordinary moment resisting frame in seismic category D or E is permitted up to a height of 65-ft. where the dead load of the roof and exterior wall tributary to the moment frame and more than 35-ft. above the base does not exceed 20-psf.

58. Single story ordinary moment resisting frame in seismic category F is permitted up to a height of 65-ft. where the dead load of the roof and exterior wall tributary to the moment frame does not exceed 20-psf.

BEAM-TO-COLUMN CONNECTION

59. Pre-qualified connections for Special and Intermediate Steel Moment Frames (SMF) & (IMF) for seismic applications shall be within limitations and specifications of AISC 358 and one of the following types:
    a. Reduced Beam Section (RBS)
    b. Bolted Unstiffened Extended End Plate (BUEEP)
    c. Bolted Stiffened Extended End Plate (BSEEP)
60. Non-qualified connections for Special and Intermediate Steel moment frames (SMF) & (IMF) shall be tested in accordance with the AISC SPSSB, Appendix S. The Research Section of Building and Safety Division shall approve the report of the test. Variations in weight and size of the frame members within the limitations of AISC SPSSB Appendix S will be permitted.
61. Proprietary connections shall be presented and approved by the Research Section of Building and Safety Division.
62. Connections for Ordinary Moment Frame (OMF) are prescriptive and are based on strength calculations and prescriptive details. No testing is required.
    a. Beam-to-column connections shall be made with welds and/or high-strength bolts. Connections are permitted to be fully restrained (FR) or partially restrained (PR) moment connections.
    b. FR and PR Moment connection shall be designed for a required flexural strength equal to $1.1R_yM_p$ (LRFD) or $(1.1/1.5)R_yM_p$ (ASD), as appropriate, of the beam or girder, or the maximum moment that can be developed by the system, whichever is less.
    c. For FR moment connections, the required shear strength, V_u or V_a, as appropriate, of the connection shall be determined by using $E=2[1.1R_yM_p]/L_h$.