Plan Check No. ________________  Checked by: ________________

Note: The AISC Seismic Provisions for Structural Steel Buildings, April 15, 1997, including supplement No. 2, published by the American Institute of Steel Construction is herein referred to as AISC.

PLAN DETAILS

A. GENERAL

9 1. Column splices made with fillet welds or partial-joint penetration groove welds shall not be located within 4 feet nor one-half the column clear height of beam-to-column connections, whichever is less. AISC I-8.3a ~

9 2. Steel elements designed primarily as flexural members shall have bracing for both the top and bottom beam flanges at the location of the support of the discontinuous system. 1630.8.2.6 ~

9 3. Provide project specific tests for (SMRF) (IMRF) moment connections in: (1) the weak axis direction of the column; (2) skewed moment connections; (3) dual axis moment connections. AISC Appendix S. ~

B. SPECIAL MOMENT- RESISTING FRAMES (SMRF)

9 1. The individual thicknesses of column webs and doubler plates, if used, shall not be less than that specified in AISC I-9.3b. ~

9 2. Doubler plates shall be welded to the column flanges using either a complete-joint-penetration groove-welded or fillet-welded joint that develops the design shear strength of the full doubler plate thickness. AISC I-9.3c ~

9 3. Abrupt changes in beam flange area are not permitted in plastic hinge regions. AISC I-9.4a ~

9 4. Continuity plates shall be provided to match the tested connection. AISC I-9.5 ~

9 5. For restrained connections, provide lateral support for the column flanges at the level of both the top and bottom flanges of the beams. AISC I-9.7a(1) ~

9 6. The unbraced length between lateral supports shall not exceed 2500 r_y/F_y and lateral bracing shall be provided just beyond the theoretical plastic hinge region. For RBS members tested in accordance with Appendix S, the placement of lateral support for the member shall be consistent with that used in the test. AISC I-9.8 ~
C. INTERMEDIATE MOMENT- RESISTING FRAMES (IMRF)

9 1. Calculate the required shear strength \( R_u \) of the panel-zone per AISC I-9.3a.

9 2. Doubler plates shall be welded to the column flanges using either a complete-joint-penetration groove-welded or fillet-welded joint that develops the design shear strength of the full doubler plate thickness. AISC I-9.3c

9 3. Continuity plates shall be provided to match the tested connection. AISC I-10.3

9 4. For restrained connections, provide lateral support for column flanges at the level of both the top and bottom flanges of the beams. AISC I-9.7a(1)

9 5. The unbraced length between lateral supports shall not exceed \( 3600 \frac{r_y}{F_y} \) and lateral bracing shall be provided just beyond the theoretical plastic hinge region. For RBS members tested in accordance with Appendix S, the placement of lateral support for the member shall be consistent with that used in the test. AISC I-10.8

D. ORDINARY MOMENT- RESISTING FRAMES (OMRF)

9 1. Partial-joint-penetration groove welds and fillet welds shall not be used to resist tensile forces in the connections. AISC I-11.2a

9 2. When fully restrained moment connections are made by means of welds of beam flanges or beam-flange connection plates directly to column flanges, continuity plates shall be provided to transmit beam flange forces to the column web or webs. Such plates shall have a minimum thickness equal to that of the beam flange or beam-flange connection plate. AISC I-11.3

9 3. Welded joints of the continuity plates to the column flanges shall be made with either complete-joint-penetration groove welds combined with reinforcing fillet welds, or two-sided fillet welds and shall provide a design strength that is at least equal to the design strength of the contact area of the plate with the column flange. AISC I-11.3

CALCULATIONS

A. GENERAL

9 1. The total static design base shear in a given direction shall be determined per 1630.2.

9 2. In addition to the load combinations listed in 1612, the special seismic load combinations specified in 1612.4 shall also be used when required by 1630.8.2 for discontinuity in lateral force resisting system or 1633.2.6 for collector elements.
3. The drift or horizontal displacements of the structure shall be computed as required in 1630.9.1 and shall be amplified as required in 1630.9.2. Story drift limits shall be determined as specified in 1630.10.~

4. Orthogonal earthquake effects shall be included in the analysis as required in 1633.1.~

5. Required strength of a connection or related member by using LRFD shall be determined from the Expected Yield Strength F_y of the connected member. AISC I-6.2 The design strength of structural steel members and connections by using ASD shall be determined per AISC III-4.3.~

6. When P_u/f P_n for columns is greater than 0.4, the requirements in AISC I-8.2 must be satisfied.~

7. The R value used to determine the base shear shall not be greater than the least R value of the different structural systems as specified in 1630.4.4.~

8. Foundation of the steel frame shall be designed to resist applicable sliding shear, uplift force, and/or moment. Provide calculations and details for design of baseplate, anchor bolts and footings.~

B. SPECIAL MOMENT- RESISTING FRAMES (SMRF)

1. The specified minimum yield strength of steel to be used for members, excluding columns, in which inelastic behavior is expected under the load combinations shall not exceed 50 ksi. AISC I-6.1~

2. The design of all beam-to-column joints and connections shall be based on qualifying cyclic test results in accordance with AISC Appendix S that demonstrate an interstory drift angle of at least 0.04 radians. Qualifying test results shall consist of at least two cyclic tests meeting requirements per AISC I-9.2a~

3. Beam-to-column connection testing shall demonstrate a flexural strength that is at least equal to the nominal plastic moment of the beam, M_p, at the required inelastic rotation. AISC I-9.2b~

4. The required shear strength Vu of a beam-to-column connection shall be determined using the load combination 1.2D + 0.5L + 0.2S plus the shear resulting from the application of 1.1R_y F_yZ in the opposite sense on each end of the beam. AISC I-9.2c~

5. Calculate the required shear strength Ru of the panel-zone per AISC I-9.3a. ~
6. Columns with the ratio in Eq. 9-3 less than or equal to 2.0 and beams shall comply with Width Thickness Ratio in Table I-9-1 in *Seismic Provisions for Structural Steel Buildings*. AISC I-9.4b~

7. Column-beam moment ratio shall be greater than 1.0 as required in AISC I-9.6.~

8. For restrained connections, the requirements shown in AISC I-9.7a(2) shall be followed for columns which cannot be shown to remain elastic outside of the panel-zone.~

9. For unrestrained connections, a column containing a beam-to-column connection with no lateral support transverse to the seismic frame at the connection shall be designed using the distance between adjacent lateral supports as the column height for buckling transverse to the seismic frame. AISC I-9.7b~

10. R value used in determining the base shear shall not exceed 8.5 per Table 16-N.~

C. INTERMEDIATE MOMENT FRAMES (IMRF)

1. The specified minimum yield strength of steel to be used for members, excluding columns, in which inelastic behavior is expected under the load combinations shall not exceed 50 ksi. AISC I-6.1~

2. The design of all beam-to-column joints and connections shall be based on qualifying cyclic test results in accordance with AISC Appendix S that demonstrate an interstory drift angle of at least 0.02 radians. Qualifying test results shall consist of at least two cyclic tests meeting requirements per AISC I-10.2a~

3. Beam-to-column connection testing shall demonstrate a flexural strength that is at least equal to the nominal plastic moment of the beam, $M_p$, at the required inelastic rotation. AISC I-10.2b~

4. The required shear strength $V_u$ of a beam-to-column connection shall be determined using the load combination $1.2D + 0.5L + 0.2S$ plus the shear resulting from the application of $1.1R_yF_yZ$ in the opposite sense on each end of the beam. AISC I-9.2c~

5. The individual thicknesses of column webs and doubler plates, if used, shall not be less than that specified in AISC I-9.3b. ~

6. Columns with the ratio in Eq. 9-3 less than or equal to 2.0 and beams shall comply with Width Thickness Ratio in Table I-9-1 in *Seismic Provisions for Structural Steel Buildings*. AISC I-10.4b~
9 7. Column-beam moment ratio shall be greater than 1.0 as required in AISC I-9.6.

9 8. For restrained connections, the requirements shown in AISC I-9.7a(2) shall be followed for columns which cannot be shown to remain elastic outside of the panel-zone.

9 9. For unrestrained connections, a column containing a beam-to-column connection with no lateral support transverse to the seismic frame at the connection shall be designed using the distance between adjacent lateral supports as the column height for buckling transverse to the seismic frame. AISC I-9.7b

9 10. R value used in determining the base shear shall not exceed 4.5. See footnote 6 in Table 16-N for limitations on building height and dead load of the roof, walls or floors.

D. ORDINARY MOMENT- RESISTING FRAMES (OMRF)

9 1. Fully restrained moment connections that are part of the Seismic Force Resisting System shall be designed for a required flexural strength Mu that is at least equal to 1.1RyMp of the beam or girder or the maximum moment that can be delivered by the system, whichever is less. AISC I-11.2a(1)

9 2. For fully restrained moment connections, the required shear strength Vu of a beam-to-column connections shall be determined using the load combination 1.2D + 0.5L + 0.2S plus the shear resulting from Mu. AISC I-11.2b

9 3. For partially restrained moment connections, Vu shall be determined from the load combination 1.2D + 0.5L + 0.2S plus the shear resulting from the maximum end moment that the partially restrained moment connections are capable of resisting. AISC I-11.2b

9 4. R value used in determining the base shear shall not exceed 3.5. See footnote 6 in Table 16-N for limitations on building height and dead load of the roof, walls or floors.

NOTES ON PLANS

A. General

9 1. The seismic design, fabrication, and erection of structural steel shall be in accordance with Part I, Part III and supplement No. 2 of the Seismic Provisions for Structural Steel Buildings, April 15, 1997, published by the American Institute of Steel Construction (AISC). These provisions shall be applied in conjunction with Chapter 22, Division II. 2210.
2. Welding shall be performed in accordance with a Welding Procedure Specification (WPS) as required in AWS D1.1, 2000 and approved by the Engineer of Record. Specify the required “Welding Procedure Specification” on plans.

3. All complete-joint-penetration groove welds used in the Seismic Force Resisting System shall be made with a filler metal that has a minimum Charpy V-notch toughness of 20 ft-lbs at minus 20°F. AISC I-7.3b

4. Discontinuities in weld created by errors or by fabrication or erection operations, such as tack welds, erection aids, air-arc gouging and flame cutting, shall be repaired as required by the Engineer of Record.

5. All bolts used as a part of the seismic force resisting system shall be fully tensioned high strength bolts.

6. Provide a sign indicating “no attachments allowed in the Reduced Beam Section”.

B. SPECIAL MOMENT- RESISTING FRAMES (SMRF)

1. Abrupt changes in beam flange area are not permitted in plastic hinge regions. AISC I-9.4a

2. Show project specific QA/QC requirements, including contractor qualifications for SMRF on plans. A general reference to AWS or FEMA 350 or 353 is not acceptable.

C. ORDINARY MOMENT- RESISTING FRAMES (OMRF)

1. For connections with welded flange joints, weld backing and run-off tabs shall be removed and repaired including the use of a reinforcing fillet weld, except that the top-flange backing is permitted to remain in place if it is attached to the column flange with a continuous fillet weld on the edge below the complete-joint-penetration groove weld.