8) Torsional effects that are concurrent with the effects of the forces mentioned in Sentence (6) and are caused by the <simultaneous actions of the> following torsional moments shall be considered in the design of the structure according to Sentence (10):

a) torsional moments introduced by eccentricity between the centres of mass and resistance and their dynamic amplification, <and>

b) torsional moments due to accidental eccentricities.

9) Torsional sensitivity shall be determined by calculating the ratio B_x for each level x according to the following equation for each orthogonal direction determined independently:

$$B_x = \delta_{max} / \delta_{ave}$$

where

B = maximum of all values of B_x in both orthogonal directions, except that the B_x for one-*storey* penthouses with a weight less than 10% of the level below need not be considered,

δ_{max} = maximum *storey* displacement at the extreme points of the structure, at level x in the direction of the earthquake induced by the equivalent static forces acting at distances ± 0.10 D_{nx} from the centres of mass at each floor, and

δ_{ave} = average of the displacements at the extreme points of the structure at level x produced by the above-mentioned forces.

10) Torsional effects shall be accounted for as follows:

a) for a *building* with $B \leq 1.7$ <or where $I_E F_a S_a(0.2)$ is less than 0.35,> by applying torsional moments about a vertical axis at each level throughout the *building*, derived for each of the following load cases considered separately:

i) $T_x = F_x(e_x + 0.10\ D_{nx})$, and

ii) $T_x = F_x(e_x - 0.10\ D_{nx})$

where F_x is the lateral force at each level determined according to Sentence (6) and where each element of the *building* is designed for the most severe effect of the above load cases, or

b) for a *building* with $B > 1.7$, in cases where $I_E F_a S_a(0.2)$ is equal to or greater than 0.35, by a Dynamic Analysis Procedure as specified in Article 4.1.8.12.

11) Where the fundamental lateral period, T_a, is determined by Clause (3)(d) for *buildings* constructed with 5 or 6 *storeys* of continuous *combustible construction* as permitted by Article 3.2.2.50. and having an SFRS of nailed shear walls with wood-based panels, the lateral earthquake force, V, as determined in Sentence (2) shall be multiplied by 1.2.

4.1.8.12. Dynamic Analysis Procedure

1) The Dynamic Analysis Procedure shall be in accordance with one of the following methods:

a) Linear Dynamic Analysis by either the Modal Response Spectrum Method or the Numerical Integration Linear Time History Method using a structural model that complies with the requirements of Sentence 4.1.8.3.(8) (see Appendix A), or

b) Non-linear Dynamic Analysis, in which case a special study shall be performed (see Appendix A).

2) The spectral acceleration values used in the Modal Response Spectrum Method shall be the design spectral acceleration values, S(T), defined in <Sentence 4.1.8.4.(7)>.

3) The ground motion histories used in the Numerical Integration Linear Time History Method shall be compatible with a response spectrum constructed from the design spectral acceleration values, S(T), defined in <Sentence 4.1.8.4.(7)>. (See Appendix A.)

4) The effects of accidental torsional moments acting concurrently with the lateral earthquake forces that cause them shall be accounted for by the following methods:

a) the static effects of torsional moments due to $(\pm 0.10\ D_{nx})F_x$ at each level x, where F_x is <either determined from the elastic dynamic analysis or> determined from Sentence 4.1.8.11.(6) <multiplied by $R_d R_o / I_E$>, shall be combined with the effects determined by dynamic analysis (see Appendix A), or

b) if B, as defined in Sentence 4.1.8.11.(9), is less than 1.7, it is permitted to use a three-dimensional dynamic analysis with the centres of mass shifted by a distance of $-0.05\ D_{nx}$ and $+\ 0.05\ D_{nx}$.

5) <Except as provided in Sentence (6), the design elastic base shear, V_{ed}, is equal to the elastic base shear, V_e, obtained from a Linear Dynamic Analysis.

6) For structures located on sites other than Class F that have an SFRS with R_d equal to or greater than 1.5, the elastic base shear obtained from a Linear Dynamic Analysis may be multiplied by the following factor to obtain the design elastic base shear, V_{ed}:

$$\frac{2S(0.2)}{3S(T_a)} \; 1.0$$

>

7) The <design elastic base shear, V_{ed}>, shall be multiplied by the importance factor, I_E, as determined in Article 4.1.8.5., and shall be divided by R_dR_o, as determined in Article 4.1.8.9., to obtain the <design> base shear, V_d.

8) Except as required by <Sentences (9)> or (12), if the base shear, V_d, obtained in <Sentence (7)> is less than 80% of the lateral earthquake design force, V, of Article 4.1.8.11., V_d shall be taken as 0.8 V.

9) For irregular structures requiring dynamic analysis in accordance with Article 4.1.8.7., V_d shall be taken as the larger of the V_d determined in Sentence (7) and 100% of V.

10) Except as required by <Sentence (11)>, the values of elastic *storey* shears, *storey* forces, member forces, and deflections obtained from the Linear Dynamic Analysis<, including the effect of accidental torsion determined in Sentence (4),> shall be multiplied by V_d/V_e to determine their design values, where V_d is the base shear.

11) For the purpose of calculating deflections, it is permitted to use a value for V based on the value for T_a determined in Clause 4.1.8.11.(3)(d) to obtain V_d in <Sentences (8) and (9)>.

12) The base shear, V_d, shall be taken as 100% of the lateral earthquake design force, V, as determined by Article 4.1.8.11. for *buildings*

a) constructed with 5 or 6 *storeys* of continuous *combustible construction* as permitted by Article 3.2.2.50.,

b) having an SFRS of nailed shear walls with wood-based panels, and

c) having a fundamental lateral period, T_a, as determined by Clause 4.1.8.11.(3)(d).

4.1.8.13. Deflections and Drift Limits

1) Lateral deflections of a structure shall be calculated in accordance with the loads and requirements defined in this Subsection.

2) Lateral deflections obtained from a linear elastic analysis using the methods given in Articles 4.1.8.11. and 4.1.8.12. and incorporating the effects of torsion, including accidental torsional moments, shall be multiplied by R_dR_o/I_E to give realistic values of anticipated deflections.

3) Based on the lateral deflections calculated in Sentence (2), the largest inter*storey* deflection at any level shall be limited to 0.01 h_s for *post-disaster buildings*, 0.02 h_s for <High Importance Category *buildings*>, and 0.025 h_s for all other *buildings*.

4) The deflections calculated in Sentence (2) shall be used to account for sway effects as required by <Sentence 4.1.3.2.(12)>. (See Appendix A.)

4.1.8.14. Structural Separation

1) Adjacent structures shall either be separated by the square root of the sum of the squares of their individual deflections calculated in Sentence 4.1.8.13.(2), or shall be connected to each other.

2) The method of connection required in Sentence (1) shall take into account the mass, stiffness, strength, ductility and anticipated motion of the connected *buildings* and the character of the connection.

3) Rigidly connected *buildings* shall be assumed to have the lowest R_dR_o value of the *buildings* connected.

4) *Buildings* with non-rigid or energy-dissipating connections require special studies.

4.1.8.15. Design Provisions

1) <Except as provided in Sentences (2) and (3), diaphragms, collectors, chords, struts> and connections shall be designed so as not to yield, and the design shall account for the shape of the diaphragm, including openings, and for the forces generated in the diaphragm due to the following cases, whichever one governs (see Appendix A):

a) forces due to loads determined in Article 4.1.8.11. or 4.1.8.12. applied to the diaphragm are increased to reflect the lateral load capacity of the SFRS, plus forces in the diaphragm due to the transfer of forces between elements of the SFRS associated with the lateral load capacity of such elements and accounting for discontinuities and changes in stiffness in these elements, or

b) a minimum force corresponding to the design-based shear divided by N for the diaphragm at level x.