Definitions in Engineering Seismology

1. Active Fault. A fault, which has moved during the recent geologic past (Quarternary) and, thus, may move again. It may or may not generate earthquakes.

2. Amplification. Modification of the input bedrock ground motion by the overlying unconsolidation materials. Amplification causes the amplitude of the surface ground motion to be increased in some range of frequencies and decreased in others. Amplification is a function of the shear wave velocity and damping of the unconsolidated materials, its thickness and geometry, and the strain level of the input rock motion.

3. Attenuation. Decrease in amplitude of the seismic waves with distance due to geometric spreading, energy absorption and scattering.

4. Bedrock. Any sedimentary, igneous, or metamorphic material represented as a unit in geology; being a sound and solid mass, layer, or ledge of mineral matter; and with shear wave velocities greater than 2500 feet per second.

5. Capable Fault. An active fault that is judged capable of producing macroearthquakes. It is defined as a fault that can be shown to exhibit one or more of the following characteristics:

a. Movement at or near the ground surface at least once within the past 35,000 years.

b. Macroseismicity (3.5 magnitude or greater) instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault.

c. A structural relationship to a capable fault such that movement on one fault could be reasonably expected to cause movement on the other.

d. Established patterns of microseismicity that define a fault and historic macroseismicity that can reasonably be associated with that fault.

6. Design Earthquakes. Design earthquakes define the ground motion at the site of the structure and form the basis for dynamic response analyses. Usually, several design earthquakes for both the maximum credible earthquake and the operating basis earthquake, as applicable, are investigated.

7. Dispersion. Distortion of the shape of a seismic-wave train because of variation of velocity with frequency.

8. Duration of Strong Ground Motion. In Inclosure 2 "bracketed duration" is used as the time interval between the first and last acceleration peaks that are equal to or greater than 0.05 gravity.

Inclosure 1

9. Epicenter. Point on the Earth's surface vertically above the earthquake focus or hypocenter.

10. Fault. A fracture or fracture zone in the earth along which there has been displacement of the two sides relative to one another parallel to the fracture.

11. Free Field. A ground area which is not influenced by topography or man-made structures and boundary effects are not significant.

12. Ground Motion Parameters. Numerical values representing vibratory ground motion, such as particle acceleration, velocity, and displacement, frequency content, predominant period, spectral intensity, and duration.

13. Hypocenter. The location within the Earth where the sudden release of energy is initiated. Also, the focus of an earthquake.

14. Intensity. A numerical index describing the effects of an earthquake on mankind, on structures built by mankind and on the earth's surface. The scale in common use in the U. S. today is the Modified Mercalli Intensity Scale of 1931 with grades indicated by Roman numerals from I to XII.

15. Magnitude (Earthquake). A measure of the strength of an earthquake, or the strain energy released by it, as determined by seismographic observations. C.F. Richter first defined local magnitude as the logarithm, to the base 10, of the amplitude in microns of the largest trace deflection that would be observed on a standard torsion seismograph at a distance of 100 km. from the epicenter. Magnitudes determined at teleseismic distances are called body-wave magnitude and surface-wave magnitude. The local, body-wave and surface-wave magnitude of an earthquake do not necessarily have the same numerical value.

16. Maximum Credible Earthquake (MCE). The earthquake(s) associated with specific seismotectonic structures, source areas, or provinces that would cause the most severe vibratory ground motion or foundation dislocation capable of being produced at the site under the currently known tectonic framework. It is determined by judgment based on all known regional and local geological and seisomological data.

17. Operating Basis Earthquake (OBE). The earthquake(s) for which the structure is designed to resist and remain operational. It may be determined on a probabilistic basis considering the regional and local geology and seismology and reflects the level of earthquake protection desired for operational or economic reasons. The OBE is usually taken as the earthquake producing the maximum motions at the site once in 100 years (recurrence interval).

18. Particle Acceleration. The time rate of change of particle velocity.

19. Particle Displacement. The difference between the initial position of a soil particle and any later temporary position during shaking.

20. Particle Velocity. The time rate of change of particle displacement.

21. Predominant Period. The period(s) at which maximum spectral energy is concentrated.

22. Response Spectrum. The maximum values of acceleration, velocity, and/or displacement of an infinite series of single-degree-of-freedom system subjected to an earthquake. The maximum response values are expressed as a function of natural period for a given damping. The response spectrum acceleration, velocity, and displacement values may be calculated from each other assuming a sinusoidal relationship between them.

23. Scaling. An adjustment to an earthquake time history or response spectrum where the amplitude of acceleration, velocity, and/or displacement is increased or decreased, usually without change to the frequency content of the ground motion. There are other methods to scale earthquakes and, if used, they should be clearly defined. The earthquake time history or response spectrum can be scaled based on ground motion parameters of peak acceleration, peak velocity, peak displacement, spectrum intensity, or other appropriate parameters.

24. Seismotectonic Province. A geographic area characterized by a combination of geology and seismic history.