

1.5 Expected Earthquake Analyses

To increase the earthquake resistance of structures, institutions and communities, it is often useful to study the effects of a particular earthquake (a deterministic or design earthquake scenario). It is also important to consider the overall likelihood of damage from a plausible suite of earthquakes. This approach is called probabilistic seismic hazard analysis (PSHA), and takes into account the recurrence rates of likely, damaging earthquakes on each fault in the area, as well as the potential ground motion that may result from each of these earthquakes. As is true for most earthquake-prone regions, many potential earthquake sources pose a threat to the County of Riverside. Which earthquake to consider depends on the application of the analysis.

1.5.1 Design Earthquakes

A **maximum probable earthquake** (MPE) is the largest earthquake a fault is predicted capable of generating within a specified time period of concern, say 30 or 100 years. Maximum probable earthquakes are most likely to occur within the time span of most development, and therefore, are commonly used in assessing seismic risk. Nevertheless, the **maximum credible earthquake** (MCE), i.e. the largest earthquake a fault is believed capable of generating, is considered in a number of planning and engineering decisions. For example, MCEs are used in the design of critical facilities like dams, fire stations, and emergency operation centers. They are also used in urban and emergency planning to identify and mitigate the risk of worst-case scenarios.

For design purposes, a worst case scenario earthquake (the MCE) for Riverside County is a magnitude 7.9 based on the rupture of the entire southern segment of the San Andreas fault from Cajon Pass to the Salton Sea. While other scenarios will expose portions of the County to intense ground shaking locally that is locally as severe as the MCE, the MCE exposes most of the County to very high intensity ground shaking.

Below are estimate of several key ground shaking parameters near the fault rupture zone for the MCE, expressed as a percentage of gravity. Peak ground acceleration, the maximum acceleration achieved at a site, often turns out to be the earthquake effect that causes most damage to buildings. The periods, 0.3 seconds and 1.0 second represent lengths of seismic waves that commonly damage structures. All of these values are well above the threshold for heavy damage (see Table 1-1).