

Mitigation against Earthquakes

The greatest impact on protecting human and animal lives in earthquakes has come primarily from improved mitigation measures. Damage to buildings from earthquakes occurs primarily as a result of lateral movement. Buildings that are most susceptible to damage are those designed and built before the current building codes were implemented. Building codes are determined by professional assessors and are agreed upon as Uniform Building Codes. The National Institute of Building Sciences, under a cooperative agreement with FEMA, is developing a nationally applicable standardized method for estimating potential earthquake losses on a regional basis. This method is known as "Hazard U.S." (HAZUS) and will also be used to stimulate mitigation actions.

Homeowners and owners of buildings, such as veterinary practices, animal shelters, and other businesses, can get a preliminary idea of the potential susceptibility of their building by looking at Table 8-5. In this table the times at which codes were introduced are summarized. Buildings built before the dates shown should be investigated to discover whether they were built according to newer standards or whether they need to be upgraded. This is particularly important for veterinary practices and animal shelters that are intended to function as critical care facilities after an earthquake. Common structural deficits found in buildings in earthquake zones are described in Table 8-6. Many of the structural measures used to improve existing buildings and structures are referred to as retrofitting procedures.

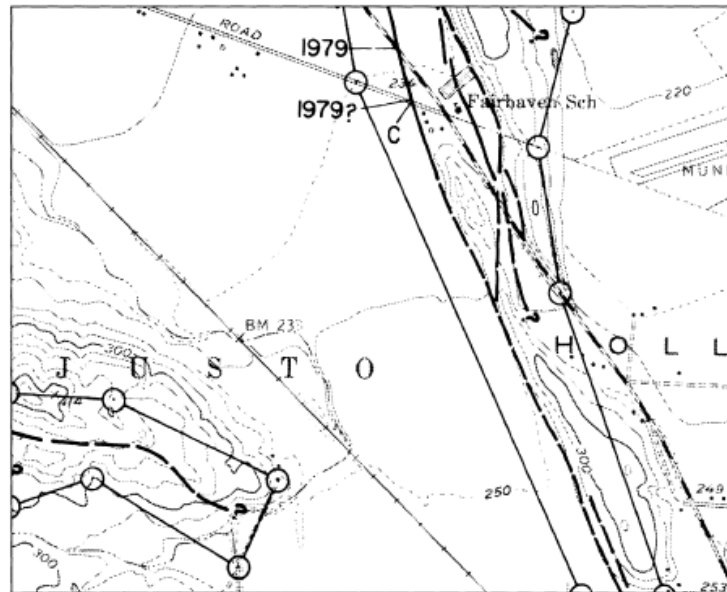


FIG. 8-7 Portion of a typical special studies zones map. (From Hart EW: *Fault-rupture hazard zones in California*, Special Publication no. 42:6, Sacramento, Calif, 1992, Division of Mines and Geology.)

Table 8-5 Uniform Building Codes for California and date of implementation

1927	First Uniform Building Code (UBC) issued; code primarily concerned with fire safety
1935	UBC requires foundation bolting and reinforcement of masonry foundations
1946	UBC requires some reinforcement of masonry chimneys
1961	UBC requires all structural members to resist earthquake forces
1973	UBC requires bracing of all cripple walls
1976	Soil site included in zone determination; special requirements for emergency response facilities introduced
1986	First retrofit laws requiring local governments to catalogue unreinforced masonry buildings and to develop a mitigation program
1989	Local governments required to adopt the same version of the UBC
1991	UBC increases the requirements for bracing cripple walls and requires bracing of water heaters
1993	Sellers of residential property required to disclose seismic weaknesses to buyers
1993	Codes regulating how to retrofit are adopted
