



## Northern California Chapter of the Earthquake Engineering Research Institute

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## Best Practices

### Health Care Seismic Retrofit

*Kaiser Permanente  
Implemented 1990-present*

#### Description

Kaiser Permanente is a health maintenance organization serving more than 6.3 million members throughout California via 28 major medical centers. This major California health care resource has started seismic mitigation work on many of its hospitals, for example completing in 2001 a \$100 million seismic rehabilitation of its San Francisco hospital. This included excavating under hospital buildings to reinforce foundations and joints, adding walls to the hospital's exterior to function as shear walls, and strapping air dampers and ceiling light fixtures. Kaiser plans to have all of its hospitals be able to continue in service after earthquakes by the year 2013 and thus meet the functionality standard 17 years in advance of requirements set by California Senate Bill 1953.

#### Problem

Health care is a critical need in communities, after disasters as well as before. Assuring that communities have hospitals that are able to provide medical care services following a major earthquake is a great benefit to California's communities. However, the cost of maintaining such functional hospitals is great.

When the Loma Prieta earthquake struck the San Francisco Bay area in 1989, Kaiser Permanente, a leading health care organization founded in 1948, experienced damage to its administrative building in Oakland, which was evacuated and closed, and to its Santa Clara Medical Center, where the chiller and cooling towers were moved off their supports. The wisdom of having a seismic mitigation program was reinforced in 1994 when the Northridge earthquake struck the Los Angeles and San Fernando Valley area. This earthquake caused significant damage including the collapse of Kaiser Permanente's Granada Hills medical office building and partial collapse of a Kaiser multi-story parking structure in Los Angeles. Kaiser Permanente hospitals in Los Angeles and Panorama City were also damaged, as were a number of other hospitals in the greater Los Angeles area.

#### Solution

Begun in 1990, the first phase of Kaiser's seismic mitigation program was to elevate the structural status of its medical and administrative buildings. Kaiser hired two structural engineering firms to conduct thorough reviews of its 28 major medical centers and approximately



300 medical and administrative buildings in California. Kaiser then established standards for its buildings. All hospital buildings would remain in service following a major earthquake. All other buildings would protect occupants from serious injury or death (i.e. meet a life safety standard), but might not be able to be utilized following a major earthquake. Next, Kaiser began funding work to achieve these standards --- replacing 13 of its hospitals (or in-patient towers) with new ones, seismically retrofitting other hospital buildings and vacating buildings that are no longer useful.

Non-structural mitigation including anchoring all major furniture, building and medical equipment has been mostly completed in Kaiser's buildings. Kaiser has also established an aggressive employee emergency preparedness program including funding for an amateur radio network that would link the company's facilities in northern and southern California.

Earthquake mitigation of hospitals is expensive and complex. In addition to the question of how to strengthen a hospital to withstand earthquake damage, Kaiser also has to factor in the potential disruption to patient care services, the functionality and flexibility of the hospitals for the future, and the value of replacing facilities as contrasted to seismically retrofitting hospitals. In addition, Kaiser analyzed the community hospital's capacity and advisability of upgrading or replacing a hospital versus the potential to utilize existing community services. Kaiser Permanente did this analysis and concluded that it needed to seismically improve its own hospitals, as community hospitals did not have the capacity to meet Kaiser member's needs.

#### Resources

Kaiser estimates that it will spend more than \$4 billion to build new hospitals and to seismically upgrade its existing hospitals. The majority of this cost will be fund by Kaiser Permanente directly, with approximately \$227 million funded through the Federal Emergency Management Agency's (FEMA) Seismic Mitigation Program for Hospitals. Nevertheless, Kaiser's administration believes it makes sense to fund this level of hospital seismic improvements now.

#### Adaptability/Sustainability

Because of the importance of providing hospital services to its members and to the communities it serves, Kaiser Permanente has launched a capital program to have all its hospitals meet life safety standards - and the majority of its hospitals be able to stay in service following a major earthquake - by 2013. Kaiser believes that these hospital seismic improvements will enhance the medical care capabilities of communities for decades to come --- a wise investment both for Kaiser Permanente and the communities it serves.