

Making Sense of the Modified Mercalli Intensity Scale (MMI) – A Measure of Shaking

The Modified Mercalli Intensity (MMI) estimates the shaking intensity from an earthquake at a specific location by considering its effects on people, objects, and buildings.

At high intensities (above MMI 6), earthquake shaking damages buildings. The severity of the damage depends on the building type, the age of the building, and the quality of the construction. Masonry and non-ductile concrete buildings can be more severely damaged than wood-frame or engineered buildings. Buildings built to older building codes can be more severely damaged than recently constructed buildings using newer codes.

The table describes the damage that three Bay Area building types can experience at the five highest shaking intensity levels expected in the San Francisco Bay region. Note that the expected damage varies with quality of construction and level of retrofitting. To accurately evaluate how your house will perform in an earthquake, it should be evaluated by a structural engineer or an appropriately certified contractor.

Larger buildings that do not fit the categories described in the table, such as multi-unit high-rise apartment buildings, typically undergo a higher level of engineering design prior to construction, but older buildings of this type can be very vulnerable to damage in earthquakes. Evaluation of larger structures for earthquake safety and the need for retrofitting is far more complicated than can be addressed here and an engineer should perform a building evaluation.

View MMI Shaking Intensity of Scenario Earthquakes

MMI is used to depict possible shaking intensities from 12 different Bay Area earthquake scenarios. You can explore the earthquake scenario maps using the [Online Hazard Viewer](#). The colors on the table correspond to MMI values shown on the Online Hazard Viewer.

Resources for Residents to Take Action

Residents of any of these structures can take positive actions to reduce their earthquake losses and risks. Methods exist to retrofit structures and to secure building contents to prevent damage and loss in future earthquakes. More detail on specific structures is included on the homequakequiz.org website. [Earthquake insurance](#) is an option to cover catastrophic losses.

Source of Information

The table and MMI descriptions were developed by ABAG and the Earthquake Mapping Update Advisory Committee in 2013 as part of a project generously funded with a grant from the USGS Earthquake Hazards Program. For more on MMI, visit the [US Geological Survey MMI Resource](#). For more information on ABAG and the Resilience Program, visit www.abag.ca.gov.

How building contents and 3 building types perform under different shaking intensities.

Intensity	Building Contents	Masonry Buildings	Multi-Family Wood-Frame Buildings	1 and 2 Story Wood-Frame Buildings
				
MMI 6 Strong Shaking	Some items thrown from shelves, pictures shifted, water thrown from pools.	Some walls and parapets of poorly constructed buildings crack.	Some drywall cracks.	Some chimneys are damaged, some drywall cracks. Some slab foundations, patios, and garage floors slightly crack.
MMI 7 Very Strong Shaking	Many items are thrown from walls and shelves. Furniture shifts.	Poorly constructed buildings are damaged and some well-constructed buildings crack. Cornices and unbraced parapets fall.	Plaster cracks, particularly at inside corners of buildings. Some soft-story buildings strain at the first floor level. Some partitions deform.	Many chimneys are broken and some collapse, damaging roofs, interiors, and porches. Weak foundations can be damaged.
MMI 8 Severe Shaking	Nearly everything is thrown down from shelves, cabinets, and walls. Furniture overturned.	Poorly constructed buildings suffer partial or full collapse. Some well-constructed buildings are damaged. Unreinforced walls fall.	Soft-story buildings are displaced out of plumb and partially collapse. Loose partition walls are damaged and may fail. Some pipes break.	Unbolted houses shift off the foundation, or partially collapse if cripple walls are not braced. Structural elements (e.g. beams, joists, and foundations) are damaged. Some pipes break.
MMI 9 Violent Shaking	Only very well anchored contents remain in place.	Poorly constructed buildings collapse. Well-constructed buildings are heavily damaged. Retrofitted buildings damaged.	Soft-story buildings partially or completely collapse. Some well-constructed buildings are damaged.	Poorly constructed buildings are heavily damaged, some partially collapse. Some well-constructed buildings are damaged.
MMI 10 Extreme Shaking	Only very well anchored contents remain in place.	Retrofitted buildings are heavily damaged, and some partially collapse.	Many well-constructed buildings are damaged.	Well-constructed buildings are damaged.