

Modified Mercalli Scale vs. Richter Scale



Intensity category	Effects	Magnitude scale
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8 +

Earthquake Magnitude and Energy Equivalence

Earthquake Magnitude	Energy Released* (Millions of Ergs)	Approximate Energy Equivalence
0	630,000	1 pound of explosives
1	20,000,000	
2	630,000,000	Energy of lightning bolt
3	20,000,000,000	
4	630,000,000,000	1000 pounds of explosives
5	20,000,000,000,000	
6	630,000,000,000,000	1946 Bikini atomic bomb test 1994 Northridge Earthquake
7	20,000,000,000,000,000	1989 Loma Prieta Earthquake
8	630,000,000,000,000,000	1906 San Francisco Earthquake 1980 Eruption of Mount St. Helens
9	20,000,000,000,000,000,000	1964 Alaskan Earthquake 1960 Chilean Earthquake
10	630,000,000,000,000,000,000	Annual U.S. energy consumption

barely
felt →

One unit of magnitude increase corresponds to ~10-fold increase in intensity and ~30-fold increase in energy.

How common are earthquakes?

- It is estimated that **around 500,000 earthquakes occur each year**, detectable with current instrumentation.
- About **100,000** of these **can be felt** (ground shaking during a moderate to large earthquake typically lasts about 10 to 30 seconds).
- **Minor earthquakes occur nearly constantly** around the world; **larger earthquakes occur less frequently**.
- While most earthquakes are caused by movement of the Earth's tectonic plates, the following human activities can also produce earthquakes:
 - storing large amounts of water behind a dam
 - drilling and injecting liquid into wells
 - coal mining and oil drilling/fracking