Modified Mercalli Scale

I. People do not feel any Earth movement.

II. A few people might notice movement if they are at rest and/or on the upper floors of tall buildings.

III. Many people indoors feel movement.
Hanging objects swing back and forth.
People outdoors might not realize that an earthquake is occurring.

IV. Most people indoors feel movement.
Hanging objects swing.
Dishes, windows, and doors rattle.
The earthquake feels like a heavy truck hitting the walls.
A few people outdoors may feel movement. Parked cars rocked.

V. Almost everyone feels movement.
Sleeping people are awakened.
Doors swing open or close.
Dishes are broken.
Pictures on the wall move.
Small objects move or are turned over.
Trees might shake.
Liquids might spill out of open containers.

VI. Everyone feels movement.
People have trouble walking.
Objects fall from shelves.
Pictures fall off walls.
Furniture moves.
Plaster in walls might crack.
Trees and bushes shake.
Damage is slight in poorly built buildings.
No structural damage.

VII. People have difficulty standing.
Drivers feel their cars shake.
Some furniture breaks.
Loose bricks fall from buildings.
Damage is slight to moderate in well-built buildings, considerable in poorly-built buildings.

VIII. Drivers have trouble steering.
Houses that are not bolted down might shift on their foundations.
Tall structures such as towers and chimneys might twist and fall.
Well-built buildings suffer moderate damage.
Poorly-built structures suffer severe damage.
Tree branches break.
Hillsides might crack if the ground is wet.
Water level in wells might change.

IX. Well-built buildings suffer considerable damage.
Houses that are not bolted down move off their foundations.
Some underground pipes are broken.
The ground cracks.
Reservoirs suffer serious damage.

X. Most buildings and their foundations are destroyed.
Some bridges are destroyed.
Dams are seriously damaged.
Large landslides occur.
Water is thrown on the banks of canals, rivers, lakes.
The ground cracks in large areas.
Railroad tracks are bent slightly.

XI. Most buildings collapse.
Some bridges are destroyed.
Large cracks appear in the ground.
Underground pipelines are destroyed.
Railroad tracks are badly bent.

XII. Almost everything is destroyed.
Objects are thrown into the air.
The ground moves in waves or ripples.
Large amounts of rock may move.

Modified Mercalli Intensity Scale

I. Not felt. Marginal and long period effects of large earthquakes.

II. Felt by persons at rest, on upper floors, or favorably placed.

III. Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.

IV. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frame creak.

V. Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.

VI. Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).

VII. Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

VIII. Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.

X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly. Rails bent greatly. Underground pipelines completely out of service. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

The Richter And Mercalli Scales

The strength of an earthquake is usually measured on one of two scales, the Modified Mercalli Scale and the Richter Scale. The Mercalli Scale is a rather arbitrary set of definitions based upon what people in the area feel, and their observations of damage to buildings around them.
The scale goes from 1 to 12, (I to XII) or using the descriptive titles of the levels, from Instrumental to Catastrophic.

Modified Mercalli Scale

Intensity	Verbal Description	Magnitude	Witness Observations
I	Instrumental	1 to 2	Detected only by seismographs
II	Feeble	2 to 3	Noticed only by sensitive people
III	Slight	3 to 4	Resembling vibrations caused by heavy traffic
IV	Moderate	4	Felt by people walking; rocking of free standing objects
V	Rather Strong	4 to 5	Sleepers awakened and bells ring
VI	Strong	5 to 6	Trees sway, some damage from overturning and falling object
VII	Very Strong	6	General alarm, cracking of walls
VIII	Destructive	6 to 7	Chimneys fall and there is some damage to buildings
IX	Ruinous	7	Ground begins to crack, houses begin to collapse and pipes break
X	Disasterous	7 to 8	Ground badly cracked and many buildings are destroyed.There are some landslides
XI	Very Disasterous	8	Few buildings remain standing; bridges and railways destroyed;water, gas, electricity and telephones out of action.
XII	Catastrophic	8 or greater	Total destruction; objects are thrown into the air,much heaving,shaking and distortion of the ground

Whilst this scale is fine if you happen to experience an earthquake in an inhabited area of a developed country, it is of no use whatsoever in the middle of a desert or in any other place without trees, houses and railways! Descriptions such as "Resembling vibrations caused by heavy traffic." depend very much upon the observer having felt heavy traffic in the past. Even then, what one person in a small town considers to be 'heavy' will most certainly differ from what a person living adjacent to a major urban road system would describe as 'heavy'.

Clearly this scale has advantages, but something else is required if we are to be able to compare the magnitude of earthquakes wherever they occur. The Intensity Scale differs from the **Richter Magnitude Scale** in that the effects of any one earthquake vary greatly from place to place, so there may be many **Intensity** values (e.g.: **IV**, **VII**) measured for the same earthquake. Each earthquake, on the other hand, should have only one **Magnitude**, although the various methods of calculating it may give slightly different values (e.g.: **4.5**, **4.6**).

The Richter Scale is designed to allow easier comparison of earthquake magnitudes, regardless of the location.

Plate Tectonic - Hazards (4)
Post Lab

SCALE OF EARTHQUAKE INTENSITIES WITH APPROXIMATELY CORRESPONDING MAGNITUDES

MERCALLI INTENSITY	DESCRIPTION	RICHTER MAGNITUDE
I.	*INSTRUMENTAL*: detected only by seismographs	3.5
II.	*FEEBLE*: noticed only by sensitive people	4.2
III.	*SLIGHT*: like the vibrations due to a passing train; felt by people at rest, especially on upper floors	4.3
IV.	*MODERATE*: felt by people while walking; rocking of loose objects, including standing houses	4.8
V.	*RATHER STRONG*: felt generally; most sleepers are awakened and bells ring	4.9 - 5.4
VI.	*STRONG*: trees sway and all suspended objects swing; damage by overturning and falling of loose objects	5.5 - 6.0
VII.	*VERY STRONG*: general alarm; walls crack; plaster falls	6.1
VIII.	*DESTRUCTIVE*: car drivers seriously disturbed; masonry fissured; chimneys fall; poorly constructed buildings damaged	6.2
IX	*RUINOUS*: some houses collapse where ground begins to crack, and pipes break open	6.9
X	*DISASTROUS*: ground cracks badly; many buildings destroyed and railway lines bent; landslides on steep slopes	7.0 - 7.3
XI	*VERY DISASTROUS*: few buildings remain standing; bridges destroyed; all services (railways, pipes and cables) out of action; great landslides and floods	7.4 - 8.1
XII	*CATASTROPHIC*: total destruction; objects thrown into air; ground rises and falls in waves	> 8.1

Mercalli scale

instrumental	People do not feel any Earth movement.
lightest	A few people might notice movement if they are at rest and/or on the upper floors of tall buildings.
light	Many people indoors feel movement. Hanging objects swing back and forth. People outdoors might not realize that an earthquake is occurring.
mediocre	Most people indoors feel movement. Hanging objects swing. Dishes, windows, and doors rattle. The earthquake feels like a heavy truck hitting the walls. A few people outdoors may feel movement. Parked cars rock.
strongly	Almost everyone feels movement. Sleeping people are awakened. Doors swing open or close. Dishes are broken. Pictures on the wall move. Small objects move or are turned over. Trees might shake. Liquids might spill out of open containers.
much fort	Everyone feels movement. People have trouble walking. Objects fall from shelves. Pictures fall off walls. Furniture moves. Plaster in walls might crack. Trees and bushes shake. Damage is slight in poorly built buildings. No structural damage.
strong	People have difficulty standing. Drivers feel their cars shaking. Some furniture breaks. Loose bricks fall from buildings. Damage is slight to moderate in well-built buildings; considerable in poorly built buildings.
violent	Drivers have trouble steering. Houses that are not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Well-built buildings suffer slight damage. Poorly built structures suffer severe damage. Tree branches break. Hillsides might crack if the ground is wet. Water levels in wells might change.
disastrous	Well-built buildings suffer considerable damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks. Reservoirs suffer serious damage.
most disastrous	Most buildings and their foundations are destroyed. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, lakes. The ground cracks in large areas. Railroad tracks are bent slightly.
catastrophic	Most buildings collapse. Some bridges are destroyed. Large cracks appear in the ground. Underground pipelines are destroyed. Railroad tracks are badly bent.
great catastrophe	Almost everything is destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move.

Richter Scale → Mercalli Scale

Richter Scale		Mercalli Scale
< 3.5	< 1.6 E+7	I
3.5	1.6 E+7	II
4.2	7.5 E+8	III
4.5	4 E+9	IV
4.8	2.1 E+10	V
5.4	5.7 E+11	VI
6.1	2.8 E+13	VII
6.5	2.5 E+14	VIII
6.9	2.3 E+15	IX
7.3	2.1 E+16	X
8.1	> 1.7 E+18	XI
> 8.1		XII

earthquake severity

Richter Scale →

less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.