

ATTACHMENT B

Seismic Hazard Ratings

The Seismic Hazard Rating (SHR) is assigned to a building as a means of estimating how the building will perform during a large (see Note 1, below) future earthquake and the amount of damage the building is projected to sustain. The ratings are described below:

Good SHR

Damage Estimate: *Minor Damage* (Note 3)

Description: Some structural or non-structural damage and/or falling hazards may occur, but these would pose minimal life hazards to occupants.

Fair SHR

Damage Estimate: *Moderate Damage* (Note 3)

Description: Structural and non-structural damage and/or falling hazards are anticipated which would pose low life hazards to occupants.

Poor SHR

Damage Estimate: *Major Damage* (Note 3)

Description: Structural and non-structural damage are anticipated which would pose appreciable life hazards to occupants.

Very Poor SHR

Damage Estimate: *Partial/Total Collapse* (Note 3)

Description: Extensive structural and non-structural damage, potential structural collapse and/or falling hazards (Note 2) are anticipated which would pose high life hazards to occupants.

Notes:

1. A "**large**" future earthquake is defined for purposes of these ratings as an earthquake at the site that would be expected for the seismic zone and Modified Mercalli Intensity Scale (MMI) rating identified in the Scope of Work. A MMI scale follows on next page.
2. "**Falling Hazards**" are defined for the purposes of these seismic performance ratings as potential falling or sliding hazards such as interior and exterior building elements including parapets, ornamentation, chimneys, walls, and partitions, but excluding equipment, fixtures, ceilings, furniture, furnishings, and other contents. The falling hazards in the excluded list above should not be used in the determination of the seismic performance rating of a building or structure but should be abated.
3. **Damage Estimate:** It is impossible to predict the amount of damage and repairs buildings will require after a large earthquake event, based on a SHR. It is reasonable to assume that buildings rated Very Poor or Poor may not be repairable, and may have restricted access following a large earthquake event. Buildings rated Fair or Good may be repairable, but some disruption and limits on access can be expected after a large earthquake event.
4. A "**Life Safety Level of Performance**" is used as a basis for evaluating a building structure and establishing the SHR, following the ASCE 31-03 Standard for Seismic Evaluation of Existing Buildings.

Modified Mercalli Intensity Scale and Related Seismic Zone

UBC 1997 Zone *	Intensity	Description
2A	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 [intensity] IV, wooden walls and frames 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).
2B	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.
3	VIII	Steering of motor cars affected. Damage to masonry C; partial collapse. Some 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.
4	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 alluviated 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. Railroad rails bent slightly.
	XI	Railroad rails bent greatly. Underground pipelines completely out of service.
	XII	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

* Correlation between Zone and Intensity is approximate to provide basis for defining a large future earthquake. Consult OBO seismic engineers for further clarification, if needed.

Definition of Masonry A, B, C, D:

Masonry A. Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

Masonry B. Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.

Masonry C. Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at the corners, but neither reinforced nor designed against horizontal forces.

Masonry D. Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.