

**SAMPLE  
Seismic Risk Assessment Requirements**

***Purpose:***

This Structural/Seismic Screening Protocol is intended to identify structures which: (1) may pose a high risk to life-safety, and (2) may exceed the tolerable risk of property damage resulting from earthquake related hazards.

***Scope of Review:***

The following earthquake-related underwriting standards shall pertain to all new commercial mortgage and equity investments made in connection with new or existing building construction located within Seismic Zones 3 and 4, as defined by the 1997 edition of the Uniform Building Code Seismic Zone Map.

ASTM E2026 and E2557 standards for the appropriate level of review are required as shown in the following table:

**ASTM E2557 Level of Review**

Project Value	UBC Seismic Zone			
	0, 1	2A, 2B	3	4
\$0M < X < \$5M	None	None	Level 0	Level 0
\$5M < X < \$15M	None	None	Level 0	Level 1
\$15M < X < \$50M	None	None	Level 1	Level 1
\$50M < X < \$100M	None	Level 0	Level 1	Level 2
\$100M < X	None	Level 1	Level 2	Level 2

As a minimum, the following scope of services shall be included:

***Level 0 Review:***

- Qualifications: This level of review may be performed by generalists familiar with the specific type of building being reviewed, however it is advisable to be a registered Professional Engineer in Civil or Structural Engineering.
- Ground Motion: Can be determined from maps or government agency based on address or zip code.
- Building Stability: Review construction documents and conduct a walkthrough of the building to determine potential seismic deficiencies based on type, era and configuration of building.
- Site Stability: Based on regional maps (liquefaction, landslide, etc.). Determine whether building lies within a designated fault, liquefaction, landslide or other seismic hazard zone.

Damageability Assessment: Determine by tables, formula or with interactive computer program. Adjust to accommodate specific building characteristics.

Level 1 Review:

Qualifications: This level of review must be performed by registered civil or structural engineers familiar with the specific type of building being reviewed.

Ground Motion: Determined from USGS website or other published program based on latitude/longitude coordinates or by site specific soils report.

Building Stability: Reviewing engineer must review available construction documents and conduct a walkthrough of the building to determine potential seismic deficiencies. Walk-through survey shall be used to determine whether conditions exist that may lead to unacceptable behavior of the building in the anticipated level of seismic ground motions. Particular attention should be given to the configuration, compatibility, continuity, redundancy, and condition of structural elements, and whether there are unusual loads applied to the structure. Global calculations shall be performed based on current building code, ASCE31 Tier 1, or similar criteria.

Site Stability: Based on project geotechnical report if available. Determine whether building lies within a designated fault, liquefaction, landslide or other seismic hazard zone.

Damageability Assessment: Determine by tables, formula or with interactive computer program, modified by engineering judgment to account for specific building characteristics.

Level 2 Review:

Qualifications: This level of review must be performed by registered structural engineer familiar with the specific type of building being reviewed.

Ground Motion: Determined from USGS website or other published program based on latitude/longitude coordinates or by site specific soils/hazards report.

Building Stability: Reviewing engineer must review available construction documents and conduct a walkthrough of the building to determine potential seismic deficiencies. Walk-through survey shall be used to determine whether conditions exist that may lead to unacceptable behavior of the building in the anticipated level of seismic ground motions. Particular attention should be given to the configuration, compatibility, continuity, redundancy, and condition of structural elements, and whether there are unusual loads applied to the structure. Calculations shall be performed

based on current building code, ASCE31 Tier 1, or similar criteria. Calculations should be sufficient to identify the existence of structural problems such as weak stories, weak column-strong beam conditions, bracing members and their connections, rigid columns on sloping floors, long unbraced elements, discontinuous shear walls, details and connections that have the potential of poor performance, and the ability of gravity load bearing members (structural and non-structural) that are not part of the lateral load-resisting system to tolerate the effects of the expected interstory drift at maximum earthquake response. In addition, non-destructive testing of building elements may be performed to generally establish the type, construction, and condition of materials.

- Site Stability: Based on site specific project geotechnical report. Determine whether building lies within a designated fault, liquefaction, landslide or other seismic hazard zone.
- Damageability Assessment: Loss values shall not be determined from tables or equivalent procedures for a basic building type, nor from use of interactive computer programs. Loss estimations shall take into consideration seismic response characteristics determined during the review.
- Non-Structural: For all levels of review, the anchoring and bracing systems for non-structural elements such as mechanical equipment, suspended ceilings and exterior walls shall be observed.

***Acceptance Criteria:***

1. If the building is deemed to be unstable in the Building Stability Assessment or Site Stability Assessment then consideration shall be given to the costs associated with seismically upgrading the structure such that the building will maintain its vertical load carrying capacity during a 475-year seismic event.
2. When the Scenario Expected Loss (SEL) exceeds 20% (of the building replacement value), consideration shall be given to the costs associated with seismically upgrading the building to reduce the expected losses to below 20% or to provide risk financing methods to cover the losses.

***Report Requirements:***

The report should include the following information.

- 1) Property description, address, etc.
- 2) Description of structural systems (vertical, lateral, foundation),
- 3) Design criteria which the building was constructed to,
- 4) Individual conducting the review, both for the site visit and the evaluation if different (allowed for Level 0 only),
- 5) Documents reviewed specific to the project,
- 6) Ground motion hazards assessment findings and methods used,
  - a) Peak Ground Acceleration for a 10% in 50-yr exceedance or 475-yr return period,

- 7) Building Stability Assessment findings and methods used,
- 8) Site Stability Assessment findings and methods used,
- 9) Non-Structural anchorage observations,
- 10) Damageability Assessment findings and methods used,
  - a) Scenario Expected Loss (SEL) or mean expected value at the 475-yr return period
  - b) Scenario Upper Loss (SUL) or the 90<sup>th</sup> percentile confidence level at the 475-yr return period,
- 11) Conclusions and Recommendations (including costs, if necessary).