UNDERSTANDING SEISMIC LOSS ESTIMATES: SEL, SUL, AND PML

Seismic loss estimates help lenders, insurers, and property owners evaluate a building's financial risk in an earthquake. These estimates are a key part of risk management and guide financing, insurance, and retrofit decisions.

This guide explains the most frequently used estimates—Scenario Expected Loss (SEL), Scenario Upper Loss (SUL), and Probable Maximum Loss (PML)—and how they influence building investment and risk management.

WHAT ARE SEISMIC LOSS ESTIMATES?

Seismic loss estimates predict how much structural damage a building may suffer during a significant earthquake. They are expressed as a percentage of the building's structural replacement cost.

These estimates do not measure life safety risk—they reflect potential repair costs and are used primarily to assess financial exposure.

SCENARIO EXPECTED LOSS (SEL)

SEL estimates the average level of damage a building is likely to experience during a specific seismic event. It represents a **50% chance** that actual losses could exceed this amount.

- **Typical Benchmark**: SEL ≤ 20%
- **Used For**: General risk assessment, investment decisions, and insurance planning
- **Also Known As**: PML50
- **Standard Basis**: Typically based on a **475-year return period**—meaning a 10% chance of this level of ground motion occurring in 50 years

Example: A building with an SEL of 15% is expected to suffer structural damage equal to 15% of its replacement cost in a defined earthquake.

SCENARIO UPPER LOSS (SUL)

SUL is a more conservative estimate that reflects the **worst-case damage** in a given seismic scenario. It is based on a **90% confidence level**, meaning there is only a 10% chance the loss will be greater.

- **Typical Benchmark**: SUL ≤ 20%
- **Used For**: Lender and insurer evaluations, risk-averse investment planning
- **Also Known As**: PML90
- **Standard Basis**: Often calculated from a 475-year return period earthquake

Example: A building with a 20% SUL has a 90% chance of not exceeding that level of structural damage in the specified seismic event.

Pro Tip: Many lenders require earthquake insurance if a building exceeds a 20% SUL. In many cases, the cost of a seismic retrofit pays for itself in 3 to 7 years—especially when factoring in reduced premiums and increased resale value.

PROBABLE MAXIMUM LOSS (PML)

PML is a general term widely used before more standardized definitions were adopted. Today, PML often refers to either SEL (PML50) or SUL (PML90), depending on the confidence level of the estimate.

- **Why it still appears**: Some older reports still use the term
- **Modern best practice**: Always clarify whether the PML value refers to SEL or SUL

HOW SEISMIC LOSS ESTIMATES ARE CALCULATED

Engineers use probabilistic models and structural analysis to estimate how a building will perform in an earthquake. These calculations factor in:

- **Building type and construction method**
- **Known structural vulnerabilities**
- **Site-specific seismic hazards (e.g., fault lines, liquefaction, flood zones, etc.)**
- **Peak Ground Acceleration (PGA)** at the location

Loss estimates only apply to structural damage and do not include contents, equipment, or business interruption costs.

RETURN PERIOD AND PEAK GROUND ACCELERATION (PGA)

Two critical technical factors used in calculating seismic loss estimates are Return Period and Peak Ground Acceleration (PGA).

RETURN PERIOD

The return period is the recurrence interval of a specific level of seismic ground shaking. The standard used in most assessments is 475 years, corresponding to a 10% chance of occurrence over 50 years—the typical lifespan of a commercial structure.

Shorter return periods correspond to smaller, more frequent earthquakes. Longer return periods correspond to larger, less frequent earthquakes.

PEAK GROUND ACCELERATION (PGA)

PGA measures how strongly the ground is expected to shake at a specific location during an earthquake. It is expressed as a percentage of gravity (%g). The type of soil at the building site can increase or decrease PGA:

- **Soft soils** amplify ground shaking, increasing the risk of structural damage.
- **Hard soils** lessen ground shaking, reducing risk.

PGA is one of the primary inputs used in calculating both SEL and SUL.

WHY SEL AND SUL MATTER

Lenders and insurers often set acceptable risk thresholds based on SEL or SUL values. The most common benchmark is an **SUL of 20% or less**. Exceeding this level may result in:

- Limited financing options
- Higher insurance premiums
- The need for a seismic retrofit before closing or approval

Pro Tip: More buyers are available when a building has an SUL under 20%. In fact, many investors won't even consider purchasing a building that exceeds this threshold.

MANAGING SEISMIC RISK

When a building's SEL or SUL exceeds acceptable thresholds, property owners can address the financial risk in several ways:

- **Accept the risk** and proceed without changes.
- **Decline to purchase or finance** the building.
- **Increase the borrower's equity** to offset lender risk.
- **Purchase additional earthquake insurance.**
- **Invest in seismic retrofitting** to strengthen the building and lower SEL and SUL ratings.

For many property owners, retrofitting is the most practical and cost-effective way to reduce risk, improve marketability, and meet lender or insurance requirements.

REDUCE YOUR SEISMIC RISK WITH SAUNDERS SEISMIC

Understanding SEL and SUL ratings is key to protecting your building and your investment. Whether you're buying, selling, refinancing, or planning a retrofit, knowing your risk level helps you make informed decisions.

At Saunders Seismic, we specialize in seismic retrofits that improve SEL and SUL ratings. We work closely with engineers, lenders, and building owners to deliver reliable results across California, Oregon, Washington, Nevada, and Utah.

Contact us today **to learn how we can help reduce your building's seismic risk.**