

All About Probable-Maximum-Loss Reports

Knowing what goes into earthquake-related estimates helps guide what comes out

By **Joe Derhake**, president, Partner Engineering and Science

NOT LONG AGO, A LENDER CALLED and asked me to perform a probable-maximum-loss (PML) report for a property in Los Angeles. This report — which estimates the damage a building is expected to receive as a percentage of the building's replacement cost — can be common for lenders, and investors often find it valuable.

In this case, however, the lender had a PML report. Two, in fact: one estimate at 19.5 percent, meeting requirements, and another at 24 percent, failing. It needed a third report to break the tie.

This story is common. PML reports are inexpensive and of great value to investors, but they are also boilerplate — they can leave users with no understanding of the thought process of why a building will perform a certain way in a seismic event.

Ultimately, lenders must know how to find a PML report they can trust, and brokers should understand how to help them accomplish this. Here's a look behind PML methodology and how all parties in a loan transaction can find consistent and reliable reports.

The purpose of PML

The purpose of a PML report is to measure a building's financial risk in the event of an earthquake or similar seismic occurrence. These reports are also known as seismic-damageability reports, probable-loss assessments or scenario-loss assessments. In all instances, PML is expressed as a percentage.

Many people are familiar with the concept of a 100-year flood or a 100-year storm — i.e., events of a magnitude that only occurs once a century. Similarly, there are 100-year earthquakes and 475-year earthquakes.

Most PML reports model how much damage

a building will suffer when a 475-year earthquake occurs.

Why are reports different?

Part of the reason for PML inconsistencies is that not all engineers follow the same standards. Even when they do, they can express the PML estimate differently.

The two ways of expressing PML can create confusion among users. In 2007, American Society of Testing and Materials (ASTM) published two new standards, "ASTM E 2026-2007 Standard Guide for Seismic Risk Assessment of Buildings" and "ASTM E 2557 Standard Practice for Probable Maximum Loss Evaluations for Earthquake Due-Diligence Assessments."

According to the new standards, PML assessments should report the scenario expected limit and the scenario upper limit. For any given building, the PML expressed as the upper limit will always be greater and more conservative than the PML expressed as the expected limit.

Here's how these come into play: Assume that 10 identical buildings are on the same street. Each building will have the same PML. If the 475-year earthquake occurs next year, then all of these buildings will likely be damaged. The amount of damage to each, however, likely will still be different, which is where these limits differ. The expected limit predicts the mean damage to these 10 buildings, while the upper limit predicts that of the second-most-damaged property.

A lender relying on the upper limit knows that in the event of a 475-year seismic event, only one property in the portfolio will receive more damage than the PML predicted.

How can they be improved?

Two competent engineers can issue PML reports

with significantly different numbers if one conveys the expected limit and the other the upper limit. Other variances can come from the engineers' judgments and assumptions.

To help alleviate inconsistencies, brokers and their lenders might be wise to seek PML reports that include the following:

1. Visible calculations: When engineers show their math, peer review is easier. In cases of conflicting reports, it's easier to see why conclusions differ.

2. Explanations of defects for high-PML buildings: In my opinion, explaining why a building has a high PML is essential. Telling a group of mortgage professionals that their deal is in peril because the statistical model is returning a high PML is unacceptable without further explanation. It's better if the engineer can explain that the roof diaphragm isn't connected to the walls, for example, or that the tuck-under parking can't bear lateral loads. Such information can help you, as a broker, remedy the situation.

In turn, lenders requiring PML calculations might be wise to create a policy that clearly identifies the standard for engineers to follow and their preferred reporting method. Conservative lenders should request that engineers make sure to include the scenario upper limit in their reports.

If they have not chosen a lender, brokers and investors should request that the PML expresses both limits and meets the "ASTM E 2026-2007" standard.

When choosing an engineering vendor, ask if an engineer visits the site. Engineers who write reports from an environmental inspector's photos cannot produce reports as reliable as those written from a personal on-site inspection.

Finally, insist that engineers show their math and explain high PMLs in terms of real building defects.

Taking these steps will help you ensure that your engineering vendors produce useful and reliable reports, not just esoteric statistical models. In the end, such reports will be of great use to brokers, lenders and property-owners. 



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