

BUILDING DAMAGE IN MANHATTAN

The most vulnerable district in Manhattan would not be the one closest to the epicenter, but rather the Upper East Side, due to vulnerable unreinforced masonry buildings on soft soils.

HAZUS subdivides building damage into five categories:¹

- ▶ No Damage (N on the figures to the right)
- ▶ Slight Damage (S)
- ▶ Moderate Damage (M)
- ▶ Extensive Damage (E)
- ▶ Complete Damage (C)

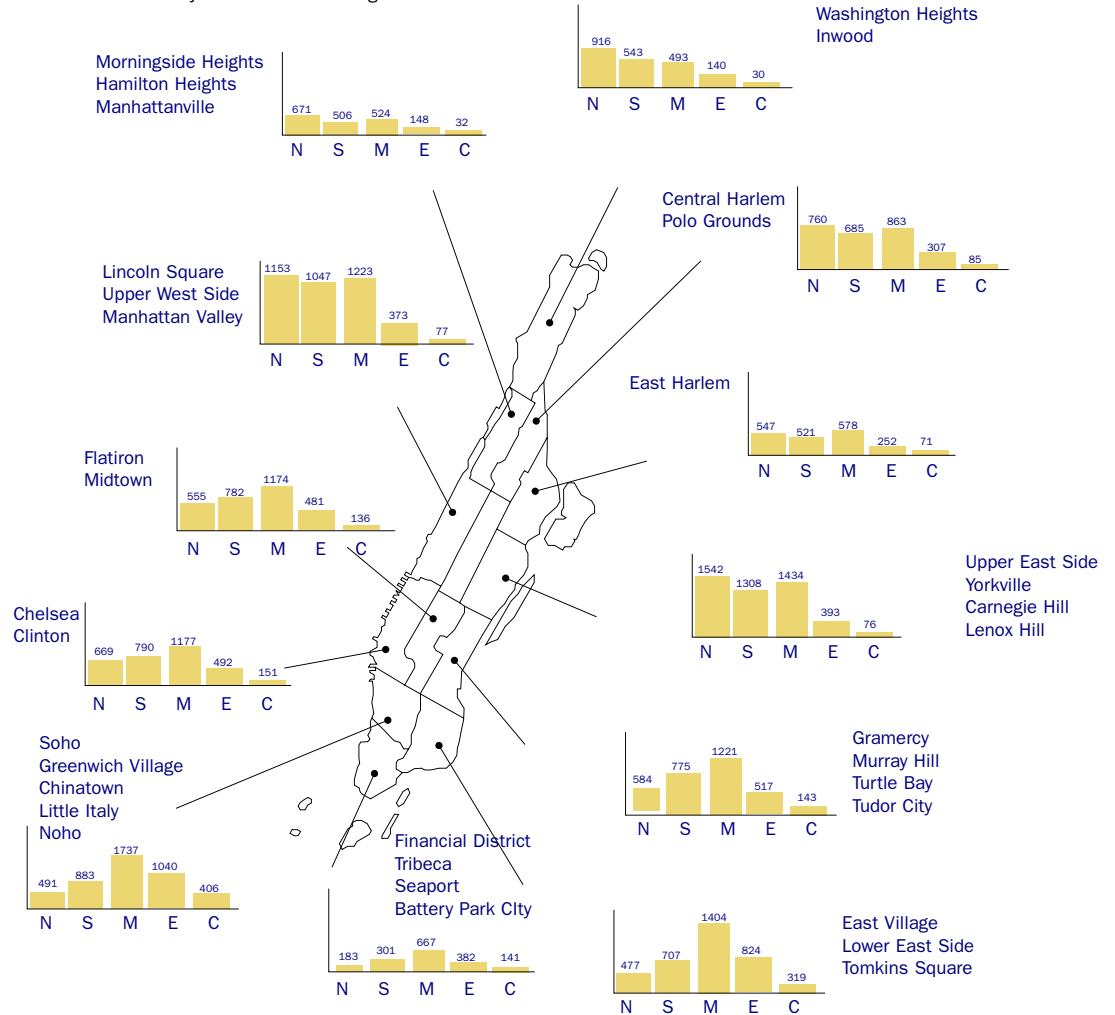
Manhattan Most at Risk

The figure on this page shows the distribution of damage likely in 12 Manhattan neighborhoods for an earthquake with Magnitude 7.0 intensity, centered at the 1884 historic site. The results indicate that an earthquake of this magnitude and location would result in the collapse or in the imminent danger of collapse of 1,667 buildings in Manhattan (the sum of all bars marked C, on the figures to the right). In this scenario, due to particularly soft soil conditions on the Upper East Side, this location would experience a PGA of 0.49, almost double the PGA that the Financial District would experience, despite being located further from the epicenter. As this area also has a high percentage of unreinforced buildings, it is particularly vulnerable to earthquakes.

Reasons for Vulnerability

As you can see from the figure to the right, the Upper East Side has the most buildings (4,753, about 13 percent) and the most unreinforced masonry buildings (1,434, also 13 percent). In fact, these buildings account for 18 percent of the total square footage in Manhattan and, therefore, are the most at risk, contributing to a large portion of the total loss in a seismic event. Buildings in Chinatown are also at greater risk for complete collapse as a result of the same two factors: softer soils and the predominance of masonry buildings.

- N **NO DAMAGE**
- S **SLIGHT DAMAGE**
Minor cracks
- M **MODERATE DAMAGE**
Larger cracks and some connection failures.
- E **EXTENSIVE DAMAGE**
Although people may escape safely, the building will eventually have to be demolished. Significant cracks and connection failures.
- C **COMPLETE DAMAGE**
Structure is collapsed or in imminent danger of collapse. Extensive member and connection failures and major foundation cracking.



¹ The version of HAZUS used in this study (HAZUS-SR2) derives the number of buildings in each of the five damage states from the damage state distributions of the total square footage in a census tract. The number of buildings assigned to each category is based on average building square footage size. Consequently, the actual number of buildings assigned to each damage state may be over estimated.