



Partners in Prevention

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New From FEMA: Publication, P-2012

FEMA's Building Science Branch is pleased to announce that FEMA P-2012, *Assessing Seismic Performance of Buildings with Configuration Irregularities*, is now available through the FEMA Warehouse as well as online.

The publication's primary purpose is to facilitate the improvement of irregularity-related design requirements of FEMA P-1050-1, *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*; ASCE/SEI 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*; and ASCE/SEI 41-17, *Seismic Evaluation and Retrofit of Existing Building*.

This guidance evaluates current building code triggers, the influence of structural irregularities on seismic building performance (in terms of collapse probability), and the effectiveness of relevant code provisions. The objective of the studies conducted under this project was to inform and improve U.S. codes and standards so that structures with configuration irregularities have a level of safety against a collapse in an earthquake that is comparable to that for regular structures. The publication focuses primarily on design requirements for new buildings, with limited consideration of the treatment of irregularities for existing buildings.

It is commonly accepted that structural configuration irregularities can affect seismic performance. A structural irregularity is defined as an aspect of configuration that detrimentally affects a structure's performance during an earthquake, leading to an unacceptable reduction in collapse safety or increase in damage. Generally, there are three remedies for such irregularities, as follows:

- Remove the irregularity from the design;
- Address the irregularity using an analytical approach; or
- Resolve the irregularity through a design approach (e.g., by changing the proportioning).

With a focus on irregularities that have detrimentally affected structural performance in past earthquakes or that are common in current construction trends, the project considered 12 classes of structural configuration irregularities identified in current U.S. codes and standards and two new classes as follows:

- Torsional stiffness
- Reentrant corner
- Diaphragm discontinuity

- Out-of-plane offset
- Nonparallel system
- Torsional strength
- Soft story
- Weight [mass]
- Vertical geometric
- In-plane discontinuity
- Weak story
- Weak-column/strong-beam

Findings and recommended treatments include quantitative evaluation of potential collapse risks for torsion, soft/weak story and weak-column/strong-beam irregularities, some suggested modifications to code triggers and requirements, and general discussions and clarifications of other irregularities.

Download FEMA P-2012 at <https://www.fema.gov/media-library/assets/documents/177455>.

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