Issue 5: Collapse Risk Definition

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Overview

• This issue focuses on the assumption that the collapse risk provided by the code for the 2% in 50 (2500 yr return) MCE shaking is 10%.

• The collapse fragility created by this assumption affects the 1% in 50 year time based collapse risk and is therefore directly related to Issue 4.
  – If the 10% in MCE is changed, the 1% in 50 would logically change
  – If the 1% in 50 were changed, the 10% in MCE would also logically change to be consistent
Relationship to FEMA P 695

- FEMA P 695 was developed as a standardized means of establishing design coefficients (primary $R_f$ factors) for structural systems proposed for adoption into the code, and secondarily, making existing systems more consistent.

- The acceptance criteria was set based on analyses of several traditional structural systems. However, definition of collapse in these analyses is limited, and, in addition, several conservative assumptions are made.

- P 695 succeeds in providing more consistent $R_f$ factors but was not intended to establish the probable risk of collapse of code complying buildings.
Use of P(C)=10% in Risk Targeted Maps

• Regardless of the intent of P 695, the 10% probability of collapse in MCE was used to set collapse fragilities for development of risk targeted maps.

• Based on observations of earthquake damage and the opinion of at least some experienced earthquake engineers, this probability of collapse is high, certainly for “average” conditions.
Proposed Study

• Appoint a panel of experts to review available data (from field and analysis) and set a different (expected to be lower) probable collapse risk resulting from use of traditional modern U.S. codes.
Risks

- Current analysis methods to predict collapse (particularly the large number of runs and conditions to get statistical results) are not available.
- Very little statistical damage data from earthquakes, particularly regarding collapse and US modern construction practice, is available.
- A new expected performance level would probably be set by expert judgement.
Risks

• A new expected performance level would cascade through the risk targeting mapping procedure, potentially making many changes to mapped values, further exacerbating the map “instability” discussed in Issue 3.