

# Seismic Risk Map of Indonesia and Performance - Risk Based Design for Super Tall Building, a Case of Thamrin Nine Project

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Indonesia has made a significant progress in regulating provisions of earthquake engineering design for buildings moving from **uniform hazard** concept to **uniform risk** concept upon recognizing the uncertainties involved in the resistance of concrete structure subjected to earthquake loads. In contrast to the seismic design map of 2002 which were based on ground motion values with 10%-in-50-years exceedance probability, the probability portion of the Risk Targeted Maximum Considered Earthquake ( $MCE_R$ ) of the current code (SNI 1726-2012) are equal to the 1% collapse probability of failure within 50 years values. The implication of this regulation is the acceptable risk for a building should be less than 1% for a design life time. For a super tall building such risk should be evaluated and achieved explicitly.

A performance based design concept for evaluation such risk is proposed for a super tall high rise structure consisting of core wall and mega columns with outrigger and belt truss as part of earthquake resistance structures. Uncertainties involved in the resistance in this type of structure due to record to record variability, limited amount of data, and material variability are included in the formulation by means of first order of second moment method. The statistics of resistance against earthquake forces are estimated by making use of incremental nonlinear time history analysis using several recorded history of earthquakes. Then, adopting total probability theorem the risk of the structure is evaluated. The method is then applied to a 72 story highrise structure in Jakarta: The Thamrin Nine Project.

**Keywords:** uniform hazard; uniform risk; performance based design, super tall building, core wall and mega column, outrigger and belt truss.