

Thesis titled **Performance Based Seismic Design and Risk Analysis** by **Aritra Chatterjee** towards Master of Technology degree in Structural Engineering in the Department of Civil Engineering at the Indian Institute of Technology Kharagpur, submitted May 2012.

Synopsis

This work primarily studies the need and scope of adopting Performance Based Design principles in existing seismic design codes. It analyses the safety of designs produced using two codes of practice-- IS 1893(Part 1):2002 and BS EN 1998-1:2004, for seismic hazard for the city of Mumbai. Non-linear models of these designs based on the semi rigid technique are then subjected to real earthquake records scaled to the spectral acceleration hazard of Mumbai, and the responses are compared with the performance based provisions of FEMA 273. A technique is then devised to compute the probabilities of failure of these structures at different performance levels using Monte Carlo Simulations. This technique models the uncertainty in the seismic hazard, the record to record variability in results and the randomness of structural properties. Detailed studies of societal risk are conducted to understand these failure probability values against a realistic background. A new risk diagram is created through extensive research of the risk associated with daily activities in India and USA at the present day, using which the acceptability of the seismic risk of these designs is assessed.