ESC2016-406-1, 2016
35th General Assembly of the European Seismological Commission

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4–10 September 2016 Trieste

A possible seismic design process to overcome the limitations of standard seismic input definition

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A possible seismic Performance Based Design (PBD) process based on a scenario based definition of the seismic input is presented. The proposed procedure aims to address the following considerations, arisen from the analysis of seismic phenomena, which cannot be taken in account using standard probabilistic seismic input (PSHA): a) any structure at a given location, regardless of its importance, is subject to the same shaking as a result of a given earthquake, b) it is impossible to determine with precision when a future earthquake of a given intensity/magnitude will occur, c) insufficient data are available to develop reliable statistics with regards to earthquakes. On the basis of these considerations, the seismic input at a given site - determined on the basis of the seismic history, the seismogenic zones and the seismogenic nodes - is defined using the Neo Deterministic Seismic Hazard Assessment (NDSHA). Two different analysis are carried out at different levels of detail. The first one (RSA) provides the "Maximum Deterministic Seismic Input" as a response spectra at the bedrock ($MDSI_{BD}$), similarly to what is proposed by the codes. The second one (SSA) takes the site effects into account, providing a site specific seismic input ($MDSI_{SS}$). A SSA provides realistic site specific seismograms that could be used to run time history analysis even where no registrations are available. Reviewing the standard PBD procedure, $MDSI_{SS}$ is always associated with the worst structural performance acceptable for a building, called Target Performance Level (TPL). In this way, the importance of the structure (risk category) is taken into account by changing the structural performance level to check rather than to change the seismic input.