

Progressive Collapse Mechanisms: Investigation on different 3D-Structures under Earthquake Loads

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In this report studies on progressive collapse mechanisms under earthquake loads are performed. Based on a discrete element model (DEM), developed at the ETH Zurich, simple reinforced concrete structures with different arrangements of walls are investigated. The structures are represented by elasto-plastic Euler-Bernoulli beams with elongation-rotation thresholds. The base points and the ground are excited by real ground motion accelerations from Friaul, North Italy, 1976. The systems are traced by observing the evolution of different forms of energy and the sequential failure of structural elements. The observed collapse mechanisms differ in their initiation time and location. The variations of the wall arrangements show strong differences in their collapse behavior, mainly originated by the failure mechanisms of the topmost slab of the structure. Finally, the potential of further research and development of the DEM approach to the field of structure dynamics is discussed.

