Progressive Collapse of Cooling Towers

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Abstract : Well documented records of the past failures of the structures reveals that the progressive collapse of structures is one of the major reasons for dramatic human loss and economical consequences. Progressive collapse is the failure mechanism in which the structure fails gradually due to the sudden removal of the structural elements. The sudden removal of some structural elements results in the excessive redistributed loads on the others. This sudden removal may be caused by any sudden loading resulted from local explosion, impact loading and terrorist attacks. Hyperbolic thin walled concrete shell structures being an important part of nuclear and thermal power plants are always prone to such terrorist attacks. In concrete structures, the gradual failure would take place by generation of initial cracks and its propagation in the supporting columns along with the tower shell leading to the collapse of the entire structure. In this study the mechanism of progressive collapse for such high raised towers would be simulated employing the finite element method. The aim of this study would be providing clear conceptual step-by-step descriptions of various procedures for progressive collapse analysis using commercially available finite element structural analysis software's, with the aim that the explanations would be clear enough that they will be readily understandable and will be used by practicing engineers. The study would be carried out in the following procedures: 1. Provide explanations of modeling, simulation and analysis procedures including input screen snapshots; 2. Interpretation of the results and discussions; 3. Conclusions and recommendations.

Keywords : progressive collapse, cooling towers, finite element analysis, crack generation, reinforced concrete