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# Assessment Progressive Collapse Scenario of Special Moment Frames with TMD under Earthquake Loading

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**Abstract**

Main objective of earthquake engineering is to provide an adequate margin of safety against any type of collapse. Progressive collapse can occur because of human-made and natural hazards such as blast, impact, fire and also earthquakes. In progressive collapse scenario, an initial local failure may cause a significant damage which then may lead to collapse of a major part of structure or even whole of it. The aim of this study is to investigate effect of tuned mass damper (TMD*) on the progressive collapse potential of structure.*
**Keywords: Progressive Collapse, TMD , Steel Frame**

## 1. Introduction

A progressive (or disproportionate) collapse of a structure is initiated by local damage that cannot be contained and propagates throughout the entire structure or a large portion of it, to the point where the extent of final damage is disproportionate to the initiating local damage. The partial collapse of a multi-story large-panel apartment building at Ronan Point in the UK in 1968 brought disproportionate collapse to the attention of the structural engineering community as a potential building performance issue. After the event of 11 September 2001, more and more researchers have started to refocus on the causes of progressive collapse in building structures, seeking ultimately the establishment of rational methods for the assessment and enhancement of structural robustness under extreme accidental events. Izzuddin et al. [1,2], proposed a novel simplified framework for progressive collapse assessment of multi-storey buildings, considering sudden column loss as a design scenario. It analyzed the non-linear static response with dynamic effects evaluated in a simple method. It offers a practical method for assessing structural robustness at various levels of structural idealization, and importantly it takes the debate on the factors influencing robustness away from the generalities towards the quantifiable.

Khandelwal et al. [3] studied the progressive collapse resistance of seismically designed steel braced frames with validated two dimensional models. Two types of braced systems are considered: namely, special concentrically braced frames and eccentrically braced frames. The study is conducted on previously designed 10-story prototype buildings by applying the alternate path method. The simulation results show that while both systems benefit from placement of the seismically designed frames on the perimeter of the building, the eccentrically braced frame is less vulnerable to progressive collapse than the special concentrically braced frame.

Jun-Hee Park [4] studied the sensitivity of the design parameters of steel buildings subjected to progressive collapse. The analysis result showed that among the design variables, the beam yield strength was ultimately the most important design parameter in moment resisting frame buildings, while the column yield strength was the most important design parameter in dual system buildings.

Hartato Wibowo [5] showed that progressive collapse phenomena can occur during earthquakes; therefore, it is not limited only to gravity and blast loads. Wibowo and Lau [6] also focused on the significance of seismic load effects in the progressive collapse behavior of structures. It is concluded that the seismic progressive collapse of structures can be analyzed by modifying the current analysis procedures.

*TMD is a viscous spring-mass unit, when attached to a vibrating main structure, provides a frequency dependant hystersis that increases the damping in the structure. Tuned Mass Damper (TMD) has been found to be most effective for controlling the structural responses forharmonic and wind excitations. In addition TMD is attractive as*