

The Role of Non-Structural Elements in Progressive Collapse Resistance: A Review of Partitions and Facades Under Extreme Loading Conditions

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Abstract. Progressive collapse occurs when the failure of a critical load-bearing component triggers a chain reaction, potentially leading to the total or partial collapse of a structure. This issue is particularly critical in reinforced concrete (RC) buildings, where limited redundancy and ineffective load redistribution accelerate failure. While research has extensively examined structural elements in collapse prevention, the role of non-structural elements—such as partitions and facades—remains insufficiently studied. Although not designed for load-bearing, these elements influence overall stability under extreme conditions. Studies show that non-structural elements respond differently to seismic, blast, and accidental loads, affecting structural integrity. Drywall partitions, though flexible and easy to install, are vulnerable to detachment and secondary failures. Masonry partitions enhance load redistribution and structural strength, proving more effective in seismic resistance. Similarly, double-skin facades (DSFs) reduce inter-story drift and improve energy efficiency, yet their behavior in progressive collapse scenarios remains underexplored. This review compiles insights from numerical modeling, experimental studies, and real-case failures to assess the role of non-structural elements in collapse resistance. It highlights research gaps and the need for full-scale testing, enhanced connection detailing, and 3D numerical modeling to integrate non-structural components into progressive collapse mitigation strategies.

Keywords : Non-structural elements , Progressive collapse, collapse resistance, Drywall Partitions, Masonry, Double Glazed Facade

