

MECHANISM OF BUILDING COLLAPSE IN AIRBLAST

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Several near full-size buildings of different structural types have been placed in the paths of high explosive airblast waves simulating those created by a 1 kiloton nuclear weapon. By measuring pressure histories inside and out, wall deflection and floor acceleration histories and by recording the final debris patterns of the collapsed buildings, some characteristics of the collapse mechanism have been revealed.

Behavior of unreinforced masonry walls can be deduced from the edge restraint. A masonry wall in a nearly rigid reinforced concrete frame exposed head-on to 37-psi blast will dissipate between 90 and 95% of the

airblast energy delivered to it by rotating and crushing against the frame. Against a wave of approximately the same pressure a masonry wall restrained only by in-plane inertial load will dissipate 40 to 45% when

overburden consists of a single floor and 75 to 80% when carrying two floors above.

Sidewalls sometimes collapse in place (as in some strong frame walls) or while moving outward (as in all load-bearing structures and in some frame walls). Although they always have moved inward at first, sidewalls have never been seen to collapse inward - even when the front wall facing the source of blast has no initial openings. Load-bearing sidewalls were not crushed by the collapse and sidewall debris patterns show no wall arching.

At 35 to 40 psi rear may begin by moving inward when the room has no openings facing the blast, then collapse outward under airblast pressure or debris impact.