

BLUNT TRAUMA VULNERABILITY OF HUMANS SUBJECTED TO EXPLOSIVELY DRIVEN WALL DEBRIS

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Explosions in buildings produce large amounts of rapidly moving wall debris, particularly from the relatively lightweight, weak construction used for interior partition walls (typically wood stud or metal stud with gypsum sheathing). This debris has the potential to generate blunt trauma injuries to occupants impacted by pieces of studs or gypsum.

To investigate this potential, instrumented anthropomorphic test devices (ATDs) were positioned in a series of four dynamic blast tests conducted in a shock tube. The test objectives were to obtain head and thorax injury data for personnel behind conventional stud walls; two of the tests used metal stud walls, while the other two used wood stud walls. Accelerometers in the head and chest recorded the acceleration histories which were subsequently processed and compared to well-established injury criteria to determine the expected injury level.

Results of the tests indicate that the expected injury levels (for the loads used in the tests) are in the range of low to moderate. Wood stud and metal stud walls produced similar injury levels, without a strong indication of one being more lethal than the other. However, injury levels for persons standing in the back of a room were seen to be distinctly lower than for those in the front of a room, owing to the in-flight breakup of the gypsum debris into smaller pieces.