EMPIRICALLY BASED MODEL FOR INJURY TO OCCUPANTS OF BLAST LOADED BUILDINGS BY GLASS AND NON-STRUCTURAL INTERIOR COMPONENTS

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This paper describes the vulnerability model used to predict injuries to occupants of blast loaded buildings from glass and non-structural interior components in the BICADS (Building Injury Calculator And DatabaseS) computer program, which was developed recently by Baker Engineering and Risk Consultants for the U.S. government. The percentages of occupants with each of four different injury levels are calculated based on user input that defines basic building construction parameters, the percentage of building occupants in perimeter and interior space, and the blast source.

The BICADS program estimates injuries to building occupants from both structural and non-structural components. This paper will focus on the methodology used to predict injuries from glass and interior, non-structural building components, which is based on correlations between the calculated blast loads on windows and inside buildings with failed windows and recorded injury levels to building occupants near the Oklahoma City and Khobar Towers bombings. Occupants within 15 to 20 ft of a window were assumed injured primarily by glass debris. Other interior occupants were assumed injured by interior components. All occupants within, or near areas of structural failure were excluded. The correlations are in the form of pressure-impulse (P-i) diagrams, where each region of the diagrams is associated with the observed percentages of injured building occupants exposed to blast loads with the pressures and impulses in the P-i diagram region. The occupant locations were based on detailed occupant location maps developed by the Oklahoma State Department of Health from post-bombing surveys of building occupants near both bombings. Injury data from World War II bombing of Japan and several accidental industrial explosions were also used.