LOCAL AND GLOBAL APPROACHES TO THE BLAST RESPONSE OF STRUCTURES

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The quasi static loading and response of structural components and the impulsive loading are limiting cases of the dynamic regime where both mechanisms are of equal importance. In all cases the pressure and deflection time histories of selected points of the structural components are accessible with modern experimental techniques. We propose two approaches to use this experimental information to model the structural response. Within the single degree of freedom model, we aim at an improved determination of response functions allowing more stringent formulations of failure models which cover all loading regimes. If this is achieved, the failure behavior of the structural component can be visualized within blast-impulse-overpressure or charge mass-distance diagrams.

Two methods are applied to determine response functions from measurement data. The local approach constructs step by step the deflection function from experimental deflection and pressure information starting from zero overpressure, deflection and response at the beginning of the blast loading. The global approach optimizes an analytical or numerical model response by globally comparing the model deflection with the experimental deflection given the experimental pressure-time history. In both cases additional explicit, e.g. zero response functions at the beginning of the loading, or implicit information, e.g. smoothness conditions, are added to arrive at a response function for a single experiment. Both approaches permit response functions which are only locally unique with respect to time or, equivalently, deflection, thus allowing for response functions that are dependent on the deflection history, e.g. showing hysteresis-like behavior.

For illustration response functions of a typical laminated glass window are generated and discussed for different loading regimes.