EXPERT TOOL FOR THE DETERMINATION OF PARAMETERS OF RESISTANCE FUNCTIONS FOR SDOF MODELS FROM DYNAMIC DATA FOR BLAST LOADING OF STRUCTUTURES

K. Fischer, I. Häring*; C. Kranzer; W. Riedel

*Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut,
Am Klingelberg 1,79588 Efringen-Kirchen, Germany;
) communicating author; +49(0)7628-9050-638, haering@emi.fhg.de

ABSTRACT

For the fast analysis of the blast response of structures often single degree of freedom (SDOF) models are used. An overview of models available for glass, masonry and concrete is given. Main topic of the paper is the determination of the parameters of SDOF resistance functions. The parameters are determined from minima of a chi-square expression that compares model and dynamic experimental deflection of the structure. The minimum of this function is found by using a downhill simplex method. To determine the ideal parameters we allocate dynamic experimental data that are obtained from pressure and laser deflection measurements. The experiments are conducted with a shock tube, free field experiments and also include week loading for natural frequency determination.
A modular software tool implements the methodology including the following options:
- Analysis of different models using blast-load parameterizations, structural resistance functions and load-mass-factors.
- The input and preprocessing of experimental pressure-time- and deflection-time histories to compare model response with experimental data.
- Using the experimental deflection the parameters of the response function of specified SDOF models are determined.
- Two-dimensional visualization of model behavior including failure criteria using predefined shapes of blast-load-impulses. Especially iso-damage-curves are generated within a pressure-impulse diagram.