PRESSURE DEVELOPMENT IN A CHAMBER DUE TO ENTERING SHOCK WAVE

MERCX,W.P.M.;WEERHEIJM,J.

For the determination of structural damage due to a shock wave, the pres-sure distribution on the structure has to be known. Most of the existing models consider the structure as fully closed, only some include the pressure build-up in the structure due to shock wave entering through openings. This delayed internal pressure build-up showed to be of importance as was learned from analysis of the observed damage. The internal pressure distribution is important also from a protective point of view as, for instance, safety distances can be calculated for internal shelters.

An experimental research program was carried out at the request of the Co-ordinator Civil Emergency Planning of the Ministry for Housing, Physical Planning and Environment. The main objective was to develop a model for the pressure development inside a structure due to an external shock wave
loading. The paper describes the experiments, their results and also the results of computational dynamic flow calculations.

The experimental set-up consisted of a steel chamber which was connected to the exit of a 2m diameter blast simulator. Variables were: the depth of the chamber, the area of the orifice, the enclosure of the orifice and the peak overpressure of the shock wave.

Pressure Transducers were mounted in the walls of the steel chamber. Transducers in the wall with the orifice were facing the simulator as well as the chamber in order to study the front wall total dynamic load in particular.

One of the remarkable findings was that frangible window panes, mounted in the orifice, had a large influence on the pressure build-up and the maximal pressures and impulses. The reflection against the pane was almost complete, also for the larger ratios of peak overpressure and dynamic failure load of the panes. Rarefaction effects during the positive phase of the applied shock wave were found to be negligible.