PRESSURE LOADS ON SIMPLE GEOMETRIES

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Blast wave resulting from gaseous charge detonation at small scale are experimentally used to investigate the blast loads on simple geometries such as parallelepipedic and cylindrical structures. Application of the Hopkinson laws allows to predict the blast wave characteristics at large scale in case of high explosive charges.

The gaseous explosive charge is a stoichiometric propane-oxygen mixture confined in an hemispherical volume of 0.07 m maximal radius. The energy release resulting from the detonation of gas mixture is expressed in terms of TNT equivalent energy. The dimensions of the structure are length : 0.14m, width 0.40 m, height 0.18 m concerning the parallelepiped, and diameter 0.36 m and height 0.36 m concerning the cylinder.

The conducted experimental tests allow to measure the pressure acting on each faces of the structure, (front face, lateral faces and rear face), with regular pressure gauges distributed on it. The incident pressure, without structure, is also measured. The effect of location of the explosive charge with respect to the structure is examined in terms of distance for the two types of structures and in terms of angles for the parallelepipedic structure. As the incident spherical shock wave impacts a complex geometry, the loading on the structure depends on the shape of the incident shock wave and complex reflected shock wave can result.

Several adimensional laws representing the evolution of characteristics of pressure wave signals (overpressure, impulsion, times) are expressed versus the reduced radial distance. The evolution of pressure signals along the structures is examined.

Numerical simulations are conducted with the code Autodyn 3D at the same scale than experiments and also at large scale.

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