NUMERICAL SIMULATION OF "V" SHAPE PLATES SUBJECTED TO LOCALISED BLAST LOAD

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"V" shape plates have been in use as a means to deflect the resulting force outwards from an explosion. For instance, the Casspir landmine vehicles, first built in 1979/80 by the CSIR, South Africa, have been certified to protect its occupants against a 14kg TNT blast under its armoured monocoque "V" shape hull. While its design has been deemed successful no studies have been published to assess the performance of "V" plates of different inclusive angles or flat plates.

Flat plates subjected to transverse blast pressures which deflect very little pressure, have been widely reported with satisfactory results both experimentally and numerically. The response of plates (both circular and quadrangular) to either uniform or localized blast loads with different boundary conditions (clamped or built-in) has been a topic of research since the 1940's. In cases where the blast pressure is not perpendicular to the plate, some of the blast pressure may be deflected with less damage occurring in the plate. This paper presents the results of validated numerical simulations, using Ansys/AutoDYN, of 'V' shaped plates subjected to localised blast load. The test specimens are 300 mm square plates folded along the centre line to provide included angles of 60°, 90°, 120°, 150° and 180° (flat plates). The shape of the explosive (PE4) is scaled from a TMRP6 landmine. Simulations and tests are carried out at various stand-off distances for the 120° V shape plates.

The predictions showed satisfactory correlation with the experiments. Figure 1 shows a typical result comparing ridge profile (side view) between experiments and numerical simulations. A linear relationship between the charge mass and the mid-point deflection of the plates is observed. A linear decrease in mid-point deflection with increasing stand-off distance is also observed for the range of tests carried out. Smaller inclusive angled plates deflect more gas pressure resulting in less mid-point deflection of the plate.

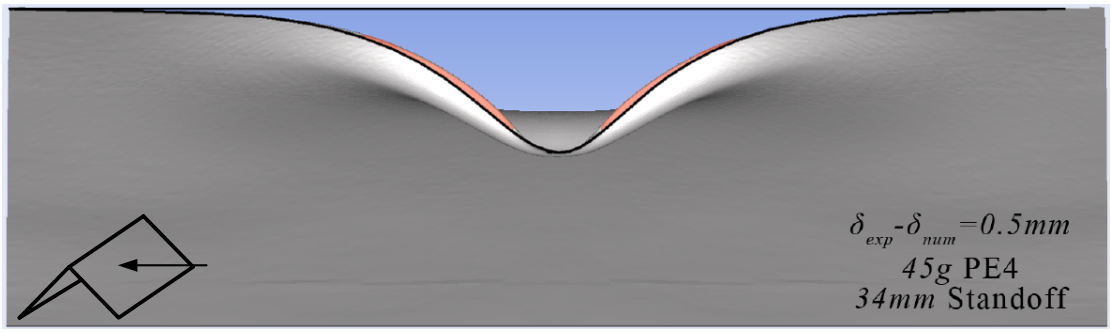

Figure 1: Comparison between numerical and experimental ridge profile (side view) for 120° V-shape plate (45g PE4; 34mm stand-off distance)