MULTI-AXIS LONG-DURATION BLAST INTERACTION WITH I-SHAPE STEEL SECTIONS

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ABSTRACT

Accurate characterisation of blast loading on intricate structural components is a challenging task. This paper reports experimental results pertaining to the effects of planar long-duration blast waves interacting with exposed I-shape steel sections about multiple axes. Long-duration blasts are defined by a positive phase duration t^+>100ms, characteristic of very large explosion events in the far field. These can result in significantly large impulses and dynamic pressures. Multi-axis long-duration blast interaction with intricate I-sections gives rise to rapid blast diffraction and translational drag loading effects which are complex to characterise, generally requiring approximation using crude drag coefficients. Blast drag coefficients available in literature lack provision for multi-axis interaction with I-shape geometries. Four full-scale long-duration blast experiments investigate the blast interaction with an I-shape column as a function of section orientation with respect to the incident shock wave. High-fidelity pressure instrumentation record coupled incident and reflected surface blast parameters. It was found that constituent surface specific impulse varied with section orientation due to relative exposure to the blast and local shielding aerodynamic effects. Results demonstrate that I-section orientation with respect to blast propagation has significant influence on the resultant translational loading. Experimental drag force coefficients as a function of section orientation are calculated from experimental data and compared to values proposed in literature providing conclusions of direct relevance to both design practitioners and academics.