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Preface to special edition on blast load characterisation

A Tyas[1,2*], SE Rigby[1] & SD Clarke[1]

[1]University of Sheffield, Department of Civil & Structural Engineering, Sir Frederick Mappin Building, Mappin Street, Sheffield, S1 3JD, UK.
[2]Blastech Ltd., The BioIncubator, 40 Leavygreave Road, Sheffield, S3 7RD, UK.
*a.tyas@sheffield.ac.uk

Recent years have seen a significant increase in the amount of published research activity in the field of high explosive blast effects on structures and materials. This is, in part, related to the perceived increase in the threat of deliberate use of high-explosives against soft civilian targets. Small hand-held improvised explosive devices (IEDs), large vehicle-borne IEDs and shallow-buried IEDs remain serious threats in both conflict areas and in urban areas targeted by terrorist activity. Furthermore, as the explosion in Tianjin, China demonstrated in 2015, civilian infrastructure may experience devastating blast loading from industrial accidents. Accordingly, whilst high explosive blast loading was rarely considered in the design of civilian structures two decades ago, today's engineers are increasingly required to assess the effects of these loads on buildings (both structural components, and non-structural envelopes), vehicles and bespoke protective systems.

A crucial step in designing blast resistant infrastructure is the accurate quantification of the load imparted by the interaction of the effects of an explosion with a target. Whilst the mechanics of blast loading are largely well understood for geometrically simple far-field scenarios, we are on far less secure ground when assessing blast loading from more complex events, such as detonations of buried explosives, non-spherical explosive charges or non-ideal explosives and near-field blast events. State-of-the-art experimental and numerical methodologies have allowed researchers to make great progress in these areas, and these research efforts are the focus of this special edition of International Journal of Protective Structures.

The papers submitted to this special edition generally fit into three distinct areas: numerical studies of blast loading in complex environments; detailed experimental measurements of blast wave parameters; and critical appraisals of existing semi-empirical blast predictions. The articles highlight both the advances made in these fields, and on-going areas of active research.

Qasrawi and Heffernan (2016) numerically study the problem of diffraction/clearing of a blast wave around the edge of an obstacle using ANSYS Autodyn and provide a simple design aid for calculating its effect. Clutter and King (2016) use CAMBER, an in-house numerical code, to investigate and compare the blast loading acting on the inside of blast containers housing either idealised spherical charges or more realistic charge configurations. Milne et al. (2016) review a range of modelling approaches for complex blast events such as near-field explosions, and discuss the importance of correct implementation of phenomena such as afterburn.

Aune et al. (2016) detail the development of an experimental facility to produce controlled, repeatable blast loading in laboratory environments using a shock tube. Cloete and Nurick (2016) and Tyas et al. (2016) both use Hopkinson pressure bars (HPBs) to experimentally measure blast loading from near-field explosions. Cloete and Nurick (2016) use HPBs in conjunction with a ballistic pendulum to investigate the extent of loading distribution, whilst Tyas et al. (2016) use HPBs to measure blast parameters in both oxygen rich and inert atmospheres to quantify the effects of afterburn on shock wave development.

Karlos et al. (2016) investigate semi-empirical predictions of the blast wave decay coefficient and provide simplified equations for calculating the decay coefficient. Finally, Netherton and Stewart (2016) discuss probabilistic blast load predictive methods and discuss the implications of these methods on cost-benefit analysis of blast mitigation methods.

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