STUDY ON THE ACTION OF BLAST WAVES ON INFRASTRUCTURES

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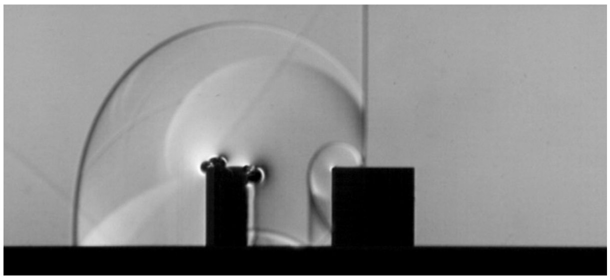
Within the frame of current threat scenarios as e.g., IED (Improved Explosive Devices) a detailed research on protective measures against damages caused by blast waves on sensible infrastructures becomes necessary. These blast waves cause heavy strain on the infrastructures due to repeated dynamic loadings in the form of reflecting shock waves that can lead to their destruction. The study and definition of protective devices, as well as finding best possible shapes of protective walls, is of greatest importance. Basic research on this field, within the frame of a feasibility study, was carried out in the transonic shock tube STT of ISL. This facility is most adequate to simulate the effects of explosive charges on infrastructures. A blast wave front possesses characteristics similar to a shock wave created in a shock tube so that a quite realistic simulation of blast loading on structures can thus be done. While shock waves have a different profile than blast waves, their impact can still reasonably simulate a blast wave during an explosion. This is because the hitting pressure causes the damage. Of primary importance is the study of the very complex shock wave patterns and their reflections on the structures being responsible for the pressure loads on them, see also [1-3]. This information is particularly important to prevent damages and in the worst case the destruction of the building. Studies carried out in the transonic shock tube STT proved the suitability of this set-up to study, blast wave effects in a reduced scale. Differential interferograms of the wave patterns were recorded with a high-speed movie camera and the pressure was measured on the surfaces of the structures. The figure enclosed shows an example of a differential interferogram of the shock wave / structure interaction of a square building (20 mm width, 20 mm height, and 120 mm depth) with a protective wall in front (10 mm width, 20 mm height, and 120 mm depth). The action of shock waves has been tested on different structure arrangements to determine the shielding effect of diverse protection wall shapes. These shock tube experiments will be presented and discussed at the conference on Military Aspects of Blast and Shock, MAPS 21.



Blast wave / square structures' interaction

[1] Ben-Dor, G., Shock wave reflections phenomena, Springer-Verlag, New York, N.Y. 1-73, 1991
[2] Ben-Dor, G., Igra, O., Elperin, T., (Editors), Handbook of Shock Waves, 3 Volumes, Academic Press, 2001
[3] Geevargehese, J. A., Study of Impact of Blast Wave on Concrete, Ph.D. Thesis, University of Texas Arlington, http://hdl.handle.net/10106/383, 2005