REVIEW OF THE SHOCK/BLAST WAVE RESEARCH AT THE BGU - PROTECTIVE TECHNOLOGIES R&D CENTER (PTR&D)

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ABSTRACT

The need to improve the design of structures in order to withstand short duration extremely high dynamic loads has become clear in light of recent attacks of terrorists on facilities throughout the world.

As a consequence the Protective Technologies Research & Development Center (PTR&DC) was established in the Faculty of Engineering Sciences of the Ben-Gurion University in almost 20 years ago in 1997.

The main goals of the PTR&DC are to better understand the following shock and blast wave related phenomena:

- The propagation of shock/blast waves inside complex structures.
- The interaction of shock/blast waves with complex structures.
- The dynamic response of structures to shock/blast waves.
- The mitigation of shock/blast waves loads by material and geometrical means.
- The behavior of absorbing energy structures/material under shock/blast waves loads.
- Shock/blast wave interaction with and propagation in granular and porous media.
- Developing numerical tools to predict the above-mentioned phenomena.
- And last but not least, educating new generations of shock/blast engineers and scientists.

The methodology of the PTR&DC is based on two main branches:

1. **Characterization of the load**: Shock tubes and explosive wire chambers are used to generate shock/blast waves in order to investigate the propagation and interaction of shock/blast waves with small-scale structures and different materials. The obtained experimental data are used to calibrate commercial and in-house numerical tools that are developed in order to simulate the investigated phenomena. Then, the developed and calibrated numerical codes are validated by full-scale field experiments.

2. **Characterization of the material response**: An impact pendulum, an impact piston, a split Hopkinson bar and some complementary facilities are used to investigate the behavior of structures/materials under short duration high dynamic loads. The results are used to calibrate numerical tools that are developed in order to predict the structure/material response. Then, the developed and calibrated numerical codes are validated by full-scale field experiments.

As a final goal, the above-mentioned two calibrated and validated numerical codes are integrated to result in a numerical tool for predicting structure response to shock/blast wave dynamic loads.

The capabilities of the above-mentioned experimental facilities will be presented in details.

In addition, the results of some of the recent research projects that have been investigated in the Protective Technologies Research and Development Center will be presented.