FULL SCALE FIELD TESTS OF CONCRETE SLABS SUBJECTED TO BLAST LOADS

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This paper describes full-scale field explosion tests on protected and non-protected concrete slabs. The experiments were performed by the Protective Technologies Research and Development Center of the Ben Gurion University (BGU-PTR&DC) under a contract with the Israeli Ministry of Defense (MoD) and the supervision of the IDF Committee for Protective Structures.

The aims of the tests were: 1) extract data on the dynamic response of concrete structure to blast loads in order to verify and validate our corresponding computer codes; and 2) check the capability of aluminum foams to mitigate blast wave loads.

Two types of concrete targets were examined: B30 usually reinforced and B100 fiber reinforced concrete plates. Two plates of each type of these concrete types, one with and one without “5%” aluminum foam layers were exposed to the blast. The aluminum foam layers were applied in two ways: the first consisted of 2 or 4 layers and the second consisted of 2 layers that were covered by a thin steel plate.

A 32-channel, high frequency (up-to100 kHz), data acquisition system and signal conditioning for 22 gauges were incorporated in experiment. The instrumentation and diagnostic systems in the tests included blast pressure, displacement, strain and acceleration measurements as well as high-speed photography.

The experimental systems setup was deployed over four areas: gauges placed on the targets; amplifiers located in a small underground shelter next to the targets; data acquisition systems in a protected concrete room about 100 m from the explosion center; and a command console in a rear room about 1 km from the test arena. The control of the data acquisition system from the rear room was achieved by means of wireless cellular phone based system, which saved the need of relaying and transmitting the data through cables and fibers. In addition, it provided the capability to remotely control the above-mentioned data acquisition system.

Time-depended measurements of the response of the above-mentioned various targets to the blast wave load were successfully recorded from all the above-mentioned gauges. The data have been used to verify and validate our computer codes.