

ATTENUATION OF SHORT DURATION AIRBLAST IN TUNNEL SYSTEMS

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A large amount of research has been conducted for the attenuation of long duration blast pulses in tunnel systems, but only a small amount of information was available for the propagation of high pressure, extremely short duration pulses produced by near-miss conventional explosives. This paper describes the results of an extensive small scale explosive test series conducted at the U.S. Army Engineer Waterways Experiment Station (WES) which produce measurements of short duration high explosive blast penetrating into relatively large tunnel systems.

The WES experimental program consisted of a series of explosions of spherical charges ranging from 113 to 907 gm of composition C-4 explosive detonated outside and inside the entrance of tunnels of circular and square cross-sections. The model structures were about 30 cm in diameter and from 4 to 24 tunnel diameters long. Both end-on and side-on burst configurations were used. Blast pressure was measured at locations ranging from 1/5 to 24 diameter from the entrance. Included in the program were tests of blast propagation in a long straight tunnel, the performance of baffles over the entrance, blast reflection at the end of short tunnels, blast attenuation in side and "T" tunnels, blast propagation in 45 and 90 degree bends and blast suppression with a vented expansion chamber.

The results of these tests are summarized. Representative pressure-time records and plots of the blast peak overpressure and impulse are given. Important differences and similarities between shock tube data for the propagation of relatively long duration pulses and the short duration blast data are noted. Several of the prediction methods and "rules of thumb" commonly used for long duration blast are shown not to apply to short duration pulses.