LOADING OF SHELTER WALLS DUE TO AN AIR BLAST INDUCED GROUND SHOCK

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An above-ground nuclear detonation produces an air blast wave which, in the Mach region, travels horizontally over a plane ground surface, producing a sudden loading of the ground. This so-called air slap effect induces p- and s-waves in the soil which may reflect and interact at the wall of buried structures.
A theoretical study of the oblique reflection of an air slap ground shock at a vertical shelter wall is presented in this paper.
For usual soil conditions the reflection angle in the 1 or 3 bar region is in the so called critical range, which makes the mathematical analysis rather complicated -even under the assumption of linear elasticity-, leading to divergent integrals with a surprising physical interpretation: namely a very short infinite pressure peak at the shelter wall (for a vertical ground shock front).
Inspired by the exact elastic solution, a simple procedure for practical shelter design is proposed which takes into account also non-linear soil effects as well as soil arching.
Some foreign experimental results are commented and possibilities for further research work are discussed.