SOIL FILLED PERIMETER WALLS UNDER BLAST

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ABSTRACT

Military camps need fast and efficient solutions against hazards like blast loads resulting from detonative scenarios with e.g. VBIEDs (Vehicle Born Improvised Explosive Devices). Beside reinforced concrete solutions often soil filled gabion like systems are used. These systems allow for a modular set-up of easy to use perimeter walls with variable height and cross-section, application as a gravity wall and use of local filling material. The latter is subject of the proposed paper.
Depending on aggregate size and morphology, size distribution and humidity, soil materials provide different material properties like compaction parameters, cohesion or angle of friction beyond others. Each of these parameters affect directly the structure's response under highly dynamic conditions. To be able to understand the influence of varying soil parameters at varying loading conditions and thus to predict the structure's behaviour precisely, the Fraunhofer Ernst-Mach-Institute (EMI) investigated soil filled perimeter walls experimentally, using hydrocode simulations as well as analytical methods. Since the soil's properties primarily influence the wall's behaviour - at the resistance side - an extensive laboratory test campaign was required to characterize different soils. The loading range varies from quasi-static (10^{-5} s^{-1}) to dynamic strength (10^{2} s^{-1}) using a standard press and a Split-Hopkinson Bar (SHB) with a triaxial pressure cell. The experimental data serves for the derivation of dynamic material models and it is complemented by numerical simulations. Furthermore, this paper describes the execution of shock tube tests on soil filled perimeter walls to analyse their load bearing behaviour under blast load. The experiments are evaluated with regard to the failure mechanism as well as the blast mitigation. Additionally, the blast mitigation effect is numerically investigated and the results are compared to the experiments.
The present conference article provides a selected view of the multi-annual research work and latest findings of Fraunhofer EMI studying soil filled perimeter walls under blast.