EXPERIMENTAL OBSERVATION OF THE HYPERDYNAMIC BEHAVIOUR OF RHR SANDWICH PANEL UNDER REPETITIVE FREE AIR BLAST LOADS USING DIFFERENT HELICAL SPRINGS STIFFNESS

[1]MOHAMED RASHAD, [2]T.Y. YANG

PhD candidate, Professor
[1,2]Department of Civil Engineering, University of British Columbia, Vancouver, Canada
[1]Department of Civil Engineering, Military Technical Collage, Cairo, Egypt
[2]International Joint Research Laboratory of Earthquake Engineering, Tongji University, Shanghai, China
E-mail: [1]mohamed.rashad@alumni.ubc.ca, [2]yang@civil.ubc.ca

Abstract - Nowadays, the terrorism attack has been increased. Most of these attacks focused on the important infrastructures and tunnels which cost the countries many victims and a lot of money to rebuild it. To properly confront these attacks, effective protection layers should be designed to be added to the underground structure to attenuate and prevent the structure from being fully damaged. These protection layers should be cheap, high strength-low weight, able to be constructed easily and able to withstand reputative blast loads. By achieving these requirements, the underground structure can withstand reputative blast loads without being damaged and without heavy additional dead loads. A novel sandwich panel, named RC panel - Helical springs- RC panel (RHR) sandwich panel, which consists of normal strength reinforced concrete (RC) panels at the front and the back and steel compression helical springs in the middle has been proposed and numerically compared its hyperdynamic behaviour with the traditional protective system RC panel – Sand - RC panel (RSR) sandwich panel. It was found that the RHR sandwich panel has a superior behaviour against the blast load considered. In this paper, an experimental investigation is conducted on the RHR sandwich panel under different levels of free air blast loads using different helical springs interlayer stiffnessesin different locations. The results show the significant effect of changing the core stiffness and the helical springs location on the damage level and the crack trajectory of the facing reinforced concrete (RC) panels. In addition, this experimental studyemphasizes the ability of the novel RHR sandwich panel on withstanding the reputative blast loads under the ranges considered.

Keywords - Reinforced concrete panel; RHR sandwich panel; compression helical springs; repetitive free air blast loads