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Numerical Investigation of Fiber-Reinforced Polymer (FRP) Panels Resistance to Blast Loads

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Abstract : Fiber-reinforced polymer (FRP) sandwich panels are increasingly making their way into structural engineering applications. One of these applications is the blast mitigation. This is attributed to FRP ability of absorbing considerable amount of energy relative to their low density. In this study, FRP sandwich panels are numerically studied using an explicit finite element code ANSYS AUTODYN. The numerical model is then validated with the experimental field tests in the literature. The inner core configurations that have been studied in the experimental field tests were formed from different orientations of the honeycomb shape. On the other hand, the conducted numerical study has proposed a new core configuration. The new core configuration is formulated from a combination of woven and honeycomb shapes. Throughout this study, two performance parameters are considered; the amount of the energy absorbed by the panels and the peak deformation of the panels. Following, a parametric study has been conducted with more variations of the studied parameters to examine the enhancement of the panels' performance. It is found that the numerical results have shown a good agreement with the experimental measurements. Furthermore, the analyses have revealed that using the proposed core configuration obviously enhances the FRP panels' behavior when subjected to blast loads.

Keywords : blast load, fiber reinforced polymers, finite element modeling, sandwich panels
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