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Damage of Laminated Corrugated Sandwich Panels under Inclined Impact Loading

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Abstract : Sandwich foam structures are efficient in impact energy absorption and making components lightweight; however their efficient use require a detailed understanding of its mechanical response. In this study, the foam core, laminated facings' sandwich panel with internal triangular rib configuration is impacted by a spherical steel projectile at different angles using ABAQUS finite element package and damage mechanics is studied. Laminated ribs' structure is sub-divided into three formations; all zeros, all 45 and optimized combination of zeros and 45 degrees. Impact velocity is varied from 250 m/s to 500 m/s with an increment of 50 m/s. The impact damage can significantly demolish the structural integrity and energy absorption due to fiber breakage, matrix cracking, and de-bonding. Macroscopic fracture study of the panel and core along with load-displacement responses and failure modes are the key parameters in the design of smart ballistic resistant structures. Ballistic impact characteristics of panels are studied on different speed, different inclination angles and its dependency on the base, and core materials, ribs formation, and cross-sectional spaces among them are determined. Impact momentum, penetration and kinetic energy absorption data and curves are compiled to predict the first and proximity impact in an effort to enhance the dynamic energy absorption.

Keywords : dynamic energy absorption, proximity impact, sandwich panels, impact momentum
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