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Low velocity bending impact behavior of foam core sandwich beams: experimental

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Abstract

This experimental study addresses the low velocity impact bending response of sandwich beams with expanded polystyrene (EPS) foam core reinforced by aluminum face-sheets using adhesive bonding technique. The deformation behaviour and the effects of the geometric and mechanical design parameters were investigated to improve the impact energy absorbing capability. The bending impact tests were performed for different foam density, foam and plate thicknesses for three impact energy levels: 4.45 13.05, 26.78 J. The photographs of the permanent deformation geometries of the sandwich beams were presented and the contact force and kinetic energy histories were discussed. The specimens with higher foam core density and thicker foam core resulted in the lowest permanent central deflections and contact force variations. As the foam core density and thickness were increased, the energy absorbing capability was improved. The specimens having thinner face-sheets exhibited higher contact force variations and the lower permanent deflection than those of the specimens with thicker face-sheet even for the lowest impact energy. However, as the impact energy was increased, the specimen with thinner face-sheet exhibited lower contact force levels and higher permanent deflections than those of the specimens having thicker face-sheets. In addition, the plastic dissipation energy was increased in the face-sheets. The face-sheet thickness was more effective on the permanent deflections, whereas the foam core density was more effective on the energy absorbing capability.

Keywords : Sandwich beam; Expanded polystyrene foam; Impact; Adhesive; Adhesive bonding.

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