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Fiber reinforced composites sandwich panels with web reinforced Wood core for building floor applications

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Abstract

The bending behavior of an innovative fiber reinforced polymer (FRP) sandwich panel was investigated for application in a multistory building. The panels featured a paulownia wood core reinforced by glass fiber reinforced polymer (GFRP) facesheets and web and was manufactured by a vacuum assisted resin infusion process. Specimens with different web thickness, web spacing, height, and facesheet thickness were loaded under four-point bending to validate the effectiveness of the detailed web configuration in improving panel stiffness and capacity. The results showed that the bending stiffness and ultimate bending strength could be enhanced by increasing the web thickness, web height, and facesheet thickness, as well as by reducing web spacing. An theoretical model based on Timoshenko beam theory was proposed to predict the bending stiffness and ultimate strength of the sandwich specimens. Furthermore, finite element analysis was established to verify the influences of web height, thickness, spacing, and facesheets on the GFRP floor panel performance. The theoretical results showed good agreement with the numerical and experimental results in terms of stiffness and ultimate bending strength. This work therefore assists the design of a multistory building completed with the proposed sandwich panel as the floor system.

Keywords