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Mechanical behavior of novel GFRP foam sandwich adhesive joints

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Abstract:

Composite foam sandwich is a new, energy-absorbing and load-bearing type of structure, which is widely used in engineering. Furthermore, utilization of connection between composite foam sandwich panels is essential. In this paper, an adhesive joint between two GFRP foam sandwich panels is proposed (model A) and several main failure modes of the novel adhesive joint structure are investigated through four-point bending test. Based on 3D-Hashin failure criterion, cohesive behavior failure criterion and brittle cracking failure criterion of novel GFRP foam sandwich adhesive joints, a progressive damaged model is established to simulate the strength and the results of FEM model and experiments are in good agreements. In order to analyze the effects of stiffness and strength on the structure's mechanical properties, three more connection were proposed to compare the simulation results, which established a simple engineering design for joint structure.

Keywords: Composite sandwich; Joints; Mechanical properties; Bending

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1. Introduction

Composite sandwich structures are widely used in many fields, such as aerospace structures, ships, cars, loads, harbors, trains, and wind turbines, because of their light weight, outstanding mechanical properties, and corrosion resistance. However, the joint connection sections are the weakest part in composite sandwich structures. An efficient mechanical connection between two