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Failure mechanism of sandwich beams subjected to three-point bending

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Abstract: An analytical solution for the failure modes of foam-core sandwich beams subjected to three-point bending is presented in this study and a failure model is established to predict the failure modes and estimate the initial failure loads for each failure mode, i.e. face yield, core shear and indentation. Quasi-static three-point bending experiments have been carried out to verify the predictions of the theoretical analysis. Analytical predictions of the failure mode and the ultimate load compare well with the experimental results and better accuracy than the previous model is achieved.

Keywords: failure modes; sandwich beam; aluminum foam; three-point bending; failure map

1. Introduction

Sandwich beams are widely used in various engineering applications where there is need for lightweight structures with high in-plane and flexural stiffness [1]. Due to their higher strength and high-temperature capability, aluminum foams compete favorably with honeycomb and polymer foams as the lightweight cores of sandwich beams [2]. Obviously, it is significant to determine the sensitivity of the collapse strength and failure modes of sandwich structures to their geometric configurations

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