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标题: 3D explicit finite element analysis of tensile failure behavior in adhesive-bonded composite single-lap joints

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摘要: The tensile failure behavior in adhesive-bonded composite single-lap joints with different overlap lengths is investigated through experiments and various three-dimensional (3D) explicit finite element methods (FEMs). Different failure modes are observed in different overlap lengths. Three parameterized finite element models are developed to discuss the accuracy and applicability of the 3D explicit FEMs based on different modeling strategies and improved failure criteria. All criteria are programmed with the explicit user subroutines employing element deletion to avoid convergence problems caused by element distortion. The load-displacement curves predicted by these models are consistent with the experimental results, while the prediction of failure morphology depends on model types. The models neglecting interface elements cannot simulate the delamination when cohesive zone models (CZMs) are adopted to predict adhesive failure. The influence of CZMs on delamination is analyzed comprehensively to address this problem. Analysis of stress distribution in an overlap of a length of 10 mm indicates that the peak stress of the adhesive layer occurs on the overlap ends along the axial direction, coinciding with implicit results.

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