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Effect of fiber orientation-based composite lamina on mitigation of stress intensity factor for a repaired plate: a finite element study

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Abstract

The bonded composite repair has proven to be an effective method for addressing crack damage propagation. Numerous studies have employed experimental and simulation techniques to demonstrate the repair performance through the composites. These studies have explored various parameters related to bonded composites, such as size and properties, to enhance repair effectiveness. However, one aspect that has not been thoroughly investigated is the impact of fiber orientation within the composites. Therefore, the current work investigates the effect of the fiber direction of the composite patch bonded on a thin plate under plane stress conditions. Three types of fiber orientation of composite patch have been considered. In this investigation, the finite element method was used to determine the stress intensity factor using the ANSYS commercial code. The research findings showed that the fiber direction influenced the mitigation of stress intensity factor. This study is particularly important for designing the composite patch based on the fiber direction. © 2024 The Author(s).

Author Keywords

Composite patch; FEM; Fiber direction; Stress intensity factor; Thin-walled structure

Index Keywords

Fibers, Plates (structural components), Repair, Stress intensity factors, Thin walled structures; Bonded composite repairs, Composite lamina, Composite patches, Crack damage, Damage propagation, Fiber direction, Fibre orientation, Finite-element study, Stress-intensity factors, Thin-walled structures; Finite element method

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