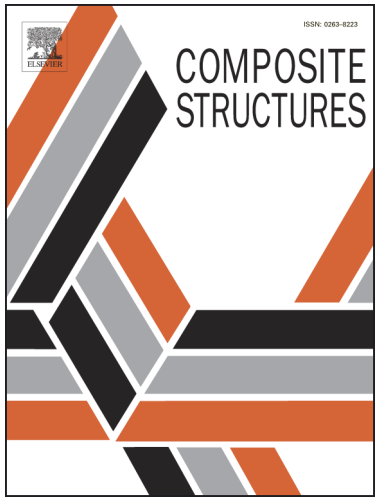

Numerical failure assessment of multi-bolt FRP composite joints with varying sizes and preloads of bolts

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Numerical failure assessment of multi-bolt FRP composite joints with varying sizes and preloads of bolts

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A three dimensional (3D) progressive damage model (PDM) is developed for the failure assessment of fibre reinforced plastic (FRP) composite bolted joints subjected to bolt preloads. Material constitutive equations and material damage model are defined in a user-subroutine UMAT which is integrated with the finite element (FE) software ABAQUS. Fibre and matrix failure in tension, compression or in shear along with delamination failure criteria are incorporated in the present numerical model. Load-displacement behavior, laminate surface strains, propagation of damage and failure of a double-lap multi-bolt composite joint have been studied and present results are validated with the results available in literature. Failure of double-lap multi-bolt FRP joints with different bolt diameters and bolt tightening torques have been investigated using the proposed progressive damage model.

Keywords: *failure analysis; FRP composite; finite element analysis; progressive damage; ABAQUS user-subroutine.*

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