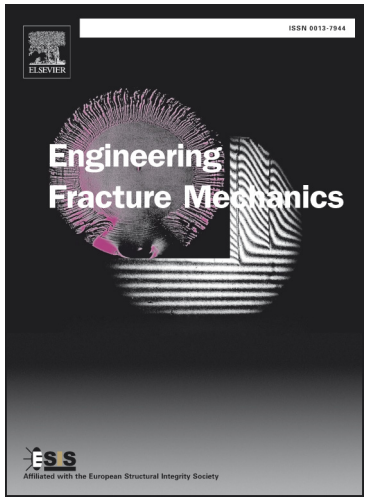

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An improved semi-analytical solution for stress at round-tip notches

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Abstract

In order to investigate the brittle failure of key-hole-notched components, the stress distribution at notch tips is studied numerically and theoretically. A semi-analytical formula is developed for the maximum notch-tip-stress, incorporating crack-tip-blunting, stress-concentration and stress-equilibrium. Stress distributions in notched plates are simulated by the finite-element method, showing improved accuracy of the formula relative to established solutions. Application of the developed equation to components containing U-notches and blunt V-notches, is explored, demonstrating its broad applicability. When combined with stress-based failure criteria, the semi-analytical model can be employed to assess brittle failure in notched components with significance towards fracture in heterogeneous materials.

Keywords: Key-hole notches; Crack tip blunting; Stress concentration; Stress equilibrium; Failure criterion

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