

A new critical plane criterion with a material-dependent exponent to account for high mean stress effect

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Abstract

Mean stress effect remains as a critical aspect in multiaxial fatigue analysis. This work presents a new criterion which, based on classical Findley criterion, applies a material-dependent exponent to the mean normal stress term and includes the ultimate tensile stress as a fitting parameter. The criterion has been checked against an extended version of the Papuga database of multiaxial experimental tests with 485 results, and compared with the criteria by Findley, Robert and Papuga. The new criterion provides outstanding results for pure uniaxial cases, with multiaxial performance similar to Robert criterion with a smaller range of error and a conservative trend. These features enhance the applicability and versatility of the criterion for its use in fatigue design of structural components.

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