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# Mixed mode brittle fracture analysis of high strength cement mortar using strain-based criteria

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## ABSTRACT

Strain based fracture criteria are employed to predict the brittle fracture of a cracked high strength cement mortar subjected to combined tensile/ shear loading. Theoretical background of a traditional and extended versions of maximum tangential strain criteria are introduced, and the mixed mode fracture toughness and crack propagation angle are calculated for centrally cracked Brazilian disk specimens with various dimensions. In addition to the strain based criteria, a traditional stress based criterion and strain energy based criteria are used to predict the crack propagation conditions of the Brazilian disk specimens. The validity of the fracture criteria are evaluated by comparing the predicted fracture conditions to the previously published experimental data. The comparisons show that the extended version of the maximum tangential strain criterion, which takes into account the effect of both the first nonsingular strain term and the singular strain terms in Williams series expansion for strain field near crack tip, provides highly accurate predictions for the crack propagation conditions. The results indicate that the T-strain, the first non-singular term, plays an important role in the crack propagation of the cement mortar.

**Keywords:** Strain based fracture criterion; T-strain; Cement mortar; Mixed mode crack; Brazilian disk specimen

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