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# Approximate Stress Intensity Factors for a Semi-Circular Crack in an Arbitrary Structure under Arbitrary Mode I Loading

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## Abstract

Approximate Stress Intensity Factors (SIFs) for a semi-circular surface crack in arbitrary elastic finite and infinite bodies are presented. Utilizing General Point Load Weight Function (GPLWF) concept, an explicit expression is derived to determine SIFs for semi-circular cracks subjected to uniform, linear, and nonlinear loads. The presented formulation not only provides a solution for cracked bodies subjected to arbitrary two-dimensional stress distribution on the crack faces, but also could present SIFs for any point on the crack front. The results of the presented formulation for special cases, i.e. semi-circular cracks in a finite thickness plate subjected to complicated loadings, central and non-central semi-circular cracks in finite-length thick-walled cylinders subjected to a uniform internal pressure, and central semi-circular cracks in an infinite-length thick-walled cylinder subjected to a non-uniform internal pressure are compared with the available results in the literature and those obtained through FEM, indicating a very good accuracy. The proposed procedure will be generalized for semi-elliptical cracks in arbitrary structures and mixed mode loading in future.

**Keyword:** Semi-circular crack; stress intensity factor; weight function method; finite thickness plate; thick-walled cylinder.

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