

SIF Computation of Cracked Plate by FEM

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Abstract : The main purpose of this paper is to perform a computations comparison of stress intensity factor 'SIF' evaluation in case of cracked thin plate with Aluminum alloy 7075-T6 and 2024-T3 used in aeronautics structure under uniaxial loading. This evaluation is based on finite element method with a virtual power principle through two techniques: the extrapolation and $G-\theta$. The first one consists to extrapolate the nodal displacements near the cracked tip using a refined triangular mesh with T3 and T6 special elements, while the second, consists of determining the energy release rate G through $G-\theta$ method by potential energy derivation which corresponds numerically to the elastic solution post-processing of a cracked solid by a contour integration computation via Gauss points. The SIF obtained results from extrapolation and $G-\theta$ methods will be compared to an analytical solution in a particular case. To illustrate the influence of the meshing kind and the size of integration contour position simulations are presented and analyzed.

Keywords : crack tip, SIF, finite element method, concentration technique, displacement extrapolation, aluminum alloy 7075-T6 and 2024-T3, energy release rate G , $G-\theta$ method, Gauss point numerical integration

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