SM6L_11523

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Generalized Stress Concentration Factors

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While the traditional stress concentration factor for a given loading is the ratio between the maximal stress in a body and the stress evaluated using simplified geometry, we regard the stress concentration factor as the ratio between the maximum of a stress component over the body, and the maximum value of the applied force fields. Then, for the given loading, we consider an optimal stress distribution which is a stress field together with additional volume force density that will equilibrate the external loading and will result in the smallest stress concentration factor. Finally, the generalized stress concentration factor K is defined as the maximum of all optimal stress concentration factors for all external loading fields. The generalized stress concentration factor is clearly a geometric property of the body. It is shown that K is equal to the norm of the mapping that extends Sobolev functions to the boundary of the body.

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