

A fracture mechanics-based generalized stress parameter approach for fatigue life prediction of welded joints considering weld profile effect

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Abstract

This paper presents a new method, based on fracture mechanics analysis of fatigue, to calculate the generalized stress parameter proposed by Maddox. The generalized stress parameter is computed from the currently existing structural stress definition and the stress intensity factor (SIF) calculation. With the structural stress term accounting for the effect of global weldment geometry, the stress intensity factor captures the local effect of the weld profile, characterized by the weld angle and weld toe radius. Weight function methods are used for the purpose of obtaining the generalized stress parameter. Finally, the generalized stress parameter is validated with fatigue test results of various specimen types and thickness combinations. It is found that the generalized stress parameter is able to effectively predict the fatigue life of welded joints and can serve as a better fatigue damage parameter than the structural stress since the weld profile effect has been included.

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