Accepted Manuscript

A generalized weight function for cracks emanated from sharp and blunt V-notches

Mohammad Reza Mohammadi, Rahman Seifi

PII: S0167-8442(18)30298-2
DOI: https://doi.org/10.1016/j.tafmec.2018.08.005
Reference: TAFMEC 2084

To appear in: *Theoretical and Applied Fracture Mechanics*

Received Date: 21 June 2018
Revised Date: 7 August 2018
Accepted Date: 8 August 2018

Please cite this article as: M. Reza Mohammadi, R. Seifi, A generalized weight function for cracks emanated from sharp and blunt V-notches, *Theoretical and Applied Fracture Mechanics* (2018), doi: https://doi.org/10.1016/j.tafmec.2018.08.005

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

A generalized weight function for cracks emanated from sharp and blunt V-notches

Mohammad Reza Mohammadi, Rahman Seifi*,

Department of Mechanical Engineering, Faculty of Engineering, Bu-Ali Sina University, P.O.C 65175-4161, Hamedan, Iran.

Email: rseifi@basu.ac.ir, Tel. +98 81 38292505, Fax. +98 81 38292631

Abstract

This paper presents a generalized weight function which applicable to cracks initiated from V-notches with sharp or blunt tips. The proposed function is based on the composition solution of the weight function of an edge crack in a semi-infinite plate. For obtaining the proper relation, two correction factors are used to express the effects of the notch depth, root radius, and opening angle. Each factor can be applied separately to present only the effects of the notch depth or root radius to improve solutions that proposed in the earlier studies. This method can be used for studying the effects of the notch parameters and loading conditions on the stress intensity factors of the notch cracks. The accuracy of the proposed function was verified by comparing the results with finite element data for a case study.

Keywords: Weight function; V-notch; Crack; Stress intensity factor.

1. Introduction

Fatigue cracks often originate from stress raiser points such as notches. Emanated crack from a notch root is not as an edge crack due to the high-stress gradient that occurs around the notch root. The first step in investigating the notch crack is the evaluation of the stress intensity factor (SIF) as the crack driving force. The concept of the SIF was initially defined for large cracks, but its application has been extended to crack initiation stage and short cracks growth [1].

Norio and Jiro [2] determined the SIFs of the initiated cracks from V-notches. This study is based on the conformal mapping function for a semi-infinite plate with an edge V-notch. This solution was provided by assuming the load as far field uniform tensile stress and does not useable for other loading conditions. Other similar work with the different method was performed for determining the SIFs of the notch cracks with a small ratio of the crack length to notch depth (small crack or deep notch) [3]. This assumption causes limitations in using with the large cracks. Other methods with the similar assumptions can be found in litrature [1]. The solutions for SIFs of the cracks emanated from notches with different shapes such as semi-elliptical [4], semi-circular [5-7] and rectangular [8] were also provided by some researchers. There are also some handbooks that give the SIFs for cracks emanated from other geometries for engineering applications [9].

Download English Version:

https://daneshyari.com/en/article/7195986

Download Persian Version:

https://daneshyari.com/article/7195986

Daneshyari.com