A Theory of Fracture for Idealized Elastoplastic Materials. (S01-snyder134538-Oral)

Authors:

- V.A.Snyder* - *Univ. PR-Agricultural Experiment Station*
- M.A.Vazquez - *Univ. of P.R.- Agricultural Experiment Station*

Abstract:

Developing a thermodynamic theory of elastoplastic fracture has been difficult, due to irreversible stress-strain relations accompanying plastic deformation during fracture. Most current theories essentially ignore irreversible deformation, through formal mechanisms such as treating the plastic zone as an effective extension of crack length in a linear elastic field, or idealizing plastic deformation as non-linear elastic behavior. Consequently these theories cannot address effects of elastic unloading behind moving crack tips in plastically deforming materials. Here an elastoplastic fracture theory is developed that incorporates irreversibility into its formal structure. Assumptions are that elastic behavior inside the plastic yield surface is fully reversible, and that surface and plastic dissipation energies during fracture are smooth, monotonically increasing functions of maximum past load-point displacement and associated current crack length. The theory is shown to agree with published data for ductile steel. Applications to soil are suggested.

Corresponding Author Information:

Miguel A. Vazquez
University of Puerto Rico
Ag. Exp. Sta., POB 21360
Rio Piedras, PR 00928

phone: 787-767-8283
fax: 787-763-0096
e-mail: elizardi@prtc.net

Presentation Information:

Presentation Date: Wednesday, November 13, 2002
Presentation Time: 8:30 am

Keywords:

elastoplastic fracture mechanics, soil fracture, fracture thermodynamics, soil plasticity