POLSKA AKADEMIA NAUK

DEUTSCHE FORSCHUNGSGEMEINSCHAFT

4th BILATERAL SYMPOSIUM P R L - B R D

MECHANICS of INELASTIC SOLIDS and STRUCTURES

ABSTRACTS

KRAKOW - MOGILANY

13-19 SEPTEMBER 1987

Z.MRÓZ, Warszawa
M.KOWALCZYK, Warszawa

ELASTO-PLASTIC ANALYSIS OF DISKS WITH ACCOUNT FOR POST-CRITICAL STATES

In elasto-plastic analysis of disks within small strain theory, there are elliptic, hiperbolic and parabolic stress regimes. For some boundary conditions or discontinuosly changing disk thickness, a continuous solution does not exist, and the discontinuities in velocity occur within hyperbolic regime or along the transition line between elliptic and hyperbolic regimes. Such discontinuous solutions were discussed in literature [1, 2]. In a series of papers K.Szuwalski and M.Życzkowski [3, 4, 5] introduced the concept of a decohesive capacity by assumption that velocity discontinuity on a stationary material line is equivalent to local brittle decohesion.

In the present paper a different viewpoint is taken. It is assumed that an additional constitutive relation is, formulated between rate of displacement discontinuity and interface traction rates along the stationary discontinuity line. On the other hand the usual flow rule occurs within domains of regular solution. Both geometric necking, material softening or hardening can be incorporated into the localized discontinuity mode. The general formulation is illustrated by a solution for an axisymetric disk for both Tresca and Huber-Mises yield condition. It is demonstrated how the solution evolves from brittle to ductile response depending on disk thickness.

Some generalization to plates under flexure and tension are indicated by formulating proper constitutive equations between traction rates and velocity discontinuities.