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Nonlinear Analysis with Failure Using the Boundary Element Method

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Abstract : The current paper shows the application of the boundary element method for the analysis of plates under shear stress causing plasticity. In this case, the shear deformation of a plate is considered by means of the Reissner's theory. The probability of failure of a Reissner's plate due to a proposed index plastic behavior is calculated taken into account the uncertainty in mechanical and geometrical properties. The problem is developed in two dimensions. The classic plasticity's theory is applied and a formulation for initial stresses that lead to the boundary integral equations due to plasticity is also used. For the plasticity calculation, the Von Misses criteria is used. To solve the non-linear equations an incremental method is employed. The results show a relatively small failure probability for the ranges of loads between 0.6 and 1.0. However, for values between 1.0 and 2.5, the probability of failure increases significantly. Consequently, for load bigger than 2.5 the plate failure is a safe event. The results are compared to those that were found in the literature and the agreement is good.

Keywords : boundary element method, failure, plasticity, probability
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