The Creep and Creep Rupture Analysis of Various Plate Members under Constant Boundary Stress

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ABSTRACT

This study adopts the continuous damage mechanics and the finite element method to investigate the creep and the rupture behavior of plate within high temperature and boundary stress environments. First of all, finite element method is used to divide the plate appropriately, and based on the force and displacement boundary condition, the stress and strain of every element are counted, and then the time periods are chosen, on the basis of quasi-steady, time-harden or strain-harden assumption, to count the increase of the creep strain and further, to accumulate all creep strain. Adapted to the virtual work principle, the creep survival force is summed up to reformulate the force vector and to count the stress and strain of every element again. In accordance with the maximum principal tensile strain, maximum principal tensile stress, maximum shear stress or mixing theory, the creep damage of every element is counted. When the damage value of an element reaches a critical value, the stiffness of the element is removed from the overall structural model, the force and the displacement boundary condition are reformulated, and the rupture life and the rupture path can be found in this way of repeating counting.

Keywords : creep ; creep damage ; continuous damage mechanics ; finite element method ; stress ; strain ; rupture life ; rupture path

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