A MODEL FOR GEOLOGIC MATERIALS, PRESENTATION AND VALIDATION FOR A LARGE RANGE OF DYNAMIC LOADS

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A damage model has been develop at Centre d'Etudes de Gramat (CEG) to simulate the behavior of concrete under severe loading. This model includes two scalar damage variables that give respectively the loss of stiffness under tensile loading and the loss of stiffness under compressive loading. Strain rate effect allows to simulate the increase of the maximum tensile and compressive strength. The Hillerborg regularization concept is applied to limit the result dependency to the mesh size. A frictional stress can been included to simulate hysteresis loops for unloading and reloading paths. Furthermore, the elastic and plastic model proposed by Krieg has also been improved to include a non linear elastic behavior where the stiffness is now pressure dependent. According to the theory of effective stresses, this model can now take into account the water contents effect on the pressure volume relationship and on the shear yield stress. Recently these two models has been coupled.

The resulting elastic plastic and damage model have been tested on a large range of situations. Firstly we simulate simple stress strain paths like cyclic one dimensional tensile and compressive plane stress tests or cyclic compressive tests under one dimensional strain paths. The response under three axial compressive paths is also given. Finally we present comparisons between experiments and numerical simulations for a large number of tests on structure (quasi static and dynamic loading on reinforced concrete beams, impacts on reinforced concrete plates, side on explosion on a concrete slab, shock wave propagation in a earth media with different levels of water saturation). These results show the ability of the new model to predict the structure response for a large variety of situations.