DYNAMIC CONCRETE BEHAVIOUR WITH AN EXPLICIT DAMAGE MODEL: COMPARISON OF NUMERICAL AND EXPERIMENTAL RESULTS ON REINFORCED CONCRETE PLATES UNDER BLAST LOADING

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The Centre d'Etudes de Gramat has developed an explicit damage model to determine the vulnerability of reinforced concrete structures exposed to accidental loading. The mechanical loading is assumed to induce mainly tensile strain. This new concrete model uses two internal scalar variables to represent material stiffness with opened or closed cracks. Inelastic tensile and inelastic compressive strains are introduced. Strain rate effects are also taken into account to increase the dynamic tensile and compressive material strength with strain rate. Friction stresses are added to simulate stress strain hysteresis along unloading and reloading paths. The Hillerborg regularisation concept is applied to reduce the effect of mesh size on the failure process. The explicit model allows computation of the stress tensor directly and exactly, without any iterative process. Hence, convergence difficulties of the iterative procedure are suppressed and computation time is reduced drastically.