EXPERIMENTAL AND NUMERICAL ANALYSIS ON AERATED AUTOCLAVED CONCRETE BEHAVIOUR SUBJECTED TO FRAGMENTS PENETRATION

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The Direction Générale de l'Armement - Techniques Navales (DGA/Tn, Toulon) is developing a new munitions storage magazine to prevent sympathetic detonation between cased munitions stored in adjacent cells. Energy absorbing systems using aerated autoclaved concrete (AAC) are being studied to reduce blast effects and fragmentation. Such lightweight concrete seems to be an efficient material due to its density, cost, workability, handling and cartage facilities, blocks modularity and fire resistance.

Experimental results of triaxial compressive tests conducted at the laboratory 3S-R (Université Joseph Fourier - Grenoble 1) and dynamic penetration tests with different small projectiles (from 1 g to 18.6 g at 1200 m/s to 1500 m/s) carried out at CEA-Gramat are presented for three AAC with various densities i.e. 400, 600 and 800 kg/m^3.

The objective of the penetration tests was to determine the capability of different AAC to resist fragment penetration and to identify the thickness required to prevent the fragments from perforating the material. In case of perforation anyway, spalling was very limited and no cracks were observed on AAC structures. Residual kinetic energy of projectiles was identified so as to give information on the risks of sympathetic detonation.

Identification of numerical material models has been performed based on the triaxial compressive results and simulations of penetration tests were carried out so as to validate the numerical approach.