A SIMPLIFIED METHOD TO EVALUATE THE EXPANSION OF THE DAMAGED ZONE INSIDE A BUILDING AFTER AN INTERNAL EXPLOSION

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ABSTRACT

PLEIADES is the French DGA software for the evaluation of the vulnerability of infrastructure to the effect of conventional weapons. This code is composed of a series of modules that are devoted to the simulation of particular physical phenomena like the penetration of a body bomb through reinforced concrete walls, the fragment fly after the detonation and their effects on equipments and systems, the blast wave effect on the building structure, etc. This paper presents a simplified method introduced in PLEIADES that evaluate the size of the damaged zone where the room walls fail one after the other under the effect of the blast wave overpressure and under the effect of the quasi static overpressure of the combustion products mixed with the ambient air.

The proposed simplified and analytic method has been designed in order to give a realistic evaluation of the damaged zone in few CPU seconds when a military warhead detonates, somewhere, inside a complex multi storey building. This method can be effective to solve parametric studies where the mass of the explosive, the location of the detonation point, the characteristics of the walls of the building, etc. are variable parameters. In order to satisfy these constrains some simplifications of the problem have been done. These assumptions will be presented and the most important features of this empirical model will be given. This method can be effective to simulate the behavior of reinforced concrete structures but also the behavior of masonry structures or a mixture of both. Existing limitations about the building arrangement of the internal walls will be discussed. Some numerical examples will be shown and the results will be commented.