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THE INFLUENCE OF AREAL DENSITY ON THE SHIELDING AND CHANNELLING OF BLAST BY BUILDINGS

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When the detonation of a military munition occurs as an act of war, buildings in the vicinity of such an event are likely to suffer varying degrees of damage. Those closest will undergo the greatest response and will, in some cases, suffer catastrophic failure. As the distance of buildings in a direct line of sight from the explosion increases, the level of damage will reduce. Those buildings that are not in the line of sight of the explosion may be shielded to some degree by other buildings in between. It is also possible that some building arrays may produce the opposite effect and load enhancement at a particular location may occur as a consequence of channelling.

This paper is concerned with the development and quantification of the blast loading experienced by buildings – in this case domestic dwellings - that are distributed on a site such that shielding or, possibly, channelling of the blast may occur. Results are presented in such a way that the influence and significance of the areal density of the arrays can be determined, where areal density is defined as the ratio of total ‘footprint’ area of an array of buildings to the total area occupied by the array.

A number of both symmetrical and random arrays of buildings were investigated both numerically using the program Air3d and experimentally using scale models. Conclusions are drawn about the influence of areal density in determining the degree of shielding provided and, paradoxically, how some building arrays actually enhance blast resultants at a particular location by generating a channelling effect.