

A COMPREHENSIVE COMPARISON OF METHODS FOR CLEARING EFFECTS ON REFLECTED AIRBLAST IMPULSE

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ABSTRACT

Having calculated the free-field pressure history at the location of a building, an engineer engaged in design or assessment of that building must then calculate the loads on the various surfaces of the structure. Numerous engineering methods have been developed that provide approximate (and generally conservative) approaches towards the calculation of these loads. Of greatest importance is the load on the front face (i.e., the building surface directly facing the explosion source). Depending on the size of the building and the blast load duration, clearing effects due to the building's boundaries may reduce the reflected impulse on the front face from the fully reflected value predicted by standard blast models.

Unfortunately, there are many methods available in the literature for evaluating clearing effects, each using somewhat similar, yet distinctly different, equations. One approach given in UFC 3-340-02 (and reproduced in UFC 3-340-01) has gained widespread acceptance; another is presented in a set of guidelines published by ASCE and used for industrial applications; and lastly, a formerly classified study dating back to 1955 which, although declassified in 1998, seems to have escaped the notice of the blast community.

The focus of the present paper is to evaluate all three of these methods empirically, by comparing their results against a series of blast tests with varying charge weights and scaled reflecting building dimensions. A comparative evaluation is then made of the strengths and weaknesses of each approach, with recommendations for future use by researchers and blast engineers.