NUMERICAL SIMULATIONS OF TAMPED WALL-BREACHING CHARGES*

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ABSTRACT

During the past several years, the US Army has focused considerable attention toward developing improved methods for breaching walls in the urban combat environment. A major thrust is centered on finding a one-step method to breach the toughest wall type that regular Army units are likely to face, i.e., a 203-mm (eight-inch) thick, double-reinforced-concrete (DRC) wall. The desired breaching method will produce a cleared, man-sized hole through the wall in a single step. The US Army Engineer Research and Development Center has conducted a series of experiments to better define the effectiveness of various C-4 charges in breaching DRC walls. As part of this research effort, numerical simulations of the experiments were conducted using the coupled Eulerian and Lagrangian code Zapotec. Based on the excellent agreement between the numerical simulations and the experimental results, simulations are now being used as a predictive tool to eliminate ineffective charge designs.

One issue of concern to the Army is the weight of the planned man-portable breaching system. One potential means of reducing the explosive weight is to apply a tamping material to the charge geometry, e.g., water or sand. This issue was addressed experimentally by subjecting two DRC slabs (nominal dimensions of 2.4 x 2.4 x 0.2 meters) to the explosive loading environments produced by 0.28- and 0.57-kilogram (0.75- and 1.25-lb) water-tamped contact-detonation charges. Numerical simulations of the 0.57-kilogram-charge experiment were conducted, as well as a series of parametric simulations in which the geometry of the tamping material was varied. The experimental results will be compared to the numerical simulations and the parametric simulations will be described in the paper. Recommendations based on the parametric simulations will be presented.