NUMERICAL SIMULATIONS OF EXPLOSIVE WALL BREACHING BLAST ENVIRONMENTS*

S. Akers, J. Ehrgott, D. Rickman

US Army Engineer Research and Development Center
3909 Halls Ferry Rd., Vicksburg, MS 39180-6199, USA

Explosive wall breaching will be a key warfighter capability in future military operations by dismounted soldiers in urban terrain environments where the close proximity of urban structures, possibly occupied by non-combatants, significantly restricts the use of large demolition charges or large caliber direct-fire weapons. The US Army Engineer Research and Development Center (ERDC) is currently investigating improved methods for breaching walls in the urban combat environment. A major thrust area is centered on developing methods for predicting the blast and fragmentation environment behind the breached wall. As part of this effort, numerical techniques are being developed to model the breaching process and the blast environment. The experimental and numerical programs will conduct comprehensive breaching research on a full range of urban construction materials. As a first step in this process, the ERDC conducted a baseline study of C 4 breaching effectiveness against steel-reinforced-concrete (RC) walls. A goal of this effort was to better define the behind wall blast environment produced by various C-4 charges placed in contact with RC walls. Numerical simulations of two selected experiments were conducted using the coupled Eulerian and Lagrangian code Zapotec. In these simulations, the concrete and reinforcing steel were modeled as Lagrangian materials, and the C-4 and air were modeled as Eulerian materials. The Microplane concrete constitutive model, which was implemented in Zapotec by ERDC personnel, was used in the simulations. Comparisons between the experimental results and the numerical simulations will be described.

ACKNOWLEDGMENT

The numerical investigation and the resulting data presented herein were obtained from research conducted under the AT40 WP 248A: Hardened Combine Warhead Penetrator Technology Work Package of the US Army Engineer Research and Development Center, Vicksburg, MS 39180-6199. Permission to publish was granted by the Director, Geotechnical and Structures Laboratory.