

INNOVATIVE SLURRY-INFILTRATED MICRO-REINFORCED CONCRETE FOR PROTECTION OF STRUCTURES AGAINST CLOSE-RANGE DETONATION

K. El-Domiaty, J. Florek

*Baker Engineering and Risk Consultants, Inc. 2500 Wilson Blvd., Suite 225
Arlington, VA 22201, United States*

Keywords : blast mitigation, fragmentation, explosive testing, FEA, MRC

This paper examines the testing and analytical validation of an innovative Micro-Reinforced Concrete (MRC) product in blast and fragment mitigation applications, particularly when dealing with explosive charges at close standoffs. The advanced composite material matrix of the MRC product, which consists of a self-consolidating, high strength mortar with multiple layers of fine-wire steel mesh reinforcement infiltrated with a cementitious slurry, has been shown to achieve high performance properties compared with standard reinforced concrete mixtures, including superior compressive strength, ductility and fragment/spall resistance. The performance of the MRC product has been demonstrated with field testing of structural components subjected to both static and blast load environments. LS-DYNA Finite Element Analysis (FEA) material models were developed for the slurry and reinforcement from provided material testing data. Representative field tests were then computationally simulated. In all cases currently considered, the FEA models predicted results similar to those observed in the field testing. Discussion is provided on the expected behavior of the MRC system to close-range blast loading, which includes noticeable advantages compared to alternative mitigation approaches, as well as possible limitations.