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Numerical Modeling of Mixing and Venting from Explosions in Bunkers[1] BENJAMIN LIU, ILYA LOMOV, LEWIS GLENN, LLNL — 2D and 3D numerical simulations were performed to study the dynamic interaction of explosion products in a concrete bunker with ambient air, stored chemical or biological warfare (CBW) agent simulant, and the surrounding walls and structure. The simulations were carried out with GEODYN, a multi-material, Godunov-based Eulerian code, that employs adaptive mesh refinement and runs efficiently on massively parallel computer platforms. Tabular equations of state were used for all materials with the exception of any high explosives employed, which were characterized with conventional JWL models. An appropriate constitutive model was used to describe the concrete. Interfaces between materials were either tracked with a volume-of-fluid method that used high-order reconstruction to specify the interface location and orientation, or a capturing approach was employed with the assumption of local thermal and mechanical equilibrium. A major focus of the study was to estimate the extent of agent heating that could be obtained prior to venting of the bunker and resultant agent dispersal. Parameters investigated included the bunker construction, agent layout, energy density in the bunker and the yield-to-agent mass ratio. Turbulent mixing was found to be the dominant heat transfer mechanism for heating the agent.

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