EVALUATION OF SOME COMPUTATIONAL CODES FOR LARGE SCALE AIRBLAST SIMULATIONS

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To evaluate the damage in an urban environment due to an explosion event a reasonable estimation of the airblast load in a large area is required. The deflection, diffraction, and reflection in a complex urban environment make it difficult to use analytical and empirical methods for an acceptable estimation of the shock wave propagation and the effect on the general damage of the buildings and the injury to inhabitants. The rapid development in the computational hardware and software in the recent decades has opened the possibility for the estimation of the shock wave propagation in an urban environment. There are many commercial and research computational software's available today that have great potentials to provide reasonable simulation of the shock wave propagation in the urban environment. Two major groups of the software are mostly used today, based on either the hydrocode, or the more general CFD code. These simulation software's differ significantly in both the mathematical algorithm and the numerical solutions. They are in general rather complex and the simulation results are often rather dependent on various parameters. It is a great concern today about the robustness, reliability, and efficiency of these codes. In this work, the focus is made to evaluate and validate some of the computational codes for the simulation of the airblast shock wave propagation in the urban environment for the accuracy and efficiency of the codes. LS-DYNA ALE, CESE solvers, and OVERTURE CFD solver have been evaluated based on the experimental measurement of overpressures within a scaled city block at various locations for the explosives detonated at different locations. The accuracy, computational hardware requirement, as well as the computational time are evaluated to identify a reasonable computational solution. The outcome of the work will also provide valuable input for future work planned as a basis for the development of analytical solutions of blast propagation in a complex urban environment.