Aspects of Modeling Block Walls

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ABSTRACT

This paper examines the finite element modeling of block walls subjected to blast loads. The walls studied are typical exterior infill walls for a variety of architectural structures. Modeling the response of concrete masonry unit (CMU) and brick structures involves different analytical approaches than those typically used to model steel or concrete structures that have intra-member continuity. Block structures inherently possess pre-defined lines of weakness due to the presence of mortar joints between blocks. CMU walls may be left ungrouted or strengthened by filling block voids with grout and reinforcement. Material properties (for CMU, brick, grout, and mortar) have shown a wide variation, and the behavior of individual blocks has not been well defined. However, there is a need to distinguish between the behavior of the entire wall and behavior of a single block. Block walls typically fail by separating along the mortar joints, and the wall sections come apart as rigid bodies. The behavior of a single block thus has a small effect on the global behavior of the wall, and precise material data is often unnecessary.

These and other issues, such as how to model the mortar and its behavior, the presence of wall openings, and the boundary conditions surrounding the wall, are discussed. Model simulations are compared to experimental results to assess their validity.