EVALUATION OF PREDICTIVE METHODS FOR INSTRUCTURE SHOCK WAVE PROPAGATION

C. Price, D. Nelson, T. Slawson & N. Boone

US Army Corps of Engineers, Engineer Research and Development Center, Geotechnical and Structures Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180, USA

The analysis of explosively-generated shock wave propagation through enclosed structures is of particular interest to engineers concerned with structural blast responses. Accurate predictions for peak pressures and impulse values are often difficult to generate analytically due to various complications inherent in modeling complex structures. Several tools based on empirical data exist to aid the engineer in quickly scoping airblast propagation, but these require many simplifying assumptions that may invalidate the results.

Three predictive methods, two analytical and one experimental, will be used to analyze blast propagation through a predefined, semi-enclosed structure. Expected blast pressure data will be determined at a series of locations on the structure for the specific case of an explosive charge detonating above an opening in the structure. Additionally, the effects of the opening size, as well as the location of the opening/charge on blast propagation, will be explored. The validity of simplifying assumptions required for each method will also be discussed.

BlastX, a simple instructure shock evaluation code, derives pressure-time history data for specific user-defined locations within a fully-enclosed, predefined space or series of spaces based purely on empirical data. DYSMAS, an advanced fully-coupled hydrocode developed by the United States Navy for the purpose of modeling underwater explosions, will be used for high fidelity analysis of shock propagation through the structure. Finally, a 1/8-scale model of the structure in question will be constructed. Scaled explosive charges will be used to gather blast pressure data at locations coincident with the analytical models. This experimental data will then be compared to the analytical methods, and the results will be presented at the 21st International Symposium on Military Aspects of Blast and Shock.