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Designing blast-resistant walls

Steel Stud Wall Analysis Code (SSWAC) is a computer program that is used to design blast-resistant wall systems for embassies and government buildings around the world. Under a grant from the Army Corps of Engineers and the Bureau of Diplomatic Security of the U.S. Department of State, this project completes five years of research by the MU Civil Engineering Blast Research Group working with the Army and the Air Force Research labs. I performed all of the programming of SSWAC from the begin- ning of the initial coding to the current version. The program evolved over time with needed changes and updated research. SSWAC will continue to evolve from the current version to conform to new threats and additional new research.SSWAC was formulated from analytical models verified using experimental lab tests performed at the University of Missouri-Columbia. Lab experiments consisted of about 50 static beams tests and 15 full-scale wall tests in the MU Static Vacuum chamber. The computer code was used to predict the response of thirteen full-scale field blast tests. SSWAC closely predicts the dynamic response of the field-tested walls under large vehicle bombs. SSWAC is a single degree of freedom model that replicates the blast force applied to a wall. It converts the mass and the resistance of the steel stud wall system into an equivalent system. To determine the survivability, the model response is compared to the maximum possible deflection of the stud wall. SSWAC is a user-friendly and interac- tive Windows-based software that allows the user to input a variety of wall and explosion threat param- eters. The code presents the results of the design in a graphical user interface allowing for easy result comparisons and design optimization. SSWAC has already been used government contractors to design and build various government installations to protect the lives of employees in high-risk areas of the world. SSWAC ability to reduce damage to the building's structure has made its designs crucial to the safety of personnel around the world.