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## Development of explosion-resistant steel-stud wall systems

Assuring the security of the nation's civil infrastructure is a priority. Technologies leading to effective protection of people and structures against bombings are of current interest to federal agencies. The National Center for Explosion Resistant Design at the University of Missouri-Columbia is developing analytical models and simulation tools to predict the response of buildings to blast pressure to design explosion-resistant wall systems. Standard walls are designed to withstand wind pressures (0.25-psi), and are not capable of surviving blast pressures (40-psi). When compared to wind, blast pressure has a very short duration (10-msec to 20-msec), thus it is hypothesized that by creating an energy-absorbent system, we will be able to design steel stud walls capable of withstanding explosions. The key to utilizing steel studs for blast-resistant systems is designing the anchorage so that premature brittle connection failures are prevented. A combination of 50 experiments to test wall configurations and an additional 30 experiments on stud connections yielded a model design incorporating 18-gauge studs with Ω-in steel angle connections. An anchoring system, to attach the stud to floor/ceiling slab, was designed and tested in order to develop the full tensile capacity of the stud. Full-scale beam and wall tests were conducted to measure the pressure-displacement response to failure of the wall and anchorage system. Ductile behavior during plastic elongation of the steel studs was observed and the energy absorbed by the wall system increased by 16 fold, and was predicted to withstand an explosion threat of 40 psi.