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EXTREME TEST

ICF structures blasted with TNT to demonstrate safety, strength

Using 50 pounds of military-grade TNT, the Insulating Concrete Form Association (ICFA) recently blasted six ICF structures to prove the blast-resistant properties of ICF building systems.

The blasts were performed over a three-day period in May at Quantico Marine Corps Base during the Force Protection Equipment Demonstration (FPED IV). FPED is sponsored by the United States Military's Joint Staff, as well as the Department of Defense, the Department of Energy, the National Institute of Justice and the Transportation Security Administration.



Day 2 explosion

Joseph Lyman, executive director of the ICFA, said that more than 9,000 generals, government procurement officers and chief decision makers used FPED IV as an opportunity to view 1,000 commercial off-the-shelf products related to force protection and anti-terrorism.

At FPED III in 2001, a wall with 2-by-4 studs was tested with a 50-pound TNT charge at 35 feet and it was destroyed. FPED IV offered the opportunity to test a minimally reinforced ICF wall under "blast" loading. During three days of detonations, the ICFA blasted the six ICF reaction boxes, built of six different ICF systems, with 50 pounds of TNT at distances between 6 feet and 40 feet. These reaction box structures were built using standard 4,000 psi concrete, 3/8-inch aggregate pump mix and a 6-inch slump.

The reaction boxes consisted of three 8-foot by 8-foot reinforced 6-inch concrete core walls placed in a U-shape with 6-inch reinforced concrete slabs on the top and bottom acting as the floor and the roof. One side remained open so the walls



Day 3 explosion



Structures suffered only singeing

On the closest blast at 6 feet, the 50-pound charge of TNT generated lateral forces well in excess of 10 times the weight of the box and created a ball of fire approximately 200 feet wide and 100 feet tall. Even at 6 feet, the blast resulted in nothing more serious than some small cracks on the face of the wall (cracks less than 2 millimeters wide) and some singeing of the EPS. There was no structural damage, no deflection and no concrete spall. The EPS was singed, a result of the close proximity of the ICF reaction boxes to the fireball created by the explosion.

“This is significant,” Lyman said. “Although we look forward to performing future blast testing to control certain variables in the blast environment, these blast demonstrations proved clients do not have to spend unlimited amounts of money on special building materials to construct blast-resistant buildings. Designed properly, ICF can be utilized to mitigate the effects during an explosive event and significantly reduce the harmful results associated with progressive collapse.”

Ed Storm, chairman of the ICFA, said it was an excellent opportunity to show the military and the federal government how ICFs can meet and exceed their needs.

Considering the long-term costs associated with government buildings, as well as the need for blast-resistant materials, the federal market is one that is a logical choice for the ICF industry to pursue.”

could be closely inspected. All the boxes were reinforced with No. 4 steel reinforcement bars on 16-inch center, and three boxes were further reinforced with structural fibers.

At each distance, the impact-resistant properties of expanded polystyrene (EPS) on the face of the reaction boxes reduced the load of the blast, with the EPS compressing against the face of the reaction boxes, absorbing and reducing the load during each explosion.

