

PROJECT FACTS

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SPONSORS

Department of Homeland Security
National Institute for Hometown Security

PROJECT VALUE

NIHS: \$991,408

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ENVIRONMENTAL & COAL TECHNOLOGIES

Rapidly Deployable System for the Structural Stabilization of Shock Damaged Structures

The U.S. Department of Homeland Security and National Institute for Hometown Security is in need of rapidly deployable automated response and fast recovery technologies that can be deployed by first responders to prevent catastrophic structural failure and to minimize disruption of critical infrastructure services.

This project will develop a rapidly deployable system to stabilize blast damaged structures to avoid catastrophic failure. The system is composed of a delivery vehicle capable of shotcreting prepackaged fiber reinforced cements mortars and micro-aggregated concretes that are strong and rapid setting. The shotcretes will be made from a single bag mix and water and will be simple to formulate. These materials are based on calcium sulfoaluminate (CSA) cement formulations that are capable of achieving set times in minutes and structural strength in hours. CSA based shotcrete can be formulated with lower cement content than Portland-based shotcrete, a higher water to cement ratio, low viscosity, and yet still achieve very high early strength. A range of CSA formulations are examined in the study including compositions rich in ferroaluminate as well as blends with calcium sulfate hemihydrate. CSA based cement will be fabricated that has controlled heat, is capable of good performance over a range of water to cement ratios and will bond to a wide range of surfaces. Fiber reinforced shotcrete mixes will be developed based on these CSA formulations. The properties of the CSA based shotcrete will be matched to the characteristics of a shotcrete delivery system (wet or dry). An operational prototype system will be built and tested as part of this effort.

