

DHS Science and Technology Directorate

Resilient Structures and Facilities Project

Focusing on protection of our nation's critical infrastructure

The Department of Homeland Security Science and Technology Directorate's Resilient Structures and Facilities project is comprised of multiple projects that address vulnerabilities to manmade and natural hazards, which could in crippling effects on mass transportation, buildings and other critical infrastructure. The respective projects will design, fabricate and test protective measures for tunnels, subway systems, bridges, buildings and other structures. Software models will aid in analysis and improve designs for bridges and tunnels. The projects aim to develop solutions that will increase structural resilience high-risk of commercial establishments, government buildings, schools and other structures.

Preventing flood damage

The Resilient Structures and Facilities project is developing technologies that can prevent or limit flooding damage to underground as well as ground-level critical infrastructure. S&T focused on solutions that can be deployed in subway tunnels in its Resilient Tunnel Project. It successfully developed the Resilient Tunnel Plug, an inflatable fabric plug that uses state-of-the-art textile technology to isolate and seal mass transit tunnel sections, limiting damage in the event of an underwater tunnel breach. A major U.S. transit system



The tunnel plug conforms to the shape of a subway tunnel to stop flooding.

plans to install tunnel plugs as part of its security program and due to significant interest, S&T is exploring other uses of the tunnel plug for flooding protection. The Advanced Flood Protection project builds on lessons learned in tunnel plug development to address the needs of major highway tunnels, as well as other key nodes of transit systems.

The project will explore membranes, plugs, deployable barriers and other concepts to protect subway entrances and stairwells, ventilation shafts, tunnel portals, rail yards and power substations.

Successful designs will be installed by transportation authorities and other infrastructure owners to reduce risk to subway systems, highway tunnels and other critical underground and surface-level critical infrastructure.

Protecting infrastructure from explosive attacks



Damage sustained to a reinforced concrete slab during testing. (Photo courtesy of USACE-ERDC)

The Bridge and Tunnel Security project focused on protecting bridges and tunnels from close-in explosive attacks. S&T successfully designed and tested protective measures for cast iron mass transit tunnels, bridge towers and cables and underwater transit structures in previous research projects. This effort will proceed on the same path with an initial focus on mass transit tunnels. Scaled experiments as well as numerical models will be used to determine vulnerabilities and evaluate mitigation approaches to protect the tunnel; full-scale testing will be employed to validate the most promising solutions. Future tasks will provide improved bridge protective measures. These efforts will test components recovered from bridges slated for destruction.

Key partners aid the effort

S&T's project team includes the U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS), the Pacific Northwest National Laboratory (Richland, WA) and the Lawrence Livermore National Laboratory (Livermore, CA). The Combating Working Group is a funding partner.



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To learn more about the Resilient Structures and Facilities Project, contact SandT.RSD@hq.dhs.gov.