Protecting buildings from bomb attack

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University of Adelaide research is producing new materials that could help protect important buildings and other structures from terrorist attacks.

Led by Dr Chengqing Wu, Senior Lecturer with the University's School of Civil, Environmental and Mining Engineering, the researchers have produced a new ultra-high performance concrete with high blast resistance against the impact of bombs.

Comprehensive testing in China, in collaboration with Tianjin Chengjian University, has shown the material has at least five times the strength of conventional concrete. It has five times the compressive strength (ability to withstand compression) and 10 times the tensile strength (ability to withstand stretching or pulling) and is much more ductile (has a higher degree of plasticity) than conventional concrete.

"While many important buildings in cities have concrete barriers to hold back cars and other vehicles that may contain explosives, in crowded downtown areas there may not be space for barriers – and they still will not prevent bombs carried in backpacks and the like," says Dr Wu who is also Director of the Tianjin Chengjian University-University of Adelaide Joint Research Centre on Disaster Prevention and Mitigation.

"We need technologies to strengthen the buildings themselves and mitigate against the blast effects."

With building columns of the same size and explosives set at the same distance, the new ultra-high performance concrete column survives a blast impact from 50kg of TNT (trinitrotoluene) while the conventional concrete column will be destroyed with 10kg of TNT.

"Our new material has very strong blast resistance," Dr Wu says. "If a suitcase explosive was placed very close to building columns made from this material, they would survive.

"The material compares very well with products already on the market in terms of both compressive and tensile stress resistance - and has the potential to be much cheaper to produce."

Currently the material is made in a laboratory setting and further work is needed to establish how the concrete can be made at a construction site.

The research is funded under the Australian Research Council Discovery Project scheme.

The research team is also investigating the use of aluminium foam as an extra layer on structures to absorb blast energy and, with Monash University, new types of structures with concrete-filled, double-skinned steel tubular columns against blast loads.

Provided by University of Adelaide

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