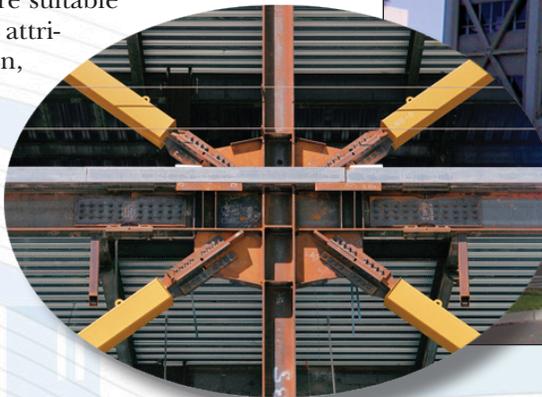


Retrofit of Buildings and Infrastructure in Large Urban Areas

Description

The building envelope is the first real defense against the effects of explosive loads and is typically the weakest component subjected to blast pressures in the event of an explosion. As a step to achieve greater building resilience, the U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate's Infrastructure Protection and Disaster Management Division (IDD) has recently initiated a project to retrofit buildings for blast resistance. The adverse effects of explosive blast on existing buildings can be significantly reduced through protective measures that involve the use of materials with characteristics, properties, and attributes directed at minimizing the damage to the building envelope and connection systems.

This project focuses on identifying innovative curtain wall systems and connections that will resist the impact of different ranges of explosive loads during terrorist events. One goal is to expand the understanding of existing materials and curtain wall systems that are suitable for blast resistance and effective for a series of attributes (e.g., energy efficiency, moisture penetration, and air leakage) that are cost effective. In addition, the project seeks to identify cost effective, innovative systems that can be widely used by manufacturers, architects, engineers, and construction contractors. This cost/benefit can profoundly impact the owners' decision to make optional improvements to the building's performance well above the requirements set by minimum National codes and standards.



Approach

Six CW and four novel connection concepts will be identified that address explosive blast and other major design attributes. For the proof of concept demonstration(s), project team members will closely coordinate with established organizations such as Department of State, University of California-San Diego, Energetic Materials Research and Testing Center (EMRTC, FORTACRETE® and Ductal®). CW and connections will be analyzed using advanced physics-based finite element models. In addition, field testing will be conducted. Based on the results of the analysis, promising CW test specimens and/or connections will be selected to be tested. Depending on the disposition of the industry and national laboratories, the field tests can vary in novel laboratory confined proof of concept type component tests (low cost). An Industry Advisory Committee will be assembled.

Probable Users

DHS Office of Infrastructure Protection; Federal Emergency Management Agency; commercial and government facilities; state and local governments; code officials; associations of engineers and architects.

The Industrial Advisory Committee

During the first year of the project an Industry Advisory Committee (IAC) was formed, comprised of experts from government agencies, architectural firms, structural engineers, curtain wall manufacturers and blast experts. The IAC will assist with enhancing the understanding of cost effective materials (currently available materials and advanced materials) and curtain wall systems that are suitable for blast resistance and also effective for a series of attributes such as: energy efficiency, moisture penetration, and air leakage.

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Homeland Security

Science and Technology