Advances in Civil Engineering

Special Issue on

Advancements in Analysis and Design of Protective Structures against Extreme Loadings

CALL FOR PAPERS

The rising of terrorist bombing threats and industrial explosion accidents highlights the necessity and importance of structural protection against intentional and accidental loadings such as blast and impact. The consequences of such extreme loading conditions have been found to be catastrophic with massive personnel injuries and fatalities, economic loss, and immeasurable social disruption in their wake. It is therefore imperative to enlighten the design of modern structures with consideration of protection against such extreme loadings.

Blast and impact loadings have the nature of short duration and high energy intensity, which results in very different structural responses as compared to when subjected to conventional quasi-static and less intense dynamic loading such as wind load and earthquake load. The analysis and design of conventional structures therefore cannot be directly implemented to the design of protective structures against extreme loadings. Moreover, structural response and material behavior under blast and impact loading are usually nonlinear and time-dependent, involving complex stress states due to stress wave propagation. Simplified analysis and design approaches do not necessarily lead to reliable predictions. A comprehensive understanding about loading characteristics, dynamic material properties, and dynamic response predictions of structures is crucial for reliable and accurate predictions.

Recently, various efforts, including experiment testing, numerical simulation, and analytical derivations, have been devoted to achieving a reliable analysis and design of protective structures. Experimental testing includes both laboratory and field tests, which can demonstrate actual structural behaviors and also be used to validate the fidelity of numerical models. With the advancement of computer technology and computational mechanics, different numerical methods have been developed and employed to model structural responses to blast and impact loadings. Simplified approaches such as single-degree-of-freedom and close-form solutions have been used to predict and analyze structural responses. All in all, the analysis and design of protective structures against blast and impact loadings in general are still a challenge.

This special issue aims to present the state-of-the-art researches and understandings on the analysis and design of protective structures against blast and impact loading.

Potential topics include but are not limited to the following:

- Structural response to blast loading
- Structural vulnerability to gas explosions
- Vulnerability of structures to impact loading
- Structural vulnerability to windborne debris impact
- Projectile penetration and perforation of structures
- Prediction and simulation of explosion and impact loading
- Innovative materials and behaviors at high strain rates
- Strengthening and mitigation for infrastructural protection

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