

Bridge and Tunnel Security Workshop Held in Virginia

By James C. Ray, P.E.

The SEI/ASCE Bridge and Tunnel Security Committee recently held a specialty workshop at the Crowne Plaza hotel in Reston, VA, July 27-28, 2006. SEI sponsored and organized the workshop, with planning and participant invitations handled by the Committee.

The Workshop's purpose was to bring together experts and practitioners in the fields of bridge and tunnel security and provide a controlled forum for presentation and open discussion of ongoing work and the state-of-practice in the rapidly evolving field of bridge and tunnel engineering.

The purpose of the Bridge and Tunnel Security Committee is to develop strategies and criteria for the deterrence, disruption, and mitigation of potential terrorist attacks against bridges. Because this is such a new and rapidly emerging field, the Committee is working to develop a series of State-of-Practice Reports focusing on technical aspects of this topic area. However, they have found very little formal or published information to draw upon due to the



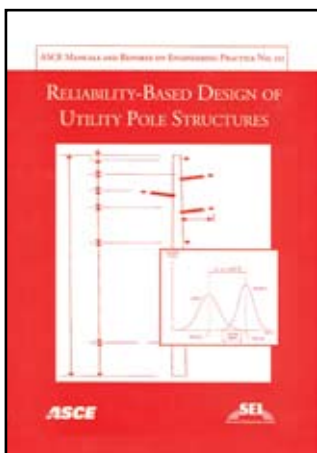
Explosive testing of a steel truss bridge

relatively recent focus on this subject, and concerns regarding confidentiality of the information. Therefore, a primary goal of the Bridge and Tunnel Security Workshop was to encourage dissemination and discussion of bridge and tunnel information from those most active in the profession.

The two-day workshop was attended by 70 engineers and scientists from around the country, all of whom were specifically invited by the Committee based upon their experience and ongoing work/research in the fields of bridge and tunnel security. By restricting invitations to only those with a "need to know," attendees were able to discuss sensitive topics and issues that otherwise could not have been discussed in a more conventional open-to-the-public forum.

This marks the first time that SEI has conducted a restricted-attendance meeting. Although this is not SEI's desired format, it proved successful in this instance, because of the many aspects of bridge and tunnel security that are highly restricted due to homeland security issues. Security and product distribution issues have been a prevalent concern for the Committee since its formation, and this invitation-only forum was a first step in getting critical information to those with a need-to-know.

The presentations were excellent and highly varied, including those from practicing engineers designing and implementing terrorist threat mitigation schemes for existing structures and researchers studying the phenomenologies associated with these threats and



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developing new mitigation technologies. A definite highlight was the presentation from the Chief Engineer of the Golden Gate Bridge who described the complex and pioneering mitigation efforts that have been implemented since 9-11. Due to its symbolism and worldwide fame, this bridge is considered to be a very high priority terrorist target. Thus, they have had to be very aggressive and innovative in their approach to security and threat mitigation. The other bridge owners and engineers were excited to learn from their vast experience.

Several other presentations focused on the importance and current lack of understanding of very-close-in detonations of vehicle bombs against critical bridge and tunnel components. The explosive loading environment from these detonations can be several orders of magnitude worse than that from detonations at even relatively small stand-offs. Little detailed knowledge currently exists about these loading effects and the associated response of structural components. Previous research and mitigation efforts for buildings (where most efforts were concentrated prior to

9-11) always assumed some reasonable degree of bomb standoff, which is by far the most effective means of mitigation. Bridge and tunnel owners do not have this luxury, as enforcement of any reasonable standoff will essentially require closure of the transportation asset. Thus, much more effort must be given to blast hardening of these critical components, and understanding the loading and response phenomena associated with these severe environments.

Progressive collapse of bridges was also an issue of significant discussion. Many complex bridge structures, such as suspension bridges, can be prone to progressive collapse failures if a sufficient number of critical structural components are heavily damaged or destroyed. Several presentations focused on detailed analytical studies conducted to more accurately define the most critical structural components of specific bridges, and the number that would actually have to be removed to induce a progressive failure. Fortunately, most studies showed that considerably more members would have to be removed than originally thought before progressive collapse would occur; because, in most cases, there is considerable internal structural redundancy. It was also shown that because many critical bridge compo-

nents are in a highly stressed *in-situ* state, the dynamic load increase effects from sudden member removal can be critical and should not be ignored in progressive collapse analyses.

The Workshop served to show the Committee the high degree of interest in the areas discussed above. As a result, they have decided to focus their near-term efforts in the two major sub-areas of structural hardening against blast and progressive collapse of bridges. These will be the subjects of their first State-of-Practice reports.

As a first-time event, the turnout and level of participation among the attendees were outstanding and the Bridge and Tunnel Security Committee has received very positive feedback. The Committee hopes that this can become an annual or at least bi-annual event. But regardless, this workshop served the desired purpose of enlightening the bridge and tunnel security community and sharing information in an open forum that previously has not been possible. The Committee hopes that it has paved the way for other security sensitive data-exchange forums in the future. ■

Practice Periodical on Structural Design and Construction

Richard A. Walther, P.E., S.E., Editor

The November 2006 issue of the *Practice Periodical on Structural Design and Construction* contains five relevant and practical papers examining topics from site management to post-construction environmental impact tests.

The first paper in this issue presents results of a case study that documents, both qualitatively and quantitatively, the impact of congested work areas on labor productivity. For construction-minded professionals, this paper presents a useful review of site management techniques which can be beneficial to improving profitability and client satisfaction.

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The 2005 hurricane season was one of the worst on record, and the second paper in this issue highlights the significant damage that occurs from windborne debris during hurricanes. Engineers and contractors who design and build structures in hurricane-prone areas will find useful the summary of residential and light commercial roof and wall assemblies that meet the missile impact provisions of the 2001 Florida Building Code.

Papers three and four deal with bridges: the first presents a compressive strength model, based on an extension of Mohr's strength theory, for confined concrete wrapped with fiber reinforced polymer (FRP) using test data from reinforced concrete bridge columns. The second presents a case study of the use of high-performance concrete (HPC), detailing a bridge constructed partially with nor-

mal strength concrete and partially with HPC. Comparisons of time-dependent performance characteristics for strength, creep, shrinkage, and camber are made. Both of these papers will be useful for bridge engineers.

The fifth, and last, paper in the November issue discusses the results of a post-construction environmental monitoring study of a fly ash-based road bed, which concludes that fly ash subbase materials can be used without adverse environmental effects. Sustainability is the future, and this paper presents a unique opportunity to use power plant waste products in a safe and beneficial way. ■

