

International Scan on Assuring Bridge Safety and Serviceability in Europe

by Dr. Dennis R. Mertz



The scan team with hosts visiting the large-scale structural testing facility of Laboratoire Central des Ponts et Chaussées in Paris, France.

In June 2009, a delegation from the United States sponsored by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials, and the National Cooperative Highway Research Program visited several European countries to review their policies and procedures to assure safety and serviceability of their highway bridges. The itinerary for the 2-week scan of technology included Helsinki, Finland; Vienna, Austria; Graz, Austria; Cologne, Germany; Paris, France; and London, United Kingdom. These five countries were selected through a desk scan that identified their use of advanced practices in assuring bridge safety and serviceability.

The scan team was led by Firas I. Sheik Ibrahim of the FHWA and Susan Hida of the California Department of Transportation (Caltrans). The remainder of the team included Gregory L. Bailey of the West Virginia Department of Transportation, Ian M. Friedland of the FHWA, Jugesh Kapur of the Washington State Department of Transportation, Barney T. Martin Jr. of Modjeski & Masters Inc., Dennis R. Mertz of the University of Delaware, Gregory R. Perfetti of the North Carolina Department of Transportation, Thomas Saad of the FHWA, and Bala Sivakumar of HNTB Corporation. Harry A. Capers of Arora and Associates was the contracted report facilitator.

The scan team conducted a series of meetings and site visits with representatives of government agencies and private sector organizations in the five countries.

Specific topics of interest to the team included:

- Safety and serviceability measures during design, construction, and operation; and
- Refined analysis applications during design, construction, and operation.

The scan team found that, as with bridge owners in the United States, the European host agencies put great value on their bridge programs not only in ensuring highway-user

safety, but also that durability and serviceability expectations are met enhancing capital investment decisions regarding their existing bridge inventories. Major emphasis is placed on ensuring that there is no interruption in service and that appropriate sophisticated methods are used to evaluate structural safety. Most of the agencies visited had major programs aimed at assuring accuracy of design and rating of the highway structures on their systems.

The scan team also identified many practices and technologies related to the previously stated topics of interest.

The preliminary recommendations of the team for examination and consideration by bridge owners in the United States are as follows (in no particular order):

- Develop a strategy for promoting and increasing the use of refined analysis for design and evaluation.
- Utilize refined analysis for evaluation in combination with reliability analysis as a measure to avoid unnecessary posting, rehabilitating, or replacing bridge structures that affect commerce, schools, and the traveling public.
- Adopt the concept of annual probability of failure (exceedance) as the quantification of safety in probability-based design and rating specifications rather than the reliability index for a 75-year design life.
- Conduct research to create the basis to systematically introduce increasing levels of sophistication into the analyses and load models with the objective of assessing bridges more accurately.
- Periodically and routinely reassess traffic highway loading, using recent weigh-in-motion data, to ensure that live-load models adequately provide for bridge safety and serviceability for a 75-year design life or greater.

- Develop an overweight permit design vehicle and design for the associated Strength II load combination, particularly in high load corridors.
- Initiate and maintain a database documenting bridge failures around the world, including sufficient information and data to assist in assessing the causes of failure, for the purpose of proactively examining practices and avoiding similar problems in the United States.
- Continue efforts on the development of techniques, guidelines, and training for proper use of non-destructive evaluation techniques to detect corrosion and breakage of cables of cable-supported bridges, strands of pretensioned girders, and internal and external tendons of post-tensioned girders.
- Explore “Independent Check Engineering” and “Check Engineer Certification” as a means to augment QA/QC of bridge designs.
- Initiate an investigation and technology transfer of selected best practices and emerging technologies identified during the scan.

The technology scan was of great value to the individual members of the team, as well as impacting our nation’s dialogue on bridge engineering. Susan Hida of Caltrans says, “The use of weigh-in-motion data to establish load models in the Eurocode and then adjust within each country was particularly inspiring to me for work back at Caltrans. We hope to do something similar for both permit and fatigue trucks on heavily travelled corridors.”

The scan team has developed a detailed implementation plan for the recommended initiatives and practices. The implementation plan and details on the findings and recommendations are included in a soon-to-be-published final scan report. For more information, go to www.international.fhwa.dot.gov where scan reports are available.