

**Report of Task Committee D
WIND ENGINEERING**

Date: 14 May 2007

Place: National Institute for Land and Infrastructure Management, Tsukuba, Japan

Attendees:	U.S. Side --	Joseph Main (Acting Co-Chair)	NIST
		Partha Sarkar	Iowa State University
		Luca Caracoglia	Northeastern University
	Japan Side --	Yasuo Okuda (Co-Chair)	BRI
		Jun Murakoshi (Co-Chair)	PWRI
		Masaaki Togashi	MRI
		Hitomitsu Kikitsu	BRI
		Yasushi Josen	PWRI

1. Objective and Scope of Work

To exchange technical information and to jointly plan, promote, and foster research and dissemination, in order to improve understanding of wind and its effects on structures, to establish more rational wind-resistant design procedures for structures, and to contribute collaboratively and synergistically to wind hazard mitigation. Specific objectives for the Task Committee include:

- (1) Strategically and collaboratively, identify research needs in wind hazard mitigation in the areas of new technology, basic and applied research in wind and structural engineering, and in social and economic impacts of wind events.
- (2) Facilitate cooperation and collaborative research between U.S. and Japanese researchers in wind engineering.
- (3) Identify and exchange successes in wind engineering and wind hazard mitigation.

The scope of the US-Japan collaboration includes:

- (1) Characterization of strong wind, especially boundary layer extreme winds.
- (2) The study of wind effects including wind loading on and wind-induced response of structures.
- (3) Performance of experimental and analytical research to predict wind effects.
- (4) Performance of damage surveys, and wind hazard and risk assessments.
- (5) Development of new technologies for wind hazard mitigation.

2. Accomplishments

- (1) The 4th US-Japan Workshop titled as "New Challenges for Reduction of High-Wind Disasters" was held in Tsukuba on July 20-22, 2006. In the workshop, 29 researchers and engineers (U.S.:12, Japan:17) participated and 21 technical papers were presented on the issues of the prediction of disaster from wind, the influence of strong wind on buildings and bridges, and so on. The proceedings of the workshop were printed by BRI and PWRI in March 2007.
- (2) A second phase of comparative analysis in the inter laboratory study of wind loading on low industrial buildings was initiated by Prof. Bogusz Bienkiewicz of Colorado State University following the 4th US-Japan Workshop. It was observed that different target empirical models for turbulence intensity were used by the participating laboratories, resulting in significant variability in the turbulence intensity, particularly for suburban terrain. This helps to account for the previously observed variability in point pressures and bending moments. These results are being presented by Joseph Main of NIST at the 39th UJNR Panel Meeting.
- (3) A second phase of wind tunnel tests on streamlined and rectangular bridge deck sections were completed recently at Iowa State University (ISU) as part of the benchmark study on flutter

derivatives that was initiated at the 3rd U.S.-Japan workshop on wind engineering in 2002. Both free and forced-vibration tests were performed. Participants included Prof. Partha Sarkar and Prof. Fred Haan (ISU) and Prof. Luca Caracoglia (Northeastern University). Results were compared with those from PWRI (Dr. Hiroshi Sato) and Kyoto University (Prof. Masaru Matsumoto) and were presented at the 39th UJNR Panel Meeting.

3. Future Plans

- (1) As a follow-up to the 4th U.S.-Japan Workshop on "New Challenges for Reduction of High-Wind Disasters" held in Tsukuba in July 2006, the 5th U.S.-Japan Workshop on Wind Engineering will be held in U.S. in fall 2009 or on January or February 2010.
- (2) Seek additional opportunities to pursue collaborative research on the following topics:
 - a) Wind characteristics and wind hazard mitigation.
 - i) Wind characteristics in complex terrains.
 - ii) Validation of wind models with full-scale data (opportunities for joint field studies).
 - iii) Arrange for the hosting of colleagues interested in participating in quick-response post-storm damage assessments.
 - b) Wind effects on buildings.
 - i) Development of reliable and consistent aerodynamic loads and probabilistic methodologies for performance-based structural design.
 - ii) Comparison of wind tunnel data sets and CFD results to full-scale measurements.
 - c) Wind effects on bridges
 - i) Prediction and mitigation of wind-induced vibration of stay cables.
 - ii) Establish guidelines, criteria, and formats for sharing data from full-scale measurements, and identify potential collaborative instrumentation opportunities.
 - d) Evolving Technologies
 - i) Jointly evaluate need and costs, and to share preliminary investigation results relative to next-generation wind tunnels for the simulation of non-stationary winds (straight-line, tornado and microburst).
 - ii) Structural control
- (3) Exchange technical information on the following topics
 - a) Wind characteristics and wind hazards
 - b) Wind pressures, loadings and performance of buildings
 - c) Wind-induced response of flexible, cable-suspended bridges and their components
 - d) New prediction and mitigation techniques for wind effects
- (4) Investigate opportunities for technical collaboration on the following topics
 - a) Distribution of airborne chemical and biological agents
 - b) Development of a distribution model for volcanic gas and dust
 - c) Collaboration with fire engineering researchers by making use of unique facilities: Fire Research Wind Tunnel and Wind and Rain Test Laboratory
 - d) Consider development of a compendium listing of relevant resources and facilities for wind engineering research
- (3) Engage in more regular interaction and communication among Task Committee members. Use email (e.g., bi-monthly updates on activities) and exchange visits between full Panel meetings was suggested as a means of facilitating and coordinating collaborative activities.
- (4) Continue to improve process, mechanisms, and funding for interaction on reconnaissance teams after future hurricane/typhoon impacts.
- (5) Strategically and collaboratively construct a vision and plan for wind engineering research needs for the next decade, and formulate collaborative activities around those plans.