Wind and Seismic Effects

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PROCEEDINGS OF THE 30TH JOINT MEETING OF THE U.S.-JAPAN COOPERATIVE PROGRAM IN NATURAL RESOURCES PANEL ON WIND AND SEISMIC EFFECTS

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SPECIAL SESSION in CELEBRATION of the PANEL'S 30th ANNIVERSARY

Completing Our Panel's Work

by

Richard N. Wright[1]

ABSTRACT

Our 30th Joint Meeting provides an opportunity to reflect on our work and accomplishments and establish our view for the future of our U.S./Japan Panel on Wind and Seismic Effects. The Panel has helped us, in the United States, in Japan, and in the world, to: (1) focus, coordinate and amplify efforts of government, academia and industry to better understand extreme wind and earthquake phenomena, and (2) increase the resistance of our built environment and society to their destructive effects. Is it not time to commit ourselves to the solution of the problem of destructive winds and earthquakes? Can we make it the objective for the next 20 years of the Panel to work together, with the international wind and earthquake communities, to provide: (1) the knowledge of extreme wind and earthquake phenomena; (2) the practices for planning, design, construction, operation, maintenance, and rehabilitation of our built environment; and (3) the incentives for societal actions to apply the practices that together will end the threat of wind and earthquake disasters?

KEY WORDS: Disaster Mitigation; Earthquakes; Earthquake Engineering; Earth Science; Japan; Meteorology; Seismology; Social Science; United States; Wind Engineering

1. INTRODUCTION

Our 30th Joint Meeting provides an opportunity to reflect on our work and accomplishments and establish our view for the future of our U.S./Japan Panel on Wind and Seismic Effects. It is a wonderful opportunity, while the founders of the Panel can still be with us, to note how the Panel has helped us, in the United States, in Japan, and in the world, to: (1) focus, coordinate and amplify efforts of government, academia and industry to better understand extreme wind and earthquake phenomena, and (2) increase the resistance of our built environment and society to their destructive effects.

Moreover, we have the opportunity to define our objectives for future Panel collaborations. Therefore, I wish to build on the thoughts of Dr. Tsuneo Katayama, Director General of the National Research Institute for Earth Science and Disaster Prevention, at the 29th Joint Meeting and at the Second U.S./Japan Earthquake Policy Symposium: **Is it not time to commit ourselves to the solution of the problem of destructive winds and earthquakes?** Can we make it the objective for the next 20 years of the Panel to work together, with the international wind and earthquake communities, to provide: **(1) the knowledge of extreme wind and earthquake phenomena; (2) the practices for planning, design, construction, operation, maintenance, and rehabilitation of our built environment; and (3) the incentives for societal actions to apply the practices that together will end the threat of wind and earthquake disasters?**

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The appendix to this paper is an excellent summary of the activities and accomplishments of the Panel prepared by our U.S.-side Secretary General, Noel Raufaste. In the following paragraphs, I draw upon the facts from this summary to show that we have established a sound basis for committing ourselves to Completing Our Panel's Work and solving the problem of destructive winds and earthquakes.

Our Panel was established in 1969 to encourage, develop and implement the exchange of wind and seismic technologies; develop stronger links between the two countries; conduct joint research and cooperative programs; and exchange guest researchers and equipment. Now, we are holding our 30th joint meeting, and have established an active family of task committees that have held more than 60 workshops and conferences, have published more than 1700 papers, and exchanged over 200 guest researchers. These activities, our collaborative investigations of effects of U.S. and Japanese extreme winds and earthquakes and our 9 Cooperative Research Programs have resulted in knowledge and recommended practices used in the United States, Japan and other nations to reduce our vulnerability.

2. CHALLENGE TO THE PANEL

Our work is gaining new scope. We are beginning to address public health issues to understand how wind and seismic effects threaten illnesses and injuries and to define countermeasures. We are beginning to address emergency information services to adapt information and communication technologies to assist: (1) emergency managers in search and rescue and in avoidance of secondary damages such as post-earthquake fires; (2) scientists and engineers in understanding wind, earthquake and fire phenomena, and the performance of the built environment and political and economic systems; and (3) the public and private sectors in recovery from the damages. We are increasingly involving leaders from industry and universities in the work of the Panel. This scope allows us to coordinate and focus public, private and academic R&D, in the U.S. and Japan, to provide the knowledge and recommended practices needed to reduce our vulnerability.

We have not yet developed cooperative activities aimed at defining and implementing the incentives needed by all levels of government, property owners, and the general public to apply the recommended practices systematically and economically to end the threat of wind and earthquake disasters. If this proposal for Completing Our Panel's Work is endorsed by the Panel, we will have to give substantial future attention to incentives for mitigation of wind and seismic effects. Our strategy for 20 years work would involve continued and strengthened collaborations to:

- Exploit the opportunities provided by wind and seismic disasters to gain knowledge and public and private policy support for mitigation.
- Improve knowledge of the destructive environments arising from extreme winds, earthquakes and post-event fires, the response of the built environment, and societal response during emergency and recovery periods.
- Develop cost effective recommended practices for planning, design, construction, and rehabilitation of the built environment.
- Develop cost effective recommended practices for emergency services and recovery.
- Develop incentives for public and private sector actions to implement recommended practices to end the threat of wind and earthquake disasters.

APPENDIX

Background On Panel On Wind And Seismic Effects

1. BACKGROUND - WHY ESTABLISHED

The U.S.-Japan Cooperative Program in Natural Resources (UJNR) was created in January 1964; one of three Programs comprising the U.S.-Japan Cooperative Science Program. The Panel on Wind and Seismic Effects was established in 1969. Its objectives are to: encourage, develop, and implement the exchange of wind and seismic technologies; develop stronger technical links between the two countries; and conduct joint research, cooperative programs, and exchange guest researchers and equipment.

Eighteen U.S. agencies participate in the Panel (see Attachment) to develop and exchange technologies aimed at reducing damages from high winds, earthquakes, storm surge, and tsunamis. This work is produced through collaboration between U.S. and Japanese member researchers working in 11 Task Committees[1] with representatives of private sector organizations. Each committee focuses on specific technical issues. Task Committee activities include exchange of technical data and information on design and construction of civil engineering lifelines, buildings, and water front structures, promote and execute joint research projects, and exchange high wind and seismic measurement records. Annual meetings alternate between Japan and the U.S. (odd numbered years in Japan; even numbered years in the U.S.). One-week technical meetings provide the forum to discuss ongoing research and research results. They are followed by one-week technical site visits. The National Institute of Standards and Technology has been the U.S.-side Chair since the Panel's creation[2].

2. ACCOMPLISHMENTS

1. Held 29 annual joint Panel Meetings,
2. Conducted more than 50 Task Committee Workshops and 15 Task Committee Conferences,
3. Published more than 1700 papers in Joint Panel Proceedings, Workshop Proceedings, and in other technical journals,
4. Published 22 year listing of publications *List of Publications 1969-1991*,

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[1] Panel on Wind and Seismic Effects' 11 Task Committees (T/C):

1. T/C "A" Strong Motion Data and Applications
2. T/C "B" Testing and Evaluation Procedures for Building Systems
3. T/C "C" Evaluation and Improvement of Structures
4. T/C "D" Earthquake Engineering for Dams
5. T/C "E" Design for Wind and Wind Hazard Mitigation
6. T/C "F" Disaster Prevention Methods for Lifeline Systems
7. T/C "G" Structural Control and Intelligent Material Systems
8. T/C "H" Soil Behavior and Stability During Earthquakes
9. T/C "I" Storm Surge and Tsunamis
10. T/C "J" Wind and Earthquake Engineering for Transportation Systems
11. T/C "K" Wind and Earthquake Engineering for Offshore and Coastal Facilities

[2] **Chairman:** Dr. Richard N. Wright, Director Building and Fire Research Laboratory National Institute of Standards and Technology, DoC

Secretary General: Noel J. Raufaste, Head, Cooperative Research Programs, Building and Fire Research Laboratory, National Institute of Standards and Technology, DoC

5. Exchanged over 200 guest researchers who performed short and long term joint cooperative research assignments that have enhanced host and supply laboratory's research mission and contributed to improved structural standards and building codes,
6. Annually visit more than 10 major public works construction projects that are using innovative civil engineering techniques and research laboratories having unique test and measurement capabilities that enhance the joint Panel's understanding of research, design, and construction procedures used by both countries,
7. Performed joint post disaster surveys and made entrees for counterpart panel members to participate in post disaster studies of the performance of constructed facilities exposed to wind, earthquake, and tsunamis; results are shared with the professional community which contribute to improved knowledge and practice for disaster resistant constructed facilities,
8. Conducted specialty symposia, e.g.,
   - a two-day symposium on Hurricane Hugo, Charleston S.C., 1990 (22nd Joint Meeting);
   - a one-day international symposium on IDNDR in Gifu, Japan, 1991 (23rd Joint Meeting);
   - a mini-symposium during technical site visits at Lehigh University ATLSS Facility, at New Orleans Corps of Engineers Facility, and at LBL, 1992 (24th Joint Meeting);
   - 25th Panel Anniversary Symposium, IDNDR focus on lessons learned in post disaster investigations, Tokyo, 1993;
   - a mini-symposium during technical site visits at Waterways Experiment Station, Vicksburg, MI, 1994 (26th Joint Meeting);
   - a mini symposium during site visits at University of Minnesota's Wind Tunnel Facility and at the Department of Geology and Mineral Industries, Portland, Oregon, 1996 (28th Joint Meeting) .

   Each event has advanced technology transfer to participants and stimulated greater attention to promoting disaster mitigation programs.
9. Translated into English two Ministry of Construction reports, *Manual for Repair Methods of Civil Engineering Structures Damaged by Earthquakes* and 2-volume *Base Isolation Systems for Buildings*; publications distributed to U.S. civil engineering community as improved practices,
10. Shared technical information during Joint Panel Meetings, Task Committee Workshops, and during routine correspondence between U.S. and counterpart Japanese researchers that improved researchers abilities to perform mission research.

3. COOPERATIVE RESEARCH PROGRAMS

Completed seven Cooperative Research Programs; two on-going Programs. Accomplishments have improved design and construction practices for both countries.

1. Reinforced Concrete Structures (1979-1987), accomplishments include testing six-story full scale

buildings which led to improve seismic design methods of reinforced concrete buildings.

2. Lifeline Facilities (1982-1989); accomplishments included development of improved seismic design methods of bridge columns.
3. *In-situ* Testing Methods for Soil Liquefaction (1983-1986); accomplishments include development of rationale for Standard Penetration Test (SPT) data based on energy ratio.
4. Masonry Structures (1984-1988); accomplishments include development of strength-based design guidelines for reinforced masonry buildings.
5. Steel Structures (1985-1987); accomplishments include testing of a full-scale five-story building to confirm prediction of performance based on components and subassemblages.
6. Hybrid Control (1990-1994); accomplishments include development of hybrid control algorithms that require less energy for controlling bridge response.
7. Precast Seismic Structural Systems (1991-1992); accomplishments include development of strength-based design guidelines.
8. Seismic Performance of Composite and Hybrid Structures (1993-).
9. Research on Countermeasures for Soil Liquefaction (1994-).

4. TYPES OF EXCHANGES

Guest research exchanges advanced state of technology in areas of steel, concrete, and masonry structures under seismic forces; developed techniques to analyze risks from liquefaction; modeled water seepage in dam foundations; performed comparative analyses of seismic design of U.S. and Japanese bridges.

5. BENEFITS

The Panel's activities resulted in improved building and bridge standards and codes and design and construction practices for constructed facilities in both countries, for example:

1. created and exchanged digitized earthquake records used as the basis of design and research for Japan and the United States.
2. transferred earthquake engineering information and strong-motion measurement techniques for use by seismically active countries, e.g., Australia, Canada, Italy, Mexico, Peru, Taiwan, Turkey, and North Africa;
3. produced data that advanced retrofit techniques for bridge structures;
4. developed field test data for use in aerodynamic retrofit of bridge structures;
5. produced full-scale test data that advanced seismic design standards for buildings;
6. advanced technology for repairing and strengthening reinforced concrete, steel, and masonry structures;
7. improved in-situ measurement methods for soil liquefaction and stability under seismic loads;
8. created a database comparing Japanese and U.S. standard penetration tests to improve prediction of soil liquefaction;
9. created database on storm surge and tsunamis and verified mathematical models of tsunami and storm surge warning systems;
10. established a library resource of current research on wind and earthquake engineering and on storm surge and tsunamis;
11. published proceedings of Panel meetings, Task Committee Workshops, and special publications such as List of Panel

Publications and translated two-volume series on earthquake resistant construction using base isolation systems;

12. gained better knowledge of both countries research, design and construction capabilities from in-depth visits to host country's laboratories and building and public works projects. Results of such visits contribute to creation of new Task Committees, agendas for Joint Panel meetings and task committee workshops, special visits of U.S.-Japan researchers, and joint collaborative research.

6. FUTURE PLANS

The Panel is planning:

1. its 30th Joint Meeting to be conducted at NIST, Gaithersburg, MD in May 1998.
2. to conduct four Task Committee workshops before the 30th Joint Panel Meeting.
3. participation in appropriate research projects of the U.S.-Japan Earthquake Disaster Mitigation Partnership of the April 17, 1996 Agreement, U.S.-Japan Common Agenda. Appropriate Task Committees will respond to the Partnership in planning its work.
4. to publish its 5th newsletter for disseminating Panel's activities to peers and to decisionmakers at Government laboratories and agencies involved in construction.
5. a Panel Home Page to electronically disseminate Panel information worldwide. The effort will build on current Panel descriptions.

ATTACHMENT

U.S. Members -- Panel on Wind and Seismic Effects

Department of Commerce	National Institute of Standards and Technology
	National Oceanic and Atmospheric Administration
Department of Energy	
Department of Health and Human Services	
	Center for Disease Control and Prevention
Department of Housing and Urban Development	
Department of Interior	Bureau of Reclamation
	U.S. Geological Survey
	Minerals Management Service
Department of State	Office of Foreign Building Operations
	Agency for International Development
Department of Transportation	Federal Highway Administration
Department of Veterans Affairs	
Department of the Army	Corps of Engineers
Department of Navy	Naval Civil Engineering Laboratory
Department of Air Force	Civil Engineering Support Agency
Federal Emergency Management Agency	
National Science Foundation	
Nuclear Regulatory Commission	
California Department of Transportation	
NSF Earthquake Eng. Centers	Center for Advanced Technologies in Earthquake Loss Reduction, State University of New York, Buffalo
	Pacific Earthquake Engineering Research Center, University of California, Berkeley
	Mid-America Earthquake Center, University of Illinois, Urbana-Champaign