30-YEAR ACCOMPLISHMENTS AND FUTURE CHALLENGES OF THE PANEL ON WIND AND SEISMIC EFFECTS

by

Yasutake Inoue[1] and Michio Okahara[2]

ABSTRACT

The Panel on Wind and Seismic Effects, which is one of the 18 Panels under the U.S. - Japan Cooperative Program in Natural Resources, was created in 1967 in order to promote technical cooperation between the U.S. and Japan for mitigating natural disasters caused by extreme wind, earthquakes, storm surge and tsunamis. Since the First Joint Panel Meeting held in Tokyo in 1969, Joint Panel Meetings have been held alternatively in Japan and U.S. every year, and the Panel celebrated its 30th Joint Meeting in 1998.

This paper prepared by the Japan-side Panel looks back on accomplishments of the Panel in the past 30 years and sets forth the future prospects.

KEY WORDS:
Wind Engineering, Earthquake Engineering, Storm Surge, Tsunami, Joint Cooperative Research Program

INTRODUCTION

The establishment of the U.S. - Japan Cooperative Program in Natural Resources (UJNR) was proposed by the United States at the First Plenary Meeting of the Third U.S. - Japan Joint Bilateral Committee on Trade and Economic Affairs held in Tokyo on January 27, 1964. In the same year UJNR was formed as a body unaffiliated to the U.S. - Japan Science Committee and the U.S. - Japan Joint Bilateral Committee on Trade and Economic Affairs.

The Panel on Wind and Seismic Effects, that is one of the 18 specialized Panels of UJNR, was proposed as a new cooperative activity at the Third UJNR Plenary Meeting held in Tokyo in 1967. The primary objective of this program was to exchange research results and views concerning the development of wind and seismic design methods, in view of the fact that both the U.S. and Japan suffer from earthquakes, high winds, storm surge and tsunamis. The range of Panel's activities has yearly expanded, and it includes exchanging results of research related to revision of design criteria and developing comprehensive measures and research fields to mitigate loss of lives and properties from natural disasters such as extreme winds and earthquakes. Since the First Joint Meeting of the Panel in Tokyo in 1969, Joint Meetings have been held every year alternately in Japan and U.S., and the Thirtieth Joint Panel Meeting was held in May, 1998.

The Panel has been jointly established in each country. The Public Works Research Institute provides the Japan-side chairman, and Japan-side Panel has about fifty members representing seven national research organizations and the ministries and agencies with which each of those organizations are affiliated. The National Institute of Standards and Technology provides the U.S.-side chairman, and the U.S.-side Panel consists of about fifty representatives of various research organizations. 11 Task Committees have also been formed to promote the Panel activities effectively by exchanging research information and holding workshops.

MAJOR ACTIVITIES OF THE PANEL

1) Since the First Joint Meeting of the Panel in Tokyo in 1969, Joint Panel Meetings have been held every year alternately in the U.S. and

[1] Director-General, Public Works Research Institute, Ministry of Construction, 1 Asahi, Tsukuba-shi, Ibaraki-ken 305-0804 Japan
[2] Director, Structure and Bridge Department, ditto

Japan.
2) At the Seventh Joint Panel Meeting held in 1975, to strengthen the Panel's activities it was decided to establish six Task Committees designated as Task Committee A to F, which cover strong motion instrumentation arrays, large-scale testing programs and so on. After that new Task Committees have been established, and 11 Task Committees; Task Committee A to K are presently active. The latest Task Committee, which deals with seismic information systems, was approved at the Thirtieth Joint Panel Meeting in 1998.
3) Since 1977, the Panel has exchanged researchers and conducted U.S. - Japan Joint Cooperative Research Programs, and the Task Committees have held workshops and technical coordinating committee meetings.
4) At the Tenth Joint Panel Meeting (1978), the Panel decided to expand activities to include the issues of storm surge and tsunamis, and the Panel membership was expanded. Since then lively activities have been conducted in this field.
5) The importance of earthquake prediction was recognized and the Panel conducted researches in this field. This research was taken over by the new Panel on Earthquake Prediction Technology in 1978. This Panel was reorganized as the Panel on Earthquake Research in 1996.
6) In 1979, the Public Works Research Institute, the Building Research Institute, the Geographical Survey Institute and the Meteorological Research Institute moved to Tsukuba Science City. On this occasion, new large-scale experimental facilities were installed and these facilities have been used effectively for the U.S. - Japan Joint Cooperative Research Programs.
7) In 1987, a charter clarifying the Panel's activity policies was enacted.
8) In 1991, an International Symposium on Disaster Prevention was held in Gifu City as part of the International Decade for Natural Disaster Reduction (IDNDR). A list of papers presented at the Joint Panel Meetings and workshops during the previous 23 years was published and distributed to various locations including those in developing nations.
9) In 1993, the Panel celebrated its 25th anniversary by holding a One-day Symposium on the IDNDR jointly with the Section of IDNDR, Ministry of Construction.
10) In December 1993, the Japan-side Panel published the first issue of the Wind and Seismic Effects Panel Newsletter. Five issues of the newsletter have been published alternately by the U.S. and the Japan sides. In 1996, the Panel opened its web site on the Internet to further disseminate the results of activities.
11) Since 1996, the Panel has been cooperating in various ways to reduce natural disasters in conjunction with the U.S. - Japan Common Agenda for Cooperation in Global Perspective (Common Agenda).

ACCOMPLISHMENTS OF THE PANEL

1) At the Joint Panel Meetings and Task Committee workshops, more than 1,800 research papers and reports have been presented. They have been published and distributed as proceedings, and have been used to improve wind and seismic technologies.
2) More than 250 U.S. and Japanese researchers have been exchanged to participate in the U.S.-Japan Joint Cooperative Research Programs, earthquake damage surveys and other activities in the counterpart country.
3) The U.S. - Japan Joint Cooperative Research Programs have been conducted on the 10 themes. These programs have facilitated exchange of technical information and personnel, including young researchers and design engineers, and contribute to further advancement of technology.
4) Since strong motion records are precious data for research on earthquake engineering, exchange system of strong motion records were developed between the U.S. and Japan. The National Research Institute for Earth Science and Disaster Prevention has recently opened the K-NET strong motion records. High wind, tsunami records and sea bottom topographical data have also been exchanged.
5) To disseminate technologies developed in Japan, Manual for Repair Methods of Civil Engineering Structures Damaged by Earthquakes, Base-isolation Systems for Buildings and Handbook on Liquefaction Remediation were translated into English.

U.S.-Japan Joint Cooperative Research Programs

Research Theme	Period
Research Program on Reinforced Concrete Structures	1979-1987
Research Program on Steel Structures	1981-1987
Lifeline Facilities	1982-1989
In-situ Testing Methods for Liquefaction	1983-1989
Research Program on Masonry Structures	1984-1988
Research Program on Precast Seismic Structural Systems	1989-1992
Seismic Improvement Technology using Hybrid Control Systems	1990-1994
Research Program on Composite and Hybrid Structures	1993 to present
Countermeasures against Soil Liquefaction	1994 to present
Research Program on Smart Structural Systems	1998 to present

6) Following disasters caused by strong hurricanes (Hurricane Hugo, Hurricane Andrew, etc.) and earthquakes (Loma Prieta Earthquake, Hokkaido Nansei-oki Earthquake, Northridge Earthquake, Hyogo-ken Nanbu Earthquake, etc.), either joint surveys or surveys assisted by experts from the counterpart country have been carried out. Causes of the disaster have been analyzed, and valuable information has been exchanged regarding restoration technology.
7) In regard to cooperation with developing countries, information was exchanged. Especially both U.S. and Japanese Panels investigated damage due to the Mexico and Chili Earthquakes and offered technical assistance. Results of cooperation were reported at the Joint Panel Meeting. In conjunction with IDNDR, the Panel held a symposium and a conference, published and distributed a list of its papers as a way to increase people's awareness of natural disasters and to provide technical support.
8) By providing expertise to the U.S. - Japan Earthquake Policy Symposia and reviewing proposals for the Earthquake Disaster Mitigation Partnership under the auspices of the Common Agenda, the Panel has been contributing to reduce natural disasters.
9) In order to disseminate the results of Panel activities, the Panel publishes newsletter and has constructed a web site.

FUTURE PLANS

Promotion of Exchanges

1) Personnel and technical information exchanges, which are fundamental activities of the Panel, should be enthusiastically continued.
2) Joint Cooperative Research Programs are effective ways to achieve great results and are to be aggressively conducted.

Establishing New Research Themes

Since UJNR is a cooperative science and technology program led by governmental research organizations of the U.S. and of Japan, the Panel should seek research themes for which government has responsibility of implementation. As Europe leads the trend to the disappearance of borders and new alliances get together, it is imperative that the U.S. and Japan consider the international role they should play in the fields of wind and earthquake engineering. Considering the above facts, the followings are examples of research themes that the Panel undertakes:

1) Application of new technologies not considered in the past wind and earthquake engineering research.
An example is the use of information technologies to perform national land management against natural disasters. In order to reduce disaster risks and effects by creating more efficient and systematic national land use, advanced information technologies such as GIS, GPS, remote sensing technology and other data communication technology are to be developed.

2) Comprehensive research subjects that are

related to several Task Committees
The development of performance-based design methodology is an example. Looking ahead to the cost reduction of public works projects and the spread of VE systems, the performance-based design technology should be established. It will also contribute to increase design freedom and reflect the creativity and innovative skills of designers to the greatest possible degree.

3) Subjects involving policy elements among international communities
Dealing with the ISO is one example. Most of technical committees of ISO have been composed of European countries, however acquisitions by governments and the private sectors will be based on ISO technical standards in the future. From this point of view, the Panel should technically contribute to ISO, e.g., proposing technical standards that are internationally compatible.

Reinforcing the Role of the Panel

Task Committees have been established to solve individual problems and hold actively workshops. To perform further smooth and effective activities of Task Committees, the Panel should make efforts to better communication and liaison among Task Committees.

Contribution to International Activities

1) The Panel will cooperate more closely with the High-Level U.S. - Japan Earthquake Policy Cooperation Forum (High Level Forum) established as a product of the U.S. - Japan Earthquake Policy Symposia and the Earthquake Disaster Mitigation Partnership in order to contribute to the achievement of the Common Agenda in the field of natural disaster reduction.
2) The Panel will disseminate technologies developed in both U.S. and Japan more widely. Recognizing that there are many developing countries that suffer from natural disasters, the Panel will transfer technologies such as technical standards, disaster planning techniques, and so on that are beneficial to those countries.

Active Information Dissemination

In addition to the publication and distribution of proceedings of Joint Panel Meetings and workshops, the Panel will accelerate and increase information dissemination activities through the use of the Internet and so forth.

ACCOMPLISHMENTS AND FUTURE PLANS OF TASK COMMITTEES

Task Committee A: Strong Motion Data and Applications

(1) Background

The Task Committee A was established by uniting the former Task Committee A (Strong Motion Instrumentation Arrays and Data) and former Task Committee E (Ground Motion and Seismic Design Forces) at the Twenty-fifth Joint Panel Meeting (1993). Task Committee A was established to perform two tasks: 1) To coordinate and promote activities intended to allow concerned researchers and technicians to effectively use strong motion records; 2) To carry out technology development and information exchanges related to the evaluation of the destructive force of earthquake motion.

The following five items represent the range of activities of Task Committee A:
1. Study of problems related to the installation of strong motion seismographs, etc.
2. Strong motion observations, processing of the records, and analysis of the records.
3. Clarification of the engineering characteristics of earthquake motion.
4. Application of seismic resistant design.
5. Earthquake danger zonation.

This Task Committee has continued to be extremely active since its establishment in 1993.

(2) Accomplishments

An international workshop concerning strong motion record data was held in Menlo Park in California in the U.S. in December 1993. At this event, strong motion observations from all parts

of the world were compared and a global scale comparative study of maximum accelerations and response spectra was carried out. The proceedings, which have already been published, include 36 papers from the U.S., Japan, New Zealand, France, and Chili. One product of this workshop was the creation of a fresh international awareness of differences in the attenuation equations of ground motions used in Japan, the U.S., and in Europe. Since then, various research projects have been undertaken to explain these differences.

Following this workshop, a series of large earthquakes occurred: the Northridge Earthquake of 1994 and the Hyogo-ken Nanbu Earthquake of 1995. The data provided by these earthquakes has substantially influenced research on strong motion records and their use, and in particular, research on earthquake motion near epicenters and ground seismic response. This has accelerated related research and prompted proposals from both Japan and the U.S. for new design earthquake motions. And since 1995, related activities of the ISO (unified international standardization organization) including international earthquake danger zonation have achieved remarkable progress, and plans call for the announcement of a series of new proposals in 1998.

As part of this trend, an international workshop on ground response to earthquakes was held in Yokosuka on January 16 and 17, 1996. More than 50 first-class internationally recognized experts in this field gathered to take part in extremely detailed discussions based on the strong motion records of the Northridge Earthquake and Hyogo-ken Nanbu Earthquake and the results of laboratory tests and numerical analyses. The discussions focused particularly on the nonlinear response of ground. The Port and Harbour Research Institute published the proceedings of this workshop in March 1996. This workshop resulted in the positioning of knowledge of the design use spectrum that accounts for the nonlinear amplification properties of the ground (U.S. NEHARP 1994, etc.), a technology not yet developed in Japan, as the common property of Japan and the U.S.

In the midst of rapid change in related standardization and research by various organizations such as the ISO mentioned above, Task Committee A has achieved the following successes:

1. The collection of the latest information regarding the UBC97 and NEHRP97 progressing in the U.S. and the most up-to-date information from the ISO/TC67 (international integrated standard preparation committee, marine structures); a body whose representative member is a member of the Japan-side Panel on Wind and Seismic Effects.
2. Proposal by the members of Task Committee A of U.S. - Japan cooperation in research on strong motion records as one of the achievements of the Earthquake Policy Symposium of the Common Agenda.
3. The K-net data provision method established by the members of Task Committee A, an ideal system for the rapid acquisition of data by concerned researchers, is a model that should serve as a reference for use by concerned organizations in the U.S. and Japan in the process of developing future strong motion observations. A CD-ROM (two disks) of K-net data has been provided to concerned organizations in both the U.S. and Japan.
4. Activity as a key member of the workshop on "nonlinear response of ground" (January 1998, sponsor; Seismic Engineering Center of the University of Southern California) of the Japan and the American Chairmen of Task Committee A and other members of the committee through their provision of the most up-to-date information and participation in debates.

It is clear from the tragic disasters caused by the Northridge Earthquake of 1994 and the Hyogo-ken Nanbu Earthquake of 1995 that reducing earthquake disasters is an urgent and important challenge for the Twenty-first Century. It has been pointed out that the weakness of the existing strong motion observation network in the U.S. is a serious obstacle to its efforts to reduce earthquake damage. The members of Task Committee A have undertaken the following activities in order to establish plans for a new strong motion observation system for

use in the Twenty-first Century:
1. Participation in the U.S. Committee for the Advancement of Strong Motion Programs (CASMP) by the members of the American side of Task Committee A.
2. Participation in the international workshop, "Vision 2005: Strong Motion Observation Promotion Action Plan for the Reduction of Earthquake Disasters in Urban Regions" (April 1997, Monterey in California).
3. Establishment of the Consortium of Organizations for Strong Motion Observational Systems (COSMOS).
4. Enactment of strong motion seismograph installation planning for buildings owned or occupied by offices of the federal government of the U.S. and approval of the plan by the CASMP and the Interagency Committee on Seismic Safety in Construction (ICSSC).

(3) Future Plans

The followings are activities Task Committee A plans to conduct in the future:
1. Up-to-date strong motion observation and data distribution systems such as K-net have been provided in Japan, but technology in this area has to be introduced in the U.S. Specific plans to achieve this goal include U.S. - Japan workshops for participants involved in strong motion observations.
2. The quantity of data regarding large earthquakes, particularly data obtained near epicenters that is extremely important in the design of structures, is limited and must be shared through international cooperation. Joint research intended to overcome this problem will continue. Specifically, it is necessary to prepare data bases linked to the internet such as the Rosrine Project (a data base of strong motion records, ground survey data, and laboratory experimental data related to the 1994 Northridge Earthquake) that has been completed in the U.S., and to establish systems for the cooperation of concerned organizations by providing access to related web sites here in Japan. Committee type activities to accomplish these goals are planned.

(Susumu Iai)

Task Committee B: Testing and Evaluation Procedures for Building Systems

(1) Background

At the Sixth Joint Panel Meeting in 1974, the following resolutions were adopted.
[Resolution 3]
Increased effort should be made in the near future to encourage joint research programs, especially in the area of mutual utilization of research facilities and the exchange of researchers.

In response to this resolution, the Task Committee on Large Scale Experiment Program was established at the Eighth Joint Panel Meeting in 1976. Then at the Tenth Joint Panel Meeting (1978), the Panel again indicated its strong support of the program by adopting the following resolution.
[Resolution 3]
The Panel on Wind and Seismic Effects recognizes the importance of the U.S.-Japan Cooperative Program on Large Scale Testing and it urges early implementation of the program under the auspices of this Panel.

Under the auspices of this Panel, the Task Committee has supported the implementation of U.S.-Japan Joint Research on building structural systems. At the Twenty-fifth Joint Panel Meeting (1993), the name of the Task Committee was changed to the Task Committee on Testing and Evaluation Procedures for Building Systems.

(2) Accomplishments

The activities of this Task Committee are carrying out U.S.-Japan Joint Research Program on building systems with under the auspices of the Panel. The following is an outline of the joint research it has conducted up till now.

1) Research Program on Reinforced Concrete Structures
Research on reinforced concrete structures was selected as the first theme for U.S.-Japan Joint Research Program. On August 10, 1979, the

Science and Technology Agency, the Ministry of Construction and the U.S. National Science Foundation (the Parties) signed the "Implementing Arrangement of the U.S.-Japan Joint Earthquake Engineering Research Program Utilizing Large-scale Testing Facilities". The Task Committee reviewed the program and recommended the endorsement to the chairmen of the Panel. The Panel chairmen endorsed the program to the Parties in July 1980.

The testing of a 7-story reinforced concrete building was started at the Building Research Institute in March 1981 and completed in November. Support tests conducted in Japan commenced in 1980 and were completed in 1982. Support tests performed in the U.S. started in 1981 and were completed in 1983.

2) Research Program on Steel Structures
On May 18, 1981, the Ministry of Construction and the U.S. National Science Foundation (the Parties) signed the "Implementing Arrangement of the U.S.-Japan Joint Earthquake Engineering Research Program Utilizing Large-scale Testing Facilities with Steel Structures". The chairmen of the Panel gave their endorsement to the Parties on May 22, 1981.

Full-size steel building testing began in 1983. All full-size testing and support tests in both countries were completed in 1986.

3) Research Program on Masonry Structures
In December 1984, the Ministry of Construction and the U.S. National Science Foundation signed the "Implementing Arrangement of the U.S.-Japan Joint Earthquake Engineering Research Program including Large-scale Testing on Masonry Structures". The chairmen of the Panel gave their endorsement during the Seventeenth Joint Panel Meeting.

Testing of 5-story masonry building began in November 1987 and completed in January 1988. Support tests in Japan commenced in 1985 and completed in 1987. In the U.S., the research was performed during 1985 to 1993.

4) Research Program on Precast Seismic Structural Systems (PRESSS)
Researchers from the U.S. proposed precast structural systems as the fourth theme, and after considering the proposal, the Japan side agreed. In October 1987, the U.S. National Bureau of Standards (now the National Institute of Standards and Technology) began to conduct a multi-year research project on the earthquake behavior of precast concrete structures. This research project was closely related to the U.S.-Japan Joint Research Program.

Testing research in Japan started in 1989 and completed in March 1992. The first stage research in the U.S. began in 1989 and ended in 1991. The second stage research extended from 1991 to 1994. The third stage research has been in progress since 1995.

5) Research Program on Composite Structure and Hybrid Structure Systems (CHS)
Researchers from the U.S. and Japan agreed on composite structures and hybrid structures as the fifth theme and the Japan planning group began its activities in May 1991.

Research in Japan began in 1993 and concluded in 1998. The Japan Structural Consultant Association performed practical research on the application of the research results. Research in the U.S. began in 1995 included more than 16 research projects.

6) Research Program on Smart Structural Systems (Auto-Adoptive Media)
The Joint Technical Subcommittee on "Research Revolution" met in Ann Arbor in February 1996 and the Joint Technical Subcommittee on "Concrete Filled Steel Pipe" met in Chicago in April 1996 to select the sixth theme for joint research. Based on their findings, the Smart Structural Systems were selected. Research in this field commenced in Japan in 1998. Work is now underway to complete plans for the research to be carried out in the U.S.

(3) Future Plans

U.S.-Japan joint research program on building structural systems including large-scale testing

is conducted divided into six themes. For the reasons related to differences in budget measures and research theme selection methods in the two countries, the research by the two sides has not been closely coordinated as was originally planned. But, the U.S.-Japan Joint Technical Coordinating Committees have functioned effectively to contribute to the success of the joint research.

In Japan, research on the fifth theme, composite structure and hybrid structure systems, has been completed and work to make use of the results has begun. Research has begun on the sixth theme, smart structural systems. In the U.S., research is continuing on two themes: the fourth theme, precast structural systems and the fifth theme, composite structure and hybrid structure systems. Studies are in progress in preparation for the beginning of research on the sixth theme, smart structural systems.

This Task Committee is striving to develop methods of disseminating the results of its joint research widely in countries in high seismic regions in order to contribute to the International Decade of Natural Disaster Reduction (IDNDR). And to maximize the use of its research data, it is planning to hold a Joint Workshop on Test Procedure, Documentation, Retrieval of Test Data, and Experimental Facilities.

A study is scheduled to plan the future U.S.-Japan joint research program performed at three Earthquake Engineering Research Centers established by the U.S. National Science Foundation. And, the future U.S.-Japan research program will consider using the 3-D Full Scale Earthquake Testing Facilities, which is constructed by the National Research Institute for Earth Science and Disaster Prevention, Science and Technology Agency. These plans include research on the destruction of structures that occurred during the Hyogo-ken Nanbu Earthquake and the Northridge Earthquake performed by carrying out dynamic evaluations of full-size model specimens.

(Keiichi Ohtani)

Task Committee C: Design, Evaluation, and Improvement of Structures

(1) Background

To promote measures and projects to improve the structural performance of new structures and to improve the wind and seismic resistance of existing structures, this Task Committee was organized by combining Task Committee C (Repair and Retrofit of Existing Structures) with Task Committee D (Evaluation of the Performance of Structures) in 1993.

The Task Committee C has been held six times since it was formed in 1993. The goals and range of its activities are listed below and it has concentrated on document exchanges and discussions related to research and technology in these areas conducted in Japan and the U.S.

1. Information exchange, preparation of research plans, and holding of workshops concerning new design methods, evaluation methods, and repair and retrofitting technologies.
2. Development of common systems concerning the screening and analysis of the wind and earthquake resistance of structures in Japan and the U.S.
3. Development of sensor technologies, measurement technologies, and expert systems to evaluate the condition of existing structures.
4. Performance evaluation of masonry structures, and precast concrete structures, and compound/hybrid structures, and provision of documentation to be used for the post-disaster performance evaluation.
5. Study of new materials and methods to be used for the repair and retrofitting of existing structures and to construct new structures.
6. Coordination between Japan and the U.S. in order to minimize the duplication of research projects and maximize the benefits obtained.

(2) Accomplishments

1) Repair and retrofitting of existing structures

1. A one and a half day workshop was held at the NIST in May 1990. With 12 participants from Japan and 12 from the U.S. in attendance for a total of 24, a total of 19 papers were

presented: 13 by Japanese and 6 by American delegates.
2. Regarding repair and retrofitting, in the U.S., FEMA published the ATC21 Existing Building Earthquake Resistance Diagnosis Handbook and ATC22 Existing Building Earthquake Resistance Repair and Retrofitting Technology. In Japan, the Japan Disaster Prevention Association completed the first revision in the 13 years since its original publication of the Existing Reinforced Concrete Building Earthquake Resistance Repair and Retrofitting Design Guidelines in October 1990. Then in March 1991, it issued new Technical Guidelines for the Assessment of the Degree of Damage and Restoration of Damaged Buildings. These guidelines made extensive use of the achievements of this Task Committee.
3. Exchange, translation, etc. of reports of wind and earthquake damage and documents concerning repair and retrofitting work.

2) Performance Evaluations of Structures
1. Panel members of Japan and the U.S. conducted earthquake damage surveys at the 1995 Hyogo-ken Nanbu Earthquake and other earthquakes.
2. In cooperation with Task Committee G, Task Committee C held workshops on smart materials and structures at the Building Research Institute in Tsukuba in May 1993 and Washington University in Maryland in December 1995. Task Committee C decided to make a smart structural system (auto-adaptive media) as the Sixth Phase of U.S. - Japan Joint Earthquake Engineering Research Program.
3. It carried out U.S.-Japan Joint Earthquake Engineering Research Program on reinforced concrete, precast structures and hybrid / composite structures. The followings are the outline of this research.
[Precast Concrete Structures]
- This research project involved a series of studies including full-scale experiments on buildings of PCa construction that clarified the structural strength of PCa structures and yielded the following results needed to prepare design guidelines.
- The committee prepared a design method for PCa buildings and a PCa joint design manual.
- Experiments to test the seismic performance of the elements that make up vertical joints and horizontal joints of PCa structures were performed along with experiments to test the seismic performance of the plane structures made of PCa members to provide background data to prepare a joint design manual.
- New design guidelines covering PCa buildings up to 60 m in height were developed.
- The trial design and dynamic response analysis of frame structures and earthquake resistant wall
- frame structures were performed to provide background data to prepare design guidelines.
- A U.S. - Japan common database of PCa joint details was constructed.

[Hybrid/Composite Structures]
This research obtained the following results in order to clarify the performance of hybrid / composite structures and to establish a seismic design method.
- A database was constructed and trial design work, experiments, and analytical research concerning concrete filled steel tube (CFT) structures were performed, and CFT design guidelines were developed.
- A database was constructed, trial design work was performed concerning structures consisting of reinforced concrete columns and steel frame girders (RCS), research on the stress transmission mechanism of the column beam joints was carried out, and design guidelines for such structures were developed.
- Along with the trial design of structures with reinforced concrete seismic resistant walls as its core and steel frameworks around the core (HWS), experiments were conducted on 1/3 scale 12-story seismic resistant walls with connecting beams in order to develop design guidelines.
- In the area of new systems utilizing new materials, studies of fiber reinforced concrete and high performance concrete were carried out to clarify the basic properties of these materials and their properties as members. As part of this research, design guidelines were prepared for a method of retrofitting of reinforced concrete members using FRP sheets. These guidelines are already in use.
4. Documents and books concerning

performance evaluations have been exchanged and translated. And personnel have been exchanged to work on joint Japan and U.S. Earthquake Engineering Research Program.

(3) Future Plans

1) The consolidation of Task Committees C and G was approved at the Thirtieth Joint Panel Meeting in May 1998. The following items are the scope of the activities and future activity plans of the new Task Committee.
1. Exchanging information, preparing research plans, and holding workshops concerning new design methods, evaluation methods, and repair and retrofitting technologies
2. Research on new materials and methods for the repair and retrofitting of existing structures and for use in new structures
3. Development of highly reliable methods of evaluating the condition of both new and existing structures.
4. Coordination between Japan and the U.S. to minimize the duplication of research and maximize the benefits obtained.

2) As the Sixth Phase of U.S. - Japan Joint Earthquake Engineering Research Program, smart structural systems will be developed. This research will be conducted in order to aggressively apply new materials, new structures, and other new technologies in order to improve the performance of the structures. This is expected to reduce the cost of construction and maintenance work and to contribute to the future sustainability of structures. The followings are the items for development.
1. Creation of a smart structural systems concept and development of performance evaluation methods for smart structural systems.
2. Development of structural property detection technologies.
3. Development of structural members made of smart materials and research on methods of evaluating such structural members.
4. Development of design methods and performance evaluation methods for smart structural systems and smart buildings.

(Hisahiro Hiraishi)

Task Committee D: Earthquake Engineering for Dams

(1) Background

At the Twenty-fifth Joint Panel Meeting held in May 1993, establishment of the Task Committee on Dam Earthquake Resistant Engineering was approved in recognition of the importance of cooperative research on the problem of the earthquake resistance of dams. The Task Committee was formed to develop measures that will contribute to the mitigation of earthquake damage to dams by conducting research exchanges concerning methods of preventing or mitigating damage to dams during earthquakes in both the U.S. and in Japan.

Earthquake resistant design of dams in Japan is based on the seismic coefficient method. No dam designed based on the seismic coefficient method has ever suffered damage that effected its safety as a result of a large earthquake. Although many civil engineering structures were severely damaged by the Hyogo-ken Nanbu Earthquake of January 1995, not one dam suffered any damage that reduced its safety. The Dam Earthquake Resistance Evaluation and Study Committee established by the Ministry of Construction after the earthquake confirmed that dams designed based on the present seismic coefficient method have earthquake resistance adequate to protect them from earthquake motion in the Hyogo-ken Nanbu Earthquake class.

But it is necessary to conduct studies based on dynamic analysis methods that can reproduce behavior during earthquakes in order to perform evaluations to determine the degree of earthquake motion that a dam designed using the seismic coefficient method can withstand safely and whether or not it is possible to create the optimum design with reference to the earthquake resistant performance a dam should have. The dynamic analysis method is an effective way to evaluate the dynamic response of a dam to verify its deformation properties, but

at this time, it is only used as a method of verifying the earthquake resistance under various earthquake motions of a section designed using the seismic coefficient method.

About 400 dams under the jurisdiction of the Ministry of Construction are now being constructed in Japan, and the Public Works Research Institute of the Ministry of Construction, the Water Resources Development Public Corporation, universities, and so on, are carrying out research on dynamic analysis methods in order to design dams that are safe from the effects of earthquakes.

In the U.S. on the other hand, while dam construction continues, there are many completed dams, and concerned organizations are working to quickly develop methods of selecting existing dams that require seismic reinforcement work and rationally establish counter-measure priorities and counter-measure construction methods. Research on ways to use dynamic analysis methods to evaluate the earthquake resistance of existing dams is underway, mainly by the Army Corps of Engineers and the Bureau of Reclamation of the Department of the Interior.

This Task Committee has, therefore, established the following three areas for research exchanges conducted to establish the systematic use of dynamic analysis methods to evaluate the earthquake resistance of both new and existing dams.

1) Numerical analysis methods of performing earthquake resistant design of dams and discharge facilities
- Comparison of design methods used in Japan and the U.S.
- Development of design ground earthquake motion.
- Study of dynamic analysis methods (modeling, calculation programs, etc.).

2) Dynamic deformation strength properties of dam body construction materials and foundation ground materials
- Study of the strength and deformation properties during earthquakes of dam body construction materials (concrete, soil quality, rock material) and foundation ground materials.

3) Analysis of measured behavior of dams and discharge facilities during earthquakes
- Analysis of behavior of dams and discharge facilities damaged by earthquakes and clarification of damage mechanisms.
- Reflection of analysis of the actual behavior of dams during earthquakes in earthquake resistant design.

(2) Accomplishments

Within less than one year after the 1993 establishment of this Task Committee, the Northridge Earthquake of January 1994 struck, and this was followed about one year later by the Hyogo-ken Nanbu Earthquake of January 1995. Immediately after the Hyogo-ken Nanbu Earthquake, members of the U.S. section of the Task Committee visited Japan to conduct a damage survey of dams and reservoirs. In March of the same year, Director Matsumoto (director at the time) of the Dam Department of the Public Works Research Institute of the Ministry of Construction visited the U.S. to give members of the U.S. section of the Task Committee an early report on damage to dams and on the earthquake motion records. In these ways, the Task Committee has carried out rapid exchanges of information about earthquake damage to dams and strong motion records.

As part of research exchanges conducted by this Task Committee, a workshop was held in the U.S. in November 1996. Based on earthquake motion records obtained at dams near the hypocenter during the Hyogo-ken Nanbu Earthquake, the workshop participants studied the properties of earthquake motion and the evaluation of earthquake resistance properties of existing dams. Reports of results of these research projects and the latest research on the U.S. side were exchanged.

And as part of researcher exchange activities, two researchers from the Public Works Research Institute of the Ministry of Construction have been sent to the Berkeley campus of the University of California to study the dynamic analysis of concrete dams and fill dams.

(3) Future Plans

In response to the Hyogo-ken Nanbu Earthquake, it is now considered necessary to design dams and other important structures to guarantee they have earthquake resistant performance able to protect them from Level 1 and Level 2 earthquake ground motions. It is, therefore, necessary to conduct research that will permit the use of dynamic analysis methods as a practical dam earthquake resistance evaluation method. In Japan, it is one of the major subjects of on-going research that looks into damage to dams, analysis of the cracking of concrete dams or the large-scale slippage of fill dams that would be caused by a large-scale earthquake, for example, so that the exchange through this Task Committee of information with the U.S. where research in this field is advanced is an effective way to contribute to this research.

During the coming ten years, the Japan side of this Task Committee plans further research exchanges with the U.S. in order to establish the systematic application of dynamic analysis methods to the evaluation of earthquake resistant performance of new dams and existing dams.

(Hitoshi Yoshida)

Task Committee E: Design for Wind and Wind Hazard Mitigation

(1) Background

The establishment of this Task Committee was approved by the Twenty-eighth Joint Panel Meeting, but prior to its formation, activities similar to those of this new Task Committee had been conducted by two other committees: the Task Committee on High Wind and the Task Committee on Wind Characteristics and Structural Response. This report will, therefore, begin with an explanation of these committees.

The Task Committee on High Wind was established by the Eighth Joint Panel Meeting and its principal activities were the exchange of high wind data, the exchange of information concerning wind observation systems, the promotion of research on the effects of high winds on structures, the exchange of data regarding wind pressure and wind velocity distribution, and the establishment of boundary layer wind tunnel experiment methods.

In order to expand the range of its activities, the Twelfth Joint Panel Meeting changed its name to the Task Committee on Wind Characteristics and Structural Response. The principal activities of this renamed Task Committee were the exchange of recording formats and recording periods for meteorological data provided by national government meteorological organizations, summarization of the results of actual wind measurements, the exchange of strong wind data and wind pressure data, the establishment of boundary layer experimental methods, encouragement of the exchange of boundary layer wind observation documents, the promotion of the exchange of information concerning methods of measuring and of estimating the wind response of structures, and the revision of standards for wind data accounting for its future uses.

In line with these activity policies, the Task Committee exchanged information, exchanged strong wind records, and arranged the exchange of researchers, but in response to the shared concern in both Japan and the U.S. with advanced technology for the design and construction of structures able to withstand strong winds and seismic forces, the Twentieth Joint Panel Meeting proposed the unification of the Task Committee on Wind Characteristics and Structural Response and the Task Committee on Evaluation of Structural Performance to form the Task Committee on Evaluation of Structural Performance, and this Task Committee commenced its activities in this new form at the time of the Twenty-first Joint Panel Meeting. At the Twenty-fifth Joint Panel Meeting, the Task Committee on Evaluation of Structural Performance and the Task Committee on Repair and Retrofit of Existing Structures were united to form the Task Committee on Design, Evaluation and Improvement of

Structures.

As a result of the above integration, the share of the range of activities of this Task Committee accounted for by wind engineering and wind resistance engineering shrunk. On the other hand, the damage caused by Hurricane Andrew and Hurricane Iniki was a reminder of the importance of wind hazard mitigation. In light of these events, the Twenty-seventh Joint Panel Meeting recommended a study of the possibility of establishing the Task Committee on Design for Wind and Wind Hazard Mitigation, and the Twenty-eighth Joint Panel Meeting approved the formation of the Task Committee on Design for Wind and Wind Hazard Mitigation.

The following five items outline the range of the activities of the Task Committee on Design for Wind and Wind Hazard Mitigation.
1. Characteristics of strong winds, particularly strong winds in the boundary layer
2. Effects of wind (wind load and wind-induced response of structures)
3. Experimental and analytical methods of predicting strong wind and its effects
4. Damage and risk assessment
5. Assessment and mitigation of wind hazard

(2) Accomplishments

The First U.S. - Japan Workshop on Design for Wind and Wind Hazard Mitigation was held at the Hawaii Imin International Conference Center at the East-West Center at the University of Hawaii from October 7 to 9, 1997. 10 U.S. members and 7 Japanese members of the Task Committee participated in the workshop. The participants presented papers concerning the control and prediction of wind-induced response, effects of topography on the characteristics of strong wind, risk assessment of strong wind, and computational fluid dynamics. The participants also discussed possible themes for future collaborative research between U.S. and Japan and concluded by recommending the following themes.
1. Application of models and field measurements to determine wind speed-up and turbulence characteristics associated with topographic features
2. Development and testing of procedures for using comprehensive aerodynamic and / or structural characteristics data bases to calculate wind loading effects and structural performance
3. Numerical simulations and measurements
a. Development of realistic aerodynamic loads for structural control applications
b. Computational Fluid Dynamics-based quantification of wind loads
c. Full-scale measurements and information obtained by numerical simulation on flow structure in cyclones and thunderstorms
d. Measurement of forces induced by wind on components, assemblies and structural systems
4. Aerodynamic control
a. Tailoring aerodynamic modifications for performance control (flexible structures, envelope / roofing)
5. Performance Evaluations
a. Evaluation of existing buildings and structures for wind vulnerability to develop retrofitting schemes
b. Evaluation of the performance of controlled systems
6. Development of prediction methods for wind response of long-span bridges
7. Cooperative efforts in post-storm damage assessment following strong wind events, e.g., tropical cyclones

In line with this final conclusion, collaborative research between the U.S. (University of Washington) and Japan (Public Works Research Institute) on the "Development of Prediction Methods for Wind Response of Long-span Bridges" is now commencing.

(3) Future Plans

The Task Committee intends to contribute to the rationalization of design for wind, and to the wind hazard mitigation by conducting cooperative research concerning the above seven themes. Of these themes, those related to bridges are now the objects of cooperative U.S. - Japan research projects, but the committee plans to study the possibility of cooperative research on themes related to buildings and to strong wind characteristics.

The Second U.S. - Japan Workshop on Design for Wind and Wind Hazard Mitigation will be held at the Public Works Research Institute in May 1999, and the Task Committee intends to take this workshop as an opportunity to present and discuss the results of present cooperative research and to arrange new cooperative research projects.

(Hisashi Okada and Hiroshi Sato)

Task Committee F: Disaster Prevention Methods for Lifeline Systems

(1) Background

It was adopted at the Seventh Joint Panel Meeting in 1975 to establish Task Committee F on Disaster Prevention Methods for Lifeline Systems. The first meeting of Task Committee F was held on the occasion of the Eighth Joint Panel Meeting in 1976. The Task Committee Report of that time identified the scope of this Task Committee as:
1. Improvement of design and disaster prevention technology for lifeline facilities should be pursued.
2. Lifeline is here defined as important facilities to take emergency measures within 72 hours after disaster occurred, including bridges, embankments, tunnels, slopes, pedestrian bridges, pipelines, water pipes, telephone and power transmission lines, waterways and tidal gates, inland water for fire fighting and the minimum facilities of wharves. Excluded from the category of Task Committee F are buildings, relay facilities, power generation plants and buildings for waterworks.

In 1978, the Miyagi-ken Oki Earthquake severely damaged lifeline facilities, resulting in increased demands for research on the safety of lifeline systems. At the Eleventh Joint Panel Meeting in 1979, it was agreed to initiate coordination of U.S. - Japan joint cooperative research on the safety of lifeline system and its component. Later, U.S. - Japan joint cooperative research on reinforced concrete column structures and embedded pipelines was conducted during 1982-1989.

On the occasion of the Twenty-first Joint Panel Meeting in 1989, the objective of this Task Committee was rearranged as follows:
Lifeline systems such as gas, oil, water and sewage pipelines; and power, communication and transportation systems are crucial to the survival and health of community, and the earthquakes affecting such systems cause severe social and economic disruptions to communities and cause human suffering to residents. In view of those facts, Task Committee F focuses on improving 1) behavior of lifeline systems during earthquakes and 2) engineering and other seismic countermeasures such as damage estimation techniques and inspection procedures. Those two points have continued to be the principal objectives of the Task Committee since then.

Following the Loma Prieta Earthquake of 1989, researchers from both the U.S. and Japan surveyed damage to lifeline facilities in the San Francisco Bay Area and conducted research on seismic behavior of lifeline facilities, repair, retrofit and so forth. After the Northridge Earthquake of 1994, with the assistance of the U.S. side, a survey team from Japan visited the damaged area in Los Angeles, where they investigated water pipes and transformer substations that were extensively damaged by the earthquake. One year later, the U.S. and Japan formed a joint damage survey team to investigate the Hyogo-ken Nanbu Earthquake. The results of the joint survey have been reported at various technical conferences, workshops, etc.

Those in the field of lifeline earthquake engineering have long been conscious of the needs for risk assessment and crisis management in addition to structural measures, and Task Committee F has promoted research in both areas. The importance of research on the former area has especially been increased after the Northridge and Hyogo-ken Nanbu Earthquakes. At the Twenty-ninth Joint Panel Meeting in 1997, "Seismic Information Systems" was adopted as a Panel Theme, and members of this

Task Committee presented papers on the subject.

(2) Accomplishments

1) U.S. - Japan Joint Cooperative Research
Since earthquake damage to lifeline facilities is a serious problem for both countries, U.S. - Japan joint cooperative research was initiated in 1982 to study the dynamic response, strength and deformation properties of lifeline facilities. This joint research project dealt with reinforced concrete column structures and embedded pipelines. The former was undertaken jointly by the Public Works Research Institute and National Bureau of Standards, and the latter was carried out primarily by the Public Works Research Institute, Columbia University, Cornell University and the National Center for Earthquake Engineering Research.

In the joint cooperative research on reinforced concrete column structures, scale effects were studied by the U.S. side with static loading tests of large specimen with cross sections as large as 2 m and medium size specimen. The effects of loading velocity and loading hysteresis were studied on the Japan side using dynamic loading facilities. The results of both investigations were complied in the form of technical reports on the scale effects by the U.S. side and on the effects of loading velocity, number of loading cycles, loading time histories, two directional loading and oblique loading by the Japan side. Technical findings and information was exchanged at the Joint Panel Meetings and workshops.

In the joint cooperative research on embedded pipelines, cooperation was initiated from strong motion monitoring for seismic response of embedded pipelines during earthquakes. Monitoring was undertaken at the site where a pipe crosses a fault in the U.S. and at the site with irregularly layered ground in Japan. Recorded data were exchanged between two countries, and the results of study on dynamic response of embedded pipelines were presented at the Joint Panel Meetings and workshops.

2) Workshops
Task Committee F has held seven workshops since the First U.S. - Japan Workshop on Lifeline Earthquake Engineering, which was held at the Highway Research Center, Federal Highway Administration in McLean, VA, U.S.A. in 1984. While UJNR is a cooperative science and technology program led by governmental organs, the Task Committee workshops are the scene of lively discussions among experts from various fields. Since this Task Committee does not focus on a specific structure but covers a wide variety of facilities that can be classified as lifeline structures, it is extremely important that the workshop participants include representatives of universities, public utility enterprises and private sectors in addition to those from governmental agencies.

At the Sixth and Seventh Workshops that were held after the Northridge Hyogo-ken Nanbu Earthquakes, results of analysis and restoration of earthquake damage and technology development following those earthquakes were actively discussed.

(3) Future Plans

The features of lifeline facilities and earthquake damage to them are:
1. Lifeline facilities have two characters; they not only function as individual structures, they are also linked in complex ways to many other structures to function as part of network systems.
2. There is a vast existing stock of lifeline facilities, and retrofitting of this stock and the rapid restoration of their functions after a disaster are important.
3. Damage to lifeline facilities has intensive socio- economic indirect impacts on the society in addition to direct impacts. Damage to water supply and sewerage facilities may cause public health problems.

Considering the above facts, the following fields are proposed as candidate themes for research and development through joint cooperative research, workshops, and so on:
1. Evaluation of seismic performance of lifeline facilities and design methods.
2. Reliability evaluation of lifeline facilities as

network systems.
3. Seismic vulnerability inspection and retrofit techniques.
4. Post-earthquake (post-disaster) response.
5. Damage assessment and evaluation of socio-economic impacts of damage to lifeline facilities.
6. Relationship between damage to water supply and sewerage facilities, and public health.

(Masahiko Yasuda)

Task Committee G: Structural Control and Intelligent Material Systems

(1) Background

The Twenty-second Joint Panel Meeting held in 1990 recognized the need for U.S. - Japan joint research on passive, active, and hybrid control systems, and formed Task Committee G (Passive, Active, and Hybrid Control Systems). Then the Twenty-fifth Joint Panel Meeting held in 1993 renamed this Task Committee the Task Committee on Structural Control and Intelligent Material Systems in response to a growing need for research on the use of new materials including smart or intelligent materials.

The following are the goals and the range of activities of Task Committee G.
1. Develop research plans in control of equipment and structures and in high performance structural and material systems;
2. Implement control techniques for motion reduction and modification;
3. Implement use of advanced materials in actual design and construction of buildings and other infrastructure systems under seismic or wind environments;
4. Promote U.S. - Japan cooperation in structural control and intelligent material systems research;
5. Bring together governmental, academic, and industrial participants in joint pursuit of these efforts; and
6. Contribute to IDNDR by organizing joint research and other technical activities in structural and intelligent material systems research based on international cooperation.

Task Committee G works closely with other organizations to provide the leadership in this emerging research by facilitating the exchange of data and information through UJNR mechanisms. The scope of work includes:
1. Providing technical assistance, consultation and coordination of UJNR affiliated research organization in the initiation, development, and execute their programs in research areas.
2. Promoting joint government - university - industry collaborative efforts to facilitate technology transfer and practical implementation.
3. Sponsoring and conducting interdisciplinary workshops and meetings to identify key area of research and opportunities for cooperation, and to stimulate public awareness and interest in this field of research.
4. Developing promotional and demonstrative activities to stimulate public awareness and interest in this field of research.
5. Providing information useful for the establishment of performance standards, design and also retrofit / rehabilitation of existing structures.
6. Promoting research in intelligent material systems, sensors, actuators, optional control system design, and encourage laboratory and field experiments of prototype and full-scale structures.

(2) Accomplishments

The successful results of the activities of Task Committee G are broadly categorized as three cooperative research activities. These are: U.S. - Japan joint research programs concerning structural control, cooperative research on passive (base isolation) and active control (vibration control) design for bridges, and cooperative research on smart structural material systems. Outlines of each of these cooperative research fields follow.

1) U.S. - Japan joint research programs concerning structural control
U.S.-Japan joint research on structural control started in 1990. Both Japan and the U.S. established domestic committees on structural

control that held workshops in their respective countries and conducted cooperative research by holding international workshops. Members of the UJNR took part in both of these national committees. The principal areas of this joint research are; 1) sensors and monitoring, 2) structural control; and 3) intelligent structures.

In August 1994, the First International Conference on Structural Control was held in Pasadena, California in the U.S. followed by the Second International Conference on Structural Control held in June and July 1998. Researchers from many countries attended both these conferences.

2) Cooperative Research on Passive (Base Isolation) and Active (Vibration Control) Control Design of Bridges

Technical information concerning passive and active control design for bridges has been exchanged at a series of workshops. The first was held in September 1991 at the National Center for Earthquake Engineering Research (Buffalo, New York). The principal activity at this workshop was the exchange of technical information regarding the application of passive design to bridges, passive control systems, etc. The second in this series was held in December 1992 at the Public Works Research Institute (Tsukuba City), the third in Berkeley in the U.S. in January 1994, and the fourth in Osaka in December 1996. The collected papers presented at these four workshops have been published by the National Center for Earthquake Engineering Research and by the Public Works Research Institute. A total of approximately 120 technical papers have been exchanged through these workshops.

This cooperative research commenced during the period when passive design was first applied to bridges. The technical information exchanged through these workshops is contributing to the enactment of design standards for passive control bridges and to the construction of actual passive control bridges in both Japan and the U.S.

With the cooperation of Task Committee J, a joint research project concerning hybrid control of bridge structures was conducted by the Public Works Research Institute, the National Science Foundation, the Federal Highway Administration, the National Institute of Standards and Technology, the National Center for Earthquake Engineering Research and the University of California at Irvine. As part of this project, vibration experiments were conducted at the Public Works Research Institute and the National Center for Earthquake Engineering Research. U.S. - Japan cooperative research includes shaking table experiments performed at the Public Works Research Institute to verify the effectiveness of a sliding base isolation system developed by the National Center for Earthquake Engineering Research. Another example is the simulation and analysis by the University of California at Irvine of the results of shaking table experiments to test variable dampers developed by the Public Works Research Institute.

3) Cooperative Research on Smart Structural Material Systems

In the field of structural technology using smart high performance materials, a U.S.-Japan Workshop on Smart High Performance Materials was held at the Building Research Institute (Tsukuba City) in May 1993. At the Building Research Institute, research on structural control and on smart material systems with self diagnosis and self restoration functions commenced in April 1994, and at the Public Works Research Institute, research on smart earthquake resistant structures made of self diagnostic material and self restoration materials commenced in April 1995.

In November 1996, the U.S.-Japan Workshop on Smart Structural Technology (Application to Large Structures) was held at the University of Maryland in the U.S. At this workshop, discussions of the next stage of Japan U.S. joint research on smart structural material systems began, and joint U.S.-Japan research on smart structural material systems commenced in 1998.

(3) Future Plans

Because the above research results have satisfied initial goals and because it appears that the research duplicates that of other Task Committees, the Thirtieth Joint Panel Meeting held in May 1998 confirmed that Task Committees C and G will be unified and that future cooperative research will be conducted by the newly organized Task Committee C.

(Shigeki Unjoh)

Task Committee H: Soil Behavior and Stability During Earthquakes

(1) Background

The establishment of this Task Committee was approved at the Eighth Joint Panel Meeting held in May 1976. The objectives of the Task Committee are to enhance the availability of technology for predicting dynamic behavior of soils, foundations and earth structures, and analyzing dynamic soil-structure interaction to assure their safe performance during earthquakes.

Although earthquakes cause devastating damage, research works on this field have a relatively short history. Even prior to the establishment of this Task Committee, both the U.S. and Japan were greatly interested in the related issues , and since the First Joint Panel Meeting, the two countries have carried on a lively exchange of information including comparison of a seismic design standards for soil structures.

(2) Accomplishments

Achievements of the Task Committee are briefly summarized below, focusing on the last decade. Major activities of the Task Committee have been the exchange of information through presentation of papers and discussions at the Joint Panel Meetings, holding workshops, exchanging researchers, and conducting joint surveys at earthquake damaged sites.

1) Exchange of information

More than 130 papers on this field have been submitted to the 30 Joint Panel Meetings. In general, interest of researchers in the field of soil dynamics may be classified into following categories through observation of subjects of the papers:

1. Mechanical properties of soil under cyclic loading.
2. Liquefaction and its related problems.
3. Prediction of permanent deformation of soil structures due to earthquakes.
4. Countermeasures against liquefaction and retrofit techniques for mitigating damage of structures.

Through observations of subjects of the papers presented in the 30 Joint Panel Meetings, which have been more than 130 papers in this field, it can be found out that research on themes 1. and 2. prevailed until about the Twentieth Joint Panel Meeting, and major interest of researches seem to have shifted to themes 3. and 4. during the last decade with the progress in analytical methods and advances in understanding dynamic properties of soils.

In order to understand the achievements in this field during the past ten years the subjects of the documents that have been exchanged in the period was analyzed in detail and divided into several categories as follows.

1. Introduction of aseismic design standards for ground, foundations and soil structures.
2. Introduction of site investigation technique and new methods for liquefaction assessments.
3. Introduction of earthquake resistant calculation methods, dynamic behavior, and case histories of earthquake damage.
4. Introduction of countermeasure techniques against liquefaction-induced damage of structures.
5. Introduction of centrifuge modeling of soil dynamics.

These are mostly results of experience and research works nurtured in the U.S. or Japan from the different point of view of the two countries. The exchanged information was believed to be extremely effective to have deepened mutual understanding between the U.S. and Japan. The materials that have been exchanged are not only papers submitted at Joint

Panel Meetings but material and data that were prepared by committees of the Panel on Wind and Seismic Effects.

2) The Workshops
Since the first workshop on in-situ testing for liquefaction assessment was held in San Francisco in August 1985, five workshops have been held so far. The second to fourth workshop dealt with a main topic of liquefaction countermeasures while the fifth workshop took up centrifuge modeling of soil dynamics problems. In this way, the Task Committee has established a record of useful achievements through taking up appropriate topics in time and exchanged views more frequently than possible at the Joint Panel Meetings or international conferences.

3) Exchanges of Researchers
The Task Committee has promoted a better mutual understanding in the two nations through the exchange of researchers. Researchers from both countries were sent to visit the other country for periods ranging from a month to a year to conduct research.

4) Joint Surveys at Earthquake Disaster Sites
Relatively large earthquakes have struck both Japan and the U.S. during the last 30 years. In particular, during the last decade, we have experienced the Loma Prieta Earthquake of 1989, the Kushiro-oki Earthquake of 1933, the Northridge Earthquake, the Hokkaido Nansei-oki Earthquake, the Hokkaido Toho-oki Earthquake of 1994, and the Hyogo-ken Nanbu Earthquake of 1995. After each of these earthquakes, engineers and researchers from Japan and the U.S. carried out joint surveys as a part of UJNR activities. The result of these surveys have yielded numerous valuable lessons.

(3) Future Plans

The 1989 Loma Prieta Earthquake and the 1995 Hyogo-ken Nanbu Earthquake have triggered important changes in a framework of earthquake resistance technologies in the both countries. It was a shift towards consideration of large earthquake motion in earthquake resistance design and towards performance-based design methods. With regard to earth structures, this was accompanied by the appearance of a mountain of research and development challenges.

In the recent years, liquefaction countermeasures have been widely executed in Japan. Indeed, it is important to share the knowledge gained through this experience with the U.S. side. In the U.S., on the other hand, research works have been extensively conducted concerning a framework for performance design, and methodologies for the prediction of damage due to strong earthquake motion. Cooperation with the U.S. in this field is considered to be extremely beneficial for Japan.

From a view point of mutual benefits, following research topics which should be tackled by the Task Committee in the future can be drawn:
1. Development of methods of predicting instability and deformation of earth structures and slopes induced by a large-scale earthquake motion.
2. Development of retrofit procedures of existing earth structures and foundations to improve their seismic stability.
3. Rationalization of design methods for liquefaction prevention measures.
4. Development of unified in-situ testing methods for the assessment of liquefaction potential of ground including gravel and fine grain soils.
5. Development of performance-based seismic design methods for earth structures.
6. Improvement of techniques of dynamic centrifuge tests and shaking table tests.

Themes 1. through 4. are extremely necessary in practice in both countries. Outcome of research on these topics could directly contribute to the improvement of reliability and to cost reductions. As necessary, information should be exchanged so that the latest information about research and practical works related to these issues is transmitted between the two countries. Themes 5. and 6. are considered to be medium term challenges, therefore, workshops should be

held at appropriate times to discuss research results and future research plan.

(Osamu Matsuo)

Task Committee I: Storm Surges and Tsunami

(1) Background

The Task Committee I was formed at the Eleventh Joint Panel Meeting in 1979 to strengthen cooperation in the field of research on storm surges and tsunami. After its formation, this Task Committee debated its activity policy and decided that its role would be the promotion of information exchanges concerning a storm surge forecasting model and a meteorological model to be used with it. At a meeting of the Task Committee in 1981, it was pointed out that the U.S. emphasized storm surge forecasting in real-time and that Japan put first priority on the design and execution of coastal structures intended to provide protection from storm surge and tsunami. To share the latest research in both countries and set common goals to be attained in the future, the First Tsunami Workshop was held in Tsukuba in 1983, with four more such workshops held alternatively in Japan and the U.S.

The Task Committee's activity policy has been reviewed through a series of discussions at workshops and at Joint Panel Meetings and it has now been summarized in the following form.

1. Exchanging the results of research on occurrence, generation, propagation, and effects of storm surge and tsunami. Particularly, the exchange of information concerning deep ocean tsunami measurements.
2. Exchanging information concerning study, planning, warnings and technology problems of storm surge and tsunami mitigation activities.
3. Exchanging technology information concerning numerical models to predict tsunami arrival time and run up height, the improvement of observation instruments, and the use of satellites for detection and prior warning.
4. Stimulating research on tsunami and storm surge by holding workshops, etc.

(2) Accomplishments

In addition to exchanging technology information regarding storm surge and tsunami that has been collected in the U.S. and in Japan, Task Committee I has held one workshop every two years to share the latest research in the field of storm surge and tsunami research. The Second Tsunami Workshop was held in Honolulu in Hawaii on November 5 and 6, 1990 and the Third Tsunami Workshop was held in Osaka on August 27 and 28, 1993. At the Third Tsunami Workshop, the results of the latest survey of the tsunami produced by the Hokkaido Nansei-oki Earthquake that devastated the community of Okushiri Island on July 12, 1993 was presented and guidelines to govern future research on the characteristics of this tsunami were confirmed. Immediately following the Hokkaido Nansei-oki Earthquake tsunami, many survey teams including one from the UJNR conducted surveys of the trace of the tsunami runup on Okushiri Island, helping clarify the characteristics of the tsunami and accumulating data that could be used to verify a numerical model. Based on these surveys and on information exchanges, the Public Works Research Institute prepared a model reproducing the seabed close to Cape Aonae at a scale of 1/1,100 to clarify the tsunami propagation mechanism and the Port and Harbour Research Institute has performed a mound scouring experiment on the breakwater of Okushiri Harbor.

A workshop on wind and earthquake engineering of marine and coastal structures was held from January 17 to 19, 1995 in Berkeley in the U.S. At this workshop, which was sponsored jointly with Task Committee K, Task Committee I presented research on the development and the prediction of storm surge in addition to research on tsunami. On the first day of the workshop, the extremely destructive Hyogo-ken Nanbu Earthquake occurred in the Hanshin and Awaji region of Japan, serving as a sharp reminder of the importance of earthquake disaster protection including protection from tsunami.

The Fourth Tsunami Workshop was held at Hilo in Hawaii from April 1 to 3, 1996. This workshop was held to commemorate the 50th anniversary of the Aleutian Tsunami that struck Hilo on April 1, 1946 and the 100th anniversary of the Sanriku Tsunami that came ashore in the Sanriku Region in 1896. From July 9 to 11, 1998, the Fifth Tsunami Workshop was held in the City of Sapporo in Hokkaido. This workshop was held to commemorate the fifth anniversary of the Hokkaido Nansei-oki Earthquake Tsunami of 1993. During this workshop, the tsunami researchers visited Okushiri Island where they attended a reception to exchange views with people who had experienced the tsunami and observed the state of recovery work in the part of the island it had devastated.

Participants in the International Tsunami Commission of 1997 realized that it was necessary to provide and improve gridded bathymetry for numerical calculation of tsunami and to undertake the international sharing of information. Task Committee I agreed to support these activities. The Fifth Workshop held in 1998 pointed out the importance of using large water tanks for model experiments of tsunami and initiated the tasks of making a list of such facilities at research institutions in Japan, U.S. and Europe, and clarifying the roles of large scale experiments in tsunami research.

(3) Future Plans

The Task Committee I will continue to study storm surge and tsunami damage reduction measures through information exchanges between Japan and the U.S. It will energetically tackle the following challenges during the coming five or six years.

1. Because it is possible to forecast tsunami generated by tsunami earthquakes with high precision using deep ocean tsunami detection systems, actual prior warning systems must be incorporated in the future. A lively exchange of information is now in progress, but because progress has been achieved in research to develop laser-type tsunami detectors and to optimize the arrangement of tsunami detectors, it is now necessary to develop low cost detection systems and to share information. The study of the possibility of using artificial satellites for tsunami detection will begin.

2. To use numerical models to predict the development and propagation of storm surge or a tsunami, it is important to provide gridded bathymetry in the modeled field. In shallow sea close to shorelines in particular, the precision of the gridded bathymetry governs errors in the prediction of the height and arrival time of tsunami. It is, therefore, necessary that precise data be provided. As two countries that have made progress in providing such data, Japan and the U.S. must play leading roles in order to create a international common environment, and Task Committee I will take part in this task. A common environment for gridded bathymetry in deep ocean will be achieved in 2000, followed by its expansion to shallow sea.

3. Based on the gridded bathymetry that has been provided, a numerical calculation model for tsunami and storm surge will be developed and improved. It is important that a tsunami model improve the precision of estimations of the initial wave profile at tsunami source area and that it reproduces wave deformation in shallow sea. In storm surge model, a wind estimation method and modeling of the stress that acts on sea surface are important. Because recent years have seen progress in research to develop such models, Task Committee I will develop and improve a practical model while jointing gridded bathymetry.

4. Because storm surge and tsunami are infrequent natural phenomena, it is difficult to obtain sufficient on-the-spot data. Hydraulic experiments performed using large-scale tanks are, therefore, effective ways to clarify the behavior of wave in coastal zone. At the Public Works Research Institute, experiments using a large-scale water tank have been performed to study scouring of the ground around structures by tsunami and joint research will be performed in order that the two countries organize their shared research objectives. Preliminary

experiments using the Public Works Research Institute's large-scale tank began in 1998, and they will continue in 1999 in order to develop a model for predicting scouring of the ground around structures by tsunami. In 2000, research intended to provide proposals for scouring prevention measures will commence.

(Shinji Sato)

Task Committee J: Wind and Earthquake Engineering for Transportation Systems

(1) Background

The Thirteenth Joint Panel Meeting held at the Public Works Research Institute of Ministry of Construction in Tsukuba Science City from May 19 to 22, 1981 tackled this theme by agreeing to form the Task Committee on Wind and Earthquake Engineering for Transportation Systems to carry out joint research between the U.S. and Japan in this field. The initial activities of the Task Committee were considering the scale of the range of wind resistance and seismic technologies related to traffic facilities and limiting the research to earthquake engineering problems with plans to expand the scope of the research to include the effects of both wind and earthquakes on traffic facilities in the future.

The principal objectives of this Task Committee were defined as the conduct of joint research and the periodical exchange of information concerning themes of common concern to both nations. Since 1982, information exchanges at annual meetings of the Task Committee have been accompanied by workshops, joint research, and ongoing consultations regarding future committee plans. Its activities related to research on the wind and earthquake engineering for transportation systems primarily concerned the wind resistant and seismic design of highway bridge structures.

The Twenty-eighth Joint Panel Meeting held in 1996 approved the establishment of the Task Committee on Design for Wind and Wind Hazard Mitigation, that has conducted research on the characteristics of strong wind and the mitigation of the damage caused by strong winds. But with this Task Committee intimately involved in wind resistance technology for transportation systems, it is to continue its research in recognition of the particular importance of the wind resistance of highway bridges.

(2) Accomplishments

Every year, this Task Committee has presented many papers and engaged in an extensive exchange of information with the participation of many researchers and papers on this theme in the past decade. Another noteworthy activity has been a series of damage surveys by cooperating American and Japanese teams immediately following a series of earthquakes in U.S. and Japan; the Loma Prieta Earthquake of October 17, 1989, the Northridge Earthquake of January 17, 1994 and the Hyogo-ken Nanbu Earthquake of January 17, 1995. The Task Committee has engaged in an exchange of information on the latest earthquake engineering technology including the results of the above surveys and detailed information obtained later, contributing to the early recovery from these disasters and the advance of seismic technology in both nations.

A Task Committee meeting held in 1983 planned the U.S. - Japan Bridge Engineering Workshop. The first U.S. - Japan Bridge Engineering Workshop was held at the Public Works Research Institute of Ministry of Construction in Tsukuba Science City in February 1984. With the venue alternating between U.S. and Japan, these workshops have continued almost every year with the thirteenth held in 1997. In Japan, these workshops have been held at the Public Works Research Institute, and in U.S., in San Francisco, San Diego, Lake Tahoe, Chicago and Buffalo. Participants have included a total of 265 representatives of U.S. and 439 from Japan, with a total of 429 papers presented. The workshops have been occasions for a lively exchange of views focused on the presentation of papers regarding design, construction, maintenance and new element technologies including criteria, related to the

wind resistance and seismic problems of highway bridges.

In addition to the Bridge Engineering Workshops, the Task Committee responded to a series of large earthquakes including the Loma Prieta Earthquake of 1989, the Northridge Earthquake of 1994, and the Hyogo-ken Nanbu Earthquake of 1995 that struck in U.S. and Japan by organizing a series of workshops on the seismic retrofit of bridges; the Workshop on Seismic Retrofit of Bridges. Three were held; one in Tsukuba in December 1990, second in Berkeley in January 1994, and the third in Osaka in December 1996. And the Task Committee also organized four Workshops on Earthquake Protective Systems for Bridges; in Buffalo in September 1991, in Tsukuba in December 1991, in Berkeley in January 1994, and in Osaka in December 1996. These workshops were integrated with the Bridge Engineering Workshops beginning in 1998.

The Task Committee has organized many exchanges of researchers between the U.S. and Japan. During the past decade, it has arranged for a number of researchers from U.S. and Japan to work at a research institute in the other country to survey and research seismic technology of highway bridges. In 1989, Dr. Shigeki Unjoh, researcher of PWRI was sent to University of Southern California and Mr. Ray Zelinsky of CALTRANS worked at PWRI. In 1990, Dr. Keiichi Tamura, senior researcher of PWRI studied at Stanford University and Mr. Kinji Hasegawa, researcher of PWRI, conducted research at University of California, Berkeley. In 1991, Mr. Inoue spent five months studying bridge maintenance and management at the Turner-Fairbank Highway Research Center. Mr. Mohsen Sultan of CALTRANS spent one year at PWRI where he carried out comparative research on seismic design of bridges between U.S. and Japan. In 1994, Mr. Mark Yashinsky of CALTRANS spent five months at Earthquake Engineering Division of PWRI conducting comparative research on seismic design of bridges between U.S. and Japan. In the same year, Mr. Michael Britt of FHWA researched bridge design technology during one year period spent at PWRI and Honshu-Shikoku Bridge Authority. Then in 1995, Dr. Phillip Yen of FHWA came to Japan for 20 days to research seismic design methods. In 1998, Dr. Jun-ichi Hoshikuma, researcher of PWRI, spent a year at University of California, San Diego to study the seismic design of bridges.

(3) Future Plans

Joint research which began in 1983 with joint research on the seismic performance of bridge piers and columns, has continued improved seismic retrofit and strengthening procedures, seismic isolation, and hybrid control for highway bridges based on experimental, analytical, and field studies, the comparison of seismic design criteria for bridges in U.S. and Japan, seismic, aeroelastic, aerodynamic response of long span bridges, seismic response and control, system identification techniques, nondestructive evaluation of bridge structures, use and performance of structural materials including new materials, and performance of jointless bridges, and so on. The Task Committee plans to undertake an active program of cooperative research on maintenance and application of high performance steel to bridges.

As the Task Committee continues to exchange research information concerning wind resistant and seismic technologies for transportation systems, arrange for the exchange of researchers in this field, and organize related joint research as described above, it must take up many new themes, and through close cooperation between its members in U.S. and Japan, become even more active than in the past.

(Kazuhiro Nishikawa)

Task Committee K: Wind and Earthquake Engineering for Offshore and Coastal Facilities

(1) Background

The Task Committee K was proposed by the Port and Harbour Research Institute of the Ministry of Transport of Japan and by the

Minerals Management Service of the Department of the Interior of the U.S., and it has been in operation since its formation was approved at the Twenty-third Joint Panel Meeting (1991). Task Committee K was established to perform technical surveys and research to prevent wind and earthquakes from damaging offshore facilities. It plans, supports, and executes surveys and research projects in line with this objective and conducts activities that apply the results of these research projects to future design standards.

The following are the specific themes studied by Task Committee K.

1. Sponsoring and conducting workshops and meetings to identify key areas of research, opportunities for cooperation, and the exchange of knowledge.
2. Predicting strong ground motions for offshore and coastal sites including assessing the effects of basin geometry, linear, and nonlinear local geological effects using actual seafloor response measurements.
3. Determining the dynamic response and the interaction of structure/foundation/soil systems to seabed motions and/or extreme wind forces.
4. Assessing the dynamic response and behavior of various operational facilities mounted on offshore and coastal structures.
5. Developing assessment methodologies for earthquakes and other characteristics of potential seismic sources (e.g., faults) for offshore and coastal sites in regards to how these conditions relate to structural design criteria.
6. Promoting the implementation of new research results into current design and construction processes.
7. Developing research efforts to include laboratory and field programs to obtain data on the response of offshore and coastal facilities to extreme wind and seismic forces.
8. Creating performance standards, design specifications, guidelines, and code recommendations for applications to new construction as well as remedial action for exiting facilities.

(2) Accomplishments

1) Holding Workshops

Two Workshops on Wind and Earthquake Engineering for Offshore and Coastal Facilities have been held. The first workshop was held in May 1993 at the Training Center of the Port and Harbour Research Institute of the Ministry of Transport. The eight and 22 representatives participated in this workshop from the U.S. and Japan, respectively. Each side presented 8 papers for a total of 16 papers. The papers dealt with the wind resistant and earthquake resistant design of marine facilities, damage inflicted on marine structures by Hurricane Andrew, earthquake observations of seabed ground, and so on. It was the first workshop, and its primary purpose was the exchange of information regarding the present state of offshore and coastal facilities in Japan and the U.S. and seismic, wind hazard mitigation design code/guidelines.

The second workshop was held at the Berkeley Campus of the University of California in the U.S. on January 1995. It was held jointly with the Task Committee I. The approximately 60 representatives who took part in the workshop were presented with a total of 40 papers: 20 from Japan and 20 from the U.S. The workshop confirmed that the following technological issues would be taken up by future joint research projects.

1. Development of earthquake risk evaluations
2. Improvement of numerical tsunami simulation technology
3. Development of methods of evaluating the wind resistance and earthquake resistance of existing structures
4. Appropriate evaluation of past high water and tsunami damage data

Information of many kinds has been exchanged as a result of these two workshops. Information concerning strong motion records of the seabed ground in deep waters obtained by means of earthquake observations at oil drilling platforms in the U.S. has been applied to the study of the earthquake resistance of deep-water structures in Japan.

2) Mutual Assistance with Earthquake Damage

Surveys
An earthquake damage survey was carried out following the 1994 Northridge Earthquake with the cooperation of the U.S., and this included a survey of damage in the Port of Los Angeles: a survey related to the concerns of Task Committee K. Then following the Hyogo-ken Nanbu Earthquake of 1995, Japan assisted with a damage survey in the Port of Kobe conducted by an earthquake damage survey team from the U.S. The results of the damage surveys in the two countries are information of use in the earthquake resistant design of port facilities in both Japan and the U.S.

3) Support for U.S. - Japan Joint Research
Task Committee K assisted with joint research by Old Dominion University of the U.S. and the Port and Harbour Research in 1992. This joint research focused on pressure acting on retaining walls during earthquakes, and Professor Ishibashi of Old Dominion University conducted the research while visiting the Port and Harbour Research Institute. The results of the project are being applied to more rational earthquake resistant design of port facilities.

4) Exchanges of Researchers
The Port and Harbour Research accepted a doctoral candidate from the University of California at Berkeley as a summer trainee for one month in August 1997, and accepted another doctoral candidate from the same university for four months beginning in August 1998 to perform model vibration experiments using a under water shaking table.

Mr. Nozu research of the Port and Harbour Research Institute is conducting research on earthquake resistant technology for offshore and coastal facilities at California Institute of Technology for a year beginning in October 1998. This researcher exchange by Mr. Nozu is connected to an exchange involving Prof. W. Iwan of California Institute of Technology who attended the first workshop held in Japan.

5) Cooperation at International Conferences
Members of Task Committee K helped to organize and participated in the workshop, "Earthquake Criteria Workshop - Recent Development in Seismic Hazard and Risk Assessment for Port, Harbor, and Offshore Structures" held concurrently with the International Offshore Mechanics and Arctic Engineering (OMAE1997) Conference in Yokohama, Japan on April 17, 1997.

(3) Future Plans

1. The Third Workshop on the Seismic, Wind and Hazard Mitigation Technique for Offshore and Coastal Facilities will be held in Japan; a specific time for this workshop are now being studied.
2. The Task Committee plans to support the provision of information concerning Japan's port facility earthquake resistant design standards that have been revised since the Hanshin Awaji Earthquake Disaster to the "Pacific Earthquake Engineering Research (PEER) Program on Ports and Harbors" of the University of Southern California.
3. Japan will carry out earthquake observations of structures in deep water and the exchange of information and research cooperation regarding the results of earthquake observations in both Japan and the U.S. will continue so that more rational earthquake resistant design methods for deep water structures can be developed.
4. The Port and Harbour Research Institute has a large-scale three-dimensional underwater shaking table of a kind not available in the U.S.; the possibility of U.S.-Japan joint research involving the use this test device to study the dynamic interaction of marine structures and water is being studied.
5. U.S.-Japan joint research will be undertaken to study the applicability to of advanced technologies such as nuclear magnetic resonance imaging (NMRI) technology and micro electric mechanical systems (MEMS).

(Tatsuo Uwabe)

Task Committee on Seismic Information Systems

(1) Background

Based on the recent large earthquakes including the 1994 Northridge Earthquake and 1995 Hyogo-ken Nanbu Earthquake, both the U.S. and Japan strongly promote developing seismic information systems for the earthquake disaster reduction. On the other hand, the U.S. and Japan policy makers have exchanged information regarding the utilization of seismic information systems to disaster prevention measures at the U.S.- Japan Earthquake Policy Symposia (September 1996 in Washington, D.C. and September 1997 in Kobe) held under the Common Agenda framework. Participants recognized the importance of further discussions on the following subjects at the U.S.- Japan Earthquake Policy Cooperation Forum that is conducted as the next stage of the Earthquake Policy Symposium.

1. Development and utilization of real-time earthquake information systems
2. Development and utilization of earthquake damage estimation models
3. Post earthquake emergency response measures and restoration measures

In response to these conditions, seismic information systems were featured as a technical session theme at the Twenty-ninth and Thirtieth Joint Panel Meetings. And the Panel approved the establishment of a new Task Committee on Seismic Information Systems at the Thirtieth Joint Panel Meeting. Objectives and scopes of the new Task Committee are as follows:

1. Improve understanding of earthquake phenomena and their social effects through the utilization of seismic information systems, earthquake damage estimation methodologies and analysis models.
2. Technically assist the earthquake policy cooperation under the Common Agenda framework by facilitating the cooperative efforts between policy makers and researchers.
3. Review the principals, objectives, structures and methodologies of both sides seismic information systems, and facilitating the practical application to earthquake prevention measures.

(2) Future Plans

The emphases of the Task Committee activities will be placed on following specific subjects.

1) Research cooperation on earthquake monitoring and notification systems

Both U.S. and Japan have been developing and practically utilizing these systems, i.e., CUBE, REDI, the Japan Meteorological Agency system, the Ministry of Construction System and others. It will be effective for both countries to exchange information on the real-time collecting / analyzing / disseminating technologies of earthquake ground motion data, and procedures of activating the ground motion data to emergency activities.

2) Research cooperation on damage estimation systems and decision-making support systems

The U.S.-side has been conducting researches on the application of GIS / GPS / remote sensing technologies, and information processing / disseminating technologies through communication networks. Japan-side has been developing and practically utilizing the damage estimation technologies using the real-timely collected ground motion data. Comprehensive research on the utilization of artificial satellites and other urgent disaster monitoring / analyzing technologies have also been initiated for the appropriate national land management against natural disasters. It will be effective for both countries to exchange knowledge and experiences on these advanced technologies.

3) Research cooperation on earthquake damage estimation models

Although several models have been developing in both the U.S. and Japan, i.e., the FEMA model, the National Land Agency model, the Ministry of Construction model and others, the verification of estimation models is not necessarily enough at this time. To exchange existing earthquake damage data possessed by each country and to compare simulated damage situations between models will be effective to improve estimation models in both countries.

The Task Committee will facilitate to promote efficient research cooperation by planning / conducting workshops with attendees of policy makers and researchers from government and

other public bodies, planning / conducting cooperative research projects, and exchanging information and personnel. The workshop will serve as a forum to technically support cooperative activities of policy makers under the U.S. - Japan Earthquake Policy Cooperation Forum. Also, the Task Committee will make efforts to exchange information with related working frameworks; i.e., Task Committee A "Strong Motion Data and Applications" regarding the real-time collecting / analyzing / disseminating technologies of ground motion data, and the Joint Panel on Earthquake Research regarding the remote sensing / GIS / GPS technologies.

(Kazuo Okayama and Hideki Sugita)

CONCLUDING REMARKS

The activities of the Panel on Wind and Seismic Effects were summarized on the occasion of the Twentieth Joint Panel Meeting. Passing ten years since then, this paper, prepared by the Japan-side Panel to commemorate the 30th anniversary of the Panel, looks back on thirty years of accomplishments and sets forth future prospects. The authors expect this paper will be a starting point to discuss future course of the Panel with the U.S.-side.