

1. Conference Outline

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Organizing Committee of the Ninth World Conference on Earthquake Engineering

The Ninth World Conference on Earthquake Engineering (9WCEE) was held in Tokyo and Kyoto from August 2 to 9, 1988, under the sponsorship of International Association for Earthquake Engineering, hosted by the Science Council of Japan, Japan Association for Earthquake Disaster Prevention, Architectural Institute of Japan, Japan Society of Civil Engineering, Japan Society of Soil Mechanics and Foundation Engineering, the Japan Society of Mechanical Engineers, and Seismological Society of Japan. Additional support was provided by the Ministry of Education, Ministry of International Trade and Industry, Ministry of Transport, Ministry of Construction, Science and Technology Agency, Water Resources Development Public Corporation, Hanshin Expressway Public Corporation, Japan Highway Public Corporation, Metropolitan Expressway Public Corporation, Japan Railway Construction Public Corporation, Honshu-Shikoku Bridge Authority, Housing and Urban Development Corporation, Tokyo Metropolitan Government and the United Nations Centre for Regional Development.

This conference was first held in 1956 in Berkeley, California, to commemorate the 50th anniversary of the San Francisco earthquake, and has since been held every four years in various places throughout the world. The basic aim of the conference is to facilitate the exchange of research information in the field of earthquake engineering. This occasion marks Japan's second hosting of the conference, the first being 28 years ago in 1960.

Attendance exceeded all expectations, with 1,737 participants—1,161 from Japan and 576 from 52 other countries. In addition, 139 spouses attended. All in all, the meeting proved a great success.

The first half of the conference took place at the New Otani Hotel in Tokyo from August 2 to 6. This began with registration on August 2 followed by a reception in the evening. The opening ceremony on August 3 featured a speech by Chairman Keizaburo Kubo of the Organizing Committee, as well as welcome addresses by Dr. Jiro Kondo, President of the Science Council of Japan, and Dr. Hajime Umemura, President of the International Association for Earthquake Engineering. A congratulatory telegram from Prime Minister Noboru Takeshita was also read.

Commendations were conveyed by Dr. Shunzo Okamoto, President of the Japan Association for Earthquake Disaster Prevention to Prof. George W. Housner (U.S.A.) of the

California Institute of Technology, and Dr. Jai Krishna (India), honorary member of the *International Association for Earthquake Engineering*, in appreciation of their achievements over long careers.

Following the ceremony, two keynote lectures were presented: "Nine Milestones on the Road to Earthquake Safety," by Dr. Donald E. Hudson (U.S.A.), honorary member of the *International Association for Earthquake Engineering*, and "Earthquake Prediction in Japan" by Dr. Toshi Asada, President of Japan's Coordinating Committee for Earthquake Prediction.

The scientific program in Tokyo took place in eight session rooms over four days, and included the following thirteen topics: (1) Earthquake damage, (2) Seismicity and seismic risk, (3) Ground motion and local effect, (4) Dynamic properties and stability of soils, (5) Soil-structure interaction and foundations, (6) Experimental methods and testing of structures and elements, (7) Response of structures, (8) Seismic design methodology and seismic codes for structures, (9) Buildings, building elements, and equipment, (10) *Civil engineering structures and industrial facilities*, (11) *Lifeline systems*, (12) *Seismic capacity assessment, repair, and strengthening of structures*, and (13) *Urban seismic risk mitigation, socio-economic aspects, and human behavior*. In all, 694 studies were presented.

In parallel with the conference, an exhibition was held at the Tokyo site. Thirty-seven organizations displayed seismographs, earthquake-resistance testing equipment, equipment to analyze soil strength, etc., and provided technical information on ground survey, earthquake-resistant technology, base isolation, seismic analysis and design methods, and general preventive measures.

On August 6 and 7, the participants moved to Kyoto, where the second half of the conference was held on August 8 and 9 at the Kyoto International Conference Hall. This was preceded by an outdoor garden party at the site on the evening of August 7, featuring traditional Japanese dance and colorful and elaborate fireworks. The actual program commenced on August 8 with a welcome speech by Dr. Takuji Kobori, the Japanese representative of the *International Association for Earthquake Engineering*, and a keynote lecture by Dr. Liu Huixian of the State Seismological Bureau of the People's Republic of China, on "The Sole Course of Mitigating Earthquake Risk."

Unlike the scientific program in Tokyo which had consisted of technical sessions in the form of oral presentations, the program in Kyoto was made up of poster sessions and special theme sessions held in parallel. The poster sessions included a total of 128 presentations

covering the following topics: (1) The Mexican earthquake of 1985, (2) Masonry structures, (3) Measurement of vibration, (4) Embankment and offshore structures, (5) Active response control and damping devices, (6) Strong motion observation, (7) Array observation of ground motion, (8) Evaluation of building performance, (9) Reinforced concrete wall, (10) Random vibration, and other specific fields.

The special theme sessions focused on problems which were considered, based on recent progress in studies, to require especially active discussion, and included the following: (1) Prediction of strong ground motion, (2) Near-field and array observation, (3) Dynamic and permanent displacements of ground and structures, (4) Dynamic soil-structure interaction: verification and application, (5) Seismic response control of structural systems, (6) Inelastic behavior and modeling of concrete structural components under multi-directional seismic forces, (7) Ductility evaluation and design of concrete structures and elements, (8) Seismic probabilistic safety assessment of structural systems, (9) Experimental methods for structures, (10) Survey methods and quantitative evaluation of earthquake damage, (11) Multi-disciplinary integration for urban seismic risk reduction, and (12) Improvement in seismic performance of masonry buildings.

A number of tours and visits, both technical and cultural, were provided for the participants and accompanying persons, especially those from overseas, during and after the conference.

These included Japanese traditional fine arts and performing arts, historical buildings, the site of a fault caused by the Nobi earthquake, as well as recent achievements such as modern buildings, Shinjuku's urban core, Tokyo Bay area construction, the Honshu-Shikoku Bridge, a large-scale shaking table at Tadotsu, and so on.

The closing ceremony on August 9, began with a speech by President Hajime Umemura of the International Association for Earthquake Engineering. Dr. Tsuneo Katayama, the new IAEE Secretary General succeeding Dr. Yutaka Osawa, then gave a summary of the IAEE executive committee meeting and the general assembly held during the conference period. Subsequently, newly nominated directors and honorary members were introduced. In appreciation of their efforts, a plaque was awarded to Dr. Osawa and Japanese sake to Dr. Kyoji Nakagawa, Secretary General of 9WCEE, causing rounds of warm applause. This was followed by a speech of acceptance by newly-elected President Giuseppe Grandori (Italy) of the IAEE and a speech by Dr. Rafael Blazquez, deputy national delegate of Spain, the host country of the 10WCEE. Finally, Dr. Keizaburo Kubo gave a closing speech

and the conference ended with promises to meet again in Madrid in 1992.

It is needless to mention that the support from the many related persons and organizations was the vital factor in realizing and successfully running the conference. In this regard, the cooperation of the Science Council of Japan as a host organization deserves special acknowledgement. In terms of participation, there was an increase of over 300 compared with the 8WCEE. Increased attendance was especially notable among people from the People's Republic of China and other East Asian countries, as well as among the young people of Japan. One of the greatest contributions of the 9WCEE could be said to be the fact that it helped these people grasp the present status of the study of earthquake engineering and its direction for the future.

The 9WCEE adopted the following new measures to help rationalize management and enrich substance: (1) separate sessions were organized for special themes, (2) an "Abstract Volume" was published, (3) papers were compiled, printed, and distributed as "Proceedings" after the Conference, and (4) the cost for the Proceedings was charged separately from the registration fee.

The number of presentations in the field of earthquake engineering has been increasing by an average of 100 per conference. This has tended to limit the time available for each presentation and discussion and made it difficult to maintain the standards required of an academic meeting. (At the 9WCEE, presentations were given simultaneously in eight session rooms.)

Special theme sessions were organized for the 9WCEE to enable intensive discussion on twelve themes considered important in view of the present and near future state of earthquake engineering, and 155 papers were selected from accepted papers for presentation. Each session was opened by a review of the present status of study, followed by presentations and discussion, and concluded with a summary. This new attempt is believed to have facilitated the promotion of information exchange and enhanced discussion.

In the past, the closing date for acceptance of papers was well before the start of the conference and the Proceedings was distributed to participants in advance, but no abstracts were made available. For the 9WCEE, papers were accepted up to and during the conference period in an attempt to enable them to reflect the latest research results. The post-conference production of Proceedings, based on actual demand, was also designed to eliminate costly surplus copies of the 7,000-page tome. On the other hand, prior distribution of the Abstract Volume must have been useful in helping participants to appreciate the

presentations.

While the cost of the Proceedings had previously been included in the registration fee, there was a separate charge this time. The reason for this was that it was seen to be unrealistic to require every participant to purchase such a large volume, and that a separation of the charges would lower the registration fee, encouraging more people to attend the conference. By the way, presenters were able to purchase the volume at a special price. The new arrangement was generally accepted with favor and, despite some fears of low demand, the Proceedings maintained a respectable level of sales.

Now for the research results presented and discussed at the 9WCEE. Nearly 1,000 papers were presented in Tokyo and Kyoto, and the conference provided a new recognition of the present status and future trend of study. It was especially noted that studies must cover more extensive fields and that the trend of studies is moving towards more specialization. In this regard, we consider it pertinent to have continued to adopt poster sessions, which began at the last conference, and introduced the special theme sessions so as to supplement conventional oral presentations. The following is list of themes likely to characterize the study of earthquake engineering from now on.

- (1) Array observation of ground motion is active in many countries as well as the quantitative study of the relationship between the mechanical properties of surface soil and the amplification of ground motion. Further achievements are expected in the understanding of the properties of incident seismic waves.
- (2) On-line and centrifugal force-applicators have been developed to enable the incorporation of new experimental methods in the study of earthquake engineering. These should provide powerful means of analyzing the seismic behavior of structures and soil.
- (3) The means of assessment and improvement of the tenacity of structures have come to be studied by many investigators. Significant improvement in the earthquake resistance of structures is expected to result from these studies.
- (4) With recognition of the importance of study to understand and counteract the effect of earthquakes on soil properties, such study is expected to advance toward a solution of this problem.
- (5) Improved understanding of the socio-economic implications of earthquake has led to an expansion of study in earthquake engineering from the conventional range of engineering to the realm of social and human sciences. The 9WCEE for the first time adopted "Urban disaster prevention: socio-economic issues and human behavior" as a new study

theme.

(6) Many participants recognized that a number of study themes remain as yet unsolved, the solution of which may help to mitigate destruction from earthquakes and to protect human life and property.

Lastly, the committee acknowledges the contributions of the many people who were instrumental in bringing to fruition the 9WCEE.