Session Report:

Disaster (Earthquake) II

Chairperson: Jenn-Chuan CHERN
(Taiwan Construction Research Institute, Taiwan)
Secretary: Susumu OKAMOTO
(National Research Institute for Earth Science and Disaster Prevention, Japan)


Dr. Jenn-Chuan Chern


Dr. Susumu Okamoto

Recent Developments and Research Initiatives for Urban Earthquake Disaster Management Technologies
by Prof. Hiroyuki Kameda
(Kyoto University, Japan)

The National Emergency Response Action Program (NERAP)
by Dr. Benito M. Pacheco
(Vibrametrics, Inc., Philippines)

A Business Perspective on Natural Disasters and the Environment
by Ms. Mary L. Carrido
(MLC & Associates, Inc., USA)


Prof. Hiroyuki Kameda


Dr. Benito M. Pacheco


Ms. Mary L. Carrido

1. Summary

The topics of this session were concerning the disaster management which included the countermeasures for many kinds of natural disasters. Prof. Kameda explained the countermeasures of civil engineering structures in Japan after the 1995 Hyogoken-nanbu (Kobe) Earthquake. And Dr. Pacheco explained the recent development of the countermeasures after natural disasters in the Philippines. Miss Carrido also explained the relationship between the natural disaster and the economic loss.
As a result of this session, it is confirmed that the importance of saving the "Human life" during earthquake is unquestionable. Those who are working in earthquake engineering field all over the world must endeavor to resolve the each country's problem in order to establish the countermeasures which can save the "Human life" from earthquake disasters.

2. Presentation Highlights

At first, Prof. Kameda reviewed the development of earthquake engineering. The development was divided into three generations. During the first generation after the 1906 San Francisco Earthquake and the 1923 Kanto Earthquake, the rational static seismic design method, which was considering the elastic behavior of structures, was used. Difference of surface motion because of soil conditions were also considered. After the 1964 Niigata Earthquake, the second generation of seismic design was established. The earthquake resistant design in the second generation considered the elasto-plastic behavior of structures. The concept of the design method was based on the consideration of dynamic behavior of structures during earthquakes. The major points of the design method were shear failure of RC columns, liquefaction of soft ground, and disruption of lifeline systems. Some strong ground motion records were also collected at several locations in disaster areas. At the third/current generation after the 1994 Northridge Earthquake and the 1995 Kobe Earthquake, complex urban disaster is considered. Near-field strong motion due to fault rupture and comprehensive earthquake engineering must especially be considered. Following three points of view are important in current seismic design: 1)Structural and geo-technical mitigation; 2)Engineering for crisis management, and 3)Systems approach for sustainable developments. Major cause of huge disaster in Kobe was the compound effect of very destructive near-field ground motions affected by specific source mechanism and accumulated urban vulnerability in existing stocks and social systems.
Three important findings regarding earthquake engineering practice of lifeline systems were pointed out. First, modern engineering technology proved to be promising. Second, the methodologies of lifeline operation under earthquake emergency proved to be useful. And last, in reconstruction, efforts were taken to incorporate new visions to initiate the next generation of earthquake engineering technology. Important lessons from the earthquake are the necessity of multi-disciplinary international integration from physical, societal, and information point of view. Multi-disciplinary integration for disaster management technology should be pursued on the basis of a comprehensive recognition of physical agenda, societal agenda, and information agenda. Organizational developments and research initiatives to realize multi-disciplinary collaboration were introduced.

Secondary, Dr. Pacheco described the history, objective, organization, and activities of the National Emergency Response Action Program, NERAP, in the Philippines. Many kinds of natural disasters such as earthquakes, volcanoes, typhoons, floods and so on affect all over the

Philippine, composed of 7,000 islands. Metro Manila is not an exception. The countermeasures for earthquake in the Philippines were explained briefly in this presentation.
The first priority is preparedness for post-earthquake emergency response. Three categories, INSPECTED, RESTRICTED and OFF-LIMITS, are used as the result of rapid and detailed inspections just after any natural disaster. The Philippine government is now training survey teams for the inspection. To evaluate the effectiveness of this inspection, nineteen volunteers dispatched to Taiwan by the Association of Structural Engineers of Philippines and the office of civil defense in 2000. Detailed visual inspection by the Filipino engineers was requested for a number of low-rise, reinforced- concrete, commercial/residential buildings. From this experience, the effectiveness of the system was confirmed.
The Association of Structural Engineers of Philippines had prepared the manual for emergency inspection and safety assessment of buildings, guide for recommending a timetable of succeeding actions and requirements to be imposed on building owners, and other technical assistance to a committee for emergency operations.
Roles of the Philippine Institute of Civil Engineers were described as follows;
1)Involve not only structural but also the other fields of civil engineering in providing emergency assessment of facilities
2)Develop the manual for emergency inspection, safety assessment of bridges
3)Integrate training of volunteers in continuing professional development activities through PICE chapters nationwide.
The National Disaster Coordinating Council, composed of almost all members of the cabinet, is the country's highest policy determining body for major disasters. Its main duty is to advise the President on the status of the national disaster preparedness program, disaster operations, and rehabilitation efforts undertaken by the local government and the private sector. Government engineers were to be oriented and trained for the rapid assessment method and detailed assessment method with private-sector potential volunteers. In fact, the coordinated training would also serve to gather further suggestions from as many sectors as possible, for the improvement of the system.
The Philippine Association of Building Officials is technically supervised by the secretary of department public works and highways, administratively supervised by the local mayor. The PABO declares and issues orders for INSPECTED, RESTRICTED USE, and OFF-LIMITS building. The PABO also sends staff to train in the standardized tools of the national emergency response action program.
Some organizations concerning the countermeasure for natural disasters including earthquake were briefly introduced in this presentation. In the future, each organizations will be trained and the organizations must be more effective.

Finally, Ms. Carrido described a business perspective on natural disasters and environment considering the circumstances after the 2001 Washington Earthquake.
Following three major topics were presented at this presentation using the result of the 2001 Washington Earthquake.
1) Business and Environmental Vulnerabilities
2) Understanding Risk
3) Opportunities for Improvement At beginning, the damage of the earthquake was explained briefly. The casualties due to the earthquake were 400 injuries, 4 serious and 1 death. And economic loss was two billion dollars in total. Major economic loss was 250 million dollars on community infrastructure. Examples of damage pictures were illustrated; the King county airport runway, the Washington federal building, the Starbucks headquarters, the Olympia sidewalk, and so on. The ground motion during this earthquake was smaller than that during the 1994 Northridge earthquake.

Two examples of business perspectives on natural disasters were reported. One was Boeing IT, and the another was Rainer Investments Management. The events what went well and the lessons learned from the earthquake were explained. For example, in the case of Boeing IT, a emergency response team was well organized, and it knew what to do, while the business unit's workstations and servers which were not located in the data center suffered severe damage.
Finally, as a conclusion of the presentation, following five points were proposed to ensure company's community economic sustainability in the event of a disaster.
1)Identify your company's internal vs. external dependencies and risks to prioritize restoration
2)Implement your continuity "program" focused on mitigation
3)Strong relationship with building owners, inspectors, government agencies prior to disaster
4)Participation in community-based
5)Joint exercises with key business partners, government agencies, lifelines, etc.

3. Conclusion

Three speakers from Japan, the Philippines and the United States explained the countermeasures for "Future huge earthquake disaster", based on the lessons from the recent earthquakes. The importance of developing the countermeasures which were suitable for each country considering not only earthquake circumstances but also economic circumstances was emphasized. In Japan, the countermeasures must be developed considering engineering, societal, and information technological point of view. In the Philippines, several governmental organizations are developing the countermeasures. These organizations are expected to work effectively when the "Future huge earthquake disaster" occurs. In United States, the economic loss due to earthquakes has became important issue because some area in the US have low seismicity.
As stated above, the countermeasures for earthquake are different from one country to another due to each earthquake and economic circumstances. And there are still many countries where the "Human life" can not always be saved because of their social circumstances. The importance of saving the "Human life" is unquestionable. Those who are working in earthquake engineering field all over the world must endeavor to resolve the each country's problem in order to establish the countermeasures which can save the "Human life" from earthquake disasters.

BACK