Introduction to Quality of Education and Research Programs in Department of Civil Engineering and Newest Technologies in Construction in Japan

by

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Abstract

This is a brief report of the 2nd KMUTT / Tokai University Joint Seminar held in Bangkok, Thailand, in March 2009. In the seminar, the Department of Civil Engineering introduced the present state of its educational and research activities, along with some of the newest technologies in public enterprises in Japan.

Keywords: Civil engineering, Present state of educational and research activities, Newest technologies in public enterprises

1. Introduction

The School of Engineering at Tokai University was established in 1943, and the Department of Construction Engineering opened at that time was later separated into Department of Architecture & Building Engineering and the Department of Civil Engineering in 1967. In response to the rapid growth of the Japanese economy and the increasing demand for educating young engineers during the period from 1970 to 1980, the enrollment capacity of the department reached over 400 students at one point, but has now settled down to 120. Up to now, the department has produced over 11,000 alumni who worked and are working in the Japanese construction industry.

2. Quality of Education and Research Programs

The role of the Department of Civil Engineering is to educate and train young engineers who will contribute to society through the construction and maintenance of infrastructures to ensure safe and comfortable living environments for citizens. For this purpose, we offer a variety of study programs mostly covering the entire discipline of civil engineering as shown in Figure 1. Freshmen and sophomore students first study basic subjects such as mathematics, physics, statistics, surveying, mechanics of materials so on, and then junior and senior students study more specific subjects such as structural engineering, geotechnical engineering, river and coastal engineering, environmental engineering, design, disaster prevention technology, and so on.

Figure 1: Subjects of Study in the Department of Civil Engineering

Figure 2 shows some scenes of practice and experiments for undergraduate students and Figure 3 shows the faculty members and their area of expertise. Most of the professors are involved in the graduate programs and about 10% of the undergraduate students go on to graduate school every year. Graduate students instructed by the full-time professors carry out excellent research work and contribute papers to academic societies.

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3. Newest Technologies in Construction in Japan

Japan has advanced technologies in construction, and many big projects have been executed in the country. Some examples of such construction projects are introduced herein. Figure 4 shows the Akashi Bridge connecting Awaji and Kobe. It is the world’s longest suspension bridge with a central span of 1991 m and total span of 3911 m, and was constructed in 1998.

Figure 5 shows the Tokyo Bay Cross-Road, which is known as the Tokyo Bay Aqualine. It is 15.1 km long and connects Kawasaki and Kisarazu by an underground tunnel and continuous bridge that were completed in 1997. The tunnel was constructed by a shield machine with a 14-meter diameter and automatic segment assembly as shown in the figure. The technology is widely employed in modern tunnel construction.

Figure 6 shows the Tokyo International Airport that is currently under re-extension work. The new D-runway has been constructed on reclaimed land in the southern region of the current airport. The section facing the mouth of the Tama River in the left of the photograph is made of pier structures to maintain the river flow, and various ground improvement techniques were applied to the reclaimed land to prevent land subsidence. When this project is completed in 2010, the maximum number of takeoffs and landings at the airport can be expanded from 300,000 to 400,000 a year, and the airport is expected to become the hub airport of the country.
Every year, we take the junior students on educational visits to actual construction sites, and Figure 7 shows scenes from such a visit last year.

Figure 8 shows the world’s largest underground surge tank constructed at the east area of the city of Kasukabe, Saitama Prefecture, near Tokyo. It has a depth of 50m and a length of 6.3 km, and its function is to store flood water from district rivers. After a flood ceases, the stored water is discharged into the Edo River through the tunnel. Many other new technologies have been developed for large-scale construction projects in Japan.

4. Research Developments of the Department

Various research projects have been undertaken in the department. Figure 9 shows a tuned rolling mass damper device developed by Prof. Shimazaki. It exhibits an excellent damping effect without any external energy.

Figure 10 shows the results of research on the effect of a rubber shock absorber in collision beams that was carried out by Prof. Kondo. The research will greatly contribute to disaster prevention technologies. In addition to these examples, many research projects have been undertaken by the faculty members of the department.

5. Concluding Remarks

In the 2nd KMUTT / Tokai University Joint Seminar, the Department of Civil Engineering at the Tokai University School of Engineering presented its activities and other technological information included in this report. The department hopes to further promote academic exchange and educational collaboration between King Mongkut’s University of Technology Thonburi and Tokai University.

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