JSCE Study Tour Grant 2008

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On 10 September 2008, I had the honor of witnessing the amazing bridges and tunnel for which new technologies have been developed in order to meet Japan's strict maintenance requirements and traffic needs, given the harsh physical conditions and the limited routes available.

To emphasize the reason for innovative technology, we refer to the damage wrought by the the Iwate-Miyagi Nairiku earthquake on 14 June 2008. Iwate-Miyagi inland earthquake damages include the collapse of bridges and roads, and occlusion of waterways. With such devastating damage, there is thus a compelling need for bridges that can be constructed under adverse work conditions, that can withstand the forces of nature, be maintained on a very long-term basis in such a severe, corrosive environment, and that can provide safe and uninterrupted smooth traffic.

To meet these requirements, Japan has, among others, the following:

1. Akashi-Kaikyo Bridge

   Also known as “Pearl Bridge,” the Akashi-Kaikyo Bridge was completed in 1998, and is the largest suspension bridge with center span of 1,991 meters (6,532 feet), spans at 960 meters at each side of the central span, and a vertical clearance of 65.72 meters below.

   The bridge was designed to withstand winds of 286 KPH, earthquakes measuring 8.5 on the Richter Scale, and harsh sea currents. The two main supporting towers rise 298 meters above sea level, and due to temperature, the bridge can expand up to 2.0 meters. The total cost of construction is estimated at 500 Billion Yen.

   For the bridge to last at least 200 years, a technology has been developed using “dry air injection system for main cables of suspension bridges” in order to protect the main cable from corrosion by drying the inside of main cable.

   To this date, there is no such similar project in the Philippines.

2. Yahagi-Gawa Bridge for the new Tomei Expressway

   A hybrid cable-stayed bridge forming part of the New Tomei Expressway, and crossing Yahagi-Gawa River at 50km east of Nagoya City, the Yahagi-Gawa Bridge is 820 meters long (175 + 2 @ 235 + 175 meters), has main span of 235 meters, and is 43.80 meters wide—making it the longest four-span continuous hybrid cable stayed bridge in the world. Pylon height is 109.60 meters from the bearing level, and girder variable depth from 6.0 meters from pylon to 4.0 meters at the standard section.

   For aesthetic reasons, the pylon has a curved shape, simulating a drop of water -- designed to create new landscapes by harmonizing the man-made structure with nature.

   The bridge was constructed in four sections, with each section having been executed in different scaffolding systems. The superstructure was constructed in free cantilever method using a super-sized form traveler.

The bridge was opened to traffic in 2005, and is the world's first PC-steel composite cable-stayed bridge using corrugated steel plate webs for PC girders.

No such similar bridge project yet exists in the Philippines.

3. Meiko Triton on Isewangan Highway

   The Ise Bay Coastal Highway links with other regional expressways, and crosses three wide channels of Nagoya Port (Meiko). Three large span bridges, cable-stayed steel bridges comprising of three spans each: the West, Central, and East Bridges.

   On completion of Meiko Central Bridge, it ranks third longest cable-stayed bridge. The Central Bridge has six lanes with central reserve.

   The West Bridge is composed of two similar bridges parallel to each other, and carries three lanes each. One of the parallel bridges was completed in 1985, and at the time was the world's longest cable-stayed bridge span.

   The Meiko Central Bridge, completed in 1995, consumed 8,600 tons of steel. It has a tower height of 190 meters.

   The East Bridge is the continuation of West and Central Bridges, and completes the Meiko Triton.

4. Wangan-Kisogawa Bridge at Mie Prefecture.

   This bridge is 275-meters long, and was completed in 2001. It uses the technology of extradosed bridges, and among PC Bridges of the same scale, it is more economical than a cable-stayed bridge.

5. Kajima Technical Research Institute

   This institute, owned by Kajima Corporation and located in Tobitakyu2-chome, Chofushi, Tokyo, performs extensive research and development, mainly developing and utilizing machines/simulators and other such technologies.

6. Shield Tunneling

   Located in Tokyo and constructed by Obayashi Corporation, it uses the Tunnel Boring Machine, and has a length of 861 meters. The project was started in 2003 and will be completed in 2012.

7. Taisei Rotec Asphalt Plant and Recycling Plant

   The plant has a capacity to produce a maximum of 180 tons of asphalt per hour, 60% of which is derived from recycled materials, and 40% from raw materials. Almost 100% of the construction waste material can be recycled.

I would like to express my deep appreciation first and foremost to JSCE for this extraordinary opportunity, and to the different contractors and members of JSCE, who have so generously provided me the opportunity to get a glimpse of the results of Japan's pioneering efforts both in the design and construction methods for bridges and tunnels. It has been quite a privilege to have seen firsthand the application of innovative construction and management technologies in Japan, and with the cooperation of our newfound friends, may this experience spur the growth of Philippine-Japanese long-span bridge, tunnel projects and new technologies.