

**Streets, Subways, and Trains:**  
Japan and Civil Engineering  
*By Alben Rome B. Bagabaldo*

**Introduction**

What can a young civil engineer or a civil engineering student learn about the practices in our chosen field in Japan? Literally, a lot! My five-day study tour in Japan last Sept. 5-9 gave me a great opportunity to explore such a beautiful country.

My visit in Japan was made possible by the Japan Society of Civil Engineers (JSCE) through its International Scientific Exchange Fund's (ISEF) Study Tour Grant (STG) program. This program annually invites young civil engineers and civil engineering students to Japan for a week with all expenses paid by ISEF. The prospective participants are nominated by the Agency of Cooperation (AOC), typically the local civil engineering society of participating countries and consequently being screened by the JSCE on who should be joining the tour. The participants are given the chance to get acquainted with newest technologies through visits of laboratories and construction sites, listen on short lectures, and have dialogues with experts of Japanese civil engineering.

This year's recipients of the grant are as follows: (1) Aung Myat Thu of Myanmar, (2) Habibie Razak of Indonesia, (3) Tran Dinh Tung of Vietnam, (4) Purevdorj Sosorbaram of Mongolia, (5) Dongacan Telli of Turkey, (6) Rattanaorn Kaewkluengkrom of Thailand, and (7) Alben Rome Bagabaldo of Philippines.

**Day 1, Sept. 5. NILIM, PWRI, and the Tajiri-Area Project of the Tokyo-Gaikan Expressway**

I arrived in Japan on Sept. 4, a night before the actual tour. Upon arrival at the airport, I was cordially greeted by Mr. Tsuyoshi Hashimoto of the International Activities Center of JSCE. He

and I had a great time talking on our way to the first hotel where we, together with the other Study Tour Grant (STG) participants spent the night.



Photo taken in front of the PWRI Building

After having a good night sleep, it then signalled the official start of the tour. Our first stop was at the compound of the National Institute for Land and Infrastructure Management (NILIM) and the Public Works Research Institute (PWRI) located in Tsukuba Science welcomed by Dr. Kazunori Wada,

Senior Advisor of NILIM, and he introduced us to the place and briefed what we are about to see.

After the warm greetings, we first visited the test track course. Experiments related to geometrical road structures and trainability, ideal method of auxiliary facilities for the improvement of safety and comfort, and other integral parts of intelligent transportation systems (ITS) are being conducted on its 6.2km length of course with 3 lanes and each lane having a width of 3.75m.

From among the many features of the test track, my favorite part is where there are portions having 28 degrees and 27 degrees as angles of inclination where one can traverse through its design speeds at 100 and 120 km/hr respectively. Our bus tried going through the part with 27 degrees of inclination and it felt exciting for it seemed like a thrilling ride in an amusement park.

As we continued driving over the test track, we are also able to see a full-sized 700m in length test tunnel. It was mentioned that at the exit of the tunnel is the weather environment test track where rainfall with intensity of 10mm/hr to 100mm/hr can be simulated and mist to test visibility can be generated simultaneously. Other experiments being conducted in the tunnel are for the design of ventilation, relation among concentration of soot, lighting level and sight distance, car fire in the tunnel and many others.



Test track course



Sample scale model of dam

After completing the journey at the test track, we then visited the Dam Hydraulic Laboratory of PWRI. The main laboratory has the dimensions of 102m (length)  $\times$  44m (width) and its annex 70m (length)  $\times$  29m (width) are used for investigation of the hydraulic phenomena concerning dams' reservoirs and hydraulic facilities such as spillways, outlet works and intake systems. Also, laboratories are used for hydraulic design of facilities of governments' dams especially that of the Ministry of Land, Infrastructure and Transportation (MLIT). Hydraulic characteristics are so complex that the use of models and test facilities are very helpful in understanding properties of structures such as dams.

Later after the quick stop at the dam hydraulic lab, we went to the Vibration Laboratory and saw the large-scale 3D shaking table with the dimensions of 8m x 8m. The said

shaking table is supported by a floating foundation through a vibration isolating system consisting of 216 air springs and 672 oil dampers to mitigate vibration propagating into the neighborhood. At this laboratory, a video during one of their experiments was shown to us.

Another interesting facility that we visited is the Structural Engineering Laboratory which houses a large-scale universal testing machine (UTM). The UTM is used to experiment on full-scale or reduced scale bridge members to conduct compressive, tensile, and bending tests. It has maximum load for testing of up to 30MN for compression, 10MN for tensile, 12MN for positive bending, and 3MN for negative bending. It has been mentioned that it is important to have full-scale models as it would help show a more realistic behavior to failure in order for them to improve their design making them less susceptible to different types of loading conditions.



30MN Universal Testing Machine

Last stop at the PWRI-NILIM compound is at the Dynamic Geotechnical Centrifuge Laboratory. This laboratory showcases one of the largest dynamic centrifuges in the world with an effective rotor radius of 6.6m, maximum acceleration of 150G for static test while 100G for dynamic test, and maximum payload of 400 ton·G.



Tunnel Construction Site

2017. They are using three tunnelling methods, the open-cut method, the shield tunnelling method, and the harmonica+underpinning method. Working together for this project is the joint venture of Taisei, Toda, and Daiho companies.

Then, we moved to a Japanese restaurant. After being filled by the sumptuous lunch, we drove over the Tokyo-Gaikan Expressway which led us to our next destination, the construction site at the Tajiri area for the highway project which is being constructed beneath the Keiyo highway at the Ichikawa interchange. At this site, we mainly looked into the construction of tunnels. We first get to know about the numerous works being done to enable them construct the massive underground structures that is expected to be part of the national expressway which is scheduled to open in

It was a tiring day. Finally, we get to check-in to our individual hotel rooms as we moved to downtown Tokyo.

### **Day 2, Sept. 6. Kajima Technical Research Institute, Tokyo Metropolitan Government, and the JR Tokyo Station Extension Project**



On the second day of our tour, we first headed to Nishichofu Complex of the Kajima Technical Research Institute (KaTRI) in Tokyo. KaTRI is the core of Kajima Corporation's research and development. The Nishichofu Complex houses the following buildings: Exhibits and Laboratory, Shaking Table Laboratory, Concrete and Wind-Tunnel Laboratory, Large-size Structural Testing Laboratory, Soil Mechanics and

Foundations Laboratory, Environmental Engineering and Laboratory, Construction and Fire Safety Laboratory, and the Equipment Storage Building.

At KaTRI, we first had an introduction about the institute and their projects both locally and abroad. Then, we visited select laboratories namely the Large-size Structural Testing Laboratory which allows the conduct of experiments to full-scale and scale models of structural members to determine its strength behavior and crack mechanism; Base Isolation Building which was built in 1986 where one can actually see the laminated rubber spring/damper used to help the building resist strong earthquakes; and the Wind Tunnel Laboratory which allows the testing on a 27.5Lx4.5Wx2.5H-sized model. We also saw various concrete materials and went to the rooftop of one of buildings to see their garden which uses lightweight artificial soil. Last thing we experienced is the “OPSODIS” 3D sound technology where the software installed is a product of intensive researches by KaTRI.

After the tour, they also served our lunch at the institute. Subsequently, we travelled to the Tokyo Metropolitan Government (TMG) where banners about the 2019 Rugby World Cup and 2020 Tokyo Olympics are already in display. We were welcomed at the office of Tokyo's vice governor and roamed around the three buildings of TMG. What I liked most is the Tokyo Metropolitan Assembly Hall where we were given the privilege to be seated at the governor's seat.



Tokyo Metropolitan Assembly Hall

Before leaving TMG, we listened to the lecture about the disaster prevention plans for Tokyo. Japan is very much exposed to different types of disasters, a reason why the importance of preventing casualties and reducing threats in times of such calamities should be given thorough considerations.

Next stop before travelling to a different prefecture is at the construction of the northern pedestrian passage enhancement project at the Tokyo Station. The station is the gateway to Tokyo, capital city of Japan, which makes it the busiest as it is also the pivot of the railway



With the engineers of Obayashi Corporation

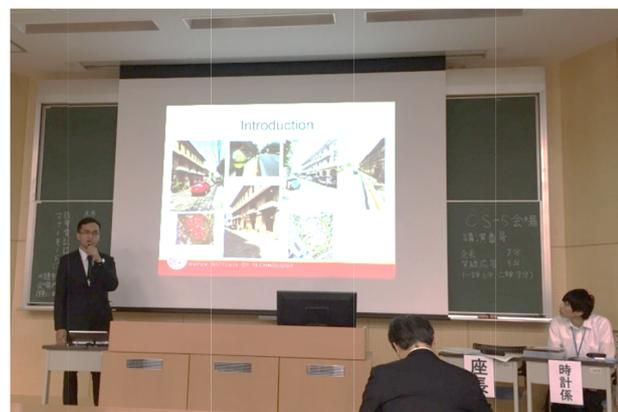
networks in Japan with 0km post located at its center. Approximately 15 lines are connected within the station with about 1.8M passengers per day going in and out of the station that caused the need for wider walkways in the aged structure of the station.

The construction of the pedestrian walkway is a challenge since it should be done without disrupting train operations above. They have been applying innovative techniques for excavation, clearance, piling works, and viaduct construction. Construction is expected to be finished in 2019, just in time for the 2020 Olympics. Main contractor for the project is the Obayashi Corporation.

Our itinerary that day was well-planned as we rode the train to our next destination from there. My dream of riding the bullet train came true as we used the JR Tohoku Shinkansen Hayabusa going to Sendai. The train ride only took one and a half hours and we arrived in Sendai at around 7pm. Upon arrival, we moved straight to our hotel, dropped our bags, and went outside to eat. As the night ended with a bountiful dinner at an Italian restaurant, so much excitement awaits as we are expected to deliver our respective presentations at the symposium held the following day.

### Day 3, Sept. 7. 18<sup>th</sup> International Summer Symposium at Tohoku University

Following the wonderful first night in Sendai is the time for our presentations at the 18<sup>th</sup> International Summer Symposium that occurred at Tohoku University in Sendai, Miyagi Prefecture. I delivered my paper entitled, “Determination of Barriers towards Addressing Mobility and Accessibility through Traffic Simulation: the Case of Intramuros, Manila.” I made this paper as a requirement for the completion of my



During my presentation

master's degree where the idea of conducting such study was driven by the need to improve traffic situation in the historic core of Manila, Philippines, itself.



After hearing all the other presentations in the morning session of symposium, we had a lunch meeting with the members of ISEF Committee at the Sendai International Center. Then, we were given some free time to explore Sendai in the afternoon. We went back to the hotel to change our clothes, roamed around the city center, travelled back nearby Tohoku

University, and went to the Aoba (Sendai) Castle and Gokoku Shrine for some sightseeing. We enjoyed our stay there, took a lot of photos and almost forgot to get track of time.

Fortunately, we arrived on time for the IAC's Networking Reception at the Kitchen Terrace Couleur at Tohoku University. We met the other officers of JSCE and the representatives from the civil engineering societies of our respective countries. In my case, there was Dr. Ernesto de Castro, President of the Philippine Institute of Civil Engineers, Inc. (PICE). Other than that, I was given a chance to meet international graduate students and I was able to learn more about their experiences and how it feels being a student in Japan as I am very much interested to pursue my studies there as well. The night happily ended as we headed back to our hotel.



At the dinner reception

#### **Day 4, Sept. 8. Visit at the 2011 Tsunami-affected Areas**

Can you still remember the 2011 Great East Japan Earthquake? It has been five (5) years since this magnitude-9 earthquake caused a 14.5m tsunami which claimed about 16,000 lives and more than a thousand went missing in March 11, 2011.

In the 4<sup>th</sup> day of touring around Japan, we visited the areas that were very much devastated by such disaster. There would still be traces of sorrows when it was hit by the tsunami but you can already see a lot of improvements in the area.

From the bus, we had sightseeing of the much affected city of Rikuzentakata at the Iwate Prefecture. We had a stopover at the Shinkasenuma bridge and have photos taken with the 438-meter bridge being constructed. Following that, we went to the site office of Shimizu Corp. Joint Venture (JV) and we were brought to a high point overlooking the entire construction project. We are able to see the so-called “miracle” pine, the only one among 70,000 trees left standing along the town's coastline after the disaster which is now considered as a symbol of hope.

Next to that is a visit at the Kajima Corp. JV to see disaster restoration works in the coastal area. There was a short discussion about the project as we stood and observed the view of the whole project from the top of the seawall (back). The former roadside station, Takata Matsubara Topic 45 is just nearby which we next dropped by into. Topic 45 reflects how badly the area was hit by the tsunami where it was submerged and only its top



BRT Lane/Station

was spared. The building still stands but damages caused by the deadly wave can be seen in its interior.

We also visited a nearby bus rapid transit (BRT) station. It was my first time to see a BRT station as we do not have one in the Philippines. Then drove over the disaster-affected sites located between Rikuzen-Takata and Minami-Sanriku towns in which reconstruction works have been implemented as we travel back to Sendai Station where we almost missed our train. Luckily, it is six minutes delayed and we are able to move back to Tokyo as scheduled.



## Day 5, Sept. 9. Free-time, Hato Bus Tour, Asakusa Area, and the Tokyo Skytree

On the last day of our tour, morning is given as the free time. I explored more of Tokyo and bought some presents for my family and friends back home.



While in the afternoon, we joined the Hato bus tour. We had some sightseeing where we saw the notable structures of Tokyo like the Imperial Palace. We have also spent some of our time at the Asakusa area, the center of Tokyo's shitamachi (literally "low city"), one of Tokyo's districts, where an atmosphere of the Tokyo of past decades survives. We had photos taken at its main attraction, the Sensoji, a very popular Buddhist temple, built in the 7th century.

Our last stop with the Hato bus is at the Tokyo Skytree. It is a broadcasting, restaurant, and observation tower in Sumida, Tokyo, Japan. It became the tallest structure in Japan in 2010 and reached its full height of 634.0 metres in March 2011. We went up at the viewing deck which is at 350m elevation.

After the tour and dinner, all of the participants still got the chance to spend another night in Tokyo as all of our flights were scheduled the following day, Sept. 10.



At the day of our flights back to our home countries, we rode the limousine bus in going to the airport. Although I am supposed to go directly to Narita Airport Terminal 2, I first joined the other STG participants at Terminal 1 and the one thing of the trip that I least liked happened there which is when we bade goodbye to each and everyone. Mr. Hashimoto is very kind to accompany me to Terminal 2 for my flight back to my country.



## **Conclusion**

My seven-day stay in Japan made me appreciate Japan and my desire to pursue my studies there has also increased. Given the geographical features of Japan and its similarities to that of my country, the Philippines, there are many things that can be applied from theirs to ours, especially in terms of the technologies that can be used to improve the resilience of structures.

The JSCE STG program serves true to its purpose - to learn Japanese civil engineering technology and projects. One thing that Filipinos can learn as one of the best practices in Japan is having the high value for time and being well-disciplined. I like it that what were listed in our itinerary were followed as written. And one more thing is cleanliness, everywhere you look even in construction sites this can be observed. Other than that, the development goals of Japanese private companies are aligned to that of the government, leading toward to having no conflicts of interest and faster improvement for their country.

The streets of Tokyo and other places in Japan would be busy day-long or even till night but these are made possible by the infrastructures made by civil engineers. Subways now play an important part of the limited space of our urban areas, without civil engineers tunnels would not have been possible. The streets and subways together with the trains which is a strong backbone of transportation in the country are the things I look up to and I dream of improving in the Philippines given that I my main interest is in transportation engineering.

The STG program helped me expand my views about things and widen my knowledge about my chosen field, civil engineering. STG does not only promote the growth among its participants but also a harmonious relationship between the AOCs and JSCE.

## **Acknowledgment**

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