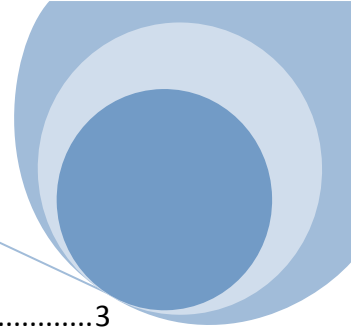




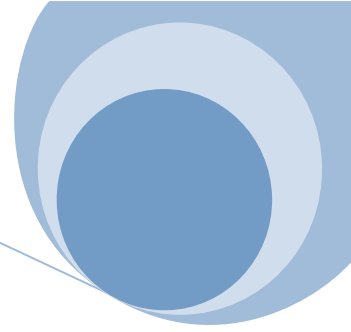
Korea Study Tour On HVAC&R Technology 2011

Report



Content

Forewords	3
Acknowledgements.....	4
1. Introduction	6
2. Itinerary of Korea Study Tour 2011	7
3. ASHRAE Chapter Regional Conference (CRC)	8
4. CRC Banquet Dinner.....	12
5. University Visits.....	13
5.1 Seoul National University.....	13
5.2 Ewha Womans University	15
5.3 Yonsei University.....	17
5.4 Yonsei University International Campus - Green home ^{plus}	18
5.5 Chungnam National University	19
5.6 Korea Advanced Institute of Science and Technology (KAIST)	21
6. Technical Visits.....	22
6.1 Korea Institute of Energy Research (KIER).....	22
7. Sightseeing	26
7.1 Hong Kong Science Park (Hong Kong).....	26
7.2 Chi Lin Nunnery and Nan Lian Garden (Hong Kong).....	27
7.4 Digital Media City Gallery (Korea).....	30
7.5 Gyeongbokgung (Korea)	31
7.6 N Seoul Tower (Korea)	32
8. Words from Delegates	33
9. Photo Gallery	41



Forewords

Message from the Advisor

With the support from the ASHRAE Hong Kong Chapter, this is the sixth year that the ASHRAE Student Branches in Hong Kong organized such a study tour. In this year the study tour combines the ASHRAE Region XIII Chapters Regional Conference held on 19-20 August 2011 in Hong Kong and a technical study tour to South Korea on 22-28 August 2011. Students from different universities in Hong Kong come together to organize this meaningful function with the aim to promote international cooperation, cultural exchange and mutual understanding.

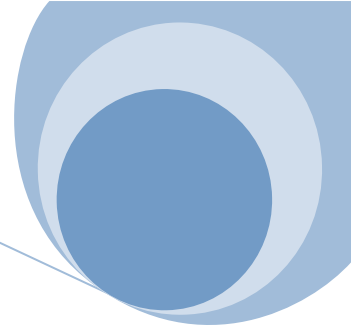
ASHRAE provides good opportunities for students to develop themselves and to participate in voluntarily professional activities. Through this study tour, the students could interact with the people from other universities, ASHRAE Hong Kong Chapter, other ASHRAE Region XIII Chapters and people from the ASHRAE Headquarters in USA. This creates an interesting platform for young people to develop themselves and exchange ideas with peer groups and professionals. It is also a valuable opportunity to visit South Korea and study the culture, technology and universities in this country.

I am very pleased to participate in this study tour and give guidance and support to the students. I believe the students can broaden their horizon, enhance their abilities and extend the experience and findings to benefit themselves, other students and our society.

Finally, I would like to express sincere thanks to the ASHRAE Hong Kong Chapter, all the sponsors and related organizations for their kind support.



Dr. Sam C. M. Hui
Study Tour Advisor
ASHRAE Hong Kong Chapter



Acknowledgements

Sincere thanks are expressed to the following organizations and persons.

Blue Sky Involve Program (Johnson Controls, Inc.)

Hsin Chong – K.N. Godfrey Yeh Education Fund for Joint Student Projects

Mr. David Chiu (Ryowo (Holding) Co., Ltd.)

ASHRAE Hong Kong Chapter

Mr. S. L. Li (Past President, ASHRAE HK Chapter)

Dr. Sam C. M. Hui (Study Tour Advisor)

Professor KIM Kwang Woo (Seoul National University)

Professor YEO Myoung Souk (Seoul National University)

Professor LIM Jae-Han (Ewha Womans University)

Professor LEIGH Seung Bok (Yonsei University)

Associate Professor KIM Tae Yon (Yonsei University)

Dr. Yoon Hyung-Kee (Korea Institute of Energy Research)

Miss KIM Hoo-Yeon Kimmy (Helper)

Miss KIM Yoon Hee Julie (Helper)

Miss Jane Shin (Helper)

Executive Summary

ASHRAE Study Tour is one of the yearly student activities that I thirst for. This year is the second time joining the tour. Similar to the last year, total 15 students from City University of Hong Kong (CityU), Hong Kong Polytechnic University (PolyU), Hong Kong University (HKU) and University of Science and Technology (HKUST) took part in this Korean study tour from 22th August to 28th August in 2011 summer.

During the seven-day trip, we visited four universities and a institute named Seoul National University, Ewha Womans University, Yonsei University, Chungnam National University and Korea Advanced Institute of Science and Technology (KAIST). The former three universities are located in Seoul and the latter are situated in Daejeon. Not only acquiring engineering knowledge, but also can we had precious opportunities to have academic and cultural exchange with students in Korea through these universities' exchange.

Moreover, we went Korea Institute of Energy Research (KIER) for the technical visit. I appreciated how great efforts that Korean paid for working on energy research and environmental development. Although Korea is a modern and cosmopolitan country, low environmental impacts and energy conservation are always the top priorities when it comes to building design.

Apart from academic visits and exchanges, we walked around some famous attraction spots in Korea such as Cheinggyecheon Museum, Digital Media City Gallery, Gyeongbokgung and N Seoul Tower. Through sightseeing, we can taste and understand the Korean culture more deeply. These experiences truly broaden our horizon. I can sure all of us benefit a lot from this precious tour.

Organizing such a successful study tour is not easy. I would like to take this chance to show my profound thanks to ASHRAE Hong Kong Chapter for supporting students' education and activities.

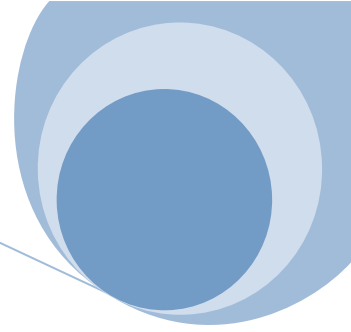
Thanks all counterparts and helpers in Korea, especially Kimmy for their cordial welcome to us.

Thanks Dr. Sam Hui for his selfless assistance and continuous guidance to youngsters. Thanks Prof. Moses Ng for taking good care of all of us in the tour. Thanks my dearest tour-mates for their valuable contribution to this wonderful tour.

Go ma wo yo. (In English: Thank you very much.)



Miss Wong Sze Man, Mandy
Team Leader of ASHRAE Study Tour 2011



1. Introduction

Background

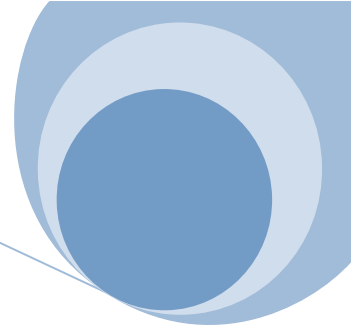
In August 2011, the ASHRAE Region XIII 14th Chapters Regional Conference was held in Hong Kong. The study tour to Korea was arranged to allow the students in Hong Kong to carry out technical and academic visits and exchanges. Successful study tours to Malaysia, Taiwan, the Philippines, Thailand and Singapore were organized in 2006, 2007, 2008, 2009 and 2010 respectively.

Objectives

The objectives of this study tour are:

- To study the culture and social-economic development of Singapore
- To enable the students to develop knowledge and skills in advanced HVAC&R technology, building environmental design and creative thinking
- To promote international cooperation, cultural exchange and mutual understanding in Asia

The participants of the study tour come from four student branches including City University of Hong Kong, The University of Hong Kong, The Hong Kong Polytechnic University, and The Hong Kong University of Science and Technology. Before having the study tour, students had to attend meetings for the preparation works. Through the meetings, students from different institutions learnt the importance of teamwork and organization skills. During the study tours, attending professional engineering conferences, technical visits, company visits and sightseeing had broadened students' horizon. In addition, students were able to meet different engineering students from the Philippines, Taiwan, Thailand, Indonesia, Singapore and Malaysia. Cultural values could be exchanged with different student chapters and a better understanding of Asian countries would be developed.



2. Itinerary of Korea Study Tour 2011

Duration: 22 August 2011 – 28 August 2011

Flight: Korean Air (KE)

Hotel: Best Western Vision Hotel, Daedeok innopolis Welfare Centrer

Day 1 22 Aug 2011 (Mon)

Depart Hong Kong to Seoul (KE608 0045/0515)

Afternoon: Visit Seoul National University (Architectural Engineering)

Day 2 23 Aug 2011 (Tue)

Morning: Visit Ewha Womans University (Arch Engg and Media Center)

Afternoon: Visit Yonsei University (Architectural Engineering)

Visit Cheonggyecheon Museum

Day 3 24 Aug 2011 (Wed)

Morning: Visit Yonsei University International Campus - Green home^{plus}

Afternoon: Visit Digital Media City

Day 4 25 Aug 2011 (Thur)

Seoul to Daejeon

Afternoon: Visit Korea Institute of Energy Research (KIER)

Day 5 26 Aug 2011 (Fri)

Morning: Visit Chungnam National University

Afternoon: Visit Korea Advanced Institute of Science and Technology (KAIST)

Day 6 27 Aug 2011 (Sat)

Daejeon to Seoul

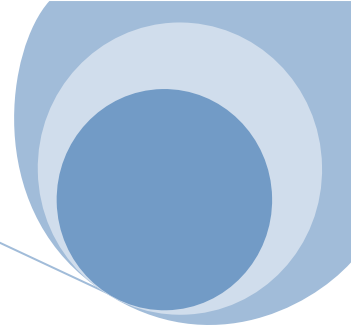
Afternoon: Visit Gyeongbokgung

Night: Visit N Seoul Tower

Day 7 28 Aug 2011 (Sun)

Seoul to Incheon Intl Airport

Depart Seoul to Hong Kong (KE607 2000/2230)



3. ASHRAE Chapter Regional Conference (CRC)

This year, ASHRAE region XIII 14th Chapters Regional Conference (CRC) was hosted by Hong Kong Chapter from 19 to 20 August 2011.

The theme of the technical seminar is **High Performance Building Design**. Three speakers were invited to introduce three topics for us. They are:

- Mr. Ronald E. Jarnagin, ASHRAE President;
- Ir CHAN Fan, Frank, Deputy Director / Regulatory Services
Electrical and Mechanical Services Department, HKSAR Government;
- Mr. Kent W. Peterson, ASHRAE Distinguished Lecturer

Speech 1: ASHRAE Headquarters Renovation (By Mr. Ronald E. Jarnagin)

In the beginning, there were many options to do with headquarter such as selling it, leasing it and renovating it. Decision was made to renovate it so as to achieve several goals:

- Deliver a healthy and productive workplace for staff;
- Demonstrate commitment to sustainability;
- Provide a learning center to advance education;
- Create a living lab for access by members.

By following own guidance such as Standard 90.1 for energy efficiency, 55 for thermal comfort and 62.1 for ventilation, multiple system was adopted. For the first floor, multi-split air-cooled variable refrigerant flow fan coil units with inverter-driven outdoor DX heat pumps were used. For the second floor, 13 ground-source direct expansion heat pumps were used. Also, dedicated outdoor air system, photovoltaic system and indoor air quality monitoring system were installed.



In order to create a living laboratory for members to learn about building performance, additional electrical circuits and sensors were installed so that members can read the actual energy use and building performance online.

After renovation, the goals are achieved. Both thermal comfort and indoor air quality satisfaction are improved from 18% to 33% and 26% to 77% respectively. Also, 47% actual annual energy savings and 67% annual water savings are made. Platinum rating of LEED-NC is achieved.

A big lesson is learned. "There probably isn't a building anywhere in the world that is operating correctly! That means that, most likely, all buildings are using more energy than they should." Mr. Ronald E. Jarnagin said.

Speech 2: Hong Kong's Strategy for Building Energy Efficiency (By Ir CHAN Fan, Frank)

Ir CHAN Fan started by showing us figures that world population, global temperature, sea level as well as energy demand have been greatly increasing. In Hong Kong, these happen the same and the building electricity consumption is equal to 60% of Hong Kong's carbon footprint. Therefore, five strategies were introduced.

1. Policy and commitment

To lead by example, there are several government energy efficiency projects. Sun shielding device and sea water cooled chiller plant are installed in HKSAR Government Headquarter. In EMSD Headquarter, 350kW photovoltaic panels and ice storage system are installed. In total, there are 745 improvement projects since 2005 which save 82 million kWh per annum and reduce 57,000 tons CO₂ per annum. Apart from that, district cooling system is going to be adopted at Kai Tak development.

2. Codes and guidelines

Several codes of practice for minimum energy efficiency standards are issued such as building energy code. There are also guidelines for energy audit and various energy efficiency technologies such as water-cooled air-conditioning system and PV system.

3. Encouragement & incentive scheme

There are funding schemes for private buildings such as \$300 million for subsidizing building owners to carry out energy efficiency projects.

4. Legislation

Apart from the incentive scheme, there is also necessity to push through legislation. For residential sector, there is mandatory energy efficiency labeling scheme for refrigerating appliances, compact fluorescent lamps and washing machines etc. For non-residential sector, there is buildings energy efficiency ordinance.

5. Publicity and education

In order to engage the people, there are some many campaigns, conferences, talks launched and held.

At the end, Ir CHAN Fan stated that the on-going commitment is to reduce 25% in energy intensity from 2005 to 2030. Also, in order to further HK's strategy, we will be exploring new technologies, upgrading the Codes and guidelines, enriching building energy database, having closer collaboration with various stakeholders and enhancing public education.



Speech 3: High Performance Building Design (By Mr. Kent W. Peterson)

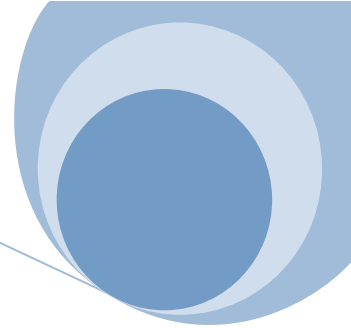
High performance building is a building that integrates and optimizes all major high-performance building attributes, including occupant productivity, energy efficiency, water efficiency, durability and life-cycle performance. Having an integrated design, the cost saved from mechanical and electrical system can be transferred to building architecture and renewable energy systems.

Early planning drives success. The design should be started early for greatest benefit. Building simulations such as energy modeling, solar analysis, daylight modeling, CFD modeling and natural ventilation modeling are important so as to predict

performance. There are several performance characteristics in different aspects we should work on. For building enclosure, we should concern thermal transfer, air leakage, indoor surface temperature etc. For HVAC, thermal comfort, pressure, filtration, acoustics etc, are all factors affecting performance. For water, we should use it efficiently as well as collect and re-use it. For lighting, services life, quality, efficiency should also be concerned.

Apart from those attributes, Mr. Kent W. Peterson then introduces how to optimize indoor environment quality and building energy. Not only lighting, thermal comfort affect productivity but also a good IAQ can lead to a healthy and productive work environment. So, contaminants in the air supply should be controlled and the indoor air pollutant concentrations should be limited. To optimize energy use, we should understand where energy is used and consider the whole building and its system to work out energy reduction strategies.

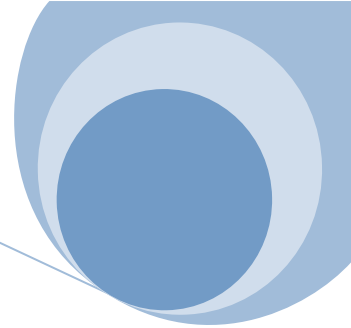
At the end, Mr. Kent W. Peterson mentioned that we must measure what we want to manage, the performance metric. Also, commissioning is very important for quality assurance which can verify if the design meets the defined objectives and criteria.



4. CRC Banquet Dinner

The banquet dinner was held in the evening of 19 August 2011 in Kowloon Shangri-la Hotel. Students were served with beautiful and gorgeous dishes. During the dinner, several events were also carried on. First there is an award giving ceremony for ASHRAE scholarship and also the winning teams of student forum held in afternoon. Then, there were student performances from different chapters. All performances were entertaining with their own culture. We had Thai boxing, dancing, singing and even lion dancing. It is so nice to have such various cultural performances. We, students from Hong Kong, gave a Chinese martial arts performance and we all did our best. The banquet dinner was wonderful with marvelous performances and great dishes.





5. University Visits

5.1 Seoul National University

In 22nd of August 1946, according to promulgation of the order of establishment of Seoul National University, Engineering Department, School of Science and Engineering of Gyeongsung University, Gyeongsung Industrial Professional School, and Gyeongsung Mining Professional School were all



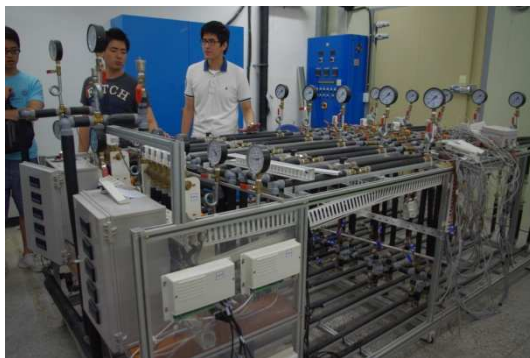
integrated into one College of Engineering at Seoul national University and it started with 10 departments Architecture, Mining, Metallurgy, Machinery, Textiles, Electricity, Communication, Shipbuilding and Aviation, Civil engineering, and Chemistry.

Architectural Environmental Planning Research Centre (AEPRC) was founded in 1989 at the Department of Architectural, College of Engineering, Seoul National University. AEPRC has been a leader in architectural environmental research in Korea. 12 doctoral degrees and 47 master's degrees were conferred. AEPRC conducts unclassified research across a wide range of scientific disciplines with key efforts in fundamental studies of building energy systems and environmental solutions. And the use of integrated computing currently has significant efforts in four major research areas: Building performance, Building Facade, Radiant heating & cooling, and Indoor air quality.



Research Areas:

Group	Research
Radiant Heating & Cooling	<ul style="list-style-type: none"> ➤ Radiant Floor Heating ➤ Radiant Floor Cooling ➤ Improvement of Hydraulic System Performance
Building Facade	<ul style="list-style-type: none"> ➤ Insulation & Condensation in Buildings ➤ Double-Skin Facade ➤ Solar Shading and Control in Buildings
IAQ	<ul style="list-style-type: none"> ➤ IAQ Simulation Program ➤ Bake-out & Flush-out
Building Performance	<ul style="list-style-type: none"> ➤ Load Calculation Program (K-Load) ➤ Stack Effect & Engineering Consulting ➤ Solar Access Right ➤ Building Performance Evaluation ➤ Green Building & Smart Building ➤ Building Integrated Management System of Facility and Property



5.2 Ewha Womans University

Ewha Womans University is a private women's university in central Seoul, South Korea. It is one of the city's largest institutions of higher learning and presently the world's largest female educational institute. Ewha was founded in 1886 by the American Methodist Episcopal missionary Mary F. Scranton.

In the Ewha Womans University, the Department of Architectural Engineering was first introduced, established in 1994. For undergraduate program, there are about 100 undergraduate students and min. 135 Credit for bachelor's degree. For graduate program, there are about 20 graduate students and three Lab.

- Structures Engineering Lab.
- **Environment Friendly Architecture Lab (EFALab)**
- Construction Business Strategies Lab.

In the introduction of the department and the lab, the presentation major concern on Environment Friendly Architecture Lab (EFALab) and its projects. The Ewha Campus Complex (ECC) was also visited, which is designed by Dominique Perrault, French and completed in 2008. Some special Environment-friendly features as:

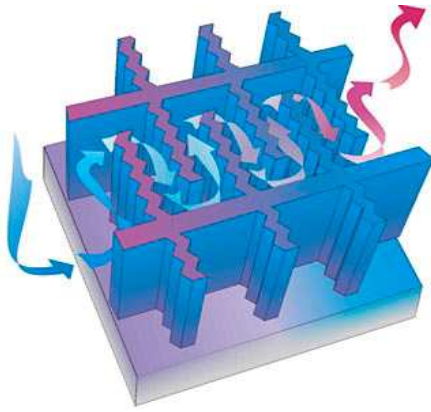
1. Lighting Plan

The giant glass cliff wall is located in east side of building to bring in natural light. Some Semi-transparent partition wall also built inside the complex. Besides, the glass facaded is also used in ECC valley, bringing the natural light to reduce the energy consumption.

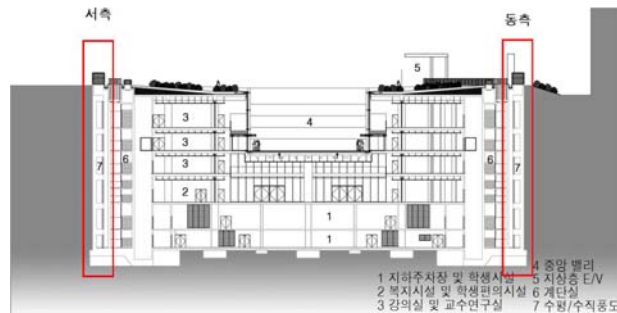


2. Thermal Labyrinth

Thermal Labyrinth system, which can significantly reduce the energy consumption of the building, is a ventilation system which intakes outdoor air through an underground concrete structure shaped like a labyrinth. By the heat exchange with ground, thi system can pre-cool and pre-heat the outdoor air in summer and winter,



respectively. In ECC, ambient airs pass through thermal labyrinth from the top of the roof (1F) to B6F AHU (Air Handling Unit). Moreover, it is first application of Thermal labyrinth system in Korea.



3. Green Roof

The EEC of top floor is covered by the plant. The Green roof can reduce the heat gain from the top floor.



5.3 Yonsei University

Yonsei University is the first private research university in Korea. Its slogan is "The first and the best". The establishment was in 1957 with the union of Yonhi College and Severance Union Medical College. The latter was one of the first modern colleges.

On 22nd August 1910, Japan annexed Korea with the Japan-Korea Annexation Treaty. Japan forced the education in Korea to adopt Japanese as the medium of teaching and learning. However, Mr Underwood helped establish the Yonsei University to use Korean as instruction medium.

In Yonsei University, the Department of Architectural Engineering has long history. This department nurtures students to become Architectural Engineers (Building services Engineers in Hong Kong), Architects, etc. Their programmes focus on building services and architectural studies. In 4-year education in this department, students can learn not only the building services design, but also architectural area.

In our opinions, the department does provide quality courses to students in order to help them equip themselves to become an Architectural Engineers or Architects in their future career. With good teachers and good resources and environment, Yonsei keeps "The first and the best" in Korea, even in Asia.



5.4 Yonsei University International Campus - Green home^{plus}

Green home^{plus} utilizes alternative energy sources including solar and wind power, and aims for sustainable development in harmony with nature to permanently improve the living conditions of human beings. Due to the building's high efficiency system and its use of renewable resources energy consumption and carbon emission are minimized. It classifies applied Energy saving technology into 3 categories: Site, Building and System.



1. Site

It aims to improve the outdoor environment through 3 concepts including green roof system application, reuse of grey and rain water and enlarge the green space.

2. Building

It aims to reduce the energy consumption through Natural Cooling and Heating Strategies Insulation and Air Tightness Strategies. Its strategies are based on 3 aspects: Floor plan, exterior insulation, finishing materials.

3. System

It aims to apply the lighting system, HVAC system and renewable energy into the building.



5.5 Chungnam National University



Chungnam National University (CNU), which was founded in 1952, is one of the most prestigious universities in the nation. CNU's mission is to provide students with academic theories and application methods which are integral for the development of the nation and human society as a whole, and which nurture creativity, service, mind, spirit,

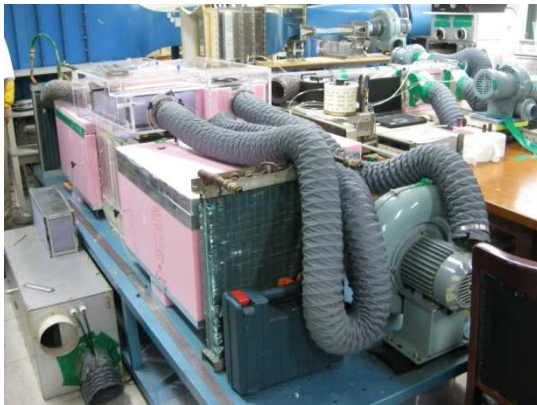
and leadership skills. Moreover, CNU's vision is D-R-E-A-M, which stands for Democratic, Rebuild, Efficient, Active, and Majestic respectively. Recently, CNU has been striving to join the ranks of the top 100 universities in the world. CNU has 170,000 alumni and friends, 900 faculty members, 18,000 undergraduates, 5,000 graduate students and 400 staff members.

For the college of engineering, their own vision is E-N-G-I-N-E, which stands for Excellence, Navigation, Globalization, Innovation, Network, and Emotion respectively. The objective is to educate creative talents with scientific technique who are able to lead information and knowledge-based society in dynamic and cutting-edge industrial society. The mechanical department of the college of engineering concentrates on heat engine, fluid machinery, industrial machine including laser processor and CNC machine tool, mobile machine including automobiles and airplane, and intellectual machine such as robot.

There was an academic exchange after arriving CNU. One presentation related to the background information of CNU and CNU mechanical department was introduced. Besides, Dr. Sam C. M. Hui gave a brief description of different universities in Hong Kong.



The presentations were followed by a laboratory tour and a research was then briefly presented. The title of the research is Development of Heat Exchanger for River Water Heat Source. The objective is to reduce fouling and to enhance heat transfer in the heat exchanger for natural heat source (river water or sewage), and verify the performance of the developed heat exchanger through model and prototype tests. Besides, two main experimental prototypes were introduced, namely the cooling tower and the heat exchangers. The performance of the heat exchangers was investigated.



A campus tour was given by the CNU student helpers. Many landmarks within CNU and memorable status were introduced. Through the tour, the knowledge of background information as well as the history of CNU was enriched.



5.6 Korea Advanced Institute of Science and Technology (KAIST)

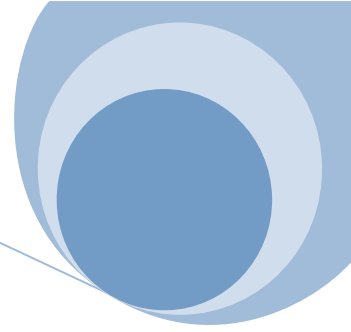
Korea Advanced Institute of Science and Technology (KAIST) was established in 1971 as the nation's first graduate school specializing in science and engineering education and research. KAIST is located in the Daedeok Research Complex in the city of Daejeon, 150 kilometers south of the capital city, Seoul. KAIST's Daedeok and Seoul campuses house six colleges (Natural Science, Life Science & Bioengineering, Engineering, Information Science & Engineering, Business, and Cultural Science with 20 departments), eight research institutes and five affiliate schools.

KAIST has a unique, autonomous and flexible academic system. Other Korean colleges and universities are required to abide by government-directed admissions and curriculum requirements. KAIST's "open major system" for the undergraduate program allows a student to take classes for three terms before choosing a discipline that suits their aptitude and interest. In addition, undergraduate students are free to change their major at anytime.

In the 21st century, KAIST will implement new research programs in energy, environment, water and sustainability (EEWS) and encourage high risk/high return (HR/HR) researchers in order to create new research fields/industries in Korea. KAIST has already initiated EEWS campus-wide trans-disciplinary research in 2007. Also, KAIST has worked with many international organizations to bring in intellectual and financial resources to KAIST from other countries and become a global university that competes and cooperates with the best institutions in the world.

Here are some photos of this fresh and green campus. As seen from below, students can rent bicycle inside the University. We found something interesting that we are surprised Geese can walk around freely!





6. Technical Visits

6.1 Korea Institute of Energy Research (KIER)

Korean institute of Energy Research (KIER) was established in 1977. KIER has a vision of being a 'Global Energy Innovator'. It has been working on a wide range of research and development (R&D) projects to meet the challenges of the time. In 2010's, KIER echoed with the national development goal of 'Low Carbon, Green Growth and New Growth Engine Technologies'. In the past,

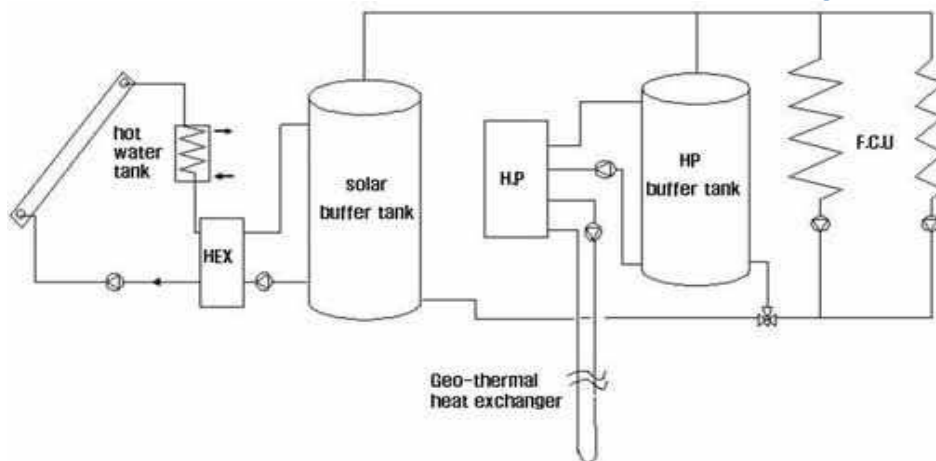


KIER has made a lot of effort on the development of different kinds of energy technologies except nuclear energy. However, the President of the Institute, Jooho Whang, believes they need to make use of all kinds of energy to create a sustainable future.

During the 2-hour visit to KIER, Zero Energy Solar House II, CO₂ Capture Facility and a centre about Renewable Energy RESource Map & Utilization System (RES-MAP) are introduced.

1. Zero Energy Solar House II

It is a 2-storey building with, surprisingly high, 85% self-sufficient in total energy load while it was design to afford 70% of the total load. Various technologies were employed to compensate the energy load, for example the super insulation high performance window, thermal bridge, and the air-tightness construction technology, forced ventilation system for heat recovery, solar heating system with geo-source heat pump system, low temperature floor radiant heating system. In particular, the roof integrated BIPV system will provide electricity for the house. The following figure is the schematic diagram of the solar heating system with geothermal heat pump.



The KIER Zero Energy Solar House (ZESH) applies the heating and cooling system which is a closed-type solar heating system. The system uses the geothermal heat pump as an auxiliary heater. It is comprised of the a flat plate collector, a heat exchanger, a solar buffer tank for space heating, a hot water storage tank, a geothermal heat pump and storage tank for the heat pump.

2. CO₂ Capture Facility

The CO₂ Capture Facility makes use of dry absorbent which is a world-class CO₂ capture technology. It transfers technology with power plants, ironworks and cement companies. During our visit to the Facility, they were conducting experiments using different kinds of technologies to try to store and recover CO₂.

3. Renewable Energy Resource Map & Utilization System (RES-MAP)

In order to meet Green-Growth and 2030 production goal (11%) of renewable energy, RES-MAP was developed to provide a better understanding about the renewable energy in Korea. With the data collected from RES-MAP, the renewable energy resources can be measured. After analysis of the data, the potentials of development of the renewable energy resources can be predicted.



Moreover, there was a presentation presented by Dr Sam Hui for the topic of the Building Environmental Assessment.

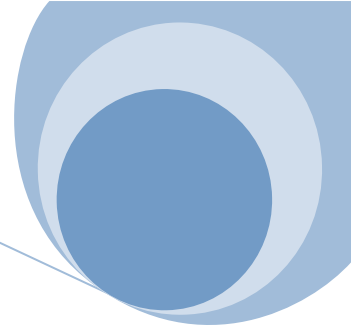
The seminar is focused on the Building Environment Assessment. The objectives of the building environment assessment are to identify and evaluate the environmental effects of the building development or operation and to inform decision-making and promote the sustainable design and management. It is important that the assessment is a useful starting point for the design and building improvements.

The reasons for the need of the environmental assessment are to provide a common set of criteria and targets, raises awareness of environmental issues/ standards, allow a verifiable method & framework. The scope of the evaluation covers the building products, building processes, structural member/elements, building system, single building, groups of buildings, district, urban, regional and city, etc.

Two broad criteria for the evaluation of the buildings are the qualitative issues and the quantitative issues. There are different types of criteria such as the ecological against the health-related issues, direct impacts against the indirect impacts, immediate against the long-term implications, global against the local, etc.

The assessment process is to examine the performance of a building or its sub-system against a declared set of criteria. Usually the process is voluntary. The scale of performance is to measure and assess the relative performance and assign the 'points' or 'scores' to various aspects. The assessing multiple criteria is to indicate the best performance. The methodology includes the cost, equivalence methods, ecocostand ecopoint. There often exists the checklist or forms, computer-based methods. The models used include the environment model, product model, life cycle model, etc.

The assessment methods include BREEAM-UK, ECO-PRO (Germany), EcoProP & PIMWAQ (Finland), EQUER (France), ECO QUANTUM (Netherlands), BREEAM-Canada & BEPAC-Canada, LEED (USA), BEES (USA) (for building products), Japan Green Building Guide & CASBEE, Korea Green Building Rating System, GB/T 50378-2006 and GOBAS (Mainland China), Taiwan Green Building Label, HK-BEAM and CEPAS (HK). The international reference model includes GBTool (Green Building Challenge).



7. Sightseeing

7.1 Hong Kong Science Park (Hong Kong)

After the CRC, we went to visit The Hong Kong Science Park which is a science park in Hong Kong, located in Pak Shek Kok, New Territories, next to the Chinese University of Hong Kong. It is an infrastructure that provides a knowledge-based and campus-like environment of where high-technology enterprises and talented people can converge to generate



synergistic forces. It is designed to accommodate companies of all sizes and stages of development and to promote interaction and innovation at both local and global level. The Park will eventually cover an area of 22 hectares and have high-tech buildings in a landscaped park setting.

There are many environmental features in the park. Their sustainable building and landscape design can maximize the use of natural daylight and minimize the noise from mechanical equipment by acoustic enclosures or silencers. They procure environmentally preferable building materials so that the paving blocks for the open spaces can be made from waste glass or soil and the ceiling panels for the majority of



the office areas can be made from waste glass also. For energy efficiency and resource conservation, they installed the irrigation system serving 3 hectares of landscaped areas with rain sensors and washbasins in office buildings with infrared controls that reduce water consumption. For cleaner operations, they installed the kitchen exhaust systems comprising electrostatic precipitators and grease filters to ensure air emissions meet emission standards.

The key health, safety and social features in the Hong Kong Science Park is to ensure good indoors air quality, and the flexibility of materials or spaces. Air filtering equipment can remove dust, odour and bacteria in air so that people can feel good in this good air condition environment. Flexible space design with facilities planned to allow for future functional changes by tenants so that it will not be affected by a little change in the unpredictable future.

7.2 Chi Lin Nunnery and Nan Lian Garden (Hong Kong)

These places are the CRC activities. After the conference, we had relaxed activities which were going to visit Chi Lin Nunnery and Nan Lian Garden. Chi Lin Nunnery is a large Buddhist temple complex located in Diamond Hill, Kowloon. This Buddhist nunnery is stunning with its monastery complex having been renovated as a piece of Tang dynasty architecture. Covering a space of more than 33,000 square meters, the temple complex includes a nunnery, temple halls, Chinese gardens, visitor's hostels and a vegetarian restaurant. There are other halls containing a treasure trove of religious relics as well as restful lotus ponds.

The Chi Lin Nunnery was founded in 1934 but was rebuilt in 1990 following the style of Tang Dynasty traditional Chinese architecture. The present-day buildings are wood frame buildings built without the use of any iron nails. This construction is based on traditional Chinese architectural techniques dating from the Tang Dynasty that uses special interlocking systems cut into the wood to hold them in place. The Chi Lin Nunnery buildings are the only buildings to be built in this style in modern day Hong Kong.

Next to the Chi Lin Nunnery, there is Nan Lian Garden. The Chinese classical garden possesses an area of 3.5 hectares, in which every hill, rock, body of water, plant and timber structure is placed according to the specific rules and methods in Tang Dynasty-style.

The garden is characterized by the four main elements of Tang-style gardens. In the Lotus Pond, it is the stunning gold perfection pavilion connected by two red painted timber Zi Wu Bridges (not accessible to visitors). To the left of the pond is Spring Hill, one of the garden's hillocks with trees and waterfall and surrounded by rocks. Next to the pond is Xiang Hai Xuan, which is



fronted by a central courtyard in Tang Style with Ying Shan roofs made of grey tiles and surrounded by a quadrangle with green lawn, ancient trees and rocks. The inner room contains a multi-purpose hall which is hired out for art exhibitions, musical performances and seminars etc.

7.3 Cheonggyecheon Museum (Korea)

The Cheonggyecheon Museum operated on 26th September 2005, which is aimed to give visitors the pre-image (including the culture and history of the Cheonggyecheon at a moment. It is a six-floor building that consumes land of 2296 square meters, located in Majang-dong, Seongdong-gu. It shows the past, present and the future of the stream as well as the whole restoration process.



In the past, Cheonggyecheon is a river that passes through almost the whole Seoul for different kinds of purpose such as transportation, drinking, domestic uses, etc. Unfortunately, under the high development in industry and urban, Cheonggyecheon has been polluted due to over consumptions of rubbish and industrial waste, and this has started the alarm to Korea. So the government of Korea has started the project for the re-development of it.

In this visit, the environment of Cheonggyecheon in different generations (from a small sewage water path to a sightseeing place for many visitors in foreign country) was introduced, also with some measuring scale in the past, which was smaller compared with today, the construction plan of it in nowadays through different figures, models and video. This information showed the importance of protection of the environment in our society. The left figure shows the past while the right shows the today construction.



In the last stop of the museum, there had a digital camera photo machine, let everyone of us to have photo with the unique natural view of the modern Cheonggyecheon on day or night given by the data base of the computer there, that

was very beautiful and attracted every of us. The below left picture is the day view while the right is the night view of the Cheonggyecheon.



7.4 Digital Media City Gallery (Korea)



Digital media city (DMC) Gallery is a place to give visitors to get a full-view of the DMC project, which is carried in northwestern Seoul, occupied 570000 square meters of land, aimed to show a state of the art digital media entertainment in Korea, and this project was lunched by the Seoul Metropolitan Government in 2002.

Before the start of the visit, a 3-D short video was shown to promote the DMC project and some flash of the future image of DMC as this project is still going on.

After the video showing, a machine that is used to introduce the DMC had shown to us, it worked by different sensors to detect user touch from different angle, and then the option of the machine will “move” to the user in the appropriate position. A game with similar properties had also shown to us in the gallery. On the other hand, they shared a technology that was, if there were objects block the light from the source, the sensor detect some of the light had blocked, the sensor will send back the data(the user want to choose that part) to the source, a TV-like model had shown to us with this technology.

Last but not least, there was an application that could upload photo to the tunnel (DMC gallery photo booklet) from the smart phone of the staff there; one of our team members had tried to put his photo to it!



7.5 Gyeongbokgung (Korea)



It was the first royal built by the Joseon Dynasty in 1395, and reconstructed in 1867, where located in the northern Seoul. The name of it, Gyeongbokgung is translated from the English (Palace of Shining Happiness). Since nearly destroyed by the Japanese Government in the 20th century, only around 40% of the original palace buildings still stand or reconstructed.

It mainly separated into six parts, main Gates (Gwanghwamun (The main and South Gate); Heungnyemun (The Second Inner Gate); Geunjeongmun (The Third Inner Gate); Sinmumun (The North Gate); Geonchunmun (The East Gate); Yeongchumun (The West Gate)); Outer court (Geunjeongmun (The Third Inner Gate); Geunjeongjeon (The Throne Hall); Sajeongjeon (The Executive Office); Sujeongjeon; Cheonchujeon; Manchunjeon); inner court (Gangnyeongjeon (The King's Quarters); Gyotaejeon (The Queen's Quarters); Jagyeongjeon (The Late Queen's Quarters)); palace of the Crown Prince (Jaseondang (The Crown Prince's and Princesses' Quarters); Bihyeongak (The Study of the Crown Prince)); pavilions(Gyeonghoeru (The Royal Banquet Hall); Hyangwonjeong); bridges (Yeongjegyo; Chwihyanggyo).



Apart from the traditional building design and structure of the Korea, culture of ancient Korea, visitors could also see some traditional Korea palace soldiers, on some particular time; they would show the visitors how they patrol and shifting in the palace.

In our point of views, the building structure and design in Gyeongbokgung were similar to the Imperial Palace in Beijing, and some of the buildings such as the University of Hawaii are based on the design in Gyeongbokgung.

This visit could let the visitors know more about the Joseon Dynasty in Korea.

7.6 N Seoul Tower (Korea)

N Seoul Tower is a communication and observation tower. The 236.7m Seoul Tower sits atop Namsan Mountain in central Seoul. It offers great panoramic views of the city, and has been a symbol of Seoul since it first opened to the public in 1980. With the new lighting system and changes to the tower's overall color scheme, event coordinators can now decorate the tower for each new season or event. The tower has not only been given a new look, but also a new name following a complete makeover, the letter 'N' of the 'N Seoul Tower' stands for 'new' look of the tower.

At the base of Seoul Tower, visitors can find the Media Zone, a Pavilion Experience Hall, exhibition rooms, performance halls, and some souvenir shops. Among them, there is a Teddy Bear Museum, which shows exhibits that chronicle the history of Seoul from past to present through the use of teddy bears. It is an amusing and innovative way for visitors to see how Seoul has changed and developed over time both as the capital of Korea and as an international city. Teddy bears are posed in scenes recreating historic events as well as various aspects of Seoul life.

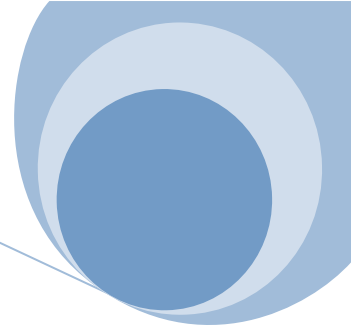
There are two ways to get there, either by bus or cable car, and we chose the latter one. We took it from Myeongdong Station, and it is a ten-minute walk to the cable car platform. The way up by cable car offers a great view of Seoul and a pleasant ride.

We chose to get there at night to see the stunning night view in Seoul. Even though we did not go up to the tower, and we were just in the base, we still saw an extremely beautiful, either the tower itself or the night view of Seoul.

At night, there will be colorful lighting to light up the whole tower, just like the Tsing Ma Bridge in Hong Kong. As



you can see from the pictures, it is sometimes yellow, sometimes purple. Besides the tower, we used much time to take photos for the Seoul view. There is a special feature in Seoul, which only consists of land, but no mountains. Therefore, we can have a look to the place far away from the tower as there is no any high object to obstruct us.



8. Words from Delegates



The Korean Study Tour is knowledgeable and useful to my career path. Before the tour, I have made some friends across different Asian countries in the Ashrae CRC conference. This lets me to understand different countries cultures and background. During the Korean Study Tour, the Korean Institute of Energy Research really interests me. The technology is really advanced .Apart from the famous Korean brands LG and Samsung, the Korean technology is really quite sparkling in other sustainable and energy efficient fields.

Lam Cheuk Yin, Victor (HKU)

I am pleased to be one of the Korea Study Tour delegates. This is the third time for me to take part in ASHRAE Study Tour. The reason why I keep on joining the ASHRAE Study Tour is that I can learn a lot from the tour. In this tour, I participated in Chapter Regional Conference, green building visits and university visits. I have enriched my knowledge on the latest HVAC technologies and green building development. Moreover, I widened my horizons on the local Korea cultures. It is really surprising that University in Korea breeds Geese, cats and many birds which are free to move inside the campus. Another attractive reason that I would like to join this tour is the banquet dinner. Students from each chapter carried out different performance to show their unique cultures. It is enjoyable for me to have a great cultural exchange.



Apart from learning and experiencing, this tour provides many opportunities for me to meet many new friends ranging from different universities in Hong Kong to different chapters. At last, I would like to express my sincere appreciation to ASHRAE Hong Kong Chapter, Dr. Sam C. M. Hui and all the tour participants for organizing a valuable and unforgettable tour.

Ho Sze Wing, Cici (HKU)



This was my first time to participate in the ASHRAE study tour. I was impressed by the trip since the things I experienced and learnt were beyond my expectation. On behalf of the study tour of Hong Kong Chapter, I had the chance to participate in the CRC and met friends from many countries like Taiwan, Singapore and Malaysia. We travelled around Hong Kong, chatted and played together. It was a memorable experience to me.

Time in Korea also brought me a lot of wonderful memories. By visiting the universities and the research centers, I can know more developments and technologies of my discipline. Academic and cultural exchanges with the universities' students and researchers also widened my horizons. The experience of having difficulties of communication is another unforgettable memory since we did not understand Korean language. We could only use body language and simple English words, or lucky find a person who could speak English to communicate.

Lastly, I would like to express my sincere thanks to ASHRAE Hong Kong Chapter and Dr. Sam Hui for giving me this wonderful tour!

Mak Yim Ting, Esther (HKU)

I am proud of participating in ASHRAE Korea Study Tour 2011. I gained a lot, not only experiences but also friendships.

I enjoy having academic and cultural exchange with Korea students in these renowned universities in Seoul. They shared a lot with us, including universities' experiences and Korean cultures. And we visited their laboratories and had a look at their researches. The most impressive one was the zero energy building. It's fabulous to have net zero energy consumption with energy input balanced by energy generated from the PV panel.



Apart from academic and cultural exchange, sightseeing and shopping were also wonderful, giving me a lot of fun.

I am indebted to ASHRAE Hong Kong Chapter and Dr. Sam Hui for organizing this study tour. It's in truth full of joy and I am more than happy to join this fascinating study tour.

Chung Cheuk Yui , Ringo (HKU)



I am glad to be one of the participants in the Korea Study Tour. 2011 is a special year for ASHARE Hong Kong Chapter because the 14th ASHRAE Region XIII Chapters Regional Conference (CRC) is held in Hong Kong. It was a real challenge for participants to prepare for the Study Tour and the CRC at the same time. However, we were energetic students with high endurance. We finally managed to assist ASHRAE Hong Kong Chapter in hosting the CRC. Credit should also go to ASHARE's staff and student helpers.

I was most excited about the Study Tour. In just 7 days, we visited 6 Universities or Institutes and a number of attractions in South Korea. I actually enjoyed such a tight schedule because we could only make good use of the time in this way. It was not an easy job to arrange the visits. Therefore, I must thank Dr Sam Hui for his effort in organizing the Study Tour.

I was delighted to experience the Korean culture. The food, the cities, and especially the citizens have never ceased to amaze and impress me throughout the week. We ate kimchi every day. We walked the streets every day. And we tried our best to communicate with Korean citizens every day. These images have remained in my memory ever since.

The most valuable experience in the Study Tour was to meet our Korean counterparts – university students. We exchanged ideas and cultures with students from 6 different Universities or Institutes. I was eager to talk with them because I wanted know more about their Universities, their lives and their culture. I want to take this chance to thank students and professors from different Universities or Institutes for their preparations for our visits. In addition, I have to express my gratitude to Kimmy and Julie, who were our voluntary guides. They were so kind and nice. It was my pleasure to meet them!

Once again, I feel so happy to be one of the participants in the Study Tour. I think the Study Tour was good but could be better if we could improve communication between participants. At last, I have to thank every participant because our concerted effort has made the Study Tour a memorable one!

Cheung Pui Kwan (장 패 곤), Paul (HKU)



“It was my second time to join ASHRAE study tour; the first time I went to Singapore, however, the weather in Korea is not as hot as I expected before. We went to different kinds of university and visited their research’s laboratory. I learnt a lot of different kinds of building technology and research during the tour. All these knowledge will be valuable in my future career. This study tour is a memorable journey in my life especially visited the Ewha Womans University, and I met a lot of people from different university. It is not only expanding my social network, but also knows more about the cultures of Korea. Although we all cannot read Korean words, we still happy guessing the words in the menu and really enjoy this tour. I would like to thank you all the people to organize this study tour.”

Law Cheuk Hei, Terry (CITYU)

It is my first time to been Korea and I never think I can get such a lot of precious moment during the 7-day trip. Time in Korea is memorable and valuable. I have been many universities, such as Seoul National University, Ewha Womans University, Yonsei University and Chungnam National University. Moreover, we visited Korea Institute of Energy Research (KIER) to take a look “Zero Energy House” in Korea. I understood that Korea is not only a modern and cosmopolitan city, but also a “Energy Saving” city.



Efficacy of energy usage is always the most important consideration in building design work. It is really appreciated.

Korea, sa rang hae yo!

Wong Sze Man, Mandy (CITYU)



This was the first time I traveled to other country. When I realized I could go to Korea, I was so excited. In 7-day visit, I was amazed by the culture and society of Korea, especially the food culture. What is more, I loved visiting universities so much as I could communicate with local students to share the study and living styles. Furthermore, the reason why I particularly enjoyed visiting universities was that the campuses of them have their styles which have integrated with different energy-efficient devices, such as PV panels, light-reflection mirror, etc. For me, the scale of campuses in Korea is beyond compare. If given the chance to me, I will probably pursue a chance to have exchange study in Korea.

Chan Man Sze, Vicky (CITYU)

The most impressed visit of this study tour in Korea is the Korea Institute of Energy Research KIER. This is the national research Centre, which play a role of leader for “Low Carbon and Green Growth” in Korea. It is a valuable chance for us to have a visit in such professional and diverse research Centre. I definitely learn a lot from it specially the CO² Capture technologies. It is not common to hear these technologies in Hong Kong. I was very interested into this research after the visiting the laboratory.



On the other hand, there is a small tip to people who will visit Korea: Bring a bottle of water wherever you go because almost every food in Korea is spicy.

Wong Chung Yin, Eddie (CITYU)



This tour is unforgettable for me. Thought it is just a seven-day tour, it makes me learn a lot of things. Not only can I have in Korea, but also learn so much knowledge of building service, especially the zero energy building and Ewha campus complex.

Besides, I saw a lot of technology, and energy efficient management which are improving the energy efficiency.

Moreover, I learnt very much the Korean culture in this tour, it makes me very amazing. Also, in this tour, I have met a lot of friends from different universities. They are so nice and active even though we sometimes have communication problem.

Cheung Ming Sze, Cecilia (CITYU)

It was my first time to join the ASHRAE study tour; I learnt a lot of innovative building technology during the tour. It is good for my study and working in future. Korea is really a well-developed country which included many good conditions for living. In the tour, I met a lot of people, who study or work on energy efficient and building field. It is not only expands my social network, but also know more about the cultures of Korea. Lastly, I am so glad that I can join this study tour and enjoy it so much.



Chan Tsz Ho, Harry (CITYU)



This 7-day study tour is so unforgettable. What I earn was not just in these seven days. We met each other in June to prepare the tour, CRC and the performance. All the fun or trouble faced will definitely be a worthwhile experience. With the leading of Dr. Hui and the contribution made by our tour mates, the tour is so successful and fruitful. I would like to express my sincere thanks to you all. Hope our friendship lasts.

Lam Yiu Fat, Henry (POLYU)

I am very happy to join this study tour, as a year 1 student, this tour gives me different kinds of knowledge (Green building, renewable energy) through the visits to many Universities in Korea. Besides, we have shared our own culture, living style and study method with Korean University students.



Apart from academic tour, we have also gone to some famous scenic spots of Korea such as Gyeongbokgung and Gyeongbokgung, it lets us to know more about the historic background and culture in Korea. On the other hand, all of us enjoy the shopping time and we have bought many souvenirs there!!!

Last but not least, I really thank Dr. Sam Hui, Prof. Moses L.F Ng and friends from other Universities, you guys add colors to my first study tour, hope our friendship can keep forever. It is worth to join this study tour!!!

Lui Tsz Kin, Alex (HKUST)



There is a Chinese saying, "To visit around the world is much better than only studying on the books." Even only visiting to the country is good, but we were also having a tour of studying technical knowledge that is related to our field of study, so it was definitely a valuable chance for us. Although we learnt a lot on the natural lighting and ventilation of a building on the books, we do not know how they can work actually. After this tour, we can easily find it out because we went to different Korean

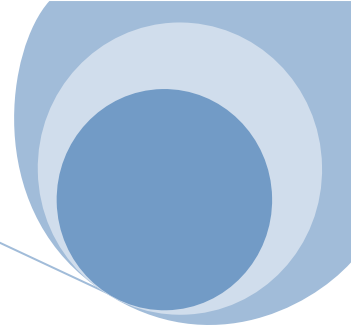
Universities and Research Institute to visit their labs, plants and innovative designs of the buildings. After all, a picture is worth a thousand words.

The most impressive institute in the tour, for me, is the Korea Institute of Energy Research (KIER), which is a large institute that puts a lot of effort for green building. I was surprised by their warm welcome. The staff leaded us to visit their demonstrative residential flat, and enthusiastically explained what installations can save energy in what extent. It is not enough to carry out a research solely on paper, so they simulate some units of a house to make the research real and see how the difference between the theoretical one and the practical one is.

Yet, we were not only having a technical study, but also the cultural one. We met many students in different Universities, we ate lots of Korean food, and we also bought dozens of their cosmetic products. The most interesting thing, compared to Hong Kong, is there are few rubbish bins in street. I think it needs a strong social morality for each citizen, otherwise the city will be so dirty.

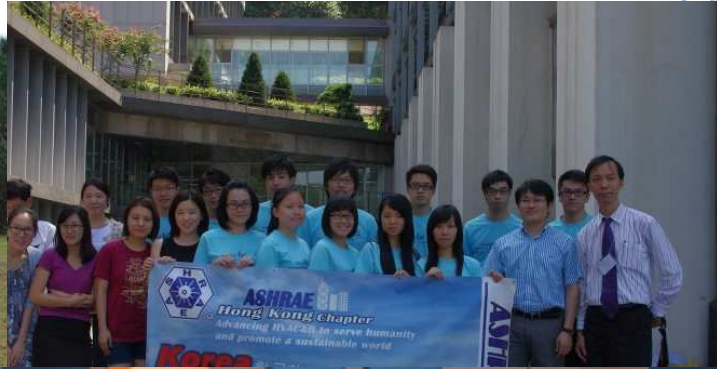
Now, I wish to sincerely thank ASHRAE-Hong Kong Chapter to sponsor us, Dr. Sam Hui to organize and hold the event, Prof. Moses Ng and all staff, students, and helpers to help us. Without all of your help, this meaningful tour cannot be realized.

Siu Yick Yin, Keith (HKUST)



9. Photo Gallery







Jointly Organized by:

- ASHRAE CityU Student Branch
- ASHRAE HKU Student Branch
- ASHRAE HKUST Student Branch
- ASHRAE PolyU Student Branch

Supported by:

ASHRAE Hong Kong Chapter



ASHRAE
Hong Kong Chapter