Overview on Activity of Building Commissioning in Asia and Japan

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Building Services Commissioning Association (BSCA)
Introduction

- In Asia, only Hong Kong has the history of commissioning recognition since 1970’s
- 1990’s Japan and Korea: some experiences on commissioning
- ICEBO 2006 together with IEA/Annex 47 meeting in Hong Kong Asia Pacific Conference on Building Commissioning, APCBC
Figure 1 Actual and Estimated Energy Demand in the World

From IEA/World Energy Outlook 2004

Equivalent Oil Million ton

Africa
Middle East
M.&S.America
Asia, incl. Jpn. & Korea
China
Former USSR
OECD, excl. Jpn. & Korea

From IEA/World Energy Outlook 2004
Figure 2 Energy-originated CO$_2$ in the World

- World
- OECD
- Developing
- Market economized developing

69% increase

(資料) IEA
Figure 3 Origin of CO$_2$ generation in Japan

- 63.9% Other industrial Sector
- 12.5% Residential building operation
- 11.4% Non-residential building operation
- 5.6% Non-residential building construction
- 5.2% Residential building construction
- 1.3% Repair

1.2 billion ton-CO$_2$/a
Figure 4  Principles of Environmental Circulation

- **Man**
  - Economy/Society
  - Health/Hygiene
  - Comfort/Efficiency
  - Active System
  - Resource/Energy
    - Conservation
    - System Theory
    - Preserve/Degrade
  - Environmental Model
    - Global Env.
    - Urban Env.
  - Chemical/Thermal Pollution
  - Recycle Diffused Energy

- **Environment**
  - Indoor Env. Load for Control (Enthalpy)
  - Passive System
  - Outdoor Env. Load for Control (Entropy)
  - Building/Urban Energy/Env. Planning
Figure 5 Principles of Energy Conservation

- Reflection
- Deliberation
- High Efficiency
- Renewable Energy
- Energy Recycle
- Proper Evaluation
- Limited Ener./Resour.
- Energy Use Pattern
- Global Env. Pollution
- Urban Environment
- Demand Control
- Optimization
- Humanism
- Maintenance/Moral
- Save
Figure 6 Evaluation System of Sustainable Building

- Eko Profile
- Promis E
- Eco Effect
- Eco Quantum
- GBCC
- LEED-Canada, GBTool
- BREEAM
- ESCALE
- E-top
- GOBAS
- HK-BEAM
- ESGB
- CASBEE
- NABERS
- LEED
- E-top
- SBAT
- Eco Quantum
- ESGB
Figure 7 Index BEE of CASBEE (Japan)

Realize Buildings with better Q&P emitting less Environmental Load

BEE = (Building Eco Efficiency)
Commissioning in Asian Countries

Commissioning in Taiwan

Professor K.H. Yang of National Sun Yat-Sen University introduced the state-of-the-art status of building Cx in Taiwan.

Being located in subtropical area, hot humid weather in Taiwan imposes heavy cooling load and the power consumption of commercial and residential buildings counts over 14% of total power consumption.

In 2003, the Ministry of the Interior, MOI, decided to conduct an overall renovation program for the HVAC systems of existing governmental buildings where BEMS adoption and system Cx practice becomes mandatory.

Public Projects with total budget sponsored by the government for over 50 million NTD (1.5 million USD)

Over 2,000 m² regulated under the Green Building Labeling system where TAB/Cx procedure is considered a must.
Commissioning in Taiwan

- All public buildings with central HVAC systems, when under renovation process, should adapt the TAB/Cx procedure recommended by the Bureau of Energy of Taiwan to be issued in December 2006.
- The procedure includes regulations under stages in design, installation, functional tests, and performance in conformity with the design intent. This structure has been adapted from the ASHRAE procedure.
- This program not only constructs an important step in responding to the national movement toward the Green Building concept, but provides a remedial strategy for building energy conservation and CO$_2$ reduction.
- TAB has never been performed sufficiently in Asian countries, so that the expression TAB/Cx mandatory process has appeared at the same time.
Figure 9 Statistic data of the number of projects with TAB/CX implemented
Mr. L.H. Leung addressed in his keynote speech at APCBC about the Cx status in Hong Kong. It has returned to China’s sovereignty on 1st July 1997 and become part of China as a Special Administrative Region (SAR).

The Buildings Department of the HKSAR has launched a new voluntary scheme, termed the Consolidated Environmental Performance Assessment Scheme (CEPAS).
Commissioning in Hong Kong

The Government of HKSAR has exerted a great effort and plays a leading role to promote high quality of buildings, not only in design and construction aspects, but for effective and efficient operation.

The Hong Kong Building Cx Centre was established and officiated by the Director of Building Department in December 2004. It is a non-profit making body aiming at promoting Cx practices for trade and benchmark competence of Cx people.


No Cx service provider are the principal bottleneck for propagating through the construction society.
Commissioning in Mainland China

Prof. Yingxin Zhu of Tsinghua Univ.: there is no building Cx in China from the viewpoint of full initial Cx process.

National code for HVAC system construction and acceptance was issued by Ministry of Construction in Oct. 1997.

National code for HVAC system operation and management written by China Academy of Building Research and China Disease Control Centre was issued at the end of 2004.

A green building assessment system named GOBAS (Green Olympic Building Assessment System) was published in August 2003.
Commissioning in Mainland China

- DeST is an annual building energy consumption analyzing software doing simulation hourly for HVAC designers.
- DeST can be used as an effective simulation tool for HVAC system design Cx. Also, it has been used for Cx of many existing HVAC systems in China.
- Tsinghua Green Building Research Center, a low energy demonstration building with 3,000m².
- Tsinghua Univ. has also been working as the Cx authority on retro-Cx for more than 20 central government buildings consigned by the Ministry of Governmental Affairs since 2005, and on design Cx of buildings for Beijing Olympic ‘8.
Activity of Building Services Commissioning Association

The BSCA, Building Services Commissioning Association, was established in March, 2004 and registered as NPO in August.

Nakahara, submitted a report to SHASE, board of directors after he had finished drafting Guideline of Cx Process for Building Services Systems at the SHASE Technical Committee.

An agreement was exchanged between the SHASE and BSCA, Building Services Cx Association, about the role sharing of both organizations for promoting Cx business and bringing up Cx professionals as shown in the Table 1.
Ties between BSCA and NCBC, PECI

- 23 members first participated in NCBC in its 9th meeting in 2001 in Cherry Hills.
- Ms. Natascha Castro has become the co-presenter of international sessions at the 12th and 14th NCBC meetings and Annex works as well.
- MQC matrix that was developed in the Annex 40 research for management of the Cx process.
- International collaboration has been a must to perform BECA’s objectives, because there was no ground at the time of inauguration among the governmental as well as commercial sectors for Cx’s need.
Ties between BSCA and NCBC, PECI

- BSCA invited Mr. Phil Welker, executive director of PECI, and Mr. Larry Luskay, Cx authority of PECI, to introduce us how Cx has been promoted in US, how Cx is profitable to building owners, how the design Cx should be effective and how functional performance test differs from TAB.

- Due to the co-working with people from various countries in Annex 40 and 47.

- Even in the western world, it is clear that the custom of construction business and desire for introducing Cx process have different motivations.
Commissioning Project Examples

The earliest example of initial Cx process on business basis is Yamatake Research Center in 2000, for which Nakahara played a role of Cx authority.

It began just at the beginning of construction phase and finished three years after the building completion.

Without this experience he could not be able to lead BSCA to a right direction. Detailed information of the building and Cx process can be referred to a report introduced at NCBC 2004, in Atlanta.
Tokyo Electric Power Company decided to apply initial Cx process in research basis, not in business basis, to a construction phase and post acceptance step. It aimed at establishing in-house HVAC Cx concept and procedures for energy and environmental quality control of the building. The research team consisted of the members who had joined the mission on visiting NCBC 2001 as described before.
Toden Tachikawa Building

- The total floor area of the office building with power control facility is 16,765m².
- The energy plant consists of air-source heat pumps, water source heat recovery heat pumps and water thermal storage tank. Interview with the owner, designers and constructors.
- Development and verification of documentation tools
- Verification of construction conditions
- Verification of TAB results
- Execution of functional performance tests
- Operational data check assisted by BEMS
- Continuous Cx and research until March 2006 and submit final report
- Fortunately, the trial operations of the HVAC system were allowed by the owner for several months between the completion and occupancy of the building.
- Cx process is generally challenging to be carried out for commercial buildings.
Japanese Red Cross Medical Center

- Existing facility was completed in 1975.
- The facility includes a hospital, a nursing college, health-care facilities and dormitory for nursing personnel.
- The owner appreciated design of energy plant from the lifecycle point of view, together with the HVAC performance management with the help of initial Cx process.
Japanese Red Cross Medical Center

The project has just entered the construction phase.
- Total floor area: 81,700m², hospital
- Number of floor: 12 and B3
- Provisional completion: Sept., 2009
- Energy plant load includes nursing college and healthcare facilities

- BSCA contracts for Cx process: Nov., 2005
- Issued Owner’s Program on behalf of the owner: Dec. 2005
- Review Preliminary design: Nov. 2005
- OPR workshop: Dec. 2005
- Issued OPR on behalf of the owner: Jan., 2006
- Issued Cx plan, program phase: Jan. 2006
- Issued Cx plan, design phase: Apr. 2006
- Issued Cx Specification, Sept., 2006
- Issued Cx plan, construction phase, version-1: Sept. 2006
- Review Design documents but insufficiently, Oct. 2006
- Follow-up of design change and add insufficient documents, Nov. 2006~
Proposal
Outline for the 2nd Conference: “APCBC Workshop 0710”
Session 1: 9:00~12:00 Status Report from Countries (break: 10:30~11:00)
Session 2: 13:00~15:00 Discussion on Strategies to Transfer Commissioning Technologies as well as Concept among Asia Pacific Countries (break: 14:30~15:00)
Session 3: 15:30~17:30 presentations on Cx Technologies and Cx examples for both initial Cx and Retro-Cx
Party: 17:30~19:00