BSCA's Activities on Promoting Building Commissioning in Japan

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About the eastern Japan great earthquake
About the eastern Japan great earthquake
The overview of the eastern Japan great earthquake

The date and time of occurrence: 2:46 p.m. March 11th (Friday), 2011

The scale of the earthquake: Magnitude 9.0
The epicenter: Near 130 km offshore from Oshika peninsula at about 24 km of depth
The focal region: Iwate Prefecture, Miyagi Prefecture, Fukushima Prefecture, Ibaraki Prefecture offing

Huge faults covering the area 200 km wide from east to west and 500 km length from north to south moved about 20 to 30 m for about three minutes, resulting the maximum land subsidence of three m deep.

Seismic intensity of 6 to 7 were experienced as widely as Iwate prefecture to Chiba prefecture, and afterwards the aftershocks with seismic intensity of 6 took place more than three hundred times. The aftershocks still continues now that two months have passed since the main shock.

The height of the tsunami: From 10 m to 38 m
The area-of-wetted-surface 561 square km, i.e., 8 times wider than the inside area within JR Yamanote Line in Tokyo

The number of building suffering from the quake: About 330,000 buildings
The number of victims: About 300,000, with 30,000 of the dead and the missing people

The area of agricultural land damage: 23600 ha (5050 times the area of Tokyo Dome)

It causes a Fukushima nuclear accident.

The direct total amount of damage: 20 to 30 trillion yen
The indirect damage: Immeasurable (as in progress).
What is made to realize looking at hundreds of images of the great earthquake and tsunami. (The essential of crisis)

1. The weakness of human beings facing the huge powers of the nature has been confirmed
   - The human being as the tiny creature on the plate on the mantle

2. The unstableness of the earth that is attacked by the sudden disaster
   - The complex system that consists of a lot of elements mutually acting in the non-equilibrium state.
   - The difficulty of prediction of the releasing process of accumulated energy culminating in the critical state.
   - The earthquake caused by the complex system of accumulated pressure at the numerous faults and cracks
   - The complex system including lots of social elements, such as production, information and distribution interacting each other.

3. Let know of the limit of civilization as well as technology when faced at the culminated power of the nature and of the vulnerability of energy-dependent civilization.
The influence of the great earthquake and future problems

This disastrous earthquake has given a big influence on the politics, the society, the industry, the technology and the way of thinking in the future.

Looking at the huge, hazardous and unstable nature, the following subjects of study have surfaced.

1. The ideal way of the future technologies against this level of the huge disasters. (The design basis, or standard )

2. The safety of technologies facing to the public, which has been shown symbolically by the nuclear accidents.

3. The problems concerning to energy that is the basic infra-structure of the society and industries.

In the following, basic frame of discussing these problems and how commissioning concept will come related to these.
The constraints on energy supply and demand given by the BIG DISASTER and subjects to be discussed

Given the constraints due to nuclear power plant accident;

The long run strategies:
  • Promotion of the stabilization of the accident
  • Diversification of the energy source together with promotion of natural energy use

The short run strategies:
  • The increase in energy efficiency of energy use
  • Load leveling using thermal storage and fuel energy
  • Energy saving using various measures
Role of commissioning concerning energy use and constraints

At the rim of energy crisis due to the power plant damages, it is necessary to urgently promote energy saving and raising energy efficiency as well, where;
① The commissioning process shall be applied to newly built buildings to clarify design requirements concerning energy efficiency and functional performance.
② It is important to apply a retro commissioning process to existing buildings and following continual commissioning with a lifecycle view.
③ On-going commissioning organization in-house of existing building accompanied with re-commissioning by professionals will realize energy saving effect as early as possible.
Subjects expected to Commissioning in Japan

Upbringing of technical experts to manage commissioning process, develop and handle commissioning tools in order to implement the commissioning procedures effectively and skillfully.

To reflect the fragility of the safety of the building services systems, the efforts of strengthening safety of the system are to be solved by applying commissioning process.

The efforts to meet the facing problems shall be initiated for such as reviewing limitation mode of operation at the energy shortage and reviewing emergency circuits as well.
BSCA’s Role and Activities

BSCA: Building Services Commissioning Associations
Cx Process Application in Japan and Role of BSCA

1989 ~ 2003
Harumi Toriton DHC, lCx ~ CCx

SHASE
BEMS/Commissioning Committees

Building Commissioning Association (BSCA)

1995 ~

2004 ~

2000  Yamatake ERCPICx

2003  TEPCO T Bldg.PICx

2005 ~ 07  Nisseki Hospital PICx

2005 ~ 09  Chuden Atsuta Bldg. RtrCx

2006 ~ 09  KEPCO Nakanoshima DHC RtrCx

2010 ~ 11  JR Kyoto Station Bldg. RtrCx

CA Qualification, Tool Development
### Commissioning Process for New Construction

<table>
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<tr>
<th>Program Phase (Pre-Design Phase)</th>
<th>Design Phase</th>
<th>Elabolation Phase</th>
<th>Construction Phase</th>
<th>Operation Stage</th>
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<tbody>
<tr>
<td>Program Step</td>
<td>Planning Step</td>
<td>Preliminary Design Step</td>
<td>Working Design Step</td>
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<tr>
<td>RFP_CA</td>
<td>RFP_Des</td>
<td>Bid/Order Contract</td>
<td>Const. Doc.</td>
<td>FPT</td>
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<td>OPR</td>
<td>Cx Plan</td>
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<td>Training</td>
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<td>Cx Plan updated</td>
<td></td>
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<td>Syst. Manual</td>
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<td>Cx Spec.</td>
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<td>Season. FPT</td>
</tr>
</tbody>
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**Cx Meeting, Progress Report, Issue Log, Review & Verif.**
Relation among Commission Types and Structure of Continuous Cx

Activity Level

O&M ordinary jobs

Time elapsed

Continuous Cx

Life-cycle Cx

On-going Cx

Re-Cx

Re-Cx

Re-Cx

Retro-Cx

Initial Cx

On-going Cx
What have we to keep in mind?

Fossil fuel is not usable infinitively

**Global warming issue** - though there are many discussions on the magnitude of it’s effects on global environment, it puts another constraint on fuel use.

**Nuclear power will not have a infinite growth, especially after Fukushima.**

Natural energy, un-used energy and recycled energy sources are highly dependent on natural and social conditions and difficult to drastically raise energy efficiency.

**Quality of design, construction and maintenance is highly dependant on ability of individuals and organization.**

Back-up energy source shall be prepared and maintained as actual stand-by for critical use.
What is the basic philosophy?

Energy Conservation/Saving, ‘Sho-energy’, is universal principle to solve energy/environment related problems, which is the premise.

Complex energy system, that is, the optimized design and operation of the compounded electricity, fuel gas, natural energy and un-used environmental energy shall be studied.

Control optimization and measurements of variables and energy consumption are the next premise for achieving ‘sho-energy’.

Continuous commissioning only achieves the realization of ‘sho-energy’ as intended. Therefore, initial Cx and retro-Cx, shall be highly recommended, and Cx oraganization shall be established for each existing building.
Principle of Environmental Circle

- Economy/Society Health/Hygiene
- Man
- Comfort/Efficiency
- Indoor Env. Load for Control (Enthalpy)
- Passive System
- Outdoor Env. Load for Control (Entropy)
- Environment
- Resource/Energy Conservation
- Recycle Diffused Energy
- System Theory Preserve/Degradation
- Environment Model
- Global Env. Urban Env.

Activities:
- Active System
- Resource/Energy Conservation
- Chemical/Thermal/Radio-active Pollution
- Recycle Diffused Energy
- System Theory Preserve/Degradation
Meaning of Energy Conservation/Saving, 省(節)能

- Energy resource limit
- Energy use pattern
- Global environment
- Regional environment

Commissioning

Deeply Consider

Reflect

Energy

Save/Conserve

Save useless demand
Optimizing concept
Humanism/moral
Proper maintenance/way of living

Raise system efficiency
Utilize natural energy
Recycle energy
Raise energy security
Proper evaluation index
To make “commissioning” accepted into society, and to promote it to energy administration and building owners

Lectures at regular meeting of BSCA
  • Development of Commissioning to productivities, environmental administration, and business issues

International workshop on Cx tools and on-going Cx
  • Beijing (Apr. 2009), Hong Kong (Feb. 2010)
  • In cooperation with Public Building Association (PBA), Tsinghua Univ., Nagoya Univ. and Texas A&M Univ.
Education and training of commissioning engineers

District heating and cooling plants and Cx
  • Cooperation with Japan Building, Mechanical and Electrical Engineers Association (JBMEE)

Cx and functional performance test of thermal energy systems
  • With Heat Pump and Thermal energy storage center Japan (HPTCJ)

Lecture of HVAC&R2000
  • With Japan refrigeration and air conditioning industrial association (JRAIA)

Training course of Cx Professional Engineers
Discrimination of information about Cx through News letters and Internet

Home page www.bsca.or.jp

- Activities and documents
- Certification of Cx Engineers
- Downloadable documentation tools
  - Functional test model documents of PECI
    - Japanese translation and original documents

News letters

- Letters from member and opinions

New Panels for exhibition

- At annual meeting of Society of heating, air conditioning and sanitary engineers Japan (SHASE)
Research and development, and technical assistance of Cx

Preparation of implementation manual and tools, as well as assistance for members and citizens.

To promote delegated researches on Cx process and Cx contracts from public sectors and develop them to education and preparation of documents

Commissioning Manual for Thermal energy storage system of new and existing buildings
  • HPTCJ

Practical research on Cx process
  • The Japan Gas Association
  • Cx process and tools
  • Cx of DHC plant and renewable energy system
Research and development, and technical assistance of Cx

TES simulation package for BEST simulation system and its evaluation
  • HPTCJ
  • Verification of ice storage program (TESP-ICECOIL)

Research on international energy performance indices and energy simulation tools
  • Public building association (PBA)
  • Evaluation of HVAC simulation programs in different countries
  • Proposal for ideal evaluation of energy systems
  • Assistance of research activity with Tsinghua Univ.
Establishment of Cx standards and Cx business

Governing board for certification of Cx engineers (Supported by utility companies)
- Completion of the Cx manual which is used in the training course
- Settlement of standard for qualification

Development of manuals, guidelines and model documents
- Japanese translation of PECI documents
- Compilation of model documents and standard forms based on Cx projects and research projects

Preparation of new Cx contracts to establish Cx
- Cx project for a DHC plat
- RetroCx for a large scale commercial building
Activities of members

Cx committee of SHASE
Opinion about Cx position to ISO/TC205/WG3/BACS/Part-1 (Specification and Implementation)
Participation to NCBC
International work shop in Beijing and Hong Kong
Lessons learned from these activities will be
  • Reflected into home page contents
  • Utilized into research activities
  • Harmonized and contributed to systemize Cx
END