Shimizu’s approach to building resilient and smart cities

October 29, 2015
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Approach: The “ecoBCP“ concept  core competence for sustainability

Low Carbon/Wellness (eco) + Business Continuity/Energy Independence (BCP)

Applying energy conservation measures during normal times to build facilities and communities, while assuring business continuity and energy independence in the event of an emergency.

Resilient and smart cities
Approach: ecoBCP urban regeneration

- Staged “ecoBCP” solutions from facility-level to district-level and area-level.
- Increasing community value and competitiveness by enhancing “ecoBCP”.

### Enhancing “ecoBCP” of disaster prevention facilities

1. **Facility level**
   - Energy conservation and the improvement of QOL during normal times
   - Securing energy supply during emergency

2. **District level**
   - Utilizing district heating/cooling/power supply
   - Accommodating those unable to return home in the event of an emergency

3. **Area level**
   - Area energy management
   - Area business/life continuity management

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**Diagram Description**

- **BC**: Business Continuity
- **LC**: Life Continuity
- **DC**: District Continuity
- **CC**: Community Continuity

- Photovoltaic generation system
- Distributed Generator
- Electricity storage
- Information
- Co-generation
- Autonomous disaster prevention facility
- Heat
- Grid power
- Area management center

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Kyobashi Smart Community

- ecoBCP management and enhancing community value and competitiveness in the area around Shimizu’s head office.

1. **Facility level**
   - A high-performance, eco-friendly, and disaster prevention facility
   - CASBEE: rank S
     BEE score: 9.7 pts.
     (highest score ever)
   - Community disaster prevention facility: Accommodates 4,000 employees and others unable to return home in a disaster

2. **District level**
   - District heating/cooling, effective use of waste heat
   - Mutual exchange of supplies in the event of an emergency
   - DHC system: comprehensive energy efficiency rate of 1.39
     (most efficient in Japan)

3. **Area level**
   - Area energy management
   - Area business/life continuity management
   - ISO 22301 (Business Continuity)
   - ISO 50001 (Energy Management)
   - (certified as the first area-wide cases in Japan)

Shimizu’s head office

- ecoBCP building

Kyobashi 1-chome/2-chome
DHC area
(4.8 ha)

Shimizu’s head office

DHC area

Shimizu’s head office

Planned area

Kyobashi Smart Community

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**Shimizu’s head office: an ecoBCP model building**

<table>
<thead>
<tr>
<th>Location</th>
<th>Chuo City, Tokyo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
<td>May 2012</td>
</tr>
<tr>
<td>Site area</td>
<td>3,000 m²</td>
</tr>
<tr>
<td>Building area</td>
<td>2,200 m²</td>
</tr>
<tr>
<td>Total floor area</td>
<td>51,800 m²</td>
</tr>
<tr>
<td>Floors</td>
<td>3 underground levels, 22 above ground levels, one penthouse</td>
</tr>
<tr>
<td>Height</td>
<td>110 m</td>
</tr>
<tr>
<td>Structure</td>
<td>Reinforced concrete (partial steel frame) Seismic isolation structure</td>
</tr>
<tr>
<td>CASBEE</td>
<td>S Rank (BEE = 9.7; highest score ever achieved)</td>
</tr>
<tr>
<td>LEED</td>
<td>NC Gold</td>
</tr>
<tr>
<td>CO₂ emissions</td>
<td>Reduced 61% in 2013 (compared to the average of general office buildings in Tokyo, 2005)</td>
</tr>
</tbody>
</table>
Shimizu Head Office

- CASBEE: S Rank (BEE = 9.7; highest score ever achieved).
- LEED: NC Gold
- Reduction of CO$_2$ emissions: 58% in 2013 compared to office buildings in Tokyo, 2005.
- Hybrid exterior panel system/task & ambient system/all IP building system.
- Community disaster prevention facility.

Seismic panels  Low-E double-glazed glass  Solar panels

Shading effect  Exterior thermal insulation
Shimizu Head Office

- **Community disaster prevention facility** accommodating 2,000 employees and up to 2,000 others unable to return home in the event of an emergency.
- Reception rooms accommodate those requiring assistance, including the elderly, the disabled, expectant mothers, overseas visitors, and the sick or injured.

### Protecting the building

**Preventing building damage**

- Seismic isolated structure

**Saving lives**

### Protecting business functions

**Maintaining head office functions**

- Maintaining head office functions for 72 hours (three days)
- Measures to respond to underground flooding

### Protecting the community

**Working with the community**

- People unable to return home
  - Accommodating the following people on floors 1–9:
    - Employees: 2,000
    - Others: 2,000
    - Total: 4,000

- DHC heat storage tanks used to supply heat (released directly using office heat pumps)
- Tap water and reclaimed water storage (for three days)
  - (Uses water receiving tanks and heat storage tanks)
- Storage of sewage and miscellaneous wastewater (three days’ capacity)
  - (Uses an underground pit.)

- Electrical substation room on rooftop
  - Micro-grid, generators, oil tanks (fuel for three days)
- Elevators available
  - (One for lower floors, one for higher floors)
- Lighting and power outlets available
  - (Floors 1–9)
- Office and business servers installed on above-ground floors (5th-floor servers)
- Restrooms available
  - (Floors 1–9)

**Seismic Isolation**

**Oil Damper**
Shimizu’s head office

Task and ambient air-conditioning system

- Power reduction of approximately 50% compared to standard air-conditioning system.
- Comfort and low-carbon performance, improved intellectual productivity.

Hybrid radiant panels
Fin-shaped radiant panels serving areas near windows where heat loads are high.

Radiant ceiling panels

Supply of chilled water from district heating/cooling facility

Humidity-controlled air from desiccant air conditioner

Personal floor vents
Sliding controls allow workers to adjust airflows to suit personal preference.
Shimizu’s head office

Task and ambient LED lighting system

- Power reduction of approximately 90% compared to standard lighting system.

Sensor-controlled ambient lighting brightness automatically adjusts to available natural light.

- Use of daylight
- Lighting

<table>
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<tr>
<th>Ambient lighting</th>
<th>Task lighting</th>
</tr>
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<tr>
<td>Use of daylight</td>
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Interior lighting deliberately set to achieve dimmer lighting levels.

- Ambient lighting
- Gradation blinds
- Office
- Task lighting

Angle of blinds adjusts to match the position of the sun.

Bright and targeted lighting for individual desks.

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Shimizu’s head office

Effective utilization of waste heat by connecting with DHC plant

RADIANT AIR-CONDITIONING SYSTEM

PERSONAL CLIMATE CONTROL

DISTRICT HEATING/COOLING PLANT

Supply 7°C

Return 14°C

Supply 14°C

Return 19°C

Water 16°C - 18°C

EXHAUST HEAT

DESICCANT DEHUMIDIFICATION SYSTEM

Supply Air

Return Air

Heat/Cold Coil

Desiccant Rotary Wheel

Fresh Air

Desiccant Rotary Wheel

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