Low Emission Buildings TOP30 in Tokyo

東京の低炭素ビル TOP30

Bureau of Environment
TOKYO METROPOLITAN GOVERNMENT

Low Carbon Buildings in Tokyo: The Performance of Green Buildings in Tokyo, which Withstood the Crisis Following March 11

More than six months have passed since the March 11 disaster, which subjected the people of Tohoku to horror and misery and sent shockwaves throughout the world. On that day, Tokyo also felt the strong earthquake at an intensity level of up to "5 upper" on the Japanese scale. In the days that followed, the metropolis faced a shortage of electric power, the most important form of energy for urban activity. The shortage was caused by the shutdown of power plants, including the nuclear plant in Fukushima, resulting from the earthquake and the ensuing tsunami.

Demand for power in the Tokyo metropolitan area reaches its peak in the hot, humid summer months. However, companies, citizens and government agencies in Tokyo have been able to overcome the crisis with comprehensive measures for saving power and energy. They succeeded in significantly reducing energy consumption by more than 20% compared with the previous year at many of the high-rise office buildings in central Tokyo, which are among the greatest power consumers, without sacrificing their function as places for conducting business.

Many players in Tokyo's building sector, such as developers, owners, design companies and construction companies, had followed the Tokyo Metropolitan Government's initiatives aimed at creating a low carbon society by introducing the latest energy saving technologies and improving daily operation and management. Such measures, taken by both the private and public sectors of Tokyo, greatly helped us in overcoming the post-March 11 power crisis.

Buildings shown in this booklet, "Low Emission Buildings TOP 30 in Tokyo," were evaluated highly under the Tokyo Metropolitan Government's urban Cap-and-Trade program and Tokyo Green Building Program. There are of course many other green buildings in Tokyo. Conversion to a low carbon society is an overarching issue for the world's cities. Amid the increasing trend toward restrictions on carbon emissions, the low carbon buildings in Tokyo, which were able to withstand the sudden power crisis caused by the earthquake, will serve as a model for cities around the world in their efforts to be sustainable.

I hope that people around the world aiming for a low carbon society will visit Tokyo and see these green buildings in person. I will be happy if those people read this booklet prior to visiting Tokyo and learn about some of the brilliant achievements made by our building sector.

I would also like to express my deep appreciation to those at the TOP 30 Buildings without whom creation of this booklet would not have been possible.

September 2011

Teruyuki Ohno

Director General

Bureau of Environment

Tokyo Metropolitan Government

Initiatives of the Tokyo Metropolitan Government (TMG) for a City and Buildings with Low Carbon Emissions

1 Measures against climate change in Tokyo

In December 2006, TMG announced a target of reducing greenhouse gas emissions 25% from 2000 levels by 2020. In the next year, TMG formulated the Tokyo Climate Change Strategy and revised the Tokyo Metropolitan Environmental Master Plan to set down specific policy measures. Since then, it has been taking steady steps toward achieving the target. Up to this point, TMG has been focusing on establishing frameworks and systems that promise a significant reduction in greenhouse gas emissions into the future, including introduction of a mandatory Cap-and-Trade program targeting large facilities, and has been implementing these initiatives in all sectors.

Tokyo is a high energy consumption city, and its emissions of greenhouse gases are equivalent to those of countries like Norway and Denmark. Emissions from buildings account for the majority of total emissions, and this is the area where TMG has been pointedly taking initiatives. Measures in the area of buildings contribute to reduction of greenhouse gas emissions in not only Tokyo but cities around the world as initiatives to deal with their rapidly growing energy demands. Here we introduce two important building-related programs from among TMG initiatives.

2 Mandatory total reduction and emissions trading scheme (Tokyo Cap-and-Trade Program)

The world's first urban Cap-and-Trade program

Japan's first Cap-and-Trade program which mandates total reduction of CO_2 emissions from large facilities was implemented in April 2010. This is also the world's first urban Cap-and-Trade program in the sense that it covers buildings and facilities in cities such as offices and commercial buildings, unlike systems such as the earlier implemented European Union Emissions Trading Scheme (EU-ETS) that mainly covers energy suppliers.

In addition to playing a role in committed efforts by national and local governments, the program's introduction in Tokyo will also have these significant effects:

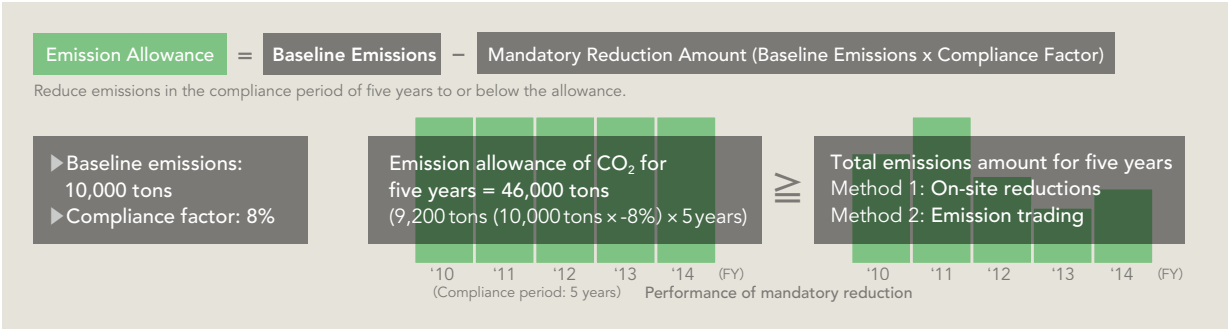
- It will be possible to steadily reduce the total amount of greenhouse gas emissions by introducing a mandatory total reduction program.
- Cost-effective measures will be advanced by using market mechanisms through the introduction of an emissions trading program.
- Reduction of emissions from cities' business and construction sectors, which will continue to grow around the world, will be promoted.

Outline of the program

The Tokyo Cap-and-Trade Program covers approximately 1,300 facilities such as office buildings and plants that emit large amounts of CO_2, accounting for approximately 40% of emissions from the city's industrial and commercial sectors. A target to be achieved by the relevant sectors has been established as a cap (emission limit) taking into account the 2020 reduction target for Tokyo as a whole, and a mandatory reduction rate has been set for each facility based on the cap.

Each facility is obliged to reduce the aggregate total of emissions for the five years from 2010 to 2014 (the first planned reduction period) by 8% or more (for office buildings, etc.) or 6% or more (for plants, etc.), compared with the amount obtained by multiplying the baseline annual emission amount by five. Owners of facilities will reduce CO_2 emissions by introducing energy-saving measures and renewable energy in their own buildings, as well as by applying credits such as excess reductions and renewable energy credits purchased from other facility owners to their own reductions.

Emission Reduction Obligation



Design of Tokyo Cap-and-Trade Program

Items	Details
Facilities Covered	1,300 large CO_2-emitting facilities in the Tokyo area that consume more than 1,500 kiloliters (crude oil equivalent) of energy annually ・Individual facilities or buildings are the basic unit of emissions reduction obligations and emissions trading ・In principle, responsibility for meeting obligations on facility owners
Gas covered	Energy-related CO_2
Compliance periods	Two five-year periods (in fiscal years) ・First period: 2010 to 2014 ・Second period: 2015 to 2019
Emission caps (sector)	6% reduction below base-year emissions (first compliance period) About 17% below base-year emissions (second compliance period)
Base-year emissions	Average emissions of three consecutive years between 2002 and 2007
Emission allowance	Base-year emissions × (1-compliance factor*)× 5 years *6% for factories, 8% for office buildings and other facilities
Emissions trading	Excess reductions (beyond compliance factor) are tradable after second year
Offsets (credits)	Three types of offset credits are currently permitted ・Emission reductions from small and midsize facilities in Tokyo ・Renewable energy credits ・Emission reductions outside Tokyo area
Reporting, verification	Verified reporting is required every year based on TMG guidelines Verification agencies are registered by TMG governor
Banking, borrowing	Banking to the second compliance period is permitted. Borrowing is not permited.
Tenant obligations	Tenants are required to cooperate with emission reduction measures taken by building owners. Specified tenants using a large floor area or a large amount of electricity are required to submit their own emission reduction plans to TMG via the building owner, and to implement the plans.
Penalties	Fines, charges (up to 1.3 times the shortfall). Violation will be published.

3 Tokyo Green Building Program

Evaluation and publication program of environmental performance of new buildings

All large buildings (with total floor area over 5,000m^2) newly constructed in Tokyo are subject to the Tokyo Green Building Program and are obliged to conduct an environmental performance evaluation and publish the building environmental plan, which indicates the evaluation results, on the TMG website. This system began in 2002, and more than 1,500 buildings have thus far prepared and published building environmental plans. The system requires building owners to adopt environmentally conscious designs based on guidelines set down by the Government, with the aim of creating a market where environmentally friendly buildings are highly valued, through publication of their environmental performance.

The system has been improved in recent revisions, focusing on measures against climate change by expanding coverage and introducing a minimum standard stricter than that under the Act on the Rational Use of Energy (Energy Saving Act) of the Japanese government. An energy performance certification program and a mandate on feasibility studies concerning on-site renewable energy have also been newly put into place.

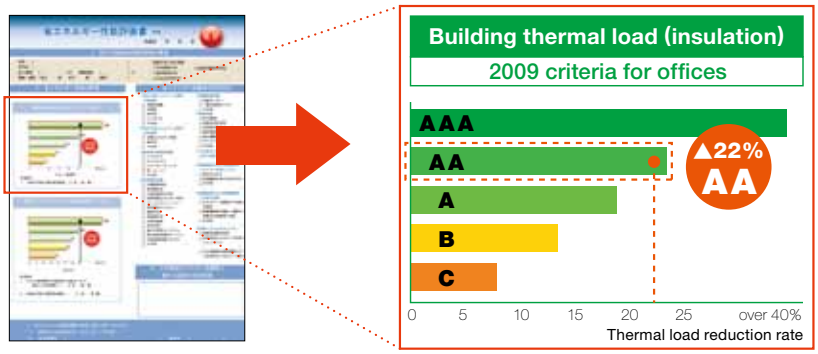
Design of Tokyo Green Building Program

Items	Description	
Facilities covered	Newly planed large buildings over 5,000 square meters in total floor area	
Items assessed	Categories	Items
	Energy	Building thermal load (insulation) Renewable energy devices (on-site renewables) Energy-efficiency systems (building equipments) Building energy management systems
	Resources, materials	Use of eco-friendly materials, ban on the use of fluorocarbons, longer building life, water recycling
	Natural environment	Greening, landscaping, bio-diversity, water conservation
	Heat-island effect	Heat emissions, ground surface cover, wind environment
Rating	Each item is rated using three rating grades (1-3)	
Reporting, disclosure	Environmental plan and rating results must be reported before applying for a building permit. Ratings are displayed with charts on TMG website.	

Program Developments
In addition to enhancement of the TMG Green Building Program itself, measures against climate change as described below are being promoted, using the details of the evaluation and information disclosure of the system effectively.

Green Labeling Program for Condominiums (since 2005)
Residential buildings constitute a large share of the buildings covered by the TMG Green Building Program, though the environmental plan itself is quite difficult for general consumers to fully utilize. Therefore, sales advertising is required to indicate five of the evaluation items in the rating system of the Green Building Program, using a starred label to show the environmental performance of condominiums. A recent revision has been made so that rental apartments are also covered.

Energy Performance Certification Program (since 2010)
TMG has also introduced a certification program to convey information on energy performance of non-residential buildings. The energy performance certificate of the building must be presented to the other party when selling, buying or leasing a building and transferring trust beneficiary rights.



Higher energy saving standards for large-scale urban development (since 2009)
Urban planning systems that offer a bonus such as a higher floor-area ratio are often used when constructing large buildings in Tokyo, and now higher environmental performance such as a building's energy savings meeting a certain standard is now required when using these various urban development systems. For example, the system mandates evaluation of items such as reduction of the building's heat load and energy saving of equipment being Level 2 or above. Effects of the system are steadily becoming apparent.

Selection Processes for the Low Emission Buildings TOP30 in Tokyo

The buildings featured in this booklet were selected in line with the policy measures of the Tokyo Metropolitan Government toward low-carbon cities, the Tokyo Cap-and-Trade Program mainly targeting existing buildings, and the Tokyo Green Building Program for new buildings. Fifteen existing (in service) buildings were selected, taking into consideration their operation status in addition to their energy performance, and the remaining 15 new buildings were selected based on their designed energy performance.

Existing Building Section

In the Tokyo Cap-and-Trade Program, buildings that consume large amounts of energy are mandated to reduce their CO_2 emissions from the entire building by 8% in the five years from 2010. Significant reductions will continue to be required in the subsequent five-year period. However, top-level facilities that have already conserved significant amounts of energy through improvements in building performance and facilities and efforts in terms of operations will find it difficult to reduce their energy consumption further. Accordingly, a certification system of top-level facilities has been established. The certified top-level facilities will have the mandatory compliance factor (reduction obligation ratio) halved. To acquire the certificate, the facility needs to have over 200 items checked in relation to the energy performance, operation, and management of the facilities and building, and the score has to be 80 or better out of 100.

Assessment items for top-level facility certification (office buildings)

Assessment category	Required items	General items	Extra credit items
1. General management Establishment of cooperative structures for energy conservation, energy management status, etc.	23	4	1
2. Energy performance (building shells and equipment) Energy efficiency of air conditioning, lighting and other facilities, equipment efficiency (COP), etc.	26	39	45
3. Operations Indoor temperature and humidity management, facility maintenance and management, etc.	25	56	9
Total number of evaluation items	228 items		

Certification procedures were carried out for the first time in 2011, and 14 office buildings were certified.
For the existing building section of the TOP 30 Buildings, in addition to these 14 top-level facilities, one building commended as excellent under the CO_2 Emission Reduction Program, which is the predecessor of the Tokyo Cap-and-Trade Program was selected.

New Building Section

For new buildings, the standards related to energy have been extracted from those of the Tokyo Green Building Program that evaluates the environmental performance of buildings. Those whose performance exceeds the following standards in all four of the evaluation categories were selected: 1. Heat load resistance of the shell; 2. Energy efficient equipment; 3. Efficient operation systems; and 4. Use of renewable energy.

Selection criteria related to energy in the Tokyo Green Building Program

Assessment category	Criteria
1. Heat load resistance of the shell Heat insulation of walls and windows, measures for shielding them from sunlight, etc.	20% or higher rate of reduction from PAL* standard (performance standard values stipulated by the Act on the Rational Use of Energy)
2. Energy efficient equipment Introduction of energy saving equipment in the facilities (air conditioners, lights, ventilators, water heaters, and elevators)	30% or higher ERR** (rate of reduction of energy use from the standard value stipulated by the Act on the Rational Use of Energy)
3. Efficient operation systems Measurement and energy management systems for optimal operation	Level 2 or higher in the evaluation scale Example: Introduction of BEMS***, which enables measurement of energy consumption by floor or by system
4. Use of renewable energy On-site installation and introduction of facilities for solar power generation and use of solar heat and other renewable energies	Amount of renewable energy introduced (30kW or more of rated wattage in the case of PV)

Of the 15 new buildings selected, one declined to be published in this booklet.

* **Perimeter Annual Load (PAL)** is the annual thermal load factor of the perimeter zone. PAL, in other words, indicates the heat insulating performance of building envelopes such as outer walls. It is expressed as a value obtained by dividing the annual thermal load of the perimeter zone of a building (an area within five metrs of the center line of the building envelope, such as the outer walls) by the total area of the zone (unit: MJ/year-m^2). The Act on the Rational Use of Energy prescribes the standard performance value by use of building. The values differ among building for different uses, and that for office buildings is 300 MJ/year-m^2). Rate of reduction from PAL* is how much lower a value is compared with the standard value mentioned above. The higher the rate of reduction, the more effectively the building is heat-insulated or shielded from sunlight and the lower its thermal load is.

** **Energy Reduction Ratio (ERR)** is the rate of reduction of energy used by a facility system, that is, its energy-saving performance. ERR is a coefficient that indicates the facility efficiency of the entire building, which is calculated based on the Coefficient of Energy Consumption (CEC) of each facility system (air conditioners, lights, ventilators, water heaters, elevators). Each facility system's efficiency is calculated by dividing its annual energy consumption (MJ/year) by the energy consumption of facilities to be introduced. Introduction of energy saving technologies will reduce the energy consumption and improve the energy efficiency of facilities. The Act on the Rational Use of Energy stipulates the standard CEC for each type of facility.

*** **Building and Energy Management System (BEMS)** refers to a computer-based system for uniform management of the energy-related and other facilities of a building. In addition to management of the building, the system automatically and uniformly monitors and controls energy consumption of the facility as a whole. The BEMS is essential for checking the energy consumption and operational status of facilities and equipment in the building to optimize their operations.

TOP30 Building List

東京の低炭素ビルTOP30 所在地マップ

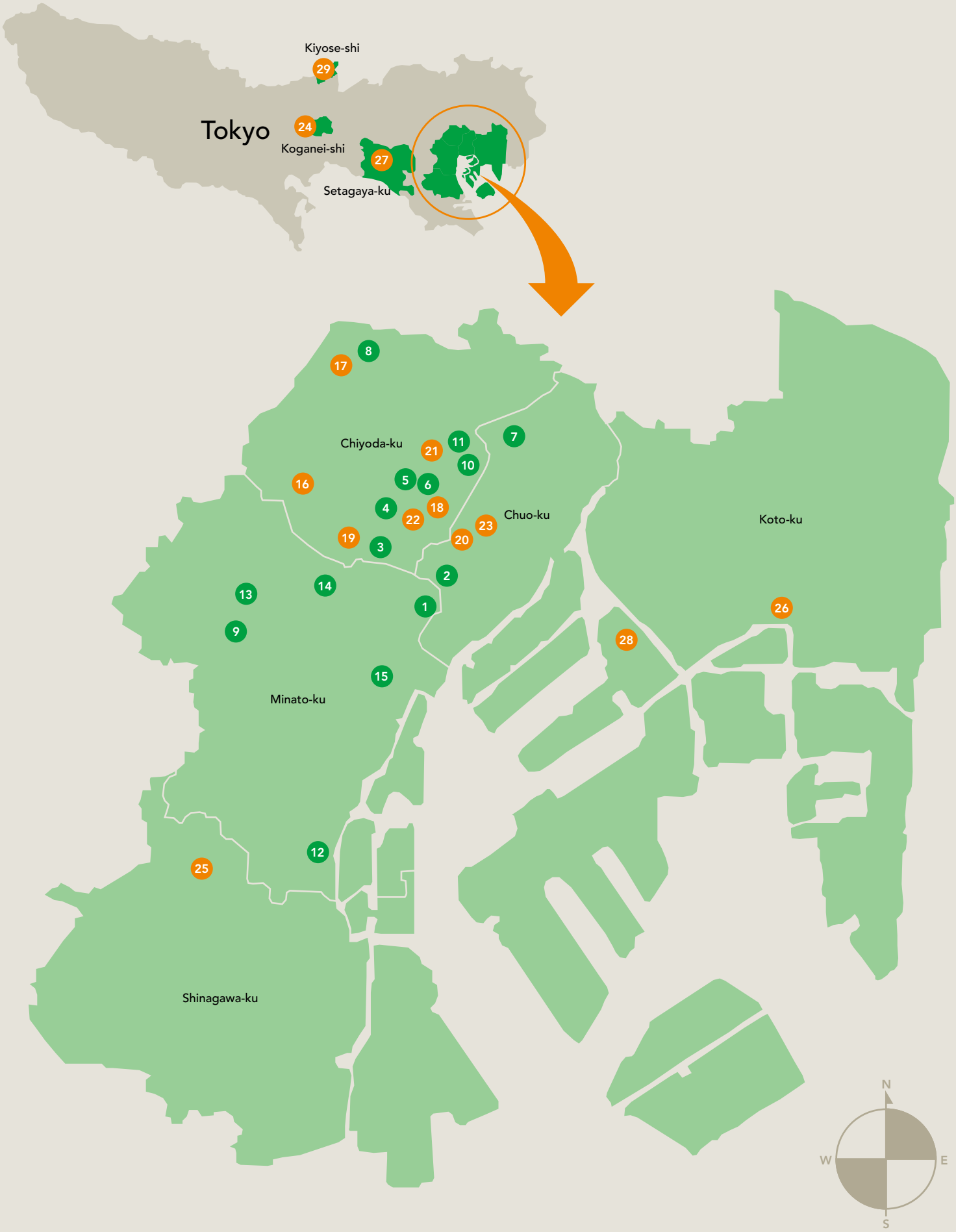
EXISTING BUILDING

1. Dentsu Shiodome Head Office Building
2. Ginza Mitsui Building
3. Hibiya International Building
4. Meiji Yasuda Seimei Building and Meiji Seimei Kan Building
5. Mitsubishi Shoji Building
6. Marunouchi Building
7. Nihonbashi Mitsui Tower
8. Otsuka Corporation Head Office Building
9. Roppongi Hills
10. Sapia Tower
11. Shin-Otemachi Building
12. Sony City
13. Tokyo Midtown
14. Toranomon Towers Office
15. Kokuryu Shiba Koen Building

Alphabetical order

NEW BUILDING

16. Chiyoda Ward Koujimachi Junior High School
17. Fujimi Mirai Kan
18. JP Tower (tentative name)
19. Kasumigaseki Common Gate Central Government Building No.7
20. Kyobashi 3-1 Project (tentative name)
21. Marunouchi 1-4 Project New Building (tentative name)
22. Marunouchi Park Building
23. Shimizu Corporation New Headquarters Construction Project
24. Shopping Center at 1-1 block in the first south area of Musashi-Koganei Station
25. Sony Corporation Sony City Osaki
26. Takenaka Corporation Tokyo Main Office
27. Tokyo Metropolitan Matsuzawa Hospital
28. Toyosu Cubic Garden
29. Obayashi Corporation Technical Research Institute Main Building (Tecno-Station)


Kiyose-shi
29
Tokyo
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Koganei-shi
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Setagaya-ku
Chiyoda-ku
Chuo-ku
Koto-ku
Minato-ku
Shinagawa-ku
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Dentsu Shiodome Head Office Building

電通汐留本社ビル

01

FACT SHEET

Address ——1-chome, Higashi Shimbashi, Minato-ku
Main use——Offices
Site area——17,244m^2
Total floor area ——231,701m^2
Number of floors —48 floors aboveground, 5 basement floors
Date completed —November 2002
Environmental performance assessment
——CASBEE 2004 self-assessment: S
Owner——Dentsu Inc.
Design ——Obayashi Corp.
Design partners —Ateliers Jean Nouvel, Jerde Partnership
URL ——http://www.dentsu.co.jp/

ASSESSMENT

Primary energy consumption: 2,129 MJ/m^2/year
CO_2 emissions: 83.8 kg/m^2/year

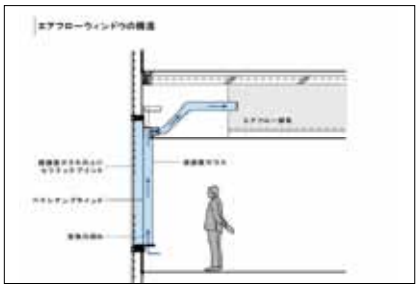
1. **General management**
   Works together with tenants to share problems and find solutions
2. **Energy performance (Building shells and equipment)**
   Has been proactive since completion in reducing CO_2, for example, by installing LED lights in office areas
3. **Operations**
   Fine-tuned operations by season and time band based on studies of efficient operational strategies

The Dentsu Head Office Building was completed in 2002 and was designed around the concept of coexistence with the global environment. Naturally, energy and resource conservation were top priority issues in the design. In particular, the designers investigated the three issues of "restraining air-conditioner load," "using natural energy" and "boosting resource and energy efficiency." To achieve these goals, they made abundant use of the latest in technology and expertise. There are at least 35 major architectural and equipment initiatives in the building, and they have been effective in increasing energy efficiency and reducing CO_2 emissions. At the time of completion, the building was approximately 30% better than conventional structures of the same scale.

After completion, the building has continued to proactively address global warming issues, including the installation of energy-conservation facilities and the adoption of more energy-conserving operations. There have been more than 40 major initiatives, including the introduction of dead bands on air-conditioning controls, improvements to the variable air volume (VAV) program to reduce admixture losses, equipping cold-water heat exchangers in the heating facilities with thermal jackets to prevent heat discharge loss, and installation of gray water treatment equipment to reuse kitchen water as a water resource. A further pioneering initiative was the installation of LED lighting in office areas in January 2010. The building's fluorescent tubes and down lights have a combined total of approximately 20,000 LEDs.

Going forward, the company will formulate a medium- and long-term plan in its "Environmental Strategy Council," an important organization that addresses climate change issues, and under that direction will continue to move forward on initiatives to tackle global warming.

Ceramic printed glass

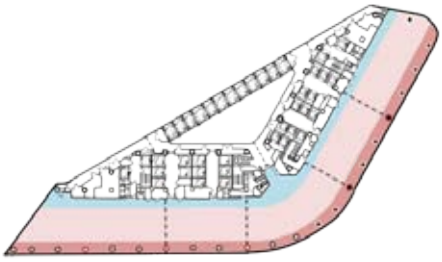


Air flow window

Cold-water heat exchanger thermal jackets

Gray water treatment equipment

Installation of LED lighting in office areas



The areas shaded on the floor plan use LED lighting

Ginza Mitsui Building (Head office building of Ricoh Co., Ltd., Mitsui Garden Hotel Ginza Premier)

銀座三井ビルディング

02

FACT SHEET

Address ——— Ginza 8-chome, Chuo-ku, Tokyo
Main use ——— Tenant building (offices, hotel)
Site area ——— 4,081m^2
Total floor area ——— 50,246m^2
Number of floors — 25 floors aboveground, 2 basement floors
Date completed — September 2005
Environmental performance assessment
——— CASBEE 2004 certification: S
Excellent building in terms of environmental performance and energy
Owner ——— Mitsui Fudosan Co., Ltd.
Design・Operation
——— MHS Planners, Architects & Engineers
Mitsui Fudosan Building Management Co., Ltd.
URL ——— http://www.gardenhotels.co.jp/ginzapremier/

ASSESSMENT

Primary energy consumption: 2,192MJ/ m^2/year
CO_2 emissions: 92 kg/m^2/year

1. General management
Aiming for development that takes performance to a new level by creating a new energy-saving system, with tenants, hotel, building operating company, engineering manager and related partners working together to save energy

2. Energy performance (Building shells and equipment)
Introduction of high-efficiency heat source, use of daylight for lighting, CO_2 control of air-conditioning and free cooling, etc.

3. Operations
Implemented energy management by optimizing use of automatic control and maintenance operation

Ginza Mitsui Building: Environmental Measures

Measures for saving energy

Ricoh Co., Ltd., Mitsui Garden Hotel Ginza Premier, the building operator and the engineering manager worked together to operate and manage energy saving.

- Held meeting to promote reduction of CO_2 emissions(monthly)
- Improved management through repeated PDCA, paying attention to office and hotel environments

Energy-saving targets

Took measures based on energy data analysis using BEMS data, with the aim of saving energy.

- Measures for highly efficient operation of each equipment instrument (heat source, air-conditioning equipment, etc.)
- Considered and implemented renovation work with high investment effect (air-conditioning equipment: introduction of external air volume control based on CO_2 density, etc.)

Measures of tenants

Environmental measures of Ricoh Co., Ltd. (offices)

- Implemented "Cool Biz"
- Turned off heat source and air-conditioning outside of core times
- Implemented light control using daylight for lighting of special rooms

Environmental measures of Mitsui Garden Hotel Ginza Premier (hotel)

- Used LED for lighting equipment of guest rooms
- Guest rooms: Saved energy while maintaining service performance by using an automatic temperature-setting function based on separate patterns
- Implemented highly efficient operation of the heat source

Improvements

Implemented turning and software construction at the primary pump system for the hotel's heat source in order to change the control of the number of units based on flow volume to the control based on real heat quantity.

- Effect: Rate of power reduction – approx. 30%; achieved reduction equivalent to approx. 1% of the annual CO_2 emissions from the hotel

External appearance

Lights down campaign
June 21, 2010

Hibiya International Building

日比谷国際ビル

FACT SHEET

Address ——— 2-2-3 Uchisaiwai-cho, Chiyoda-ku
Main use ——— Office-use tenant-occupied building
Site area ——— 10,396m^2
Total floor area ——— 123,228m^2(Excluding the floor area of the district cooling and heating facility)
Number of floors — 31 floors aboveground, 5 basement floors
Date completed — October 1981
Owner ——— Mitsubishi Estate Co., Ltd.
Operator ——— Mitsubishi Estate Building Management Co., Ltd.
URL ——— http://office.mec.co.jp/lineup/bldg_detail?bd=532

ASSESSMENT

Primary energy consumption: 1,927 MJ/m^2/year
CO_2 emissions: 76.8 kg/m^2/year

1. **General management**
   Requests for cooperation and educational activities on energy saving by holding conference on measures for preventing global warming for tenants and introduction of an environmental and energy information delivery system
2. **Energy performance (Building shells and equipment)**
   Introduction of high-efficiency lighting apparatuses, high-efficiency transformers, air conditioner variable air volume system, total heat exchangers, control of the volume of outside air depending on CO_2 concentration, etc.
3. **Operations**
   Periodic maintenance and improvement of meters and gauges, implementation of broad range of educational activities on energy saving, etc.

This is an office-use, tenant-occupied building completed in 1981 and now in its 30th year. It has 31 floors aboveground. The building receives heat energy and greywater supplied by the district cooling and heating facility.

In anticipation of aging, the building facilities have been renewed based on the plan since around its 20th year. As many adoptable energy-saving technologies as possible have been introduced while analyzing the operation condition of each facility before conducting its renewal and reviewing the facilities in response to the changes. For electrical facilities, the lighting apparatuses and transformers were updated to high-efficiency models. The air conditioning zones were segmentalized and control of the volume of outside air depending on the indoor CO_2 concentration was introduced. For sanitary equipment, water-saving lavatory basins were adopted.

Meanwhile, in terms of building management and control, Mitsubishi Estate, the building owner, acquired ISO14001, an external certification, for its building management, based on which a CO_2 emissions reduction target is established each year and more efficient facility operation is promoted while checking the status of energy consumption daily.

Activities targeted at building users include educational activities on energy-saving conducted via hanging posters, etc. for the general public who use the building, and for tenants by holding twice yearly conferences on measures for preventing global warming, promoting a broad range of energy-saving activities such as “Cool Biz” and requesting cooperation with waste recycling activities.

Meiji Yasuda Seimei Building and Meiji Seimei Kan Building

明治安田生命ビル・明治生命館

FACT SHEET

Address ——————1-1 Marunouchi 2-chome, Chiyoda-ku, Tokyo
Main use——————Tenant occupied building
Site area——————11,347m^2
Total floor area ——178,954m^2
Number of floors —30 floors aboveground, 4 basement floors
Date completed —August 2004
Environmental performance assessment
————————————CASBEE 2006 self-assessment: S
Owner——————Meiji Yasuda Life Insurance Company
Design ——————Mitsubishi Jisho Sekkei Inc.
Operator ——————Meiji Yasuda Real Estate Management Company Limited
URL ——————http://www.meijiyasuda.co.jp/

ASSESSMENT

Primary energy consumption: 1,835MJ/ m^2/year
CO_2 emissions: 72.3 kg/m^2/year

1. **General management**
   Efforts made to reduce CO_2 emissions by proposing and implementing measures for reducing CO_2 emissions based on continuous commissioning data (performance testing data) since the building was completed
2. **Energy performance (Building shells and equipment)**
   The environmental impact of the building as a whole has been reduced by adopting high performance window systems and external ventilation guaranteed air conditioners, and by creating high efficiency heat source systems mainly based on ice storage
3. **Operations**
   The method for operating heat sources has been reviewed and improved in order to achieve higher efficiencies, based on the results of analyzing BEMS data

This building, which was completed in 2005, seeks to bring about the coexistence of a historical building and a skyscraper equipped with the latest technology, by preserving and revitalizing the Meiji Seimei Kan (which has been designated as an important cultural asset) and by creating the new Meiji Yasuda Seimei Building.

For the lighting and air conditioning equipment, which account for more than half of the building's energy consumption, energy efficient systems have been adopted, such as a high efficiency lighting and light control systems, a large temperature differential variable flow system, a guaranteed variable flow air conditioning system that uses external ventilation, and a large scale ice storage systems that is the centerpiece of the high efficiency heat source equipment. The revitalization of the Meji Seimei Kan, an important cultural asset, has been achieved by significantly reducing the transfer force through the adoption of a natural refrigerant circulation method that uses a low temperature heat source derived from ice storage.

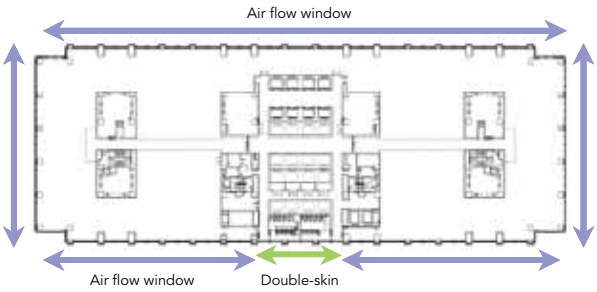
To take advantage of its location facing the Imperial Palace to the left, the Meiji Yasuda Seimei Building has adopted air flow windows that incorporate automatically controlled blinds (with double skins in some parts). This system appropriately controls shielding from sunlight, while still maintaining natural light and the view, striking a balance between the conflicting requirements of letting light in while also shielding against solar radiation, and thereby reducing the load on the air conditioners and reducing the amount of electricity consumed for lighting.

The various energy conservation systems that have been installed aim to substantially reduce energy consumption and CO_2 emissions by seeking and achieving even better operating conditions, in addition to the various operational improvements that have been already been achieved, through a process of consultation and coordination based on collaboration between the owner, the manager, the architect and the construction company.

The Meiji Seimei Kan in the foreground, with the Meiji Yasuda Seimei Building in the background

The atrium linking the old and new buildings

Air flow windows in a typical floor



Floor plan for a typical floor with air flow windows, double-skinned in some parts

Mitsubishi Shoji Building

三菱商事ビルディング

05

FACT SHEET

Address ——— Marunouchi 2-chome,Chiyoda-ku, Tokyo
Main use ——— Head office building
Site area ——— 5,308m^2
Total floor area ——— 59,661m^2
Number of floors ——— 21 floors aboveground, 3 basement floors
Date completed ——— March 31, 2006
Environmental performance assessment
——— CASBEE 2006 self-assessment: S
Owner ——— Mitsubishi Corporation
Design ——— Mitsubishi Jisho Sekkei Inc.

ASSESSMENT

Primary energy consumption: 1,874 MJ/m^2/year
CO_2 emissions: 73.7 kg/m^2/year

1. **General management**
   Actively worked to reduce CO_2 emissions, with a framework for promoting reduction of CO_2 emissions put in place in close collaboration with an environment management system
2. **Energy performance (Building shells and equipment)**
   Introduced high-performance lighting and air-conditioning equipment paying attention to environmental burden
3. **Operations**
   Employees are united in their commitment to energy-saving activities, in addition to the delicate operation of equipment.

The Mitsubishi Shoji Building was completed in March 2006 as an office building blending with the characteristics of the Marunouchi area that faces the Imperial Palace and with attention paid to living in harmony with the environment. A general trading company is the tenant.

The building's standard floors (office floors) are equipped with energy-saving systems such as an automatic ceiling light controller, natural ventilation system and ice thermal storage system, and increase thermal insulation properties from the outside by adopting systems such as a facade that blocks out direct sunlight, airflow (double-paned) windows and a solar position-tracking automatic blind control system. The building also actively adopts various kinds of energy-saving equipment, including an air-conditioning system capable of handling partial loading (zone-mixing VAV unit).

External appearance of Mitsubishi Shoji Building

In conjunction with these facilities, the building uses rainwater by establishing a mid-water system for recycling resources, aiming at 100% cyclical use of waste on the operation side. In the building, all employees work to further save energy (electricity) through environmental management system activities and promotion of initiatives to reduce future CO_2 emissions, including committed introduction of a task and ambient lighting system (reducing the illumination of ceiling lights and complementing desk illumination with LED task lights) in fiscal 2011 and enhancement of LED lighting in some of the common areas.

Marunouchi Building

丸の内ビルディング

06

FACT SHEET

Address ——————2-4-1 Marunouchi, Chiyoda-ku
Main use——————Multiple-use tenant-occupied building
Site area——————10,029m^2
Total floor area ——159,084m^2(Excluding the floor area of the district cooling and heating facility)
Number of floors —37 floors aboveground, 4 basement floors
Date completed —August 2002
Owner——————Mitsubishi Estate Co., Ltd.
Operator ——————Mitsubishi Estate Building Management Co., Ltd.
URL http://office.mec.co.jp/lineup/bldg_detail?bd=916

ASSESSMENT

Primary energy consumption: 3,411MJ/ m^2/year
CO_2 emissions: 135.1 kg/m^2/year

1. **General management**
   Requests for cooperation and educational activities on energy saving by holding conference on measures for preventing global warming for tenants and introduction of an environmental and energy information delivery system
2. **Energy performance (Building shells and equipment)**
   Introduction of high-efficiency lighting apparatuses, lighting control by using daylight, air conditioner variable air volume system, latent heat storage system, air conditioning using outside air, control of the volume of outside air depending on CO_2 concentration, etc.
3. **Operations**
   Periodic maintenance and improvement of meters and gauges, implementation of a broad range of educational activities on energy saving, etc.

This is a multiple-use tenant-occupied building, completed in 2002 and now in its ninth year. It has 37 floors aboveground. The building receives heat energy supplied by the district cooling and heating facility.

This building is designed to proactively take in adoptable energy-saving technologies. For architecture, the louvers on the exterior walls block sunlight. For electrical facilities, high-efficiency lighting apparatuses and lighting control using daylight are adopted. For air conditioning facilities, high-efficiency heat source devices, a latent heat storage system, an air conditioner variable air volume system, air conditioners using outside air and control of the volume of outside air depending on CO_2 concentration are adopted. For sanitary equipment, water-saving lavatory basins are adopted.

Meanwhile, for building management and control, Mitsubishi Estate, the building owner, acquired ISO14001, an external certification, for its building management, based on which a CO_2 emissions reduction target is established each year and more efficient facility operation is promoted while checking the status of energy consumption daily.

Activities targeted at building users include educational activities on energy-saving conducted via hanging posters, etc. for the general public who use the building, and for tenants by holding twice yearly conferences on measures for preventing global warming, promoting a broad range of energy-saving activities such as “Cool Biz” and requesting cooperation with waste recycling activities.

Nihonbashi Mitsui Tower

日本橋三井タワー

07

FACT SHEET

Address ——————1-1 Nihonbashi Muromachi 2-chome, Chuo-ku
Main use——————Tenant-occupied building (offices, hotel, retail shops)
Site area——————14,375m^2
Total floor area ——133,727m^2
Number of floors —39 floors aboveground, 4 basement floors
Date completed —July 2005
Environmental performance assessment
——————CASBEE 2004 certification: S
Owner——————Mitsui Fudosan Co., Ltd.; Sembikiya-Sohonten Ltd.
Design ——————Nihon Sekkei, Inc.
Operator ——————Mitsui Fudosan Building Management Co., Ltd.
URL ——————http://www.mitsuitower.jp/

ASSESSMENT

Primary energy consumption: 2,732MJ/m^2/year
CO_2 emissions:111.5 kg/m^2/year

1. General management
A three-party organization for reducing CO_2 emissions has been established between the tenants, owner, and technical supervisor. CO_2 reduction measures are being implemented that fully utilize various types of measurement data, and the effects have been verified.

2. Energy performance (Building shells and equipment)
Adoption of inverter heat source pumps, use of daylight for lighting exclusive tenant areas, introduction of task & ambient lighting, management of lighting in exclusive tenant areas based on schedules, CO_2 management for air conditioners

3. Operations
CO_2 reduction measures are being implemented effectively, based on comprehensive energy data analysis and maintenance and operation management

CO_2 Reduction Measures at Nihonbashi Mitsui Tower Enhanced Tennant Relations

Measures undertaken at the hotel

A joint application was made with Mandarin Oriental, Tokyo for an excellent business establishment, as the managers of several types of energy sources. As a luxury hotel, the reduction of CO_2 emissions needs to be a focus, while maintaining service quality. For this reason, inverter heat source pumps have been adopted to enhance facility performance, and detailed operation, maintenance and management are being practiced for better operation. Proactive CO_2 reduction measures are being implemented jointly with the building owner.

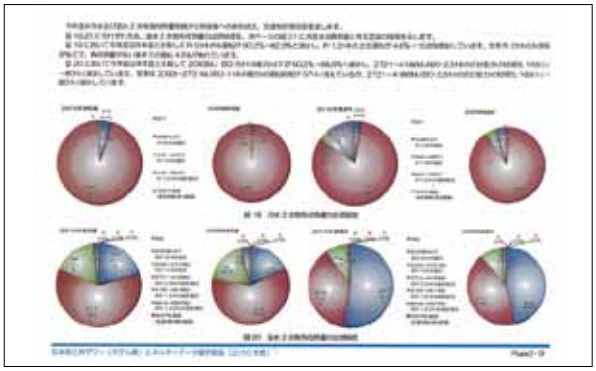
Measures undertaken by office tenants

Information on CO_2 reduction is being exchanged with the tenants at regular monthly meetings. With investments made by both by the building owner and the office tenants, the adoption of task & ambient lighting, human detection and control utilizing human sensors, and the adoption of a lighting schedule are being implemented. The proactive efforts of the tenants have contributed toward the reduction of CO_2 emissions.

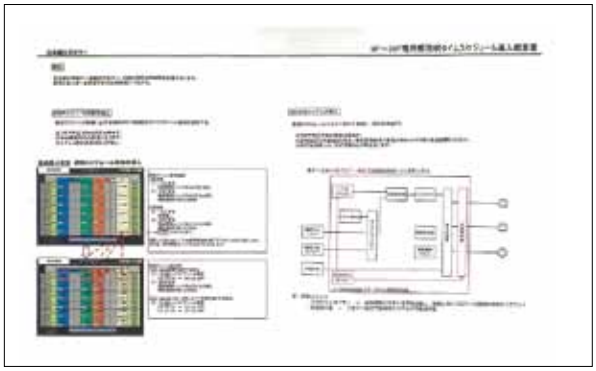
Evaluation of the reduction effects

Our tenants have also generously cooperated in improving operations by setting Cool-Biz temperatures (27°C or higher) and curtailing air-conditioner operation times once rooms cease to be used. In addition, even more effective CO_2 reduction measures and evaluations are being conducted, using around 860 energy data measurement gauges. Through these efforts, a 22% reduction in CO_2 emissions has been achieved by the tenants alone in 2010, compared to the standard year.

Together with the tenants, we will continue focusing on reducing CO_2 emissions.



Energy data analysis for the hotel



Schedule-based lighting system adopted

Photograph showing external appearance

Otsuka Corporation Head Office Building

大塚商会本社ビル

08

FACT SHEET

Address ——————Iidabashi 2-chome, Chiyoda-ku
Main use——————Office
Site area——————3,226m^2
Total floor area ——23,543m^2
Number of floors —12 floors aboveground, 2 basement floors
Date completed —January 2003
Owner——————Otsuka Corporation
Design ——————Nikken Sekkei Ltd.
URL ——————http://www.otsuka-shokai.co.jp

ASSESSMENT

Primary energy consumption: 2,909MJ/ m^2/year
CO_2 emissions: 116.0 kg/m^2/year

1. General management
CO_2 emission status is clarified and reduction plans formulated at regular CO_2 reduction committee meetings
An organization has been established that allows prompt implementation and verification of the plans

2. Energy performance (Building shells and equipment)
A heat storage tank has been adopted and used effectively, at the same time introducing LED lighting and other energy-conserving devices

3. Operations
Building management with greater efficiency and detail has been conducted through analysis of BEMS data, instead of leaving everything to automated systems

The Otsuka Head Office Building has been designed for generation of new IT solutions, under the following design concepts.

Concept1: Office building offering advanced functions and ensures safety
Concept2: Building development gentle on the Earth
Concept3: Creating an affluent "town" open to regional communities

Concerning Concept 2, the building is equipped with the following environmentally considerate technologies and facilities.

1. Rooftop garden as a re-creating of forests in the Musashino plain
2. Urban greening (greening plans integrated with regional development and existing environment), outdoor facilities that recall the historic background
3. Adoption of eco-friendly materials (recycled aluminum panels, etc. using waste glass and aluminum)
4. Reduced fresh air load by heat-dissipating glass and airflow windows
5. Suppressed air-conditioner usage between seasons and at times of emergency, using natural ventilation holes
6. Office lighting controlled by daylight sensor; lights are turned off in public areas when not needed, using human and daylight sensors; decreased use of lighting in elevator shafts by surrounding them with glass
7. Adoption of water-conserving sanitation equipment
8. Employee cafeteria kitchen is entirely powered by electricity
9. Recycled rainwater and greywater from kitchen drains is used as flushing water
10. Waste recycling through sorted treatment; adoption of raw garbage decomposition and treatment facility for reducing waste
11. Rational use of CAD data throughout the design, construction, maintenance and management phases, and other measures for construction management utilizing IT
12. Adoption of facilities for making power consumption visible as a measure to raise awareness on the need to save electricity

Outdoor facility

Rooftop garden

Lobby

Elevator hall

Roppongi Hills (Roppongi Hills Mori Tower, Keyakizaka Complex, Grand Hyatt Tokyo)

六本木ヒルズ

09

FACT SHEET

Address ——————Roppongi 6-chome, Minato-ku, Tokyo
Main use——————Offices, commercial facilities and hotels
Site area——————39,288m^2
Total floor area ——461,151m^2
Number of floors —54 floors aboveground, 6 basement floors
Date completed —April 2003
Owner——————Mori Building Co., Ltd., etc.
Design・Operation
——————Mori Building Co., Ltd., etc.
URL ——————http://www.roppongihills.com/

ASSESSMENT

Primary energy consumption: 3,304MJ/m^2/year
CO_2 emissions: 129.3 kg/m^2/year

1. General management
Enhanced the system for reducing CO_2 emissions and shared awareness of the issue in the Tenant Council
Thorough improvement of efficiency of operation by utilizing BEMS and comprehensive elimination of waste

2. Energy performance (Building shells and equipment)
Heat is supplied by highly efficient DHC using large-scale gas cogeneration
Variable flow and variable air volume systems are also utilized as a secondary system
Various energy-saving systems, such as outdoor air cooling and CO_2 control systems, are also utilized

3. Operations
The daily operation controls were conducted in detail and the operations were reviewed repeatedly by using BEMS in an appropriate manner

The ponds and green zones that were once the Mouri's villa were preserved, and the parks and squares were improved, turning the majority of the planned site into open space and creating an affluent urban space full of lush greenery. To minimize the impact on global warming and the existing infrastructures in the neighboring area of the developed site while maintaining high-quality service provision, efforts are being made to improve the environmental friendliness of the whole district and introduce an energy-saving system.

A highly efficient, environmental, energy-saving system was constructed to supply energy by installing a local cooling and heating plant using the power generated by a large-scale gas turbine and the exhaust heat from the plant. It allows optimal power generation according to fluctuating demand for electricity and heat, cutting down energy by approximately 20% compared with the conventional system while at the same time reducing CO_2 and NOx emissions considerably.

Furthermore, from the viewpoint of resource circulation, a greywater treatment facility and a rainwater treatment facility were constructed to effectively utilize water resources. The greywater treatment facility's capacity to produce greywater is approximately 1,000 m^3 per day, and the greywater produced is used for flushing the toilets. This contributes to savings of approximately 30% of the clean water supply. Rainwater storage tanks were installed in 13 locations throughout the entire district to effectively utilize rainwater for air conditioning systems after filtration.

Even individual buildings in the district, such as Mori Tower, utilize various environmental systems, such as the implementation of commissioning (performance verification) by BEMS and the introduction of a system to provide environmental energy information not only to residents, but also to visitors, in addition to the introduction of various highly efficient devices.

Roppongi Hills Mori Tower

Roppongi Hills Keyakizaka Complex

Grand Hyatt Tokyo

Sapia Tower

サピアタワー

10

FACT SHEET

Address ——————7-12. Marunouchi 1-chome, Chiyoda-ku
Main use——————Offices, conference halls, hotel
Site area——————5,404m^2
Total floor area ——78,279m^2
Number of floors —35 floors aboveground, 4 basement floors,1 penthouse floor
Date completed —March 2007
Environmental performance assessment
——————CASBEE 2008 certification: S
Owner——————East Japan Railway Company
Design ——————Tokyo Construction Office, East Japan Railway Company; JR East Design Corporation
Operator ——————JR East Building Co., Ltd.; Nippon Hotel Co., Ltd.
URL ——————http://www.jebl.co.jp/outline/sapiatower/index.html

ASSESSMENT

Primary energy consumption: 2,321MJ/ m^2/year
CO_2 emissions: 96.3 kg/m^2/year

1. General management
Enhanced cooperative organization with operator and tenants to promote reduction of CO_2 emissions

2. Energy performance (Building shells and equipment)
Introduced system to control outdoor air volume to suit CO_2 density, high-efficiency lighting fixtures, and high-efficiency heat source equipment

3. Operations
Utilized Building and Energy Management System (BEMS) for analyzing energy in detail, and realized efficient facility operations

Sapia Tower is connected directly with Tokyo Station,which is a central train station of Japan located in the Marunouchi business district of Tokyo.

Environmental measures during development

The architectural sustainable building plan that places emphasis on environmental and energy conservation starting from the development phase was certified as Rank S certification, which is the highest in the 2008 CASBEE evaluation for new buildings.

Environmental measures since going into service

CO_2 emissions have reduced significantly since the building has gone into service, as the owner company, operating company, tenants, and facility management company collaborate in making facility investments and improving operation efficiency to further reduce the environmental loads.

- Improved heat insulation of steam and heated water ducts (CO_2 emissions reduced by about 45 ton-CO_2 /year)
- Adopted a device to control the outdoor air intake volume to suit the CO_2 density (CO_2 emissions reduced by about 85 ton-CO_2 /year)
- Adopted a device to control the secondary chilled water and heated water pumps based on the estimated pressure difference at the terminals (CO_2 emissions reduced by about 46 ton-CO_2 /year)
- Replaced lamps with LED lamps (office, conference hall, corridors, hotel restaurant, guest rooms, etc.) (CO_2 emissions reduced by about 85 ton-CO_2 /year)
- Ceased operation of one transformer unit for power reception (CO_2 emissions reduced by about 35 ton-CO_2 /year)
- Organized meetings (for the owner and operating companies group, tenant group) as occasions for formulating policies for reducing CO_2 emissions and sharing information

Shin-Otemachi Building

新大手町ビル

FACT SHEET

Address ——————2-2-1 Otemachi, Chiyoda-ku
Main use——————Office-use tenant-occupied building
Site area——————8,530m^2
Total floor area ——87,988m^2(Excluding the floor area of the district cooling and heating facility)
Number of floors —10 floors aboveground, 3 basement floors
Date completed —December 1958
Owner——————Mitsubishi Estate Co., Ltd.
Operation ————Mitsubishi Estate Building Management Co., Ltd.
URL ———————http://office.mec.co.jp/lineup/bldg_detail?bd=544

ASSESSMENT

Primary energy consumption: 1,633MJ/m^2/year
CO_2 emissions: 63.8 kg/m^2/year

1. **General management**
   Requests for cooperation and educational activities on energy saving by holding conference on measures for preventing global warming for tenants and introduction of an environmental and energy information delivery system
2. **Energy performance (Building shells and equipment)**
   Introduction of high-efficiency lighting apparatuses, lighting control by using daylight, segmentalized air conditioning zones, control of the volume of outside air depending on CO_2 concentration, etc.
3. **Operations**
   Periodic maintenance and improvement of meters and gauges, implementation of a broad range of educational activities on energy saving, etc.

This is an office-use, tenant-occupied building, completed in 1958 and now in its 53rd year. It has 10 floors aboveground. The building receives heat energy supplied by the district cooling and heating facility.

When the building was broadly refurbished due to aging around its 40th year, its facilities were also refurbished taking energy-saving characteristics into account. The lighting apparatuses were renewed to high-efficiency lights and sensors to detect illumination intensity were installed. The air conditioning zones were segmentalized and variable air volume systems were introduced. Regarding sanitary equipment, water-saving lavatory basins were adopted. Even after the large-scale refurbishment, adoptable energy-saving technologies are being studied in order of precedence and the refurbishment continues.

Meanwhile, in terms of building management and control, Mitsubishi Estate, the building owner, acquired ISO14001, an external certification, for its building management, based on which a CO_2 emissions reduction target is established each year and more efficient facility operation is promoted while checking the status of energy consumption daily.

Activities targeted at building users include educational activities on energy-saving conducted via hanging posters, etc. for the general public who use the building, and for tenants by holding twice yearly conferences on measures for preventing global warming, promoting a broad range of energy-saving activities such as “Cool Biz” and requesting cooperation with waste recycling activities.

Sony City

ソニーシティ

FACT SHEET

Address ——————1 cho-me, Konan, Minato-ku
Main use——————Office/Conference Hall/Shops etc
Site area——————18,165m^2
Total floor area ——162,888m^2
Number of floors —20 floors aboveground, 2 basement floors
Date completed —October 2006
Owner——————Sony Corporation
Sony Life Insurance Co,.Ltd

ASSESSMENT

Primary energy consumption: 1,772MJ/ m^2/year
CO_2 emissions: 70.9 kg/m^2/year

1. General management
Close exchanges of views with tenants for proper building management

2. Energy performance (Building shells and equipment)
・Double Layered Framework
・High-efficiency of Heat Source System
・Use of untapped energy

3. Operations
Verification of the actual data and continuous improvement of operation

Sony City is the headquarters building of Sony Corporation. From construction plan phase to office operation phase, Sony has promoted the following environmental consciousness to this building at the maximum level.

Main measurements for reducing CO_2 emissions

1. **Introduction of a Double Layered Framework (outside wall)**
   Blinds are set between the double layers, and the structure discharges the heat collected between the double layers into the outside by the natural ventilation. (Figure 1)
2. **Introduction of high-efficiency of Heat Source System**
   We introduce inverter centrifugal chillers and high-efficient centrifugal chillers, and large thermal storage for heating and cooling.
   We implement optimal control as a whole system to operate each equipment at maximum efficiency by introducing high- efficient integrated heat source system, which has been introduced in our semiconductor factories.
3. **Use of untapped energy**
   We utilize untapped energy for use in heat source equipment from treated sewage water from the nearby Shibaura Water Treatment Center of Tokyo Metropolitan Government Bureau. (Figure 2)
4. **Energy management by monitoring in real time**
   We continuously implement study of actual data and operation improvement by utilizing online monitoring system on the Web.

Building Extenor

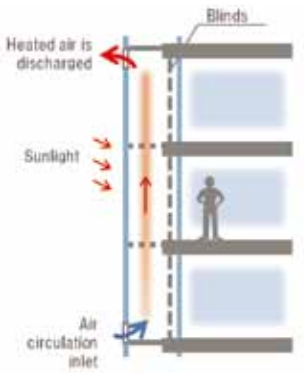


Figure 1 : Image of a Double Layered Framework

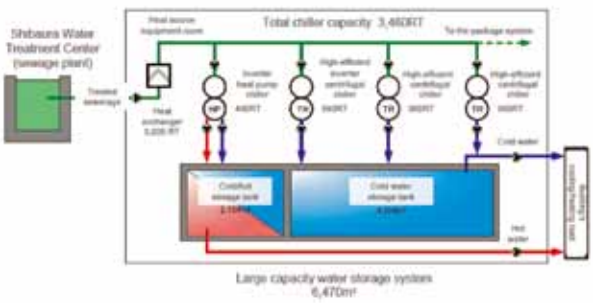


Figure 2 : Heat Source System Structure

Tokyo Midtown

東京ミッドタウン

FACT SHEET

Address ——— Akasaka 9-chome, Minato-ku, Tokyo
Main use ——— Tenant building
Site area ——— 63,531m^2
Total floor area ——— 456,340m^2(except housing)
Number of floors ——— 54 floors aboveground, 5 basement floors
*Tower building
Date completed ——— January 2007
Owner ——— Mitsui Fudosan Co., Ltd. and nine other companies
Design・Operation
——— Nikken Sekkei Ltd.
Tokyo Midtown Management Co., Ltd.
URL ——— http://www.tokyo-midtown.com

ASSESSMENT

Primary energy consumption: 2,755MJ/m^2/year
CO_2 emissions: 114.7 kg/m^2/year

1. General management
Strengthened a cooperative framework with tenants and information sharing
Implement an energy analysis and diagnosis based on performance verification each year after completion

2. Energy performance (Building shells and equipment)
Introduced high-efficiency heat source equipment
Introduced eco-friendly and energy saving-conscious outer surface for the building

3. Operations
Implemented delicate management for optimized operation by conducting efficiency analysis of each equipment instrument
Continually improve operation by analyzing it based on performance data.

Development concept of Tokyo Midtown

With "on the green," "diversity" and "hospitality" as the concepts for a large-scale urban redevelopment project of a planned area of approximately 10 hectares, urban development was conducted with attention paid to urban rejuvenation, sustainable energy saving and resource saving, and coexistence with the environment.

Urban rejuvenation

With the aim of creating a complex city coupled with all the functions of work, life, play and rest, a town with diversified functions (diversity) was created by establishing facilities such as offices with high functionality, housing, a hotel, commercial facilities, parks and museums.

Sustainable energy saving and resource saving

With an eye toward sustainable architecture, an energy-and resource-saving infrastructure system was constructed, aiming to create a low-carbon town with measures for long operating life as well as high functionality.

Coexistence with the environment

Measures to moderate the heat-island phenomenon were taken by arranging green areas throughout the town, in addition to an open green space of approximately 4 hectare combined with Minato-ku's Hinokicho Park.

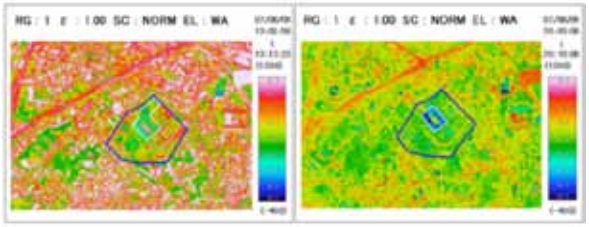
Measures to reduce CO_2

Related parties such as the building owner, operating company and tenants are proactively working together to improve the efficient operation based on the operation analysis of each equipment instrument.


External appearance


Green space of approx. 4 ha


Sunshade louver


Thermal image from above: Temperature is 3°C and 1°C lower than the surrounding areas respectively during the day and night


Underground space using natural light


Cogeneration system

Toranomon Towers Office

虎ノ門タワーズ オフィス

14

FACT SHEET

Address ——————1-28, Toranomon 4-chome, Minato-ku,
Main use——————Tenant occupied building
Site area——————6,733m^2
Total floor area ——59,705m^2
Number of floors —23 floors aboveground, 3 basement floors
Date completed —August 2006
Environmental performance assessment
——————CASBEE 2006 self-assessment: S
Owner——————KT Buildings Limited
Design・Operation
——————Kajima Corporation
URL ——————http://www.toranomontowers-office.jp/

ASSESSMENT

Primary energy consumption: 1,712MJ/ m^2/year
CO_2 emissions: 69.8 kg/m^2/year

1. General management
An Energy Conservation Committee has been formed with the tenants as its members, so that tenants and building operators can work together to cut greenhouse gas emissions.

2. Energy performance (Building shells and equipment)
The building has been constructed so as to conserve energy, and has also been equipped with energy conservation systems, such as high efficiency heat source systems.

3. Operations
Continuous performance testing and operational improvements are being made so that the energy conservation facilities and systems can operate rationally, based on an understanding of the design intent in accordance with BEMS data.

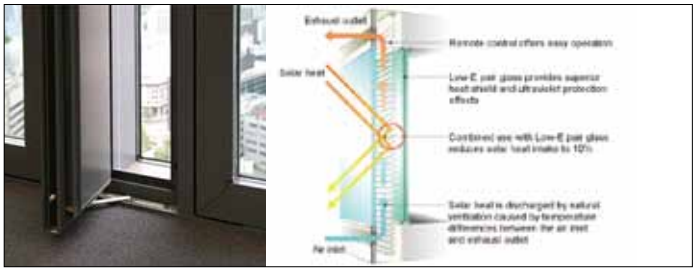
This building, which was completed in 2006, makes proactive use of futuristic environmental technologies.
In terms of construction and facilities, the building has a double-skin curtain walls and a high efficiency heat source and air conditioning system. A Web-based system has been installed that allows tenants to check the status of greenhouse gas emissions and energy conservation measures for the area that they occupy. Similarly, in terms of management and operations, energy conservation facilities are operated efficiently based on analyses of BEMS data. Energy Conservation Committee meetings are also held, and are attended by building tenants.

The cooperation of tenants is essential in order to achieve energy conservation for the building as a whole. Since different tenants have different approaches to energy conservation, efforts are made to respond precisely to these different approaches. For example, as a mechanism for encouraging voluntary and proactive engagement, the building operators have prepared a "menu" of energy conservation measures, and the building operators change settings in accordance with requests from tenants.

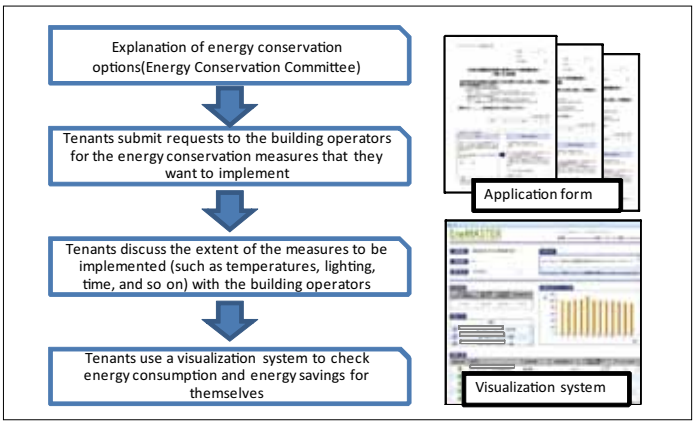
As well as checking the benefits of operational improvements by continuously creating reports that summarize the energy consumption status, a PDCA management cycle is also being implemented in relation to energy conservation, with proposals for new energy conservation measures.

Kajima Corporation and its group companies will continue to put their joint energies into proactively pursuing tenant-oriented energy conservation activities, so that our buildings can continue to be selected by tenants.

The Toranomon Towers Office building on the right. To the left is a residential building.



Double-skin curtain walls cross-sectional



Working together with tenants on energy conservation activities

Kokuryu Shiba Koen Building

黒龍芝公園ビル

15

EXISTING BUILDING

15

Kokuryu Shiba Koen Building

FACT SHEET

Address ——— Shibakoen 2-chome, Minato-ku
Main use ——— Tenant-occupied building
Site area ——— 1,457m^2
Total floor area ——— West building: 2,853m^2
East building: 6,646m^2
Number of floors ——— West building: 6 floors aboveground, 1 basement floors
East building: 9 floors aboveground, 1 basement floors
Date completed ——— Completed in 1970
Expanded in 1978
Renovated in 2006
Owner ——— Kokuryudo Co., Ltd.
Name of technical advisor
——— Yabana Yoshiji (Advisor), Shimizu Corporation
URL ——— http://www.kokuryudo.co.jp/

Evaluation of Business Establishment Commended by the Governor

Unit CO_2 emissions: 57.9 kg/m^2/year (fiscal 2009)
1. Reduction ratio in total emissions: 20.4%
2. Reduction ratio for the target measures※ implemented: 18.3%
3. Major measures:
① Introduction of VAV to manage air-conditioning compartments
② Replaced lighting facilities with inverter fixtures
③ Set up a promotion committee with the participation of all tenants for sharing information, and reimbursed both the tenants and the building management company for the economic benefits obtained through the measures

※Target measures: measures through which facilities with an investment recovery period of four years or more are introduced

Kokuryu Shiba Koen Building is one of the tenant-occupied buildings owned and operated by Kokuryudo Co., Ltd., a cosmetics manufacturer established in 1907. Efforts are being made to achieve a low-carbon way of life as part of the plan for enhancing asset values that aims to improve tenant satisfaction and the added value of the building.

Of the energy within the building, 80% is consumed by the tenants. As a tenant-occupied building, however, it is difficult to control energy consumption through force. We presented the tenants with details of the energy usage direction targeted by our building to share awareness and information, referring to the guidelines of the Tokyo Metropolitan Government. In addition, an incentive system was introduced, whereby part of the energy cost reductions achieved through energy conservation measures are reimbursed to the tenants, thereby encouraging all tenants to undertake self-initiated energy conservation efforts. Reimbursement was also made to the building management company responsible for facility operation, in amounts commensurate with the reduction in energy consumption.

Our efforts and outcomes indicate that the transition to a low-carbon lifestyle within a tenant-occupied building is not just asking tenants to be open-minded with regard to saving energy, and also that it is not merely an issue of old or new building facilities. We intend to make the process of awareness and information sharing even more intensive, with the aim of achieving both a comfortable and low-carbon lifestyle at the same time.

Kokuryu Shiba Koen Building, located in Shiba Koen and surrounded by abundant greenery (The two buildings on the right; the one on the left is the west building, and the one on the right is the east building)

Chiyoda Ward Koujimachi Junior High School

千代田区立麹町中学校

16

FACT SHEET

Address ——————Hirakawacho 2-5-1, Chiyoda-ku
Main use——————Junior High School
Site area——————8,794m^2
Total floor area ——12,222m^2
Number of floors —6 floors aboveground, 1 basement floors
Date completed —September 28, 2012 (scheduled)
Environmental performance assessment
——————————CASBEE 2008 brief version self-assessment: S
Owner——————Chiyoda-ku
Design ——————Nihonsekkei Inc.
Construction ———Fujita/Bairin/Tokiwa JV, Toko/Iwasaki JV,
Daidan/Sakyu JV, Nikkan/Sato JV,
Mitsubishi Electric Corporation

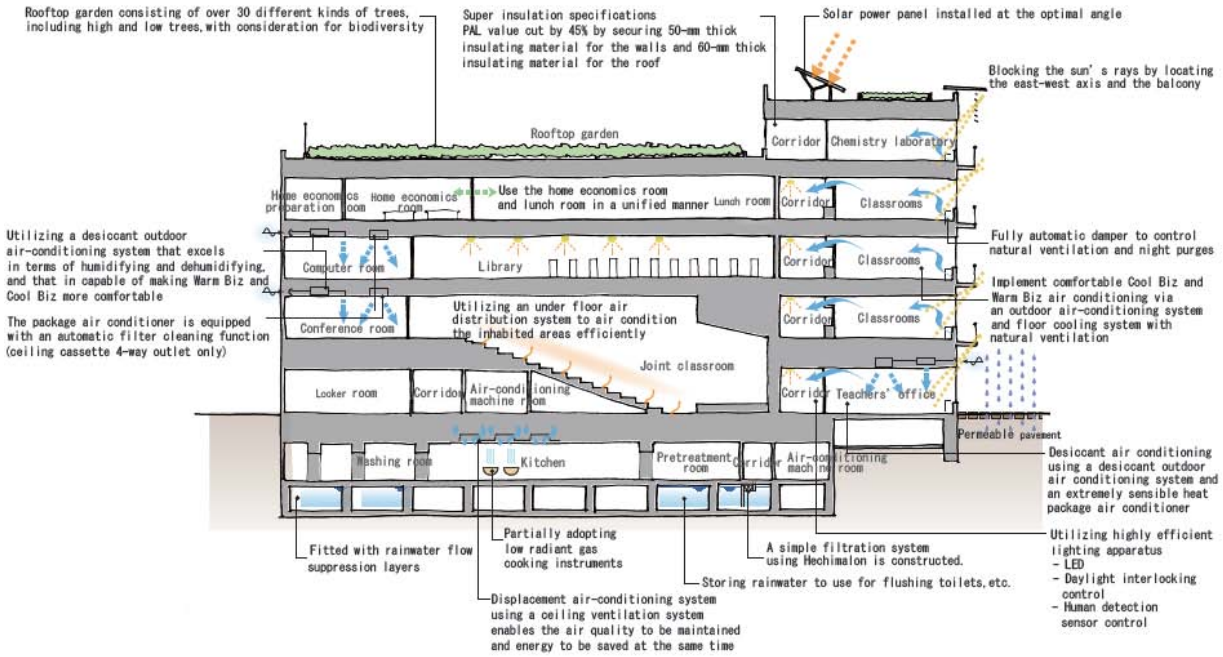
ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 47.41%)**
   Adoption of Low-e pair glass (U=2.40W/m^2・K), canopy, and rooftop gardening
2. **Energy efficient equipment (ERR: 41.76%)**
   Adoption of micro cogeneration system and water storage (COP3.26)
3. **Efficient operating systems**
   Power and calorimetric measurement by area using BEMS
4. **Use of renewable energy (60kW)**
   Geothermal utilization using cool heat trench and solar power generation 60kW

Reduce CO_2 emissions as an environment-conscious model school

This building aims to be a practical study example for environmental education as a cutting-edge eco-school.

- It maximizes the utilization of natural energy by using solar power, geothermal energy and a natural ventilation system to reduce the environmental burdens of the metropolitan area.
- It will be a place to experience and learn that serves as ecological study material, allowing students to familiarize themselves with nature and the environment through water, light, air (heat) and soil.
- It utilizes highly efficient devices and systems including LED lighting, a humidity outdoor air-conditioning system, a water storage system, and a floor radiation cooling and heating system.
- Cogeneration system using micro cogeneration, which is capable of generating power even during power outages.



Fujimi Mirai Kan

富士見みらい館

FACT SHEET

Address ——— 1-10-3 Fujimi, Chiyoda-ku
Main use ——— Elementary school, children's daycare facilities, children's accommodation
Site area ——— 3,776m^2
Total floor area ——— 13,533m^2
Number of floors — 6 floors aboveground
Date completed — January 2010
Environmental performance assessment
——— CASBEE 2008 self-assessment: A
Owner ——— Enfant Fujimi Inc. (PFI in Chiyoda-ku)
Design ——— Nissoken Architects / Engineers, Inc.
Construction ——— Kyoritsu/ Ueki Construction Joint Venture; Tokyo Energy & Systems/FS Techno Service Joint Venture; Mitsubishi Electric Building Techno Service; Kinza Joint Venture

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 22.22%)**
   Greening of building walls, fences, roof, and balcony
2. **Energy efficient equipment (ERR: 45.63%)**
   Heated water supply using heat pumps, ice thermal storage heat pumps, nighttime heat storage steam generator, high-efficiency lighting apparatus, control system linked to daylight, lighting adjustment system for appropriate luminance
3. **Efficient operating systems**
   Independent air-conditioning systems, energy consumption measurement systems
4. **Use of renewable energy (65kW)**
   Solar power generation (35kW), wind power generation (1kW), panels for collecting solar heat on outer walls (29kW), geo-heat ventilation system, rainwater recycling system

This is a childcare facility for children aged between 0 and 18 years, comprising an elementary school, children's daycare center combining a kindergarten and daycare center, development support functions for school children, and a community center, developed as a PFI project.
The facility enables greenery to be experienced in an urban setting with a limited land area, with greening on the external walls that harmonizes with the trees along the street, as well as a playground with natural grass and greening fences, and a rooftop vegetable patch cultivated by the children. The facility also uses solar power generation, wind power generation, panels for collecting solar heat on the external walls, a geo-heat ventilation system and other natural energy sources to reduce CO_2 emissions and heat-island phenomena. An urban eco-school has been created where children can interact with diverse aspects of the natural environment, by making environmental measures as visible as possible and being available for children's environmental studies.

Main approach and greening on outer walls

Facility composition unified with environmental measures

JP Tower (tentative name)

JP タワー（仮称）

18

FACT SHEET

Address ——————2-7-2, Marunouchi, Chiyoda-ku
Main use——————Offices, retail shops, parking etc
Site area——————Approx. 11,600m^2
Total floor area ——Approx. 212,000m^2
Number of floors —38 floors aboveground, 4 basement floors
Date completed —Spring, 2012 (scheduled)
Environmental performance assessment
——————————CASBEE 2006 self-assessment: S
Owner——————Japan Post Network Co., Ltd.
East Japan Railway Company,
Mitsubishi Estate Co., Ltd.
Design and Supervision
——————————Mitsubishi Jisho Sekkei Inc.
Construction ———Taisei Corporation

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 34%)**
   High-performance Low-e glass + air barrier window Sunshade louvers
2. **Energy efficient equipment (ERR: 35% offices)**
   Natural ventilation window in an atrium
   Cooling with outside air, VAV control, VWV Control, High-efficiency transformers
3. **Efficient operating systems**
   Building and Energy Management System
   Monitoring individual energy consumption
4. **Use of renewable energy (60kW)**
   60kW photovoltaic modules
   Underfloor heating /cooling system with ground source heat pumps

Measures to reduce environmental burden in the JP Tower design

Achieving both human comfort and drastic energy conservation in the office floors

Offices on the upper floors are designed to ensure superb views while at the same time reduce skin load by combining sun-shielding louvers and an air flow window system using Low-e glasses with high thermal insulation and heat-shielding performance. Other energy saving systems will also be introduced including LED illumination, utilization of natural daylight, and outdoor air cooling. Through these energy saving efforts, we are aiming to reduce CO_2 emission by 4,700 tons per year, and reduce CO_2 emission intensity in the office area to a level 36% lower than the office standards specified by TMG in the "Tokyo Green Building Guidelines".

Incorporating natural energy in the atrium environment

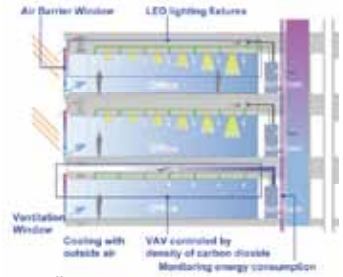
We will make maximum use of natural energy sources such as sunlight, wind and water to save energy consumption in the atrium space.

- Utilization of sunlight: Installation of see-through type solar panels on the top light
- Utilization of the wind: Natural ventilation by opening and closing the top-light window
- Utilization of water: Introduction of a heating/cooling system utilizing geothermal energy to tap unused energy sources and mitigate the heat- island phenomenon

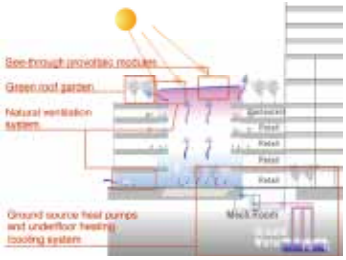
Target: reduction of CO_2 emission by 110 tons per year through utilization of natural energy

CO_2 reduction by district heating and cooling (DHC)

The heat and cold source system to be used in this plan will be collaboratively operated with another DHC system of an adjacent building, thus aiming to reduce CO_2 emission by 850 tons annually.



Tower office section



Atrium section

Kasumigaseki Common Gate–Central Government Building No.7

霞が関コモンゲート・中央合同庁舎第７号館

19

FACT SHEET

Address ——— 2-1, 2-2, and 2-3, Kasumigaseki 3-chome, Chiyoda-ku
Main use ——— Offices, retail shops, parking
Site area ——— 24,232m^2
Total floor area ——— 253,493m^2
Number of floors — 38 floors aboveground, 3 basement floors
Date completed — September 30, 2008
Environmental performance assessment
——— CASBEE 2006 self-assessment: S
Owner ——— Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Education, Culture, Sports, Science and Technology, Japan, Board of Audit of Japan, Financial Services Agency, Urban Renaissance Agency, Kasumigaseki Nanagoukan PFI Kabusikigaisya
Design ——— JV of Kume Sekkei Co., Ltd., Taisei Corporation, and Nippon Steel Engineering Co., Ltd.
Construction ——— JV of Taisei Corporation, Nippon Steel Engineering Co., Ltd., Nippon Dentetsu Kogyo Co., Ltd., and Mitsubishi Heavy Industries Parking Co., Ltd.
URL ——— http://www.kasumigaseki-commongate.com/

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 29%)**
   Main measures implemented: Low-e double glass (U=2.6W/m^2-K), horizontal louvers, column-shaped projections beside windows, rooftop greening, etc
2. **Energy efficient equipment (ERR: 43% offices)**
   Main measures implemented: Gas co-generation systems (CGS), fuel cells, water supply utilizing large temperature differences, variable water flow volume systems, temperature stratification-type heat storage tanks, fresh air cooling, volume control of fresh air intake by CO_2 concentrations, simple air-flow windows, variable air flow volume systems, use of greywater, etc
3. **Efficient operating systems**
   Main measures implemented: Measurement of supplied electricity, heat volume, and water volume by areas and uses, utilizing BEMS
4. **Use of renewable energy (77 kW)**
   Main measures implemented: Solar power generation, wind power generation, natural ventilation (night purge), lighting control utilizing daylight, earth tubes (geothermal utilization), use of rainwater, etc

The project, which is a large-scale collaborative project utilizing PFI undertaken by government-private sectors, is for an advanced super high-rise building that takes energy conservation and environmental consideration, designed under the three concepts of urban renaissance, environmental co-existence, and the revival of history.

Direct use of natural energy sources

・Lighting control using daylight
Sensors installed in offices detect daylight to correct the illuminance of lighting apparatus and save electricity.

・Night purge
The building frame is cooled by natural ventilation at night, utilizing the chimney effect in the void space, thereby reducing the air-conditioning load during the day.

Indirect use of natural energy sources

・Solar power generation and wind power generation
Polycrystalline silicon solar power generation panels and wind power generation facilities have been installed on the roof of the high-rise building.

Diverse measures for energy conservation and reduction of environmental loads

・Co-generation systems (CGS)
Electricity is generated using a gas engine generator and fuel cells, and the waste heat is used for air conditioning and hot water supply in an effort to enhance energy efficiency.

・Highly efficient chilled water heat storage system
Heat source equipment is operated at high efficiency at night to store chilled water in the heat storage tanks for use by the air conditioners during the day. The heat storage tanks are of a highly efficient temperature stratification type, helping to level electricity demand.

・Simple airflow window
The air conditioning loads have been reduced by the windows of the office spaces, by discharging heated air near the ceilings during summer and discharging chilled air from underneath the windows during winter.

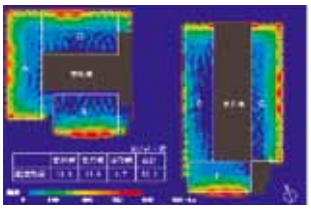
・Using greywater and rainwater
Efforts are being made to save water resources by utilizing greywater such as miscellaneous drains and kitchen drains, as well as rainwater, to flush toilets and water plants.

・Rooftop greening
The air conditioning loads in low-rise sections (conservation wings) have been reduced through rooftop afforestation.

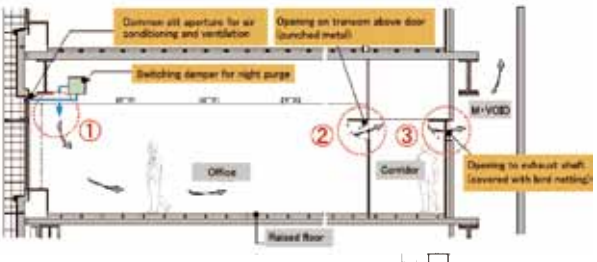

Appearance of the building


Solar power generation panels on the roof

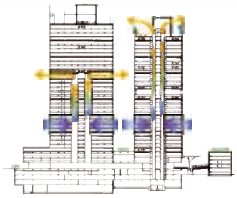

Rooftop greening in low-rise sections


simulation of lighting control using daylight


lighting in the office space



Schematic drawing of night purge; photographs of air way ((1) to (3))



(tentative name) Kyobashi 3–1 Project

（仮称）京橋3–1プロジェクト

FACT SHEET

Address ——————Kyobashi 3-chome, Chuo-ku
Main use——————Offices/merchandisers/ restaurant/meeting places
Site area——————8,131m^2
Total floor area ——Approx. 117,000m^2
Number of floors —24 floors aboveground, 4 basement floors
Date completed —March 2013 (scheduled)
Environmental performance assessment
——————————CASBEE 2008 self-assessment: S
Owner——————Kyobashi Development Special Purpose Corporation, etc.
Design ——————Nikken Sekkei Ltd./Nihonsekkei Inc. Joint Venture
Shimizu/Taisei (Tentative) Kyobashi 3-1 Project Design and Supervision Joint Venture
Construction ———Shimizu/Taisei (Tentative) Kyobashi 3-1 Project New Construction Joint Venture

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 43.93% offices)**
   Upper floors: Adopting large canopies, Low-e pair glass
   Lower floors: Large-scale rooftop gardening in addition to the canopies
2. **Energy efficient equipment (ERR: 39.78%)**
   Air conditioning: cooling with outside air (office floors), inverter control
   Lighting: Automatic light control for offices using sensors, LED lighting for common use spaces
   Satellite: use of rainwater and greywater
3. **Efficient operating systems**
   Energy control through utilizing BEMS
4. **Use of renewable energy (180kW)**
   Solar power generation of 50kW is installed
   A geothermal utilization heat pump chiller with a thermal source capacity of 130kW is installed

CO_2 reduction technology in this project and its impact

Hybrid exterior

The building in this project blocks the sun's rays with large canopies fitted around the building's exterior, and takes in natural light by opening the canopies wide. The large canopies also serve as a corridor for the maintenance of the exterior walls, facilitating maintenance and thus contributing to the long life of the building To comprehensively reduce the heat load, Low-e double-glazed glass is utilized for the windows, and solar tracker electric blinds are also installed. In addition, the CO_2 reduction hybrid exterior consists of several CO_2 reduction technologies, including the natural ventilation system on the exterior walls that utilizes the eco-void and lighting load reduction by using human detection and brightness sensors.

CO_2 reduction heat source/facility system

The operation efficiency is improved by reducing the peak load through the super heat shield and super insulation of the exterior walls, the heat storage tank, the outside air volume control and LED lighting to downsize the heat devices, and by maintaining a constant heat load level throughout the year.

Renewable energy utilization system

Geothermal heat, which is untapped energy in urban areas, is pumped out from the underground part of the building for use in cooling or heating the building. The rooftop is covered by as many solar power panels as the space allows.

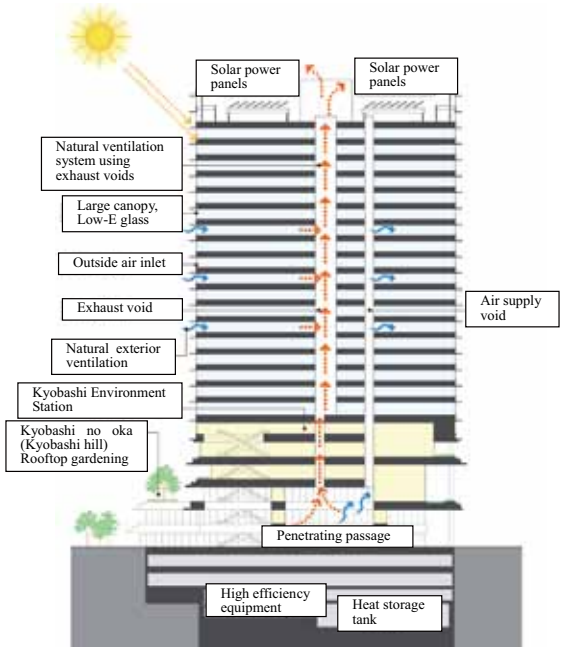


Image of approach for reducing CO_2

(tentative name) Marunouchi 1–4 Project New Building

（仮称）丸の内1–4計画新築工事

FACT SHEET

Address	1-2-1, 2, 3, 4 and 5 Marunouchi, Chiyoda-ku
Main use	Offices, finance-related stores, stores, parking, daycare center
Site area	8,034m^2
Total floor area	Approx. 139,000m^2
Number of floors	27 floors aboveground, 4 basement floors, 3 penthouse floors
Date completed	January 2012 (scheduled)
Owner	Mitsubishi Estate Co., Ltd., The Sumitomo Trust & Banking Co., Ltd. and The Bank of Tokyo-Mitsubishi UFJ, Ltd.
Design	Mitsubishi Jisho Sekkei Inc.
Construction	Shimizu Corporation, Kyudenko Co., Inc., Mitsubishi Electric Corporation, Shinryo Corporation, Hitachi Ltd., Saikyu Kogyo Co., Ltd. and DRICO Ltd.

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 30% Offices)**
   Introduction of air-flow windows (Low-e pair glass for exterior)
2. **Energy efficient equipment (ERR: 35% offices)**
   Installation of total heat exchangers and IPM motors in the offices on the standard floors
   Installation of LED lighting in entire building
3. **Efficient operating systems**
   Measurement of amount of use of electricity and heat in each of the air conditioning systems of offices on the standard floors
   Energy control with BEMS
   Implementation of commissioning
4. **Use of renewable energy (100kW)**
   Installation of 100kW solar power generation system

Approaches to coexistence with the global environment

Reduction of heat load of the exterior

- Airflow window system and Low-e pair glass
  The airflow inlets are incorporated into the baseboards to neutralize cold drafts during the winter while reducing the heating and cooling load.
- Horizontal and vertical louver optimized based on direction
  Deep fins effective for shielding direct sunlight are installed, considering the sun's location in each direction.
- Solar tracking automatic angle control blind
  The automatic angle control assures sunlight shielding, good visibility and passage of light.
- Energy-saving using daylight
  Maximized opening assures good visibility, while reducing lighting energy by taking in natural light.
- Cool roof
  The thermal barrier coating is applied to the rooftop to prevent the room temperature from rising due to sunlight.

Adoption of high-efficiency facilities

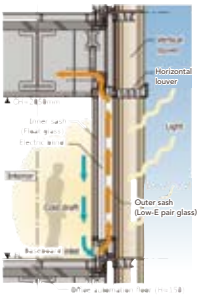
- Adoption of ultrahigh efficiency transformer
  Adoption of a high-efficiency transformer that exceeds even the leading standard value of transformers reduces loss of power in the transformer and contributes to further reduction of CO_2 emissions.
- Adoption of total heat exchangers for office air conditioning
- Adoption of IPM motors for air conditioners and pumps
- Reduction of amount of ventilation by adopting DRV (highly efficient suction hood) for the kitchen

Improvement of operation efficiency

- Installation of a calorimeter and power meter in each air conditioner
  Measuring amount of heat in each of the seven air conditioners enables even more detailed energy-saving operation control.
- Implementation of commissioning

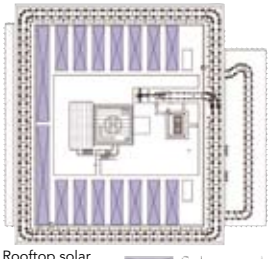
Use of natural energy

- Solar power generation
  Power generation output, of approx. 100kW, which is largest in the area
- Natural ventilation (on floors 6 and 8-10)
- Installation of void inside the core (to take in outside air)



Airflow window system


Measurement units of standard floor office



Rooftop solar power generation

Marunouchi Park Building

丸の内パークビルディング

FACT SHEET

Address ——— 2-6-1 and 2 Marunouchi, Chiyoda-ku
Main use ——— Offices, stores, art museum, parking, district heating and cooling facility
Site area ——— 11,932m^2
Total floor area ——— Approx. 204,700m^2
Number of floors — 34 floors aboveground, 4 basement floors,3 penthouse floors
Date completed — April 2009
Owner ——— Mitsubishi Estate Co., Ltd,
Design ——— Mitsubishi Jisho Sekkei Inc.
Construction ——— Takenaka Corporation, Kinden Corporation, Toko Electrical Construction Co., Ltd., Koudensha Co., Ltd., Takasago Thermal Engineering Co., Ltd., Saikyu Kogyo Co., Ltd., Nishihara Engineering Co., Ltd., Mitsubishi Electric Corporation, Hitachi, Ltd., Toshiba Corporation, Koiwai Farm, Ltd.

ASSESSMENT

1. Heat load resistance of the shell (PAL reduction ratio: 36% offices)
Adoption of airflow windows with Low-e glass
Adoption of vertical and horizontal sun-shielding canopies
2. Energy efficient equipment (ERR: 31.97% offices)
Adoption of ultra-high efficiency lighting apparatuses and dimmer control on office floors
Introduction of high-efficiency DHC
Adoption of air conditioning using outdoor air, CO_2 emissions control, VAV control and VWV control
3. Efficient operating systems
Measurement and recognition of amount of use of electricity, heat and water in each of the systems
Energy control with BEMS
Implementation of commissioning
4. Use of renewable energy (60kW)
Installation of 60kW solar power generation system

Approaches to coexistence with the global environment

Reduction of heat load of exterior

- Airflow window system and Low-e pair glass
  The airflow inlets are incorporated in the baseboards to neutralize cold drafts during winter while reducing the heating and cooling load.
- Horizontal canopy and vertical louver installed around the windows on the exterior walls
  The building appearance consists of deep canopies and louvers, which keep the sun's direct heat from entering the office space.
- Solar tracking automatic angle control blind
  The automatic angle control assures sunlight shielding, good visibility and passage of light.
- Energy-saving by using daylight
  Natural light path as well as good visibility is assured to save lighting energy.
- Cool roof
  The thermal barrier coating is applied to the rooftop to prevent the room temperature from rising due to sunlight.

Adoption of high-efficiency facilities

- Adoption of ultra-high efficiency lighting apparatuses
  Adoption of highly efficient lighting with reexamined reflector shape, coating color and coating method reduces power consumption.
- Adoption of ultra-high efficiency transformer
  This transformer exceeds even the leading standard value for transformers, reduces loss of power in the transformer and contributes to further reduction of CO_2 emissions.
- Adoption of high efficiency motors for air conditioner and pumps

Improvement of operation efficiency

- Installation of a calorimeter and power meter for each tenant enables even more detailed energy-saving operation control
- Implementation of commissioning

Introduction of natural energy

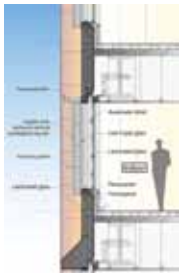
- Solar power generation
  The solar power generation panels installed on the rooftop secure 60kW power generation output.

Countermeasure against heat-island effect

- Gardening on the rooftop, ground and walls and adoption of water-retention coating, water viewing facilities and dry mist contribute to countering the heat-island effect

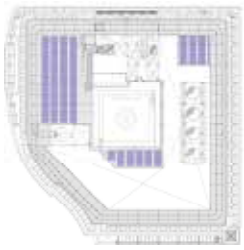
Reconstruction of district cooling and heating facility (renewal of facility)

- Acceptance of the district cooling and heating facility transferred from the adjacent building and renewal of the facility (improving system efficiency) contributes to reducing the environmental burden by saving energy through steam supply to the entire district and reduction of CO_2 and NO_x emissions



Airflow window system

Countermeasure against heat-island effect



Rooftop solar power

Shimizu Corporation New Headquarters Construction Project

清水建設新本社プロジェクト

FACT SHEET

Address ——— 2-16-1 Kyobashi, Chuo-ku
Main use ——— Office building
Site area ——— Approx 3,000m^2
Total floor area ——— Approx 518,000m^2
Number of floors ——— 22 floors aboveground, 3 basement floors
Date completed ——— Spring, 2012 (scheduled)
Environmental performance assessment
——— CASBEE 2010 self-assessment: S
Owner ——— Shimizu Corporation
Design・Construction
——— Shimizu Corporation

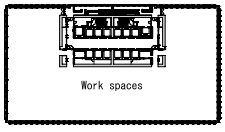
ASSESSMENT

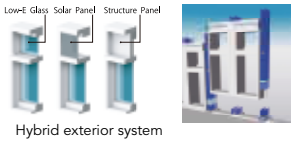
1. **Heat load resistance of the shell (PAL reduction ratio:25%)**
   Hybrid exterior system
2. **Energy efficient equipment (ERR: 42.4%)**
   Task-specific and ambient radiative air-conditioning system
   Energy offset lighting system
3. **Efficient operating systems**
   Shimizu Microgrid system
4. **Use of renewable energy (137kW)**
   Solar panels (annual power generation 84,000kWh) are installed in the sides of windows

Cutting Carbon Emissions by Half

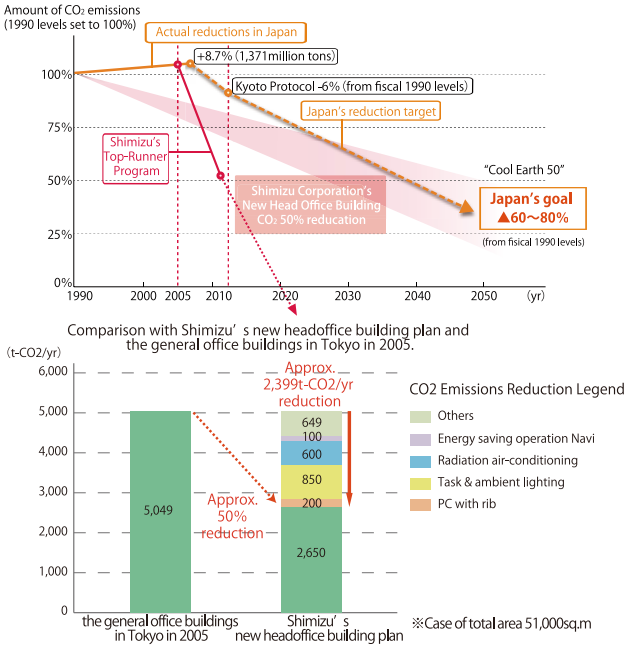
We are living in an age of environmental awareness and have long known that the earth is finite. Yet, despite the program for reduction introduced by the Kyoto Protocol, emissions of gases that cause global warming have continued to rise. To make the required shift to a sustainable social structure, we must transform our technology, institutions, and mindset. This is the background to the goal of curtailing worldwide greenhouse gas (CO_2) emissions by 50% before 2050, which was declared at the Hokkaido Toyako Summit.

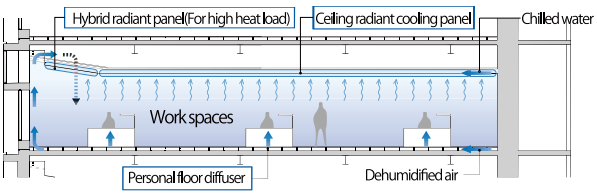
In developing this new company headquarters project, we aimed to create a super-environmental office building that meets the 50% CO_2 reduction target (from the Tokyo municipal average) well ahead of 2050 through use of the most advanced construction and environmental technologies. The 50% figure is an incredible challenge, however. Meeting it requires that a host of new environmental technologies should be developed, fused together, and integrated into architectural design. This project showcases some of the technologies being developed by Shimizu: a hybrid exterior system that cuts external heat loading and has power generation functionality; a task-specific and ambient radiative air-conditioning system particularly suited to the Japanese climate; a lighting system that maximizes solar energy offset, and the Shimizu Microgrid System.



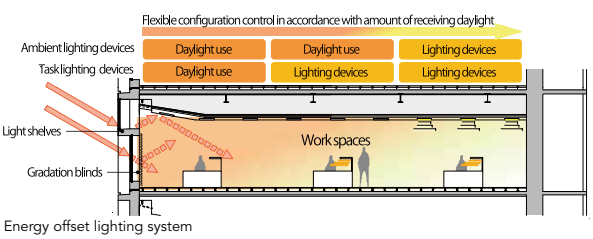


Hybrid exterior system





Task-specific and ambient radiative air-conditioning system



Energy offset lighting system

Shopping center at 1–I block in the first south area of Musashi-Koganei Station

武蔵小金井駅南口第１地区(再)1–I街区大規模店舗棟計画

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FACT SHEET

Address ——————6-1900,Honcho,Koganei City
Main use——————Shopping center
Site area——————10,290m^2
Total floor area ——54,971m^2
Number of floors —7 floors aboveground, 1 basement floors
Date completed —Feburary 27,2009
Owner——————Fusae Hoshino (representative)
Takenao Mitsuzono(Guardian of adult,lawyer)
Design ——————Tokyu Architects & Engineers Inc.
Construction ———Obayashi Corporation(Tokyo hq)
URL ———————http://www.tokyu-sekkei.co.jp/works/business/itomusashi.html

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 33.39%)**
   Insulated performance improvement of the outside wall
   Installation of eaves
2. **Energy efficient equipment (ERR: 40.24%)**
   Much use of LED lightning
   Introduction of highly effective heat source(turbo freezer)
   Ice thermal storage air-conditioning system
3. **Efficient operating systems**
   Measurement for the best operation and energy management system(concentrated meter-reading,data output function,time programmed control,event programmed control,etc)
4. **Use of renewable energy (35.6kW)**
   Photovoltaic generation(35.6kW)

We aim at the gentle facility for an environment and people

The theme of this facility is the gentle shopping center for environment and people. It corresponds to the life style of city outskirts (yamanote) along the chuo-line, as a refined and sophisticated shopping center in the center of commercial area. We designed this facility as "the Shopping center of the future". The features are facilities environment loved long by people in region and good sense space with pure and refined image. We also consider energy conservation and barrier-free enough.

Photovoltaic generation

We received the subsidy from the NEDO (New Energy and Industrial Technology Development Organization), because installation method of solar panel (all-in-one design with outside wall) was evaluated.

The amount of power generation (35.6kW/h) has been used as assistance of the lighting electricity of the store.

Much Use of LED lightining

By multiusing the LED apparatus as the lighting of the store,we can decrease running cost. It contributes to long-term cost measures.

Highly effective air-conditioning system

The air-conditioning system equipped with the ice storage tank is adopted, because we don't use heating among air-conditioning excluding for a certain period of time in winter. It contributes in a great effect of the CO_2 emission reduction.

Greening plan

We planted street trees in pavement area and rooftop gardening. It contributes to the reduction of thermal loading and enrichment to the entire building.


External appearance


Street trees


LED lightning in store


The Stairs for guest (Barrier-free)


Solar panel and eaves


Solar panel


Cooling tower in rooftop


Rooftop gardening


The restroom for kids (Barrier-free)


LED lightning of parking

Sony Corporation Sony City Osaki

ソニー株式会社 ソニーシティ大崎

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FACT SHEET

Address ——— 2-10-1 Osaki, Shinagawa-ku
Main use ——— Office building
Site area ——— 16,559m^2
Total floor area ——— 124,041m^2
Number of floors ——— 25 floors aboveground, 2 basement floors, 2 penthouse floor
Date completed ——— March 18, 2011
Owner ——— Sony Corporation
Design ——— (AEMP)Nikken Sekkei Ltd.
Construction ——— (A)Kajima Corporation, (E)Kandenko Co., Ltd, (MP)Tonets Corporation

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 31.7%)**
   Low-e Window(U=1.8W/sq.m), Balcony eaves, Solar cell eaves, Bio-Skin(Water vapor cooling of terra-cotta louver)
2. **Energy efficient equipment (ERR: 54.5%)**
   High efficiency transformer, Motion sensor dimmer, High efficiency refrigerator (COP=6.0), Variable water volume, Variable air volume, CO_2 or CO ventilation control, EcoCute, Elevator VVVF
3. **Efficient operating systems**
   BEMS.(Automatic measuring and monitoring system of electricity and HVAC energy classification)
4. **Use of renewable energy (130kW)**
   Solar cell (30kW), Solar water heater (100kW)

Bio-Skin system covers the north-east front facade. The fins of Bio-Skin louver, which are made of terra-cotta, have oval void. Supplied water in these void sinks out of inside, vapor, make cool surfaces and cool air around the fin. As a result, building perimeter cooling Load is reduced. The balustrades from 3rd to 24th floor are all cooling louvers and it has 14,300 maters fin in all. For the cool biz, we keep cooling room temperature around 28 degrees, but Bio-skin system makes cool outdoor environment, so cool biz is established by around 26 degrees room cooling. This makes not only eco but a good condition for the workers to get high performance at the same time. Cooling air, made by Bio-skin, flow down to the pedestrian deck of the building foot. Town cooling efficiency, equal to about 20,000sq.m green park, same as this building site area, is estimated by pre simulations.

To reuse roof rain in this water supply and circulate system, potable water consumption is reduced.

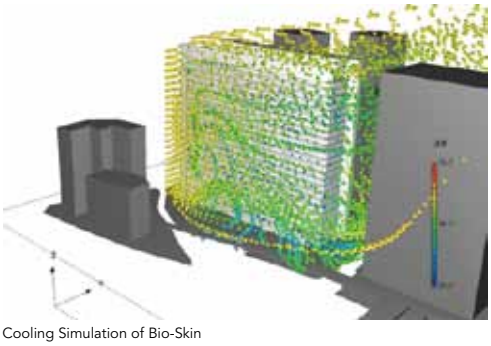
Solar cell is established on the edgy of south balcony. Six groups of cell, every three floor from 9th to 21st floor, are useful as big eaves.

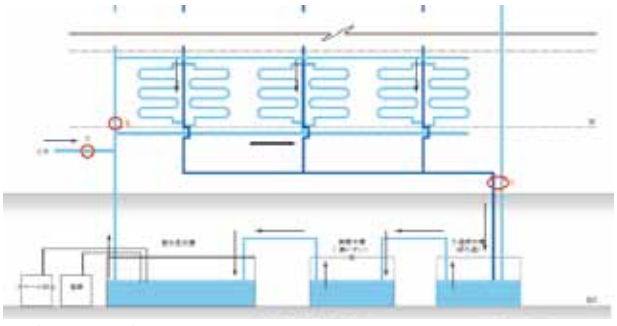
Solar water heater panels are on the roof top and they are useful as hot water supply for company dining kitchen. Two kind of panels, one has heat insulation back board, another has no insulation, are compared which is able to get a lot of solar heat, and for future the saved data will be useful for the choices as a new water heat system of Sony's factories in the world.


Bio-Skin


Solar cell eaves


Solar water heat panel


Cooling Simulation of Bio-Skin


Bio-Skin water circulation system

Takenaka Corporation Tokyo Main Office

竹中工務店　東京本店社屋

FACT SHEET

Address ——————1-1-1 Shinsuna, Koto-ku,
Main use——————Offices
Site area——————23,383m^2
Total floor area ——29,748m^2
Number of floors —7 floors aboveground
Date completed —September 29, 2004
Environmental performance assessment
————————————CASBEE 2004 certification: S (BEE=4.9)
Owner——————Takenaka Corporation
Design・Construction
————————————Takenaka Corporation
URL ————————http://www. takenaka.co.jp/news/pr1003/m1003_01.html

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 25%)**
   Minimization of window size (small-sized window design) and adoption of Low-e double-glazed glass
   Installation of the large canopies and insulation of the exterior walls
2. **Energy efficient equipment (ERR: 42.43%)**
   Energy usage control based mainly on natural energy, introduction of natural light and wind (breathing outer skin and three light wells), hybrid air conditioning, solar heat-collection duct, use of daylight for lighting, lighting using a sensor to detect human presence, use of rainwater, introduction of high-efficiency heat source (COP5.0), office LED lighting (renovated in August 2011)
3. **Efficient operating systems**
   Measurement and analysis of electricity and heat by area and usage with BEMS
   Power demand control and continuous activity of the organization promoting energy usage reduction
4. **Use of renewable energy (290kW)**
   Solar heat-collection duct 140kW
   150kW solar power generation panels (installed in August 2011)

This building was constructed under the main office transfer project and completed in 2004. The project aimed to provide a highly productive and high-quality office space while at the same time realizing an urban-type sustainable building through various technologies combining architecture and facilities in consideration of the global environment throughout its lifecycle.

The south end of the building site touches the canal leading up to Tokyo Bay, through which natural wind and light are carried, unimpeded, to the building. This "introduction of light and wind" is the concept of the environmental plan. The operation form of the building, based mainly on natural energy in contact inside and outside the building, is enabled by embodying this concept with the breathing outer skin and the large light wells and voids located in the center of the building.
"Introduction of light and wind" applies not only to the building itself, but also to the local area: the low and elongated shape of the building, stretching north to south, does not block natural wind and light and the area along the canal is a park opened to the public as a recreation area.

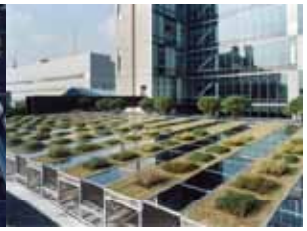
To maximize the use of fresh air energy throughout the four seasons, the hybrid air-conditioning system using natural ventilation automatically selects an operation mode based on the environmental conditions inside and outside the building from four modes:
1) "natural ventilation" mode in which air conditioner is turned off and natural wind allowed to blow from the outer skin to the light wells
2) "hybrid" mode in which natural ventilation and complementary low-temperature air supply are provided simultaneously
3.) "Fresh air cooling" mode in which outside air is distributed evenly by the ducts
4) "low-temperature air supply" mode of 11 degrees

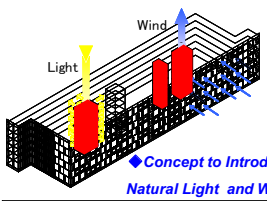
The lighting is controlled so that it can supplement the natural light taken in from both the interior and exterior sides of the building. The sun's heat is collected by the heat-collection ducts and used for heating and ventilation, while rainwater is use for flushing the toilet.

Thanks to the continuous improvement of the building operation after its completion, the amount of annual primary energy consumption has also been reduced annually and was cut in half compared to the previous main office building.

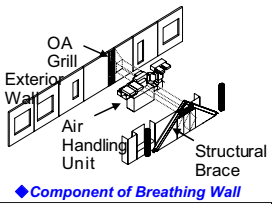

Overview of Takenaka Corp. Tokyo Main Office


Light Well

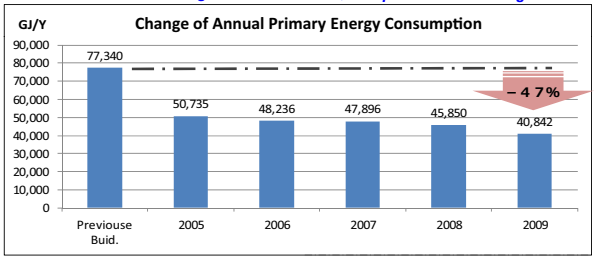

Solar Heat-Collection Duct



◆Concept to Introduce Natural Light and Wind



◆Component of Breathing Wall



Tokyo Metropolitan Matsuzawa Hospital

精神医療センター（仮称）東京都立松沢病院

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FACT SHEET

Address ——————1-1, Kamikitazawa 2-chome, Setagaya-ku
Main use——————Hospital
Site area——————183,512m^2
Total floor area ——55,314m^2
Number of floors —7 floors aboveground
Date completed —End of January, 2014 (scheduled)
Owner ——————Medical Management Matsuzawa Co.Ltd..
Design ——————Showa Sekkei, Incorporated
Construction ———JGC Corporation
URL ———————http://www.byouin.metro.tokyo.jp/matsuzawa/

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 25.00%)**
   Better solar radiation inhibition as a result of installing eaves and balconies
   Lower air conditioning load as a result of insulating walls and roofs
2. **Energy efficient equipment (ERR: 37.36%)**
   Lower electricity consumption for lighting as a result of installing light wells and skylights
   Lower air conditioning load as a result of adopting cool trenches and heat trenches
   Lower electricity consumption as a result of large temperature differential systems for heat source equipment
   Lower electricity consumption as a result of variable water/air flow control for heat source transfer equipment
3. **Efficient operating systems**
   Installation of central monitoring/control devices that support BEMS for energy management
4. **Use of renewable energy (30kW)**
   Lower electricity consumption as a result of adopting solar panels (30kW)

Tokyo Metropolitan Matsuzawa Hospital, the central psychiatric services in Tokyo, is a newly rebuilt hospital in accordance with the Master Plan for Tokyo Metropolitan Hospital and the Action Program for Tokyo Metropolitan Hospital. The hospital is aiming to play a role as a key location for mental health treatment in the Tokyo municipal area, and is hoping that the restructure and upgrade will lead to better functionality and better accessibility as a result of consolidation. The Matsuzawa Forest where the hospital is located provides a rich natural environment, and has a history that dates back to the middle of the Taisho era. The following initiatives are being taken to preserve this rich natural environment, and to conserve energy and minimize CO_2 emissions from the perspective of protecting the global environment.

Protecting the natural environment

- The planar form of the building has been designed to be as compact as possible
- Rooftop gardens have been installed to preserve continuous greenery in three dimensions
- The land use classification has been clarified, and the landscaping plan highlights the potential of the greenery in the project area

Initiatives for energy conservation and low CO_2 emissions (Items other than those listed in the Evaluation of environmental planning for the building)

- Lower air conditioning burden through total heat exchangers, cooling using outside air, etc.
- Lower electricity consumption through local ventilation and controlling the amount of ventilation through temperature sensors
- Lower electricity consumption through the adoption of high efficiency lighting and equipment
- Lower electricity consumption through motion sensors and light control systems
- Lower electricity consumption through time schedules for the central lighting control board
- Application of high efficiency energy through the use of heat pumps for the hot water supply
- Adoption of gray water facilities through the use of rain water and kitchen waste water

The entrance hall, which incorporates the surrounding greenery as well as bringing in natural light from sky lights and openings

Toyosu Cubic Garden

豊洲キュービックガーデン

FACT SHEET

Address ——————3-2-3 Toyosu, Koto-ku,
Main use——————Commercial premises for lease
Site area——————16,243m^2
Total floor area ——98,806m^2
Number of floors —14 floors aboveground, 1 basement floors ,1 penthouse floor
Date completed —January 31, 2011
Environmental performance assessment
——————CASBEE 2008 certification: S
Owner——————The Dai-ichi Life Insurance Company, Limited.
Design ——————Shimizu Corporation Design Division+ HARUKI UMEGAKI
Construction ———Joint venture of Shimizu Corporation, Maeda Corporation and Nihon Kensetsu

ASSESSMENT

1. **Heat load resistance of the shell (PAL reduction ratio: 22.93%)**
   Double-skin facade (U=0.58W/m^2・K)
2. **Energy efficient equipment (ERR: 35.98%)**
   Lighting control using a sensor to detect illumination intensity and human presence, high-efficiency transformer, introduction of high-efficiency heat source, water supply by large temperature difference, variable flow technique, ventilation volume control by CO_2 sensor, night purge, cooling using outside air
3. **Efficient operating systems**
   Energy control with BEMS
4. **Use of renewable energy (30kW)**
   30kW solar power generation system (amount introduced: 28.348kWh/year)

Toyosu Cubic Garden is characterized by its vast office floor space of 1500 *tsubo* (approx. 4950 m^2) that brings nature into the building. The full-height opening in the outer circumferential areas and the void introduced in the middle of the building bring natural light into the interior of the office. The amenity space, which contains toilets, refreshment rooms and smoking rooms, is located in the outer circumferential areas, which are brightened by natural light to maximize the use of natural energy sources. The void introduced in the building has functions for cooling the building with outside air and performing the night purge process by capturing open air from the lower quake-absorbing layer. A full-height double-skin facade is utilized for the exterior and equipped with blinds whose angles can be adjusted according to the altitude of the sun to maintain the comfort of the office users and save energy at the same time. The system allows the reduction of energy consumption (ERR) by 35% and CO_2 emissions by 30%, resulting in Rank S certification in the CASBEE evaluation. The plants outside, on the roof and in the private lounges occupy 40% of the site area, providing the office users with places for relaxation and providing landscaping considerations to the neighboring residents. The offices with their gardens full of lush greenery are the very reason why the building is named " Toyosu Cubic Garden."


Appearance of the building


Void terrace lounge

Cross-sectional plan to bring more nature into the office


Double skin with blinds incorporated


The void through the office building


Rooftop garden on the second floor

Obayashi Corporation Technical Research Institute Main Building (Tecno-Station)

大林組技術研究所本館（テクノステーション）

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FACT SHEET

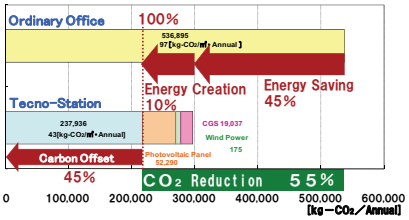
Address ——————4-640 Shimokiyoto, Kiyose City
Main use——————Office building
Site area——————69,401m^2
Total floor area ——5,535m^2
Number of floors —3 floors aboveground
Date completed —September 2010
Environmental performance assessment
——————CASBEE 2008 certification: S (BEE=7.6)
Owner ——————Obayashi Corporation
Design・Construction
——————Obayashi Corporation
URL ——————http://www.obayashi.co.jp/tri/
Model project by MLIT that Reduce CO_2 Emissions

ASSESSMENT

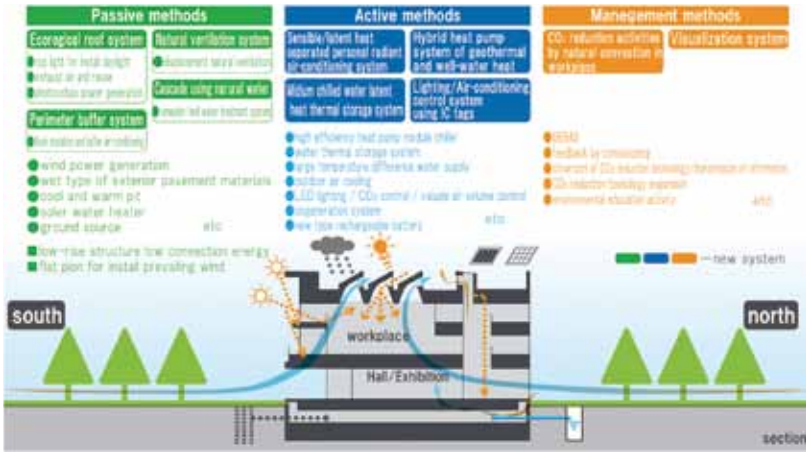
1. **Heat load resistance of the shell (PAL reduction ratio: 35.9%)**
   Perimeter buffer system (Eave, External vertical glass fins, Automatic control blind, Air barrier), Low-e window
2. **Energy efficient equipment (ERR: 42%)**
   Sensible/latent heat separated air-conditioning, Medium chilled water latent heat storage system, Personal air-conditioning (O-TASK), Lighting/Air-conditioning control system using IC tags
3. **Efficient operating systems**
   Advanced building energy management system, commissioning Visualization system
4. **Use of renewable energy (152kW)**
   Photovoltaic generation 150kW, Wind power generation 2kW

Building Outline
Large eaves, vertical glass fins, and automatic control blinds for the reduction of solar radiation cut the direct light. Photovoltaic generation.

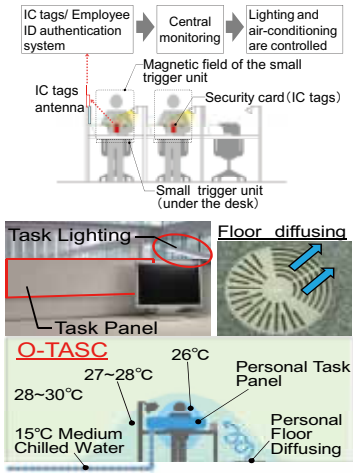
Workplace
Workplace with high visibility and sense of unity that allows for intellectual productivity and energy saving by using natural energy.



CO_2 Reduction
55% reduction in CO_2 emissions through the energy saving and energy creation.
Achievement of carbon neutral through the purchase of carbon credit equivalent to 45%



Technologies for low-carbon



Active methods (Adoption of next-generation equipment)

Solar panel

Using of natural light and natural ventilation

Air barrier

Passive methods (Active Uses and Control of Natural Energies)
Ecological roof system is using natural light and natural ventilation for energy saving.
Perimeter buffer system is using large eaves and automatic control blinds, vertical glass fins for reduce the AC load.

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Of the 15 new buildings selected, one declined to be published in this booklet.

Low Emission Buildings TOP30 in Tokyo
東京の低炭素ビル TOP30

September 2011
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Articles for the TOP 30 Buildings were written by the operators of each building.

www.kankyo.metro.tokyo.jp/en/climate/