CASBEE® for Building (New Construction)

Comprehensive Assessment System for Built Environment Efficiency

●Technical Manual (2014 Edition)

Editorial Assistance : JSBC 一般社団法人 日本サステナブル建築協会 Japan Sustainable Building Consortium

Published by : IBEC 一般財団法人 建築環境・省エネルギー機構 Institute for Building Environment and Energy Conservation

Table of Contents

Introduction

In recent years, climate change has become a global issue of extraordinary importance. The restriction on increasing energy consumption in the civilian sector has become a major issue. In light of the increased number of indoor heat strokes due to record temperatures in recent years, the nationwide electricity shortfall attributed to the Great East Japan Earthquake, in terms of buildings, environmental measures that achieve both energy saving and comfort have attracted public attention. Meanwhile, the governmental standard for energy saving was revised in 2013, and a tighter standard for energy consumption of the entire building as a criterion has been established, which requires a great deal more consideration to the environment in buildings than before.

Against this backdrop, a joint industrial/government/academic project was initiated in Japan with the support of the Housing Bureau, a branch of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), in April 2001. Since then, a committee established as part of the project has been working on development of the Comprehensive Assessment System for Built Environment Efficiency (CASBEE). CASBEE, which allows assessment of the seismic capacity, reliability and comfort of buildings, is recognized as an important national policy. As of March 2014, the notification system utilizing CASBEE has been introduced in 24 municipalities across the country.

Since the first tool was drawn up in 2002, there have been numerous revisions to CASBEE. In 2008, with a view to promote efforts towards the reduction of CO_2, which is the primary cause of global warming, CASBEE for New Construction (2008 Edition) was issued, in which various measures in relation to the reduction of operational energy and CO_2 due to manufacturing of construction materials (embodied CO_2) are expressly incorporated as part of the Global Warming Prevention Measures in the Life Cycle CO_2 ($LCCO_2$) assessment. In 2010, in order to further promote and enhance low-carbon performance, additional revisions were made in CASBEE, and CASBEE for New Building (2010 Edition) was issued, which encourages efforts towards a higher level of energy saving, eco-friendly materials and longer service life. The revisions also cover assessments for buildings with a higher level of low-carbon performance, such as the Zero Energy Buildings (ZEB), Zero Energy Homes (ZEH) and Life Cycle Carbon Minus (LCCM) Houses.

The latest revisions include amendments to CASBEE assessment standards in accordance with the general revision to the national energy conservation standards in 2013. The existing CASBEE for New Building and CASBEE for New Construction (Brief Version) have been integrated, and were newly issued as CASBEE for Building (New Construction). We expect that CASBEE for Building (New Construction) will be widely used for planning, design and construction of buildings in actual situations, which would greatly contribute to the promotion of sustainable buildings in our country.

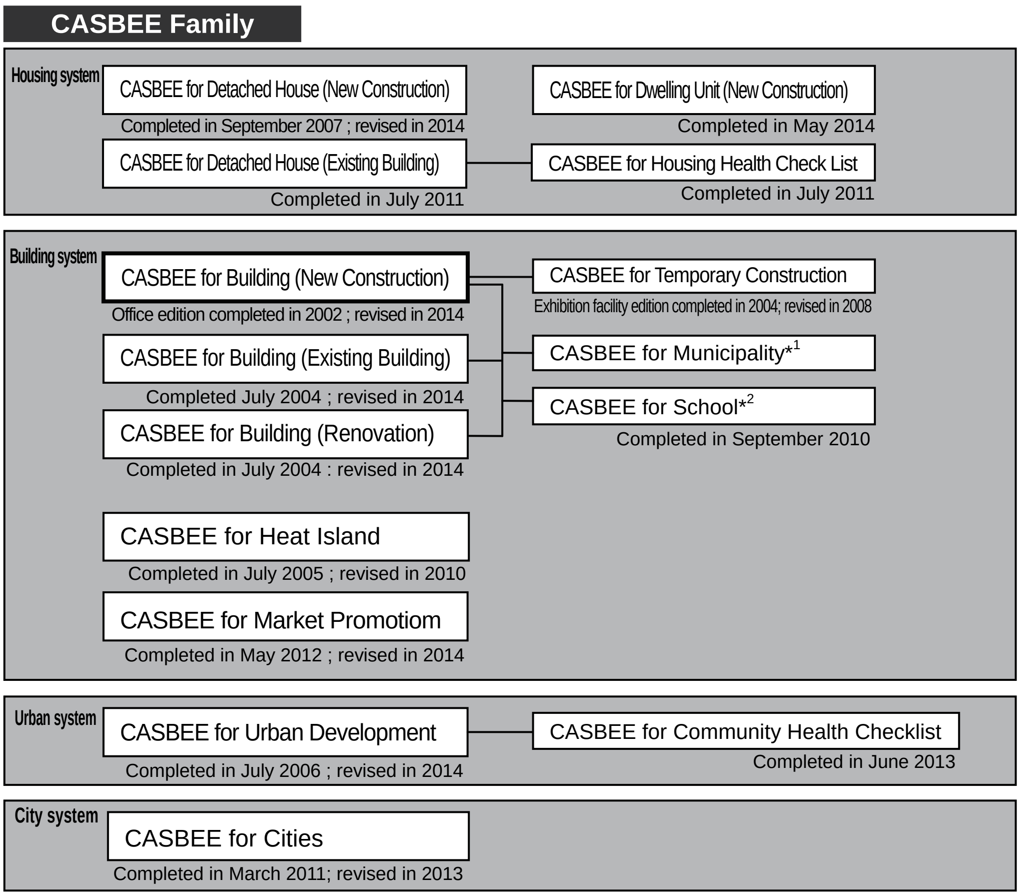
Shuzo Murakami, Chair
CASBEE Board of the Stakeholders
Japan Sustainable Building Consortium (JSBC)

PART Ⅰ. Outline of CASBEE for Building (New Construction)

1. Framework for CASBEE for Building (New Construction)

1.1 What is CASBEE?

CASBEE (Comprehensive Assessment System for Built Environment Efficiency) is a method for the evaluation and rating the environmental performance of buildings. It is a comprehensive assessment of the quality of a building, evaluating features such as interior comfort and scenic aesthetics, in consideration of environmental practices which include using materials and equipment that save energy or achieve smaller environmental loads. The CASBEE assessment is ranked in five grades: Excellent (S), Very Good (A), Good (B+), Fairly Poor (B-) and Poor (C).
CASBEE includes, as shown in Figure I.1.1, different assessment tools depending on the size of the building subject to the assessment, such as housing, buildings, urban areas and cities, all of which are collectively called CASBEE Family.
CASBEE has been developed by a research committee established in 2001 as part of a joint industrial/government/academic project with the support of MLIT. The first assessment tool, CASBEE for Office, was completed in 2002, followed by CASBEE for New Construction in July 2003, CASBEE for Existing Building in July 2004 and CASBEE for Renovation in July 2005. The CASBEE assessment tools were developed on the basis of the following three principles: (1) Comprehensive assessment throughout the life cycle of the building, (2) Assessment of the "environmental quality of building (Q)" and "environmental load of building (L)" and (3) Assessment based on the newly-developed Built Environment Efficiency (BEE) indicator.



*1) CASBEE tools are adapted in municipalities nationwide, including CASBEE-Nagoya (April 2004), CASBEE-Osaka (October 2004) and CASBEE-Yokohama (July 2005).
*2) CASBEE for School is a tool designed and developed by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the users of which are mainly officers in charge of facility management in elementary, junior high, and high schools.

Figure I.1.1 Structure of the CASBEE family

1.2 Background of the development of CASBEE for Building (New Construction)

CASBEE for Building (New Construction), upon its development of the 2014 edition, integrates the existing tools: CASBEE for New Construction and CASBEE for New Construction (Brief Version), and takes over the functions of both tools. In other words, the new tools may be used for purposes of CASBEE for New Construction (Brief Version), which include setting environmental performance standards and design goals for buildings and preparation of documents for filing with local governments, as well as those of CASBEE for New Construction, which are, for example, detailed assessments of the actual implementation of environmental designs and obtaining third-party certification.

1.3 The position of CASBEE for Building (New Construction) within the four basic tools

CASBEE offers four basic tools for the planning, new construction, existing building and renovation stages of a building's life cycle.
CASBEE for Building (New Construction) is a tool for use with newly-constructed buildings. Therefore, the system is able to make assessments at each stage of a building's design and construction (preliminary design, execution design and construction completion), on the basis of target performance, design specification and forecast performance, enabling consideration of improvements at each stage. This tool could also be used for rebuilding, in which the existing structure is reutilized.
As CASBEE for Building (New Construction) produces predictive assessments based on design specifications, the assessments results remain valid for three years past the completion of construction. After that period, if necessary, the building should be evaluates at that stage using the latest edition of CASBEE for Building (Existing Building).

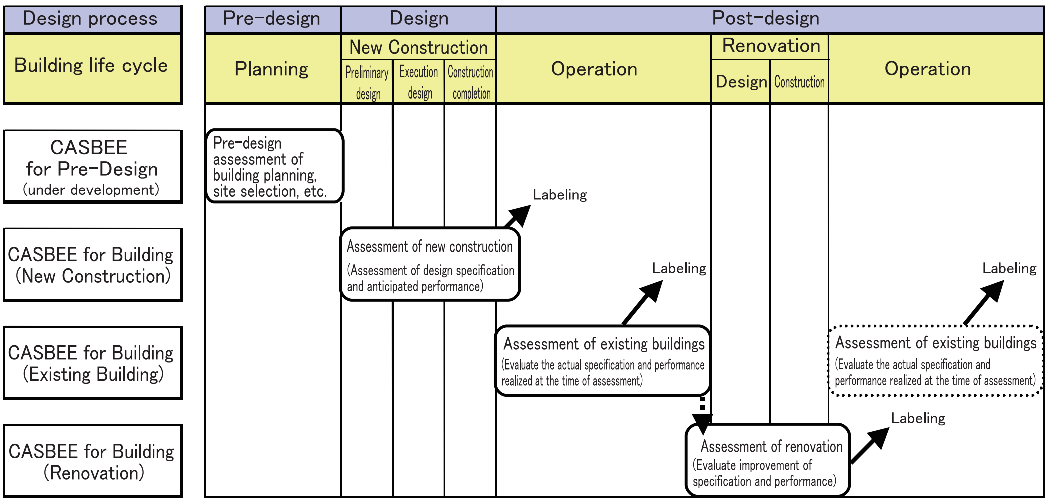


Figure I.1.2 Building life cycle and the four basic tools of CASBEE

2. Assessment Method

2.1 Buildings for assessment under CASBEE for Building (New Construction)

CASBEE for Building (New Construction) is applicable to all building types except for detached houses. The building classification consists of 8 purposes adopted in the energy conservation standards (including factories) and apartments, excluding detached houses. For factories, assessments under "Q1 Indoor Environment" and "Q2.1 Service Ability" mainly address occupied areas (e.g. office space), and exclude production areas. The energy consumption in production areas of factories, which is excluded from the calculation based on the energy conservation standards, is also excluded from the assessment of "LR1 Energy."
The building types covered are broadly divided into "non-residential" and "residential." In particular, hospitals, hotels and apartments that fall in the residential category are buildings that include living or accommodation space for users (hereinafter referred to as <Residential and Accommodation Sections>). Assessment of these buildings with residential building types is divided between <Residential and Accommodation Sections> and other common sections (hereinafter referred to as <Entire Building and Common Properties>).

Table I.2.1 Building types targeted for assessment (divided into non-residential and residential)

Classification	Building type	Types included
Non-residential	Offices	Offices, government buildings, libraries, museums, post offices, etc.
	Schools	Elementary schools, junior high schools, high schools, universities, technical colleges, higher vocational school and other school types
	Retailers	Department stores, supermarkets, etc.
	Restaurants	Restaurants, canteens, cafes, etc.
	Halls	Auditoriums, halls, bowling lanes, gymnasiums, theaters, movie theaters, pachinko parlors exhibition facilities, etc.
	Factories	Factories, garages, warehouses, spectator stands, wholesale markets, computer rooms, etc.
Residential	Hospitals	Hospitals, homes for elderly, welfare homes for the handicapped, etc.
	Hotels	Hotels, inn, etc.
	Apartments	Apartments (detached houses are not applied)

2.2 Approaches to scoring criteria

One characteristic of CASBEE is that it assigns separate scores for Q (Quality: Environmental quality of building) and L (Load: Environmental load of building) and ultimately gives an assessment of Built Environment Efficiency (BEE) as an indicator based on the results for Q and L. L is first evaluated as LR (Environmental load reduction of building). That approach is employed because "higher marks for improving load reduction quality" is easier to understand than "higher marks for load reduction" as an assessment system, just as "improvements in quality and performance earn higher marks."
The scoring criteria were examined with a view to applicability to each building type of subject buildings through keeping the criteria simple as possible. The scoring criteria for each assessment score are based on the approaches below.

1) Assessment on a five scale, level 1 to 5 with level 3 as the standard score.
2) As a general rule, level 1 is earned for satisfying the minimum conditions required by laws, regulations and other standards of Japan, such as Building Standard Law, and a building at what is judged to be a general, ordinary level earns 3.
3) The ordinary level (level 3) is a level corresponding to ordinary technical and social practices at the time of assessment.

2.3 Outline of the assessment system

(1) Scoring

The assessment items included in Q (environmental quality of building) and L (environmental load of building) should be according to the scoring criteria set for each level (level 1-5). The points for each item are assigned as one point for level one to five points for level five.
For apartments, hotels and hospitals (classified as "Residential"), the assessment is subdivided between <Residential and Accommodation Sections> and all other sections <Entire Building and Common Properties>. Different scoring criteria are applied for the <Residential and Accommodation Sections> and the <Entire Building and Common Properties>, depending on the assessment items. In obtaining assessment results for the building as a whole, the score for each item is weighted according to the share of floor area occupied by each part, to obtain the whole-building result.

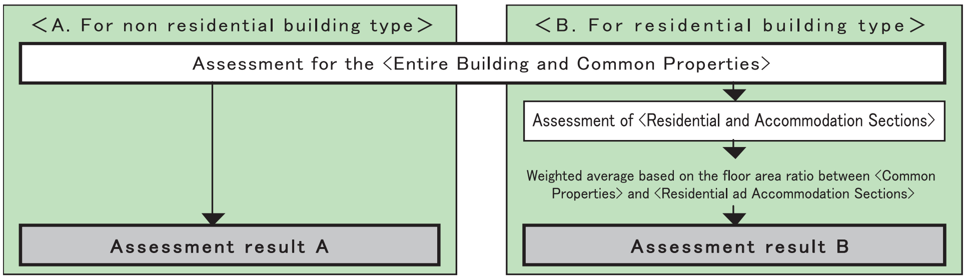


Figure I.2.1 Building assessment system including buildings for "Residential" and "Non-residential"

(2) $LCCO_2$ calculation

- Standard calculation

$LCCO_2$ is used as an indicator for assessment of items under "LR3.1 Consideration of Global Warming." Calculation of $LCCO_2$ for a building is usually a very large task, but CASBEE uses an approximate calculation method (i.e. Standard Calculation) in order to simplify the process. Specifically, a reference $LCCO_2$ emission for each building type was set based on the $LCCO_2$ of a building with level-3 performance in all assessment categories excluding "LR1 Energy" and is equivalent to the evaluation standard for building owners as referred to in the Energy Conservation Law. Using the reference values, calculation can be carried out more-or-less automatically, with some individual input, based on the CO_2-related assessment results (scores) at each stage of a building life cycle (i.e. construction, operation, maintenance/upgrade/demolition).

1) Construction stage
Under "LR2 Resources & Materials," "Continuing use of existing structural frame, etc." and "Use of recycled materials" are evaluated. For these items, CO_2 emissions related to the manufacture of construction materials (embodied CO_2) are approximated based on the usage rates of existing structural frames and blast furnace cement.
2) Operation stage
CO_2 emissions in the operational phase are estimated in a simple manner by using values such as the primary energy consumption ratio BEI (BEIm in cases of the Model Building Method) evaluated in "LR1 Energy" and the reduction ratio correspond to individual efforts in efficient operations.
3) Maintenance/Upgrade/Demolition stages
The extended service life achieved through longevity improvement is evaluated in "Q2 Quality of Service." However, it is still difficult to estimate the future service life with the level of accuracy that may be used as a condition for calculating $LCCO_2$. Therefore, excluding residential buildings, $LCCO_2$ shall be estimated, assuming the respective service life, as follows:

- Offices, hospitals, hotels, schools and halls: Fixed 60 years
- Retailers, restaurants and factories: Fixed 30 years
- Apartments: 30, 60 or 90 years, according to anti-deterioration grades under the Housing Performance Indicator system

- Individual calculation

When a highly-accurate $LCCO_2$ estimation is performed by an assessor based on detailed data and calculations, it is considered as an individual calculation and can be included in the assessment result. The individual calculation follows the life cycle assessment (LCA) methods made available to the public. The assessor must provide a detailed description of the calculation process, such as the method and the calculation assumptions used. Publicly available LCA methods include the LCA Guidelines for Buildings compiled by the Architectural Institute of Japan (published by Maruzen in 2013). Also, the description of the calculation process is submitted using the $LCCO_2$ Calculation Assumptions sheet provided with the CASBEE assessment software.

(3) Assessment result

Assessment results are collated in two forms, the Score Sheet and the Assessment Results Sheet. First, the scoring results for each assessment item are tabulated on the Score Sheet. These are weighted using weighting coefficient for each assessment item to produce overall scores SQ1-SQ3 and SLR1-SLR3, specific to major categories Q1-Q3 and LR1-LR3. SQ and SLR are also calculated as scores for Q and LR.

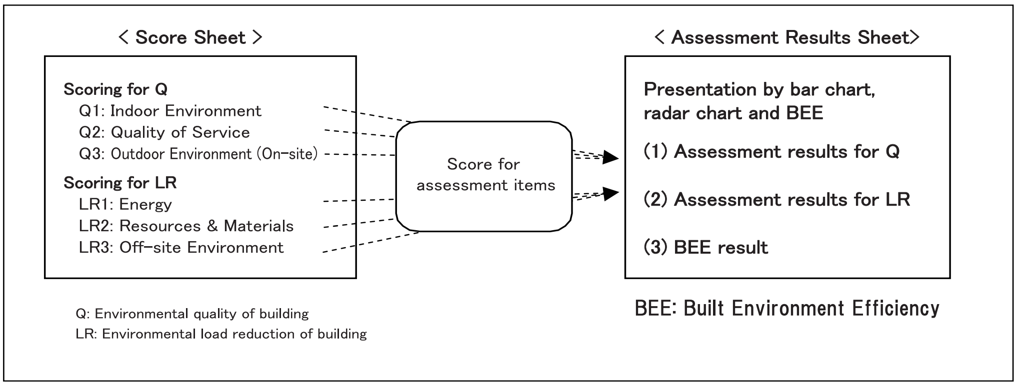


Figure I.2.2 Basic configuration of CASBEE

The Assessment Results Sheet presents assessment results for each category as radar charts, bar charts and numerical data for Q (environmental quality of building) and LR (environmental load reduction of building). The BEE (Built Environment Efficiency) result is also presented numerically and graphically, giving a multi-faceted and comprehensive grasp of the environmental characteristics of the evaluated building.
BEE is calculated from SQ and SLR, the scores for Q and LR, according to the formula below.

$$\text{BEE} = \frac{\text{Q: Environmental Quality of Building}}{\text{L: Environmental Load of Building}} = \frac{25\times(SQ - 1)}{25\times(5 - SLR)} \quad (1)$$

The graph points are plotted with Q values on the Y axis and L values on the X axis to determine the Built Environment Efficiency position, which enables Built Environment Efficiency ranking on five levels from S down to C as shown in Table I.2.2 (refer to PART III for the details). Each rank corresponds to the assessment expressions used in Table I.2.2, and are also expressed as a number of stars for clarity.

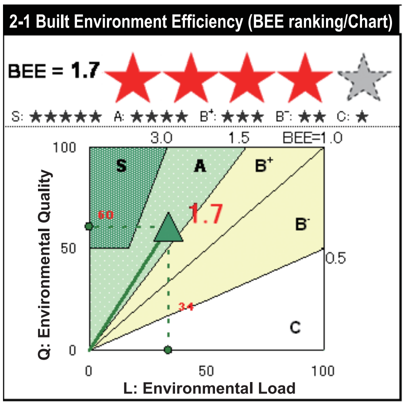


Figure I.2.3 Building environmental efficiency ranking with BEE and red stars

Table I.2.2 Correspondence between ranks based on BEE values and assessments

Ranks	Assessment	BEE value, etc.	Expression
S	Excellent	BEE = 3.0 or more and Q = 50 or more	★★★★★
A	Very Good	BEE = 1.5-3.0 BEE = 3.0 or more and Q is less than 50	★★★★
B+	Good	BEE = 1.0-1.5	★★★
B-	Fairy Poor	BEE = 0.5-1.0	★★
C	Poor	BEE = less than 0.5	★

2.4 Assessment of building complex

The assessment for buildings which combine two or more types is calculated as a weighted average of assessment results for each type of the building, according to the ratio of floor areas for each type. The scores for the building complex are calculated using the equation (2) below, using the ratio between floor areas for each building type.

Score for building complex

$$=\Sigma(\text{score for each building type x corresponding floor area ratio}) \quad (2)$$

This equation can also be applied to building complex for different types on a single site, similar to a single building complex.

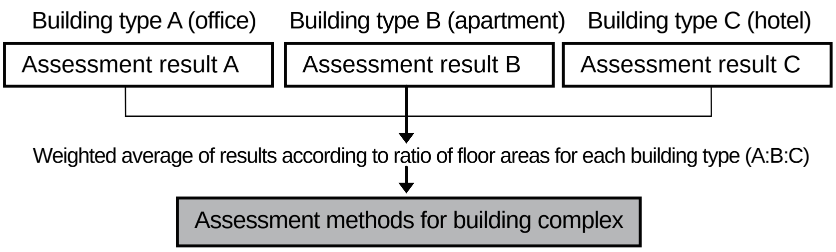


Figure I.2.4 Assessment methods for building complex (for a building combining three types)

In the assessment of "LR1 Energy," the weighted average is obtained in terms of individual floor space ratios depending on the levels determined in accordance with the rating levels with respect to non-residential buildings, private and common spaces of residential buildings (evaluated depending on the Energy Saving Countermeasure Grades based on the BPI or the Housing Quality Assurance Act, and the primary energy consumption ratio).

2.5 Assessment items of CASBEE for Building (New Construction)

Q: Environmental Quality of Building

In a building such as that shown in table I.2.3, CASBEE for Building (New Construction) takes the environmental quality of building as quality related to improving everyday amenity for users, and evaluates each item.

Table I.2.3 Assessment items included in Q: Environmental quality of building

Q1. Indoor Environment	1. Sound Environment	1.1 Noise
		1.2 Sound Insulation
		1.3 Sound Absorption
	2. Thermal Comfort	2.1 Room Temperature Control
		2.2 Humidity Control
		2.3 Type of Air Conditioning System
	3. Lighting & Illumination	3.1 Daylight
		3.2 Anti-glare Measures
		3.3 Illuminance Level
		3.4 Lighting Controllability
	4. Air Quality	4.1 Source Control
		4.2 Ventilation
		4.3 Operation Plan
Q2. Quality of Service	1. Service Ability	1.1 Functionality & Usability
		1.2 Amenity
		1.3 Maintenance
	2. Durability & Reliability	2.1 Earthquake Resistance
		2.2 Service Life of Components
		2.4 Reliability
	3. Flexibility & Adaptability	3.1 Spatial Margin
		3.2 Floor Load Margin
		3.3 System Renewability
Q3. Outdoor Environment (On-site)	1. Preservation & Creation of Biotope	
	2. Townscape & Landscape	
	3. Local Characteristics & Outdoor Amenity	3.1 Attention to Local Character & Improvement of Comfort
		3.2 Improvement of the Thermal Environment on Site

Q1 Indoor Environment

Evaluate the indoor environment, which has a major impact on the health, comfort and intellectual productivity of occupants, as basic performance of the building. Research into the performance of indoor environments began before global environmental problems rose to prominence, and it already has a strong record and body of knowledge. POEM-O (Post Occupancy Evaluation Method Office) is one example. However, those evaluation methods were aimed to evaluate performance after completion of the building, or during its operation life. In contrast, this "CASBEE for Building (New Construction)" has developed the indoor environment assessment methods previously used in the construction and environmental engineering fields. The aim was to make it as easy as possible to evaluate target values for performance (heat, illuminance and noise values, etc.) at the design and construction stages. In that process, aspects such as systems for operation, management, monitoring and control are evaluated as efforts to improve environmental performance.

1. Sound Environment

The assessment is carried out regarding the level of background noise, which is closely related to the level of comfort and ease of operation, the level of sound insulation in order to prevent noises from entering the living space, and the level of sound absorption in order to prevent noises generated indoors or coming in from outside from echoing.

2. Thermal Comfort

Evaluate the setting, control and maintenance systems for interior temperature, humidity and air conditioning, and the related equipment.

3. Lighting & Illumination

The assessment is carried out regarding the efficient utilization of natural light (Daylight use), measures against the glare of direct sunlight during the day (Glare countermeasures), the balance and level of brightness (Illuminance) and the control of brightness and positions of lights (Lighting control).

4. Air Quality

Evaluate the level of consideration given to selection of materials to maintain safe interior indoor air quality (IAQ), ventilation methods, construction methods and other aspects. This assessment item comprises three elements, Source Control, mainly avoidance of pollution-generating materials, Ventilation, with the aim of expelling released contaminants, and Operation Plan.

Q2 Quality of Service

Assessment of service functions to the users and owners of a building covers functional aspects that impact users' activities within the building, and others that are necessary for keeping the building itself in good condition in the long term.

1. Service Ability

Evaluate ease of movement and comfort. It is not easy to express such aspects as direct quantitative indices, so this assessment uses substitute indices such as floor area per occupant, ceiling height, adaptation to IT equipment, and availability of refreshment space, and consideration of maintenance. This assessment of functionality is an unprecedented characteristic, developed from the assessment of spatial elements under POEM-O. In contrast to POEM-O, which emphasized users' psychological reactions, this assessment mainly considers the physical performance of the indoor environment.

2. Durability & Reliability

Evaluate the ability to maintain good operational condition over a long period of time.

First, potential threats to human life such as building collapse during a disaster and compromised occupant comfort during strong winds are taken into consideration as environmental factors for the space within virtual boundaries. Evaluate remedial measures for such issues under "2.1 Earthquake Resistance." The lifespan of building components is evaluated under "2.2 Service Life of Components," whereas assessment under "2.3 Appropriate Renewal" evaluates whether building components are replaced before the specified service life expires ("2.3 Appropriate Renewal" is excluded from CASBEE for Building (New Construction)). Interruption of building functions in the event of a disaster or an accident is taken into consideration as a functionality issue. Evaluate the functionality level retained by each building equipment type during an emergency situation under "2.4 Reliability."

3. Flexibility and Adaptability

Evaluate readiness for long-term use, including future renewals and changes of usage, in terms of the substitute functions allowance for load and allowance for space. Spatial Margin focuses on two aspects, allowance for story height and adaptability of floor layout evaluates consideration given to such renewal of building facilities in construction planning and equipment planning.

Q3 Outdoor Environment (On-site)

Q3 evaluates improvement of the environmental quality of the outdoor environment (on-site) and its surroundings, derived from efforts within the building and within the site. It comprises "Preservation & Creation of Biotope," "Townscape & Landscape" and "Local Characteristics & Outdoor Amenity." However, there is no assessment from the perspective of aesthetic and design characteristics. As quantitative assessment is difficult, the assessment method converts the existence of individual efforts, and their levels, into points, and uses the total point score to determine the level.

1. Preservation & Creation of Biotope

Evaluate efforts to conserve and create a natural habitat for wildlife. In new constructions, since plants are not fully grown, evaluate potential to sustain wildlife habitation.

2. Townscape & Landscape

Evaluate how well urban context and scenery have been considered. There are now many moves by national and regional governments to place legal regulations on scenery. This assessment should examine the level of consideration that has been given to rules for the urban context and scenery (urban context guidelines, etc.).

3. Local Characteristics & Outdoor Amenity

Make a wide-ranging assessment of efforts to preserve local characteristics and cultural heritage, community relations and amenity improvement in and around the property. Also evaluate measures to improve the thermal environment of the site as part of initiatives for alleviating the heat island effect (corresponding measures for outside the site are evaluated under "LR3.2.2 Heat Island Effect").

LR: Environmental Load Reduction of Building

The aspects of environmental load reduction of building that are considered by CASBEE for Building (New Construction) are largely narrowed down to energy consumption, resource consumption and diverse impact on the off-site environment (pollution, etc.), as shown in Table I.2.4 below, and evaluate each of these items.

Table I.2.4 Assessment items in environmental load reduction of building (LR)

LR1 Energy	1. Control of Heat Load on the Outer Surface of Buildings	
	2. Natural Energy Utilization	
	3. Efficiency in Building Service System	
	4. Efficient Operation	4.1 Monitoring
		4.2 Operation & Management System
LR2 Resources & Materials	1. Water Resources	1.1 Water Saving
		1.2 Rain Water & Grey Water
	2. Reducing Use of Non-renewable Resources	2.1 Reducing Use of Materials
		2.2 Continuing Use of Existing Structural Frame, etc.
		2.3 Use of Recycled Materials as Structural Materials
		2.4 Use of Recycled Materials as Non-structural Materials
		2.5 Timber from Sustainable Forestry
		2.6 Efforts to Enhance the Reusability of Components and Materials
	3. Avoiding the Use of Materials with Pollutant Content	3.1 Use of Materials without Harmful Substances
		3.2 Elimination of CFCs and Halons
LR3 Off-site Environment	1. Consideration of Global Warming	
	2. Consideration of Local Environment	2.1 Air Pollution
		2.2 Heat Island Effect
		2.3 Load on Local Infrastructure
	3. Consideration of Surrounding Environment	3.1 Noise, Vibration & Odor
		3.2 Wind/Sand Damage & Daylight Obstruction
		3.3 Light Pollution

LR1 Energy

Efforts to reduce the energy load caused by the operation of the building are classified into "1 Control of Heat Load on the Outer Surface of Buildings," "2 Natural Energy Utilization," "3 Efficiency in Building Service System" and "4 Efficient Operation," which are all evaluated. Reductions in CO_2 emissions caused by energy consumption are to be evaluated under "LR3.1 Consideration of Global Warming."

Energy conservation standards for buildings in Japan have been established based on the Energy Conservation Law since 1980. There are 2 kinds of numerical indicators: PAL and CEC, used so far. Upon revisions to Energy Conservation Law in 2013, in terms of the assessment of the outer surface of buildings, the assessment standard has been changed from the annual load factor PAL into the Building PAL* Index (BPI), a standard of the annual load factor PAL*, in compliance with the standard for the primary energy consumption described below. At the same time, in the assessment of the energy saving performance of equipment and systems, the CEC standard, in which the assessment is carried out regarding each facility, has been replaced with the Building Energy Index (BEI), a standard of the primary energy consumption of the entire building. In addition to these changes to standards, in terms of relatively small-sized buildings, the Model Building Method has been adopted to replace the Point Method, in which special features of the Model Building Method including the BPI for Model Building Method (BPIm), a standard of the annual load, and the BEI for Model Building Method (BEIm), a standard of the primary energy consumption, have been adopted. On the other hand, energy saving measures from a wider viewpoint are also required, such as the active use of natural energy and unused energy, introduction of the BEMS, and adjustments or streamlining during the building's operation. Therefore, CASBEE has newly established a comprehensive assessment frame that covers these new energy conservation standards and efforts from wider aspects in the scope of the assessment.

Regarding the assessment of apartments, an assessment frame in compliance with the rating standard of the Housing Performance Indicator System (the Housing Quality Assurance Act) to be revised according to the 2013 energy conservation standards has been established for private areas. In terms of common areas, the same as non-residential buildings, an assessment frame in conformity to the 2013 energy conservation standards has been established. Further, since residents in apartments are also required to choose a way of living that would contribute to energy saving, "4. Efficient Operation" has been newly added to the scope of the assessment.

1. Control of Heat Load on the Outer Surface of Buildings

Improvements in the performance of outer surfaces in building plans closely related to the reduction of energy consumption due to air conditioning are evaluated in accordance with the BPI, a standard of the annual thermal load, and other related standards. For apartments, evaluate the thermal load in accordance with the Housing Performance Indicator system under the Housing Quality Assurance Act.

2. Natural Energy Utilization

The assessment is carried out regarding the direct use of natural energy (daylighting, ventilation, etc.).

3. Efficiency in Building Service System

The degree of increased efficiency in terms of air conditioning, ventilation, lighting, hot water supply, escalators and the like, is evaluated in accordance with the Building Energy Index (BEI), a standard of the primary energy consumption. In terms of apartments, private areas and common areas are evaluated according to the Housing Performance Indicator System (the Housing Quality Assurance Act) and the BEI, respectively. Transformation of natural energy for power use including solar power generation, which is has becoming increasingly popular, is also evaluated in this section.

4. Efficient Operation

Evaluates the operation and maintenance system and whether there is an energy consumption

monitoring system in running since the building went into operation.
The 2014 edition includes apartments in the scope of assessment.

LR2 Resources & Materials

In this section, "1 Water Resources," "2 Reducing Use of Non-renewable Resources" and "3 Avoiding the Use of Materials with Pollutant Content" are evaluated as ways of reducing the consumption of resources and materials through the life cycle of the building.
Various methods using existing environmental performance assessment tools are employed for evaluating the environmental load generated by the use of resources in buildings. However, they have their own assessment indices and no common standard method has been established. Therefore the development of CASBEE collected and analyzed the assessment indicators used by existing Japanese and foreign assessment tools in connection with the use of resources in buildings. The CASBEE assessment items were based on that analysis, so that the concepts are incorporated in a new group of assessment indicators that avoids redundancy.

1. Water Resources

Regard water shortage due to rapid use of large volumes of potable water as an environmental problem beyond the virtual enclosed space boundary and evaluate reduction of potable water usage, referring to whether or not there are efforts for saving water, using rain water, and reusing grey water.

2. Reducing Use of Non-renewable Resources

Regard depletion of non-renewable resources as an environmental problem beyond the virtual enclosed space boundary, and evaluate efforts to reduce consumption of such resources. Specifically, evaluate reduction in the resource usage volume itself under "2.1 Reducing Use of Materials," and the state of usage of reused and reusable materials and products under "2.2 Continuing Use of Existing Structural Frame, etc.," "2.3 Use of Recycled Materials in Structural Materials" and "2.4 Use of Recycled Materials as Non-structural Materials." Furthermore, evaluate use of renewable resources under "2.5 Timber from Sustainable Forests," and the ease of reuse and recycling at the demolition stage under "2.6 Efforts to Enhance the Reusability of Components and Materials," in order to evaluate indirect reduction in the use of non-renewable resources. Ability to improve climate change through resource usage efforts should be evaluated under LR3.

3. Avoiding the Use of Materials with Pollutant Content

To reduce the environmental load associated with use of resources, it is important to reduce the amount of the resources used, and also to reduce the use of materials that include pollutants. This item evaluates performance in reducing the emission of pollutants associated with the use of resources, under "3.1 Use of Materials without Harmful Substances" and "3.2 Elimination of CFCs and Halons," and also improvements on issues such as ozone depletion.

LR3 Off-site Environment

LR3 Off-site Environment evaluates the efforts to reduce the impact that environmental loads generated in the building and its site that affects the global environment, local environment and surrounding area beyond site boundaries. Pollution of soil and groundwater is not classified as an assessment item, because with strict observance of the law there is little risk of such pollution by the building, and assessment is based on the assumption that laws and regulations are strictly observed.

1. Consideration of Global Warming

Evaluate the following CO_2 reduction initiatives using the quantitative $LCCO_2$ indicators:
(1) Efforts to reduce operating energy affecting climate change
(2) Use of existing structural frames and recycled construction materials, which contribute to the reduction of embodied CO_2 related to the manufacture of construction materials
(3) Efforts to extend building lifespan that contribute to $LCCO_2$ reduction
The assessment is based on the emission ratio (%) against the $LCCO_2$ (kg-CO_2/year-m^2) in terms

of buildings having all assessment items other than this item (excluding LR1 Energy) at Level 3 equivalent (Reference Buildings).

2. Consideration of Local Environment

Under "2.1 Air Pollution," evaluate the reduction of atmospheric pollutants emitted from buildings or from within the property. This includes measures such as the control of pollutants from the operation of building equipment and pollutants removal by plants.
Under "2.2 Heat Island Effect," evaluate efforts that contribute to mitigation of the heat island effect of surrounding areas. This includes enhanced airflow leaving the site, greening of the building, and reductions in solar absorption and artificial heat discharge. On-site mitigation of the heat island effect is evaluated under "Q3.3.2 Improvement of the Thermal Environment on Site." Efforts to reduce the environmental load imposed on local infrastructure facilities by the operation of the building are evaluated under "2.3 Load on Local Infrastructure." The four elements to consider are rain water runoff, sewage treatment, traffic volume and waste disposal.

3. Consideration of Surrounding Environment

Under "3.1 Noise, Vibration and Odor," evaluate noise, vibration and odor generated during the operation of the building. Noise and vibration generated during the operation of the equipment are evaluated according to whether measures for source elimination and propagation control have been established. Assessment of odor is based on reduction measures for odors generated from chemical substances designated under the Offensive Odor Control Law and from organic waste.
Buildings that would occur wind hazards (e.g. large structure buildings) should be carefully considered during the design stage. Under "3.2 Wind/Sand Damage & Daylight Obstruction," evaluate whether wind hazard control measures have been established for such buildings.
Also evaluate measures put into effect to limit impact of daylight obstruction on adjacent buildings and the surrounding area caused by the building. Additionally, assessment of sand and dust control measures is also performed for school buildings. Light pollution, such as light spillage from exterior lighting, billboard lighting, the building itself, and daylight glare reflecting off exterior walls, has become an important urban issue. Under "3.3 Light Pollution," evaluate measures to reduce the impact of light pollution based on the guidelines published by the Ministry of the Environment (MOE).

2.6 Weighting coefficients

The weighting coefficients between assessment categories should not be determined solely on scientific knowledge. They should also take into account the value and perceptions of various interested parties, such as designers, building owners and managers and related officials. For the 2003 edition, the weighting coefficients were determined by votes and case studies by the experts of the CASBEE Research and Development Committee. In the development conducted a wide-ranging questionnaire survey of the designers, building owners and operators, related officials and others who would actually use the system was held (110 valid samples were received). Paired comparison judgments based on the responses were used in a hierarchical process to judge the importance of multiple items by an Analytic Hierarchy Process (AHP). Different weighting coefficients for detailed assessment levels are set for individual buildings, as appropriate for their types.
In developing the 2008 edition of CASBEE for New Construction, criteria considering global warming were added in LR3. Due to the social importance of such assessment, a new survey was conducted to further analyze weighting coefficients. From the results of 254 responses, application of the same coefficients as in the 2006 edition were determined, as shown in Table I.2.3. These values remain unchanged in the 2014 edition.

Table I.2.3 Weighting coefficients

Assessment Categories		
Q1 Indoor Environment	Non-factory	Factory
	0.40	0.30
Q2 Quality of Service	0.30	0.30
Q3 Outdoor Environment (On-site)	0.30	0.40
LR1 Energy	0.40	
LR2 Resources & Materials	0.30	
LR3 Off-site Environment	0.30	

3. Assessment Procedures

3.1 Composition of the assessment tool

CASBEE for Building (New Construction) has been developed to allow simple data entry from general-purpose spreadsheet software for various usage of assessment result.

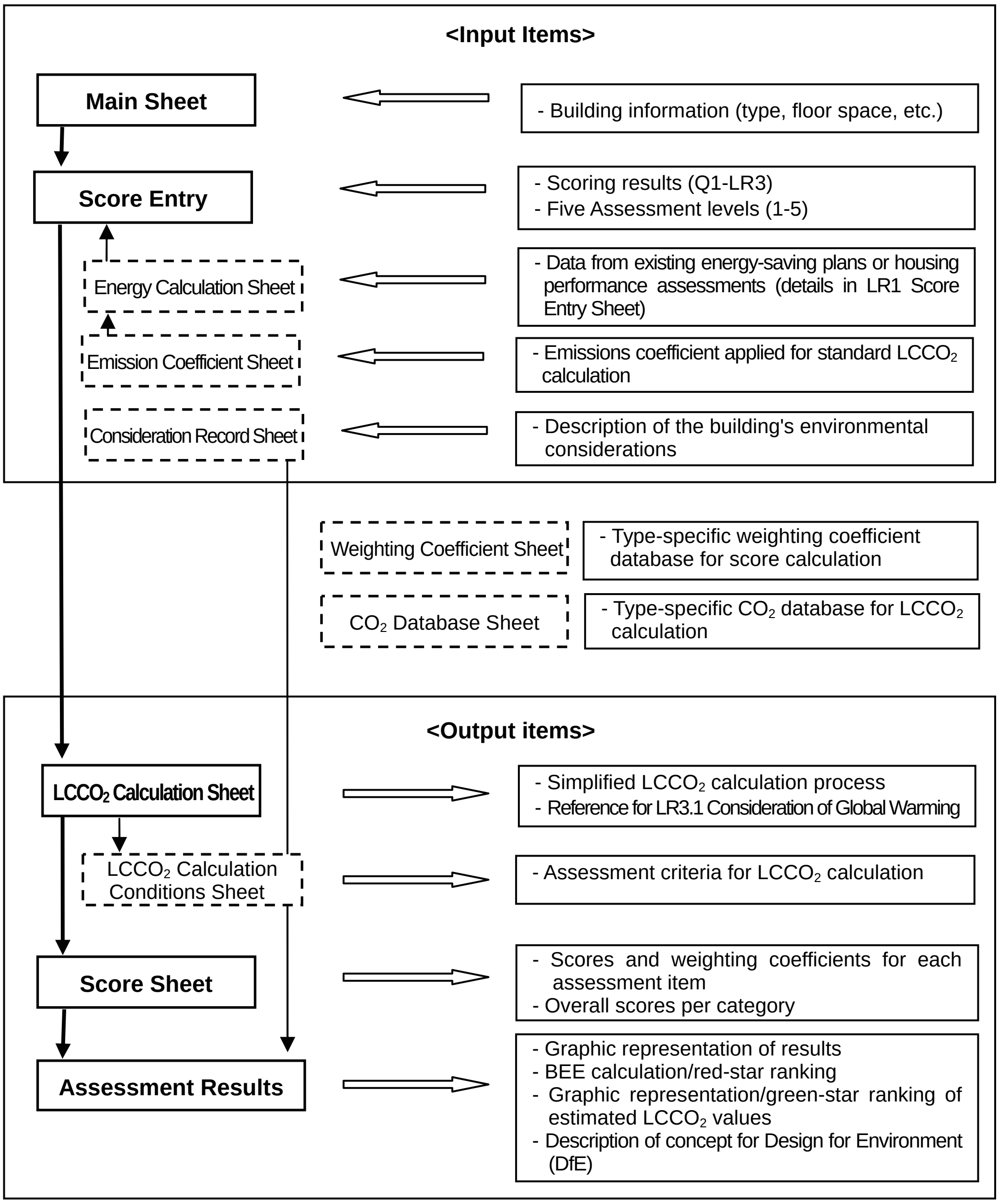
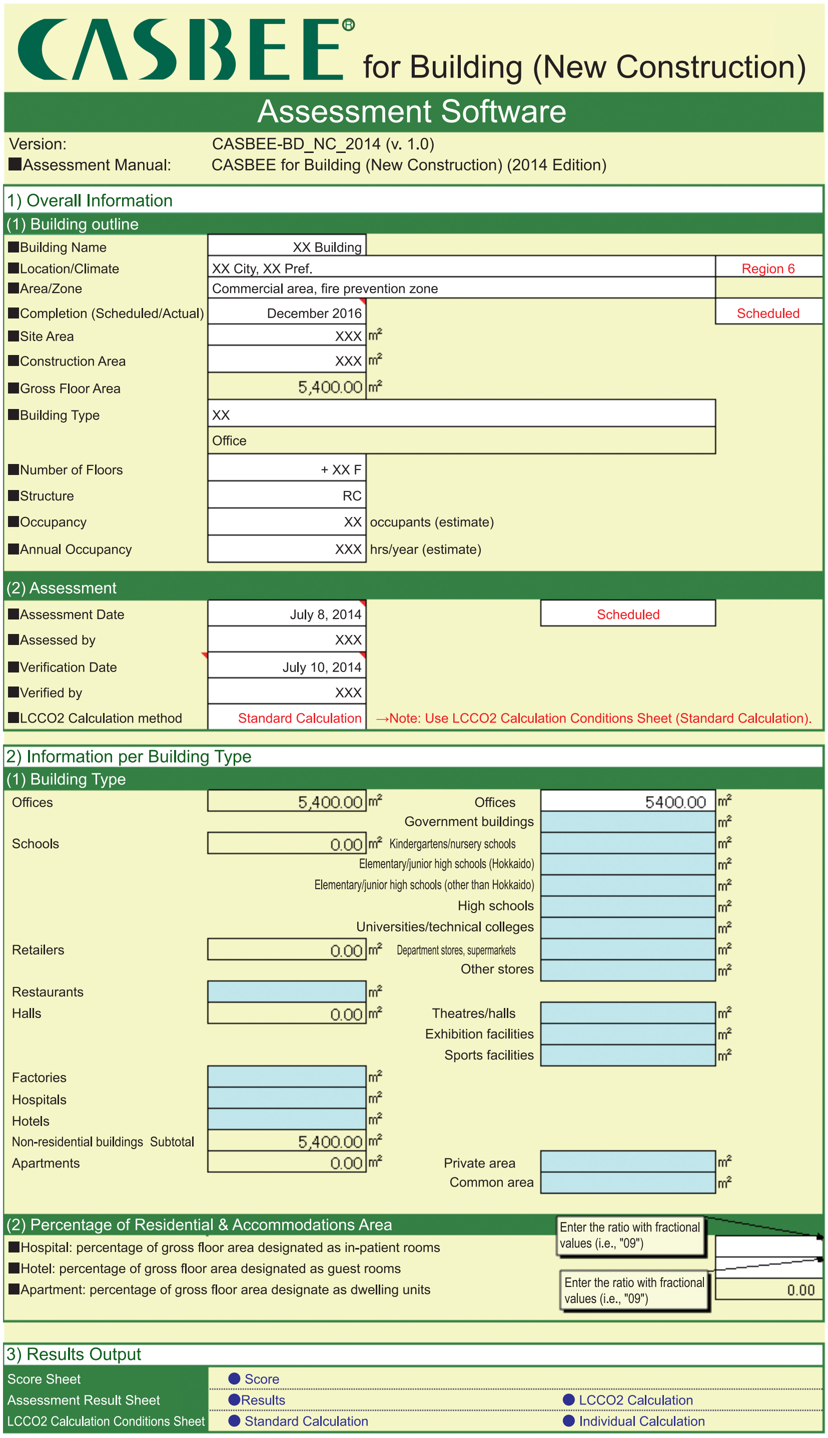


Figure I.3.1 Assessment sheet overview

3.2 Main Sheet

Figure I.3.2 shows the Main Sheet. The Main Sheet is the sheet where the assessor makes the first input. Enter the information necessary for the assessment, such as basic information on the subject building (name, type, size, etc.). From the assessment of buildings with residential type buildings, enter the floor area ratio between <Entire Building and Common Properties> and <Residential and Accommodation Sections>.



CASBEE® for Building (New Construction)

Assessment Software

Version: CASBEE-BD_NC_2014 (v. 1.0)

■Assessment Manual: CASBEE for Building (New Construction) (2014 Edition)

1) Overall Information

(1) Building outline

■Building Name	XX Building		
■Location/Climate	XX City, XX Pref.		Region 6
■Area/Zone	Commercial area, fire prevention zone		
■Completion (Scheduled/Actual)	December 2016		Scheduled
■Site Area	XXX	m²	
■Construction Area	XXX	m²	
■Gross Floor Area	5,400.00	m²	
■Building Type	XX		
	Office		
■Number of Floors	+ XX F		
■Structure	RC		
■Occupancy	XX	occupants (estimate)	
■Annual Occupancy	XXX	hrs/year (estimate)	

(2) Assessment

■Assessment Date	July 8, 2014		Scheduled
■Assessed by	XXX		
■Verification Date	July 10, 2014		
■Verified by	XXX		
■LCCO2 Calculation method	Standard Calculation	→Note: Use LCCO2 Calculation Conditions Sheet (Standard Calculation).	

2) Information per Building Type

(1) Building Type

Offices	5,400.00 m²	Offices	5400.00 m²
		Government buildings	m²
Schools	0.00 m²	Kindergartens/nursery schools	m²
		Elementary/junior high schools (Hokkaido)	m²
		Elementary/junior high schools (other than Hokkaido)	m²
		High schools	m²
		Universities/technical colleges	m²
Retailers	0.00 m²	Department stores, supermarkets	m²
		Other stores	m²
Restaurants	m²		
Halls	0.00 m²	Theatres/halls	m²
		Exhibition facilities	m²
		Sports facilities	m²
Factories	m²		
Hospitals	m²		
Hotels	m²		
Non-residential buildings Subtotal	5,400.00 m²		
Apartments	0.00 m²	Private area	m²
		Common area	m²

(2) Percentage of Residential & Accommodations Area

■Hospital: percentage of gross floor area designated as in-patient rooms	Enter the ratio with fractional values (i.e., "09")	
■Hotel: percentage of gross floor area designated as guest rooms		
■Apartment: percentage of gross floor area designate as dwelling units	Enter the ratio with fractional values (i.e., "09")	0.00

3) Results Output

Score Sheet	● Score	
Assessment Result Sheet	●Results	● LCCO2 Calculation
LCCO2 Calculation Conditions Sheet	● Standard Calculation	● Individual Calculation

Figure I.3.2 Main Sheet screen (date entry example)

1) Summary input
(1) Building outline
Enter the basic information necessary for the assessment (name, type, scale, etc.). This information will be transferred to the Assessment Results Sheet.
Enter the average occupancy and the annual occupancy time where possible. These are for reference only and do not directly affect the CASBEE assessment.

Table I.3.1 Input items and examples of building outline

Entry item	Example	Entry item	Example
Building Name	XX Building	Gross floor area*2	(squre meter)
Location/Climate	XX City, XX Pref.	Building type	Office, school, apartment
Area/Zone	Commercial area	(Building type)*3	City hall, college
Regional Category	Region 6*1	Number of floor	+ XX F
Completion	2014.12	Structure	S
Site area	(squre meter)	Average	(number of people)
Construction area	(squre meter)	Annual occupancy	(hours)

*1 Select the regional category from among eight regions (1 to 8) in the Appendix Table I Evaluation Standards for Clients and Owners of Specified Buildings Concerning Rational Use of Energy in Housing (the Ministry of Economy, Trade and Industry (METI)/MLIT, 2013 Directive No.1).
*2 Gross floor area is automatically entered as the sum of the previously-entered floor space in all usage areas.
*3 Building type is automatically entered from the types selected in the column for the usage-specific floor area, based on the CASBEE building type categories. More specific information on the building type can be entered in the additional Building Type column above (optional).

(2) Assessment Implementation
Input the date of the assessment and the name of the assessor. If the contents of the assessment are checked by a different person, enter the date of the check and name of the checker in this column.

2) Entry for individual building type
(1) Building types
Select the most applicable building type name from those listed in Table I.3.2. Enter the gross floor area for each building type. Use 1) Summary input to enter more specific type for the building concerned. In the 2014 edition, with respect to buildings whose purposes are offices, schools, stores and meeting places, the floor space is provided in terms of individual detailed purposes.

(2) Ratio of residential and accommodation sections
Enter the floor area ratio of <Entire Building and Common Properties> and <Residential and Accommodation Sections> when evaluating residential type building. (Input the value, in the range 0-1.0, for the proportion of wards in hospitals, guest rooms in hotels and residential portions in apartments. Make no input for buildings of non-residential use.)

Table I.3.2 Classification for entering total floor space by building purpose

Classification	Building type	Detailed purpose	Types included
Non-residential	Offices	Offices, government buildings	Offices, government buildings, libraries, museums, post offices, etc.
	Schools	Kindergartens/nursery schools, elementary/junior high schools (Hokkaido), elementary/junior high schools (other than Hokkaido), high schools, universities/technical colleges	Elementary schools, junior high schools, high schools, universities, technical colleges, higher vocational school and other school types
	Retailers	Department stores, supermarkets, other stores	Department stores, supermarkets, etc.
	Restaurants		Restaurants, canteens, cafes, etc.
	Halls	Theatres/halls, exhibition facilities, sports facilities	Auditoriums, halls, bowling lanes, gymnasiums, theaters, movie theaters, pachinko parlors, etc.
	Factories		Factories, garages, warehouses, spectator stands, wholesale markets, computer rooms, etc.
Residential	Hospitals		Hospitals, homes for elderly, welfare homes for the handicapped, etc.
	Hotels		Hotels, inn etc.
	Apartments		Apartments (Detached houses are not applied.)

3) Display of each sheet

The Assessment Results Sheet, Score Sheet and $LCCO_2$ Calculation Sheet can be selected in the output results column to display the sheet on the screen.

3.3 Score Entry Sheet

The Score Entry Sheet indicates an assessment standard list for individual purposes, in which a five-level assessment standard on a scale of Level 1 to Level 5 is described. The assessor marks in accordance with the list.

Table I.3.3 Main elements in Score Entry Sheet

Element	Description
Scoring	Choose level 1-5 (or Not Applicable) from pull-down menu.
Scoring Criteria	Display assessment criteria for each item.
Efforts to be evaluated	A scoring method used for some items. Points which should be considered for the environment are listed, and can be selected for scoring.
Weighting coefficients (default)	Displays weighting coefficients stipulated for the application (cannot be altered)

The input method for the Score Entry Sheet is as stated below.

1) Scoring criteria

As shown in Figure I.3.3, Score Entry Sheet displays a list of scoring criteria for each building type, and the assessor should assign points accordingly. "Entire Building and Common Properties" should be scored for all types in common. However, for residential building, the Score Entry Sheets for Q1 and Q2 have scoring criteria and assessment columns for "Residential and Accommodation Sections," and those should be used for scoring.

Scoring criteria are set for levels 1-5, and the number for the level (e.g. "3" for level 3) should be chosen from the pull-down menu in the assessment column. If it is not possible to apply the scoring criteria as they stand, due to individual conditions in the target building, "Not Applicable" can be selected for some assessment items (Items which can be excluded are listed in the commentary in the manual). If "Not Applicable" is selected, the excluded scoring items are assigned a weighting of "0" unless otherwise specified, and distributed according to the weighting of other scoring items.

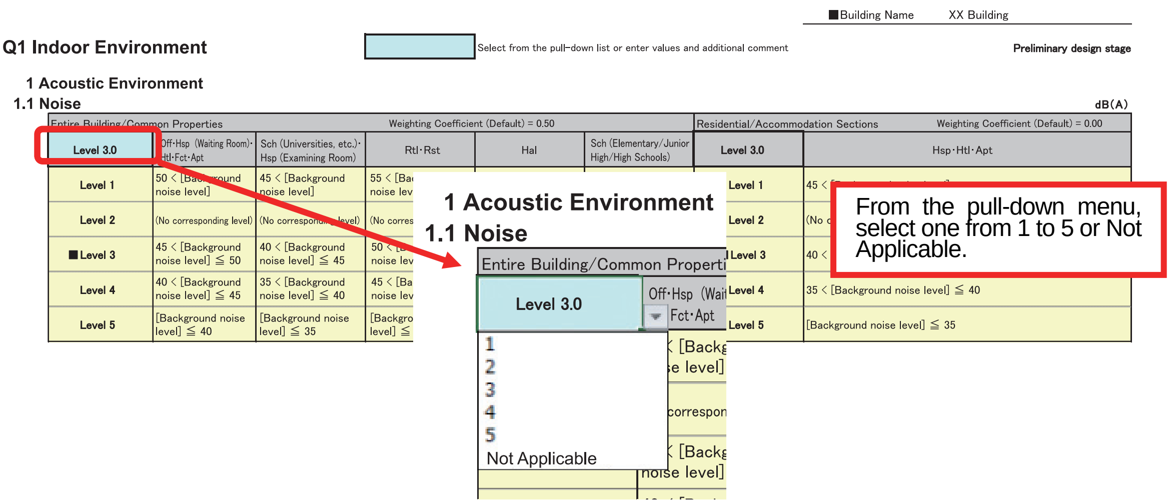


Figure I.3.3 Score Entry Sheet Display

2) Efforts to be evaluated

For some scoring items (particularly "Q3 Outdoor Environment (On-site)" and "LR3 Off-site Environment"), the score is determined by checking the levels of efforts indicated in the table of the efforts to be evaluated attached to the scoring criteria table. This information is listed under "Efforts to be evaluated," as a checklist of points to be considered in Design for Environment (DfE), or as a list of methods. Evaluate whether each of the listed efforts has been made, and score the item concerned according to the total number of points awarded (or the number of items).

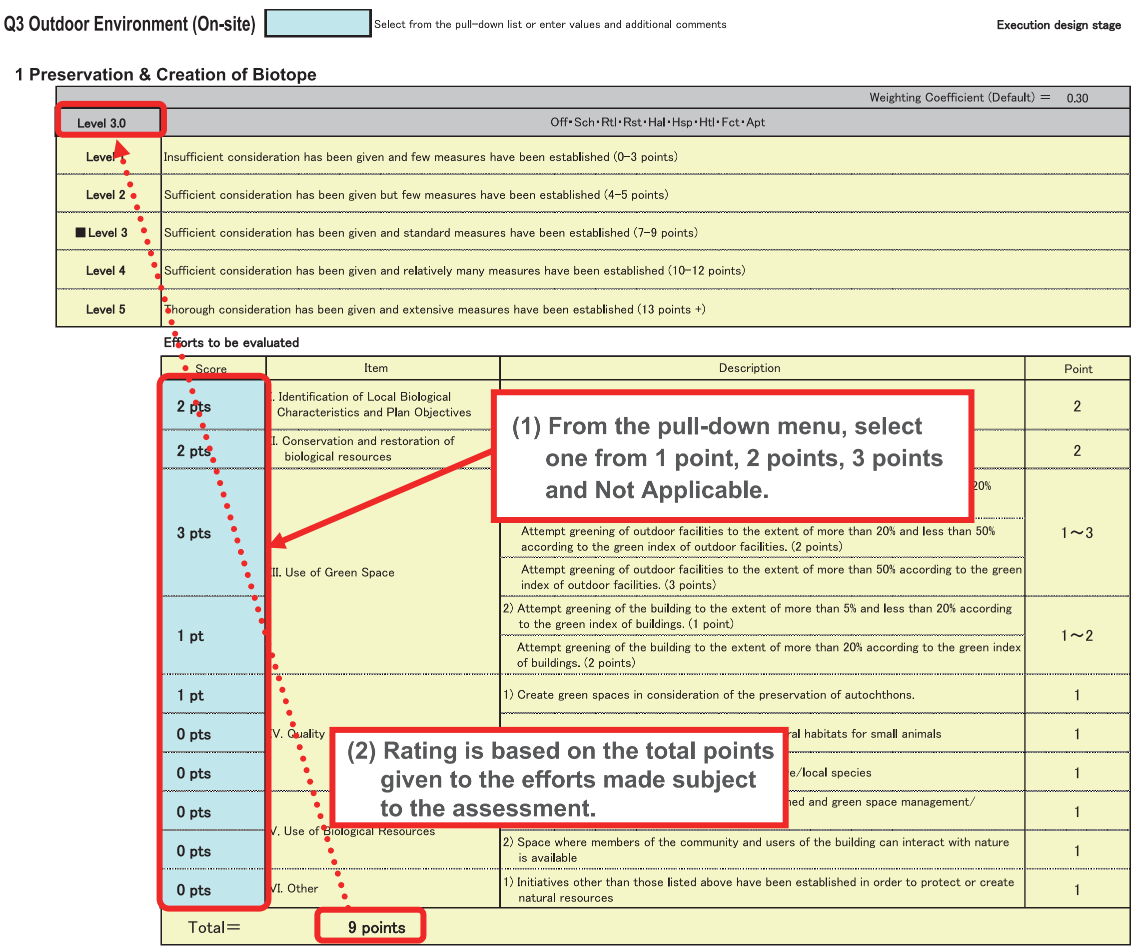


Figure I.3.4 Score Entry Sheet with method using "efforts to be evaluated"

3) Scoring method for LR1 Energy

Building energy conservation standards based on the Energy Conservation Law are incorporated in some assessment items under "LR1 Energy." In "1 Control of Heat Load on the Outer Surface of Buildings" the assessment is carried out based on the BPI or BPIm of the Model Building Method (in cases of residential buildings, the Energy Saving Countermeasure Grades under the Housing Quality Assurance Act).
In "3 Efficiency in Building Service System," the assessment is carried out according to the primary energy consumption ratio, utilizing the BEI or BEIm of the Model Building Method. Use the Energy Calculation Sheet shown in Figure I.3.5 to enter data for these two categories. Specifically, in terms of individual items such as the outer surface performance, the standard primary energy consumption and the designed primary energy consumption, the corresponding values are entered in accordance with the energy conservation standards. When an energy-saving plan or a housing performance assessment has already been developed, transfer the corresponding figures in the documents for the evaluations under "1 Control of Heat Load on the Outer Surface of Buildings" and "3 Efficiency in Building Service System."

* BPI: Building PAL＊ Index (An index that replaces the PAL, representing the thermal performance of the outer surface of a building)
BEI: Building Energy Index (An index that replaces the CEC, representing the energy consumption ratio of a building)

■LR1 Data from energy-saving plan ■Building Name XX Building

	Non-residential purposes		Residential purposes
1 Performance of the outer surface of a building			
Assessment according to the BPI — BPI=	0.890	in the Housing Quality Assurance Act	Grade 4

Level	Regions 1-7	Region 8
In cases of the assessment according to the BPI	Level 4.1	Level 4.5
In cases of the assessment according to the BPIm	Level 3.0	Level 3.0

	Non-residential purposes		Residential purposes	
Region: Region 6	Level 4.1		Level 5.0	
Floor space	5,400	m²(excluding factories)	0	m²
Ratio	1.00		0.00	
LR1.1 Control of Heat Load on the Outer Surface of Buildings — Overall building	Level 4.1			

3 Primary energy consumption of the building

Assessment according to the BEI

	Non-residential purposes		Common area	Private area (Total of all households)	
Primary energy consumption ratio; BEI(1)=	0.740	Primary energy consumption ratio =	–	0.00	* Excluding the power for home appliances and cooking in private areas
	Level 4.8		Level	Level	
Floor space	5,400	m²	0	0	
LR1.3 Increasing efficiency of equipment and systems	Level 4.8		Level		
■Standard primary energy consumption	8,961,360	GJ/year			GJ/year
Other energy consumption (for home appliances and cooking) included therein					←may be transcribed from the simple calculation
■Designed primary energy consumption (1)	6,632,871				
■Designed primary energy consumption (2)*	6,633,951				
■Total energy including solar power generation ((3) Efforts made on-site)	1,080	GJ/year			GJ/year
BEI(1)	0.74		–		
BEI(2)	0.74		–		

* Designed primary energy consumption (2); The primary energy obtained by adding the reduced energy consumption evaluated in (3) Efforts made on-site (including solar power generation and the like) back to the designed primary energy consumption (1) used when obtaining the BEI in the energy saving calculation

Simple calculation of energy required in dwelling units and other areas

	Area ratio	Total floor space (m²)	α M	Number of dwelling units	β M	EM	Total	
a (Less than 30 m²)		0	0		12,181	0	316	GJ/year
b (More than 30 m2 and less than 60 m²)		0	87		9,571	0		
c (More than 60 m2 and less than 90 m²)	0.8	0	167	50	4,771	238,550		
d (More than 90 m2 and less than 120 m²)	0.2	0	47	5	15,571	77,855		
e (More than 120 m²)		0	0		21,211	0		

■When the primary energy consumption is not calculated (Private areas of apartments) **The assessment is based on the primary energy consumption.**

The building is rated as Level 3 when it satisfies the Standard of the Primary Energy Consumption specified in the Guideline for Design, Construction and Maintenance regarding the Rationalization of Energy Use in Residential Buildings (2013 MLIT Notification No. 907), and meets the conditions for Grade 4 in 5-1 Energy Saving Countermeasure Grades of the Japan Housing Performance Indication Standard. When the requirements above are not satisfied, the building is rated as Level 1.

Heating method: A
A: Method in which the entire dwelling unit is heated
B: Method in which only the living space is heated (Continuous heating)
C: Method in which only the living space is heated (Intermittent heating)

Cooling method: a
a: Method in which the entire dwelling unit is cooled
b: Method in which only the living space is cooled (Intermittent cooling)

Figure I.3.5 Energy Calculation Sheet (Input sample, extract)

4) Scoring for building complex

When evaluating a building complex, enter the average of the levels (points) for all applicable building types, weighted for relative floor areas of each complex. Obtain the area-weighted average for each assessment item, and select the corresponding values from the pull-down list in the Score Entry Sheet of CASBEE for Building (New Construction). The averaged results are rounded to the nearest whole integer. In cases when a detailed assessment is conducted such as when applying for a certification system, values including weight-averaged fractional values may be entered directly in the rating field.

In the assessment of "LR1 Energy," in the cases of building complexes, the Energy Calculation Sheet has fields to which values may be transcribed either from the energy saving plan or the housing performance assessment report in terms of buildings for residential purposes and those for non-residential purposes. Therefore, the corresponding values may be entered in terms of individual purposes. The assessment is carried out based on the floor weighted average of the levels rated in all purposes (automatically calculated).

3.4 Consideration Record Sheet

State points are considered in Design for Environment (DfE), so that it is easy for a third party to gain an overview of environmental considerations in the evaluated building. The content of such statements is indicated in "3 Design Considerations" in the Assessment Results Sheet.
Make statements (free content) in each space for General, Q1-LR3 and Other in the Consideration Record Sheet. State the concept of the building as a whole in the General space, and make any statements related to assessment items in the relevant columns Q1-LR3. Use the Other column to describe other environment-oriented efforts not evaluated under Q1-LR3.

■ Considerations in environmental design ■ Building Name XX Building

Design Considerations	
General	Describe briefly comprehensive concept of environmental design of the building.
Q1 Indoor Environment	Describe briefly considerations for Q1 Indoor Environment of the building.
Q2 Quality of Service	Describe briefly considerations for Q2 Quality of Service of the building.
Q3 Outdoor Environment (On-site)	Describe briefly considerations for Q3 Outdoor Environment (On-site) of the building.
LR1 Energy	Describe briefly considerations for LR1 Energy of the building.
LR2 Resources & Materials	Describe briefly considerations for LR2 Resources & Materials of the building.
LR3 Off-site Environment	Describe briefly considerations for LR3 Off-site Environment of the building.
Other	Describe briefly considerations for other than 6 categories above that are not assessed in CASBEE, such as recycling activities at constriction site and preservation of historic buildings.

Figure I.3.6 Consideration Record Sheet

3.5 Emissions Coefficient Sheet

Select the appropriate CO_2 emissions coefficient for electricity use specific to the assessment objective. The assessment software for the 2014 edition allows use of the most recent actual emissions coefficient and alternative values (i.e. actual 2012 values and published values announced in December 2013). These values are based on Article 2-4 of the Ordinance on Calculation of Greenhouse Gas (GHG) Emissions from Business Activities of Specified Emitters. The assessor may also choose and apply other appropriate emissions coefficients (optional). Figure I.3.7 Emission Coefficient Sheet shows the coefficient selection form for electricity use.

Emissions Coefficient

Emissions coefficient for electricity use (Standard Calculation)

PPS/Reasons, etc.	Coefficient	
Please provide evidence.	N.A.	t-CO_2/kWh

(1) Using a designated emissions coefficient:

PPS/Reasons, etc.	Coefficient	
		(t-CO_2/kWh)

(2) Using a coefficient based on the calculation method for GHG emissions as referred to in the Basic Law for Prevention of Global Warming:

A: Electricity supplied by general and specified power producers/suppliers (PPS)

Name of PPS	Coefficient	
	#N/A	(t-CO_2/kWh)

B: Other:

PPS/Reasons, etc.	Coefficient	
		(t-CO_2/kWh)

C: Alternative coefficient value

Reasons, etc.	Coefficient	
Alternative value		(t-CO_2/kWh)

(3) Other:

PPS/Reasons, etc.	Coefficient	
		(t-CO_2/kWh)

CO_2 Emission Coefficient per PPS published in 2012

◇Coefficient per PPS and alternative value based on Ordinance on Calculations of GHG Emissions

[1] Actual emissions coefficient

Hokkaido Electric Power Co., Inc.	0.000688
Tohoku Electric Power Co., Inc.	0.000600
Tokyo Electric Power Co., Inc.	0.000525
Chubu Electric Power Co., Inc.	0.000516
Hokuriku Electric Power Co., Inc.	0.000663
Kansai Electric Power Co., Inc.	0.000514
Chugoku Electric Power Co., Inc.	0.000738
Shikoku Electric Power Co., Inc.	0.000700
Kyushu Electric Power Co., Inc.	0.000612
Okinawa Electric Power Co., Inc.	0.000903
eREX Co., Ltd.	0.000603
Idemitsu Green Power Co., Ltd.	0.000086
Itochu Enex Co., Ltd.	0.000676
Eneserve Corp.	0.000616
Ebara Environmental Plant Co., Ltd.	0.000456
Oji Paper Co., Ltd.	0.000475
ORIX Corp.	0.000762
e-sell Co., Ltd.	0.000000
Ennet Corp.	0.000429
F-Power Co., Ltd.	0.000525
G-Power Co., Ltd.	0.000441
Nihon Ceremony Corp.	0.000797
Summit Energy Corp.	0.000438
JX Nippon Oil & Energy Corp.	0.000367
JEN Holdings Co., Ltd.	0.000494
Shigakogen Resort Kaihatsu Corp.	0.000312
Showa Shell Sekiyu K.K.	0.000367
Nippon Steel & Sumikin Engineering Co, Ltd.	0.000655
Senboku Natural Gas Power Generation Co., Ltd.	0.000388
Diamond Power Corp.	0.000431
Tess Engineering Co., Ltd.	0.000494
Tokyo Eco Service Co., Ltd.	0.000092
Nihon Techno Service Co., Ltd.	0.000508
Japan Logistic Coop.	0.000486
Panasonic Corp.	0.000498
Premium Green Power Corp.	0.000018
Marubeni Corp.	0.000378
Mitsuuroko Green Energy Co., Ltd.	0.000366
Les Power Co.,Ltd.	0.000420 (t-CO_2/kWh)

[2] Alternative value

Alternative value	0.000550 (t-CO_2/kWh)

Figure I.3.7 Emissions Coefficient Sheet

(1) Using a designated emissions coefficient:

Check the box in Item 1, describe reasons for your choice and enter the emissions coefficient.

<Example>

Application for a subsidiary project (coefficient designated by the organizer), participation design/proposal competitions (designated by the organizer), submission under CASBEE for Municipality (designated by the municipality), etc.

(2) Using a coefficient based on the calculation method for GHG emissions as referred to in the Basic Law for Prevention of Global Warming:

Select the appropriate item below and enter the corresponding data*.

A: When use of electricity supplied by general and specified power producers/suppliers (PPS) is expected, apply PPS-specific emission coefficient set by the government.

→ Check the box in Item A and select the name of the PPS from the list.

2. Using a coefficient based on the calculation method for GHG emissions as referred to in the Basic Law for Prevention of Global Warming:

A: Electricity supplied by general and specified power producers/suppliers (PPS)

Name of PPS	Coefficient	
▼		(t-CO_2/kWh)

Chugoku Electric Power Co., Inc.
Shikoku Electric Power Co., Inc.
Kyushu Electric Power Co., Inc.
Okinawa Electric Power Co., Inc.
eREX Co., Ltd.
Eneserve Corp.
Ennet Corp.
F-Power Co., Ltd.
Coefficient

B:

Coefficient	
	(t-CO_2/kWh)

Figure I.3.8 Pull-Down Selection of Power Provider/Supplier

B: When assuming electricity is supplied by a producer/supplier not listed in Item A, apply the appropriate emissions coefficient calculated based on actual measurement data and which is equivalent to the values in Item A.

→ Check the box in Item B and enter the emissions coefficient and the name of the PPS.

C: When neither method A nor B applies, select an alternative coefficient value established by MOE and METI.
→ Check the box in Item C.

*Note: The PPS-specific emissions coefficients (actual coefficient/adjusted coefficient) and alternative coefficient values are revised and published annually by the government. Check whether the values are current in the CASBEE assessment software. If the revisions are not reflected in the software, confirm the latest coefficients available on MOE website and enter the value in Item (3) Other.

(3) Other:
Check the box in Item 3, describe the reasons for this choice and enter the emissions coefficient.

3.6 Life Cycle CO_2 Calculation Sheet

Figure I.3.9 shows the Life Cycle CO_2 ($LCCO_2$) calculation sheet. The sheet displays the automatic calculation process for $LCCO_2$ (standard calculation) based on data entered in the Score Entry Sheet and the Energy Calculation Sheet.
Under each category of the building's life cycle stages (i.e., construction, maintenance/upgrade/demolition and operation), the reference value (Standard building = Level 3 equivalent in all assessment items) and CO_2 emissions of a building subject to the assessment are indicated in kg-CO_2/year-m^2.

CASBEE for Building (New Construction) 2014 Edition
XX Building

■Manual: CASBEE for New Building (2014 Edition)
■Software: CASBEE-BD_NC_2014(v.1.0)

Life Cycle CO_2 Calculation Sheet (Standard Calculation)

1. CO_2 Emissions Related to Construction

1-1. Conversion of Assessment Results to CO_2 Emissions (Level 3 / Level 4 / Level 5 in kg-CO_2/year-m^2; Target and Reference CO_2 Emissions in kg-CO_2/year-m^2)

Q2.2.2.1 Structural Materials	Gross floor area ratio	Level 3	Level 4	Level 5	Score Results (Target)	CO2 Emissions (Target)	Score Results (Reference)	CO2 Emissions (Reference)
Offices	1.00	12.99	12.99	12.99	3.0	12.99	3.0	13.23
Schools	0.00	11.53	11.53	11.53	3.0	11.53	3.0	11.76
Retailers	0.00	21.88	21.88	21.88	3.0	21.88	3.0	22.39
Restaurants	0.00	21.88	21.88	21.88	3.0	21.88	3.0	22.39
Halls	0.00	12.22	12.22	12.22	3.0	12.22	3.0	12.47
Factories	0.00	22.05	22.05	22.05	3.0	22.05	3.0	22.50
Hospitals	0.00	12.05	12.05	12.05	3.0	12.05	3.0	12.26
Hotels	0.00	12.50	12.50	12.50	3.0	12.50	3.0	12.77
Apartments	0.00	19.22	9.61	6.41	3.0	19.22	3.0	19.62

Item	Target	Reference
Structure	RC	
LR2.2.2 Continuing Use of Existing Structural Frame, etc.	0%	0%
LR2.2.3 Recycled Materials for Structural Components (Blast Furnace Cement)	5%	0%
1-2. Total	12.99	13.23

2. CO_2 Emissions Related to Maintenance & Demolition

2-1. Conversion of Assessment Results to CO_2 Emissions (kg-CO_2/year-m^2)

Q2.2.2.1 Service Life of Structural Materials	Gross floor area ratio	Level 3	Level 4	Level 5	Score Results (Target)	CO2 Emissions (Target)	Score Results (Reference)	CO2 Emissions (Reference)
Offices	1.00	16.46	16.46	16.46	3.0	16.46	3.0	16.46
Schools	0.00	12.42	12.42	12.42	3.0	12.42	3.0	12.42
Retailers	0.00	13.19	13.19	13.19	3.0	13.19	3.0	7.74
Restaurants	0.00	7.74	7.74	7.74	3.0	7.74	3.0	7.74
Halls	0.00	13.43	13.43	13.43	3.0	13.43	3.0	13.43
Factories	0.00	9.42	9.42	9.42	3.0	9.42	3.0	9.42
Hospitals	0.00	16.05	16.05	16.05	3.0	16.05	3.0	16.05
Hotels	0.00	13.94	13.94	13.94	3.0	13.94	3.0	13.94
Apartments	0.00	8.37	9.74	10.86	3.0	8.37	3.0	8.37
2-2. Total						16.46		16.46

3. CO_2 Emissions Related to Operation Energy

3-1 Building-related Initiatives (2) — Target: 59.40 kg-CO_2/year-m^2; Reference value (1): 83.39 kg-CO_2/year-m^2

	Floor space	Primary energy consumption GJ/year: Reference building [1]	Primary energy consumption GJ/year: Assessment building [2]	CO_2 conversion factor kg-CO_2/MJ	Target kg-CO_2/year-m^2	Reference kg-CO_2/year-m^2
Non-residential area	5,400	8,316	5,923	0.0541479	59.40	83.39
Residential building Private area (All dwelling units)	0	0	0	0.0560164	0.00	0.00
Residential building Common area	0	0	0	0.053791	0.00	0.00

3-2 Above Initiatives + Other On-site Measures (3) — Target: 48.57 kg-CO_2/year-m^2

	Floor space	Primary energy consumption GJ/year: Reduced amount	Primary energy consumption GJ/year: Assessment building [3]	CO_2 conversion factor kg-CO_2/MJ	Target kg-CO_2/year-m^2
Non-residential area	5,400	1,080	4,843	0.0541479	48.57
Residential building Private area (All dwelling units)	0	0	0	0.0560164	0.00
Residential building Common area	0	0	0	0.053791	0.00

4. $LCCO_2$ Calculation (Standard Calculation)

	Target: CO2 Emissions (kg-CO2/year-m2)	Reference: CO2 Emissions (kg-CO2/year-m2)
Construction	12.99	13.23
Maintenance & Demolition	16.46	16.46
Operation	48.57	83.39
Total	78.01	113.07

Figure I.3.9 $LCCO_2$ Calculation Sheet (output example)

LCCO$_2$ Calculation Conditions Sheet (standard calculation)

For assessments based on the standard calculation, LCCO$_2$ Calculation Conditions Sheet displays the assessment conditions applied in the LCCO$_2$ calculation, such as amount of key materials, environmental load units, CO_2 emissions coefficient for energy, and other source data.

■ LCCO$_2$ Calculation Conditions Sheet (Standard Calculation) ■ Building Name XX Building

CASBEE_BD-NC_2014 (v.1.0)

Item		Reference Values (Reference Building)	Target	Note
Building Overview	Building type	Office	Office	
	Gross floor area	5,400 m^2	5,400 m^2	
	Structure	RC	RC	
Life Cycle	Estimated service life	Office area, 60 years	Office area, 60 years	
Construction Stage	CO_2 emissions	13.23	12.99	kg-CO_2/year-m^2
	Embodied CO_2 calculation method	Japan's average CO_2 emissions based on 2005 I-O table analysis by the Architectural Institute of Japan	Estimated by subtracting CO_2 reduction due to recycled material use from the reference value	
	Reference for CO_2 emissions unit	CO_2 emissions based on the analysis of the 2005 I-O Table by the Architectural Institute of Japan	See reference method	
	Boundary	Domestic consumption expenditures	See reference method	
	Representative main material amounts			
	Regular concrete	0.77	0.73	m^3/m^2
	Blast furnace cement concrete	0.00	0.04	m^3/m^2
	Steel frame	0.04	0.04	t/m^2
	Steel frame (electric furnace)	0.00	0.00	t/m^2
	Steel reinforced	0.10	0.10	t/m^2
	Lumber	0.01	0.01	t/m^2
	XX	XX	〃	kg/m^2
	Representative material environmental load			
	Regular concrete	266.71	〃	kg-CO_2/m^3
	Blast furnace cement concrete	216.57	〃	kg-CO_2/m^3
	Steel frame	1.28	〃	kg-CO_2/kg
	Steel frame (electric furnace)	1.28	〃	kg-CO_2/kg
	Steel reinforced	0.51	〃	kg-CO_2/kg
	Cement formwork	4.75	〃	kg-CO_2/m^2
	XX	XX	〃	kg-CO_2/kg
	Main recycled materials and usage			
	Blast furnace cement (structural use)	0%	5%	
	Existing frame materials (structural use)	0%	0%	
	Electric furnace steel (reinforcement)	0%	0%	
	Electric furnace steel (steel materials)	0%	0%	
Maintenance/ Upgrade/ Demolition Stage	CO_2 emissions	16.46	16.46	kg-CO_2/year-m^2
	Upgrade period (year)			
	Exterior	25 years	25 years	
	Interior	18 years	18 years	
	Service system	15 years	15 years	
	Average maintenance rate (%/year)			
	Exterior	1%	1%	
	Interior	1%	1%	
	Service system	2%	2%	
	Calculation method for demolition-related CO_2 emissions	Estimated assuming demolition materials of 2,000 kg/m^2 and road transport distance of 30 km	See reference method	
Operation Stage	CO_2 emissions			
	1. Reference value/2. Building-related initiatives	83.39	59.40	kg-CO_2/year-m^2
	3. Above + other on-site initiatives	-	48.57	kg-CO_2/year-m^2
	4. Above + other off-site measures	-	48.57	kg-CO_2/year-m^2
	Reference	(a) Carbon offsetting with renewable energy certificates	-	
		(b) Carbon offsetting with green heat certificate	-	
		(c) Other carbon credit	-	
		(d) Difference between actual and adjusted emissions (obtained from the adjusted emissions coefficient)	-	
	Calculation method for energy consumption	Average primary energy consumptions based on statistical value	Estimated based on energy conservation achieved with LR1-related measures	
	Primary energy consumption	8,316	4,843	GJ/year
	CO_2 emissions coefficient for energy			
	Primary energy Non-residential buildings	0.0560	As reference value	kg-CO_2/MJ
	Primary energy Residential buildings (Private areas)	0.0541	As reference value	kg-CO_2/MJ
	Electricity	0.525	As reference value	kg-CO_2/kWh
	Gas	0.0499	As reference value	kg-CO_2/MJ
	Other energy ( )	XX	As reference value	kg-CO_2/MJ
	Potable water			
Other				

Figure I.3.10 LCCO$_2$ Calculation Conditions Sheet (standard calculation)

When the existing structural frame or blast furnace cement is used, enter the percentage utilization for each item. These values are reflected in the calculation of the CO_2 emissions under the construction stage category of the $LCCO_2$ Calculation Sheet.

Item		Reference Values (Standard Building)	Target	Note
Construction Stage	Blast furnace cement (structural use)	0%	0%	
	Existing frame materials (structural use)	0%	0%	

Figure I.3.11 $LCCO_2$ Calculation Conditions Sheet (standard calculation): Utilization of blast furnace cement and existing frame materials (%)

3.7 Entry into the Score Sheet

Rating results entered into individual Score Entry Sheets are indicated in the rating fields in the Score Sheet. The standard for the final rating is 3 points. With respect to assessment items to which more than 3 points are given, specific grounds of such assessment results must be provided in the "Summary for Design for Environment (DfE)" column located in the middle of the Score Sheet.

CASBEE for Building (New Construction) 2014 Edition
XX Building

Enter values or additional comments

■Assessment Manual: CASBEE for Building (New Construction) (2014 Edition)
■Assessment Software: CASBEE-BD_NC_2014(v.1.0)

Score Sheet Execution design stage

Concerned items			Summary for Design for Environment (DfE)	Entire Building and Common Properties: Score	Entire Building and Common Properties: Weighting coefficients	Residential and Accommodation sections: Score	Residential and Accommodation sections: Weighting coefficients	Total
Q: Environmental Quality of Building					1.00		-	3.4
Q1 Indoor Environment					0.40			3.5
1. Sound Environment				3.0	0.15	-	-	3.0
1.1 Noise			Indicate specific measures taken (Mandatory for assessment items that obtained more than 3 points)	3.0	0.40	-	-	
1.2 Sound Insulation				3.0	0.40	-	-	
	1	Sound Insulation of Openings		3.0	0.60	3.0	-	
	2	Sound Insulation of Partition Walls		3.0	0.40	3.0	-	
	3	Sound Insulation Performance of Floor Slabs (light-weight impact source)		3.0	-	3.0	-	
	4	Sound Insulation Performance of Floor Slabs (heavy-weight impact source)		3.0	-	3.0	-	
1.3 Sound Absorption				3.0	0.20	3.0	-	

Figure I. 3.12 How to enter into the Score Sheet

CASBEE for Building (New Construction) 2014 Edition		■Assessment Manual: CASBEE for Building (New Construction) 2014 Edition
XX Building	Enter values or additional comments	■Assessment Software: CASBEE-BD_NC_2014(v.1.0)

Score Sheet Execution design stage		Entire Building and Common Properties		Residential and Accommodation Sections		
Concerned Items	Summary for Design for Environment (DfE)	Score	Weighting Coefficients	Score	Weighting Coefficients	Total
Q: Environmental Quality of Building			1.00		-	3.4
Q1 Indoor Environment			0.40			3.5
1. Sound Environment		3.0	0.15	-	-	3.0
1.1 Noise		3.0	0.40	-	-	
1.2 Sound Insulation		3.0	0.40	-	-	
1 Sound Insulation of Openings		3.0	0.60	3.0	-	
2 Sound Insulation of Partition Walls		3.0	0.40	3.0	-	
3 Sound Insulation Performance of Floor Slabs (light-weight impact source)		3.0	-	3.0	-	
4 Sound Insulation Performance of Floor Slabs (heavy-weight impact source)		3.0	-	3.0	-	
1.3 Sound Absorption		3.0	0.20	3.0	-	
2. Thermal Comfort		4.1	0.35	-	-	4.1
2.1 Room Temperature Control		4.0	0.50	-	-	
1 Room Temperature	At 25 degree in summer, 22 degree in winter	5.0	0.30	3.0	-	
2 Perimeter Performance		3.0	-	-	-	
3 Zoned Control		3.0	0.30	-	-	
2.2 Humidity Control		3.0	0.20	3.0	-	
2.3 Type of Air Conditioning System	Floor vented system	5.0	0.30	3.0	-	
3. Lighting & Illumination		3.6	0.25	-	-	3.6
3.1 Daylight		5.0	0.30	-	-	
1 Daylight Factor	2.5%	5.0	0.60	3.0	-	
2 Openings by Orientation		-	-	3.0	-	
3 Daylight Devices	Light shelf	5.0	0.40	3.0	-	
3.2 Anti-glare Measures		3.0	0.30	-	-	
1 Daylight Control		3.0	0.60	3.0	-	
2 Reflection Control		3.0				
3.3 Illuminance Level		3.0	0.15	3.0	-	
3.4 Lighting Controllability		3.0	0.25	3.0	-	
4. Air Quality		3.2	0.25	-	-	3.2
4.1 Source Control		3.0	0.50	-	-	
1 Chemical Pollutants		3.0	0.33	3.0	-	
2 Asbestos		3.0	-	-	-	
4.2 Ventilation		3.0	0.30	-	-	
1 Ventilation Rate		3.0	0.25	3.0	-	
2 Natural Ventilation Performance		3.0	0.25	3.0	-	
3 Consideration for Outside Air Intake		3.0	0.25	3.0	-	
4.3 Operation Plan		4.0	0.20	-	-	
1 CO_2 Monitoring	CO_2 monitoring system	5.0	0.50	-	-	
2 Control of Smoking		3.0	0.50	-	-	
Q2 Quality of Service		–	0.30	-	-	3.2
1. Service Ability		3.5	0.40	-	-	3.5
1.1 Functionality & Usability		3.6	0.40	-	-	
1 Provision of Space & Storage		3.0	0.33	3.0	-	
2 Use of Advanced Information System	Power supply 40 VA/m² or higher	4.0	0.33	3.0	-	
3 Barrier-free Planning	Mobility guidance standards	4.0	0.33	-	-	
1.2 Amenity		4.0	0.30	-	-	
1 Perceived Spaciousness & Access to View		3.0	0.33	3.0	-	
2 Space for Refreshment	Provision of space for refreshment	5.0	0.33	-	-	
3 Décor Planning	Mockup verification	4.0	0.33	-	-	
1.3 Maintenance		3.0	0.30	-	-	
1 Design That Considers Maintenance		3.0	0.50	-	-	
2 Securing Maintenance Functions		3.0	0.50	-	-	
3 Public Health Management		-	-	-	-	
2. Durability & Reliability		3.1	0.30	-	-	3.1
2.1 Earthquake Resistance		3.2	0.50	-	-	
1 Earthquake-resistance		3.0	0.80	-	-	
2 Seismic Isolation & Vibration Damping Systems	Vibration Damping Systems	4.0	0.20	-	-	
2.2 Service Life of Components		3.0	0.30	-	-	
1 Service Life of Structural Materials		3.0	0.20	-	-	
2 Necessary Refurbishment Interval for Exterior Finishes		3.0	0.20	-	-	
3 Necessary Renewal Interval for Main Interior Finishes		3.0	0.10	-	-	
4 Necessary Replacement Interval for Air Conditioning and Ventilation Ducts		3.0	0.10	-	-	
5 Necessary Renewal Interval for HVAC and Water Supply and Drainage Pipes		3.0	0.20	-	-	
6 Necessary Renewal Interval for Major Equipment and Services		3.0	0.20	-	-	
2.4 Reliability		3.0	0.20	-	-	
1 HVAC System		3.0	0.20	-	-	
2 Water Supply & Drainage		3.0	0.20	-	-	
3 Electrical Equipment		3.0	0.20	-	-	
4 Support Method of Machines & Ducts		3.0	0.20	-	-	
5 Communications & IT Equipment		3.0	0.20	-	-	
3. Flexibility & Adaptability		3.0	0.30	-	-	3.0
3.1 Spatial Margin		3.0	0.30	-	-	
1 Allowance for Floor-to-floor Height		3.0	0.60	3.0	-	
2 Adaptability of Floor Layout		3.0	0.40	3.0	-	
3.2 Floor Load Margin		3.0	0.30	3.0	-	
3.3 System Renewability		3.0	0.40	-	-	
1 Ease of Air Conditioning Duct Renewal		3.0	0.20	-	-	
2 Ease of Water Supply and Drain Pipe Renewal		3.0	0.20	-	-	
3 Ease of Electrical Wiring Renewal		3.0	0.10	-	-	
4 Ease of Communications Cable Renewal		3.0	0.10	-	-	
5 Ease of Equipment Renewal		3.0	0.20	-	-	
6 Provision of Backup Space		3.0	0.20	-	-	

Figure I.3.13 Score sheet screen (1/2)

Q3: Outdoor Environment (On-site)		–	0.30	-	-	3.4
1. Preservation & Creation of Biotope	Biotope	4.0	0.30	-	-	4.0
2. Townscape & Landscape		3.0	0.40	-	-	3.0
3. Local Characteristics & Outdoor Amenity		3.5	0.30	-	-	3.5
3.1 Attention to Local Character & Improvement of Comfort		3.0	0.50	-	-	
3.2 Improvement of the Thermal Environment on Site	Planting on site	4.0	0.50	-	-	
LR: Environmental Load Reduction of Building		–	-	-	-	3.8
LR1: Energy		–	0.40	-	-	4.5
1. Control of Heat Load on the Outer Surface of Buildings	BPI=0.89	4.1	0.20	-	-	4.1
2. Natural Energy Utilization	Amount used 20 MJ/m²/Year, light shelf, natural ventilation	5.0	0.10	-	-	5.0
3. Efficiency in Building Service System	BEI = Non-residential 0.74 Residential (private area) —	4.7	0.50	-	-	4.7
Assessment of buildings other than apartments (3a.3b)	LED introduction, highly efficient air conditioning	4.7	1.00	-	-	
Assessment of apartments (3c)		-	-	-	-	
4. Efficient Operation		4.5	0.20	-	-	4.5
Assessment of buildings other than apartments		4.5	1.00	-	-	
4.1 Monitoring	Introduction of BEMS	5.0	0.50	-	-	
4.2 Operation & Management System	Implementing energy analysis	4.0	0.50	-	-	
Assessment of apartments		-	-	-	-	
4.1 Monitoring		-	-	-	-	
4.2 Operation & Management System		-	-	-	-	
LR2: Resources & Materials		–	0.30	-	-	3.3
1. Water Resources		3.4	0.20	-	-	3.4
1.1 Water Saving		3.0	0.40	-	-	
1.2 Rain Water & Grey Water		3.7	0.60	-	-	
1 Rain Water Use System	Rain water Use System	4.0	0.70	-	-	
2 Grey Water Use System		3.0	0.30	-	-	
2. Reducing Use of Non-renewable Resources		3.4	0.60	-	-	3.4
2.1 Reducing Use of Materials		3.0	0.10	-	-	
2.2 Continuing Use of Existing Structural Frame, etc.		3.0	0.20	-	-	
2.3 Use of Recycled Materials as Structural Materials	Use of blast furnaces	5.0	0.20	-	-	
2.4 Use of Recycled Materials as Non-structural Materials	—	3.0	0.20	-	-	
2.5 Timber from Sustainable Forestry		3.0	0.10	-	-	
2.6 Efforts to Enhance the Reusability of Components and Materials		3.0	0.20	-	-	
3. Avoiding the Use of Materials with Pollutant Content		3.2	0.20	-	-	3.2
3.1 Use of Materials without Harmful Substances		3.0	0.30	-	-	
3.2 Elimination of CFCs and Halons		3.3	0.70	-	-	
1 Fire Retardant		4.0	0.33	-	-	
2 Foaming Agents (Insulation Materials, etc.)		3.0	0.33	-	-	
3 Refrigerants		3.0	0.33	-	-	
LR3: Off-site Environment		–	0.30	-	-	3.5
1. Consideration of Global Warming	Aggressive energy saving measures, use of blast furnaces	4.2	0.33	-	-	4.2
2. Consideration of Local Environment		3.5	0.33	-	-	3.5
2.1 Air Pollution		3.0	0.25	-	-	
2.2 Heat Island Effect	Planting on site	4.0	0.50	-	-	
2.3 Load on Local Infrastructure		3.0	0.25	-	-	
1 Reduction of Rain Water Discharge Loads		3.0	0.25	-	-	
2 Sewage Load Suppression		3.0	0.25	-	-	
3 Traffic Load Control		3.0	0.25	-	-	
4 Waste Treatment Loads		3.0	0.25	-	-	
3. Consideration of Surrounding Environment		2.8	0.33	-	-	2.8
3.1 Noise, Vibration & Odor		3.0	0.40	-	-	
1 Noise		3.0	0.33	-	-	
2 Vibration		3.0	0.33	-	-	
3 Odor		3.0	0.33	-	-	
3.2 Wind Damage, Sand/Dust & Obstruction of Daylight		3.0	0.40	-	-	
1 Restriction of Wind Damage		3.0	0.70		-	
2 Restriction of Sand and Dust		3.0	-			
3 Restriction of Daylight Obstruction		3.0	0.30		-	
3.3 Light Pollution		2.4	0.20	-	-	
1 Outdoor Illumination and Light that Spills from Interiors		3.0	0.70		-	
2 Measures for Reflected Solar Glare from Building Walls		1.0	0.30		-	

Figure I.3.14 Score sheet screen (2/2)

3.8 Assessment Results Sheet

The Assessment Results Sheet is shown in Figure I.3.15. The assessment results of Q (Environmental quality of building), LR (Environmental load reduction of building), BEE (Built Environment Efficiency) and $LCCO_2$ emission rates are shown in graph and numerical formats.

[Display contents]

1. Building outline
2. CASBEE Assessment results
   - 2-1 Assessment results of BEE (Q/L)
   - 2-2 Lifecycle CO_2 (Global Warming Impact Chart)
   - 2-3 Radar Chart
   - 2-4 Bar Chart
     - Assessment results of Q
     - Assessment results of LR
3. Design Considerations

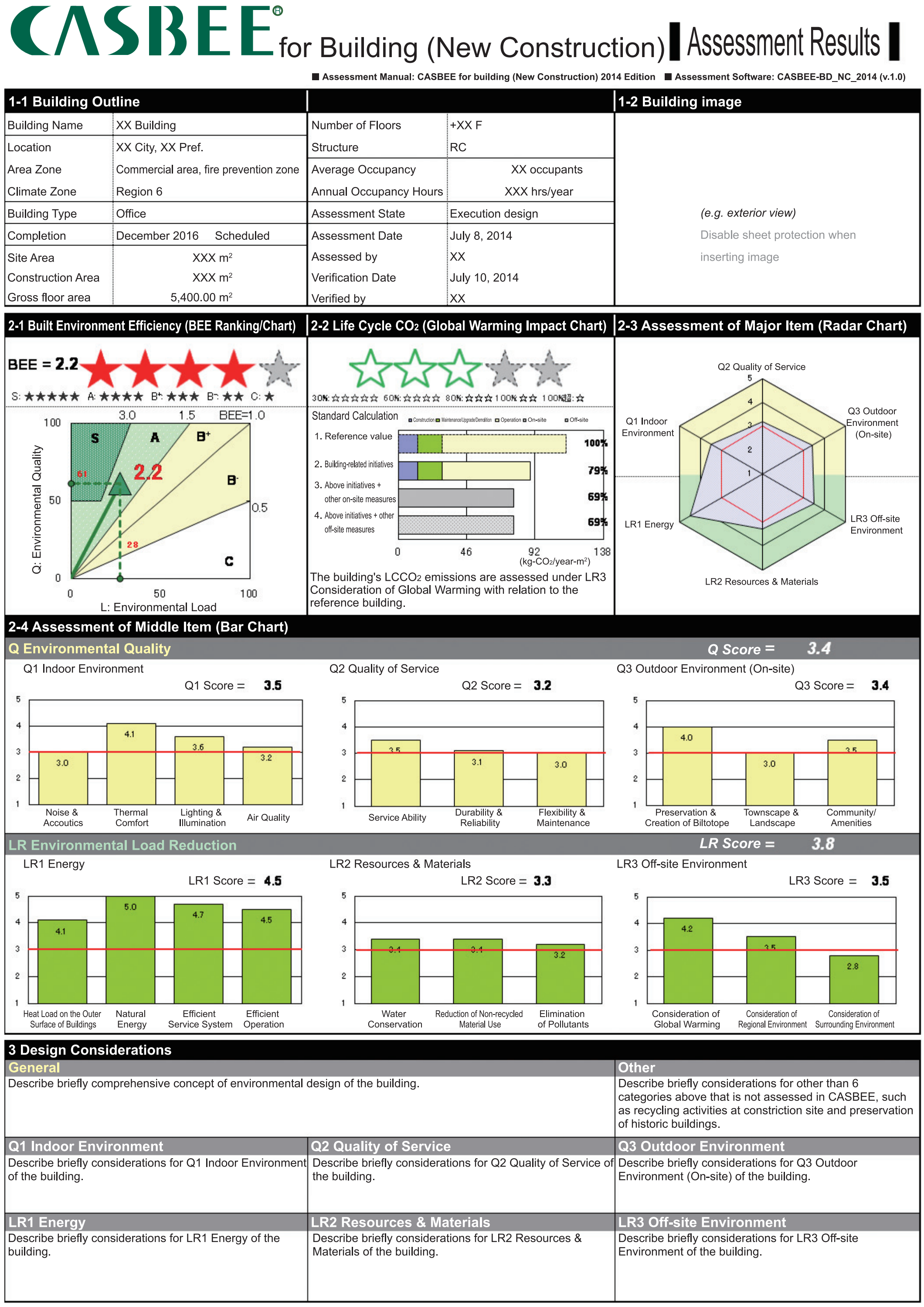


Figure I.3.15 Assessment Results Sheet for CASBEE for Building(New Construction) (output example)

The details of the Assessment Results Sheet are shown below.

Table I.3.4 Content of the Assessment Results Sheet

Item			Content
1. Building outline			Description of targeted building
2. CASBEE assessment results			Graph presentation of assessment results
	2-1	BEE: Built Environment Efficiency (BEE ranking/chart)	Q and L evaluation results and BEE Rank indicated by red stars
	2-2	$LCCO_2$ (Global Warming Impact Chart)	$LCCO_2$ of reference building and subject building Rank indicated by green stars
	2-3	Radar chart	Separate radar charts for results in each category
	2-4	Bar chart	Separate bar chart for results in each category
		Results under Q: environmental quality of building	
		Results under LR: environmental load reduction of building	
3. Design considerations			

1. Building outline
Shows the project summary information from the 1. Building outline entry of the Main Sheet 1), including building name and type, location, scale and structure.

2. Assessment results of CASBEE
The assessment results for environmental performance assessment items on the building itself are presented in this column. It shows graphs of the input results for the scoring items collated on the Score Sheet.
The indicated score for each assessment item is the value rounded to two decimal places. Unrounded values are used for calculating the score for each item.

2-1. BEE: Built Environment Efficiency
Built Environment Efficiency (BEE), which is calculated from the assessment results of Q (Environmental quality of building) and L (Environmental load of building), is shown here. The values for Q and L are derived from SQ (the total score for the Q categories) and SLR (the total score for the LR categories). First the numerator Q is defined as Q = 25(SQ-1) to convert the SQ (from 1 to 5) for the environmental quality of building into the Q scale of 0 to 100. Then the denominator L is defined as L = 25(5-SLR) to convert the SLR (from 1 to 5) for load reduction into the L scale of 0 to 100.
BEE is presented as a graph on the left of the table, with Q on the Y axis and L on the X axis, so that BEE is the gradient of the line joining the point with coordinates equal to the Q and L values to the origin (Q = 0, L = 0). The higher the Q value and the lower the L value, the steeper the gradient and the more sustainable the building is. CASBEE labels buildings with an overall environmental performance assessment rating ranging from C (Poor) through B-, B+, A and S (Excellent), corresponding to regions divided according to the line gradient. The ranks correspond to the assessment expressions shown in Figure I.3.16, using a number of red stars for clarity.

2-2 Lifecycle CO_2 (Global warming impact chart)
The reference values and $LCCO_2$ for the evaluated building are indicated on a bar chart. The emission rate (%) for the assessment subject is displayed, relative to the reference value of $LCCO_2$ emission as 100%.
1. Reference value ($LCCO_2$ emissions of a standard building that satisfies the standard for building

owners as referred to in the Energy Conservation Law)
2. $LCCO_2$ emissions of subject building: assessment of building-related initiatives (e.g. energy efficiency improvement, use of ecological materials and extended building lifespan)
3. Assessment of above initiatives + other on-site measures (e.g. on-site solar power generation)
4. Assessment of above initiatives + off-site measures (e.g. procurement of renewable energy certificates and carbon credits)

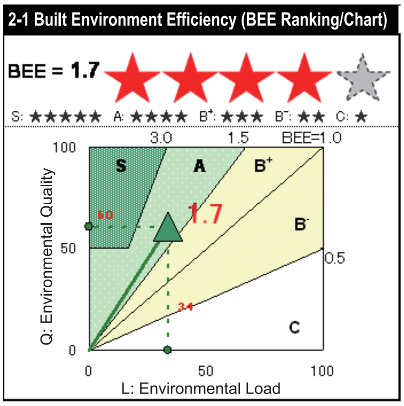


Figure I.3.16 Enlarged image of section 2-1 (BEE value and red star ranking)

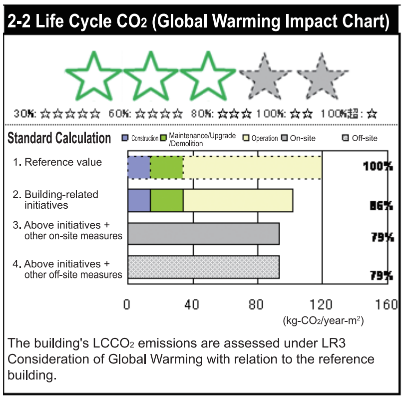


Figure I.3.17 Enlarged image of section 2-2 ($LCCO_2$ and green star ranking)

2-3 Radar Chart

The points for the six major categories from Q1 to LR3 are shown together in a radar chart (Figure I.3.18) on the upper right of the second column, to give an immediate clear presentation of the characteristics of environmental considerations in the target building.

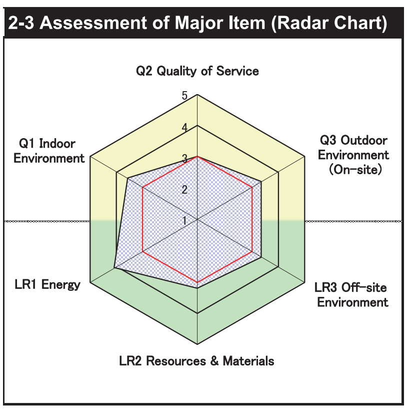


Figure I.3.18 Enlarged image of section 2-3 (rader chart)

2-4 Bar Chart

Assessment results for Q (environmental quality of building) is presented as a bar chart per middle item on the upper column for each major category, "Q1 Indoor Environment," "Q2 Quality of Service" and "Q3 Outdoor Environment (On-site)." And the assessment results for LR (environmental load reduction of building) are presented likewise, for "LR1 Energy," "LR2 Resources & Materials" and "LR3 Off-site Environment."

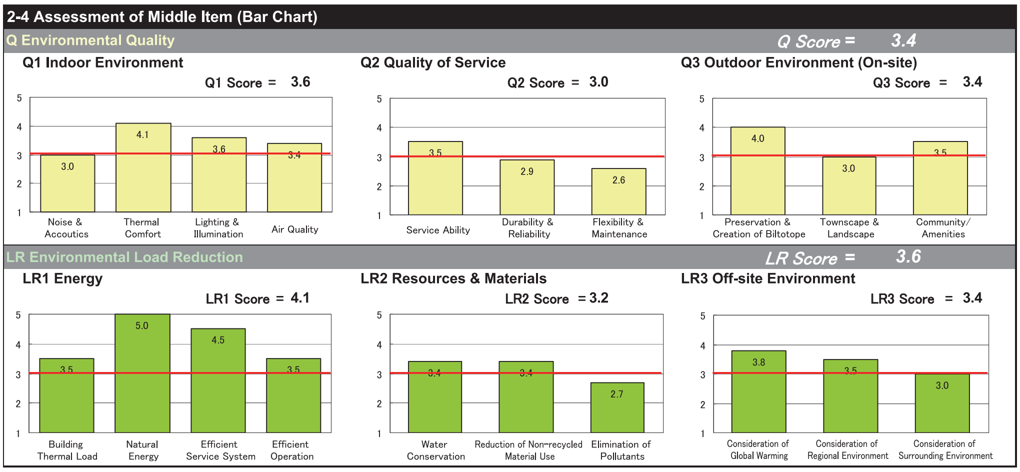


Figure I.3.19 Enlarged Image of Section 2-4 (Bar Chart)

3. Design Considerations

Indicate items considered in the Design for Environment (DfE), so that it is easy for a third party to gain an overview of environmental considerations in the evaluated building. The statements made in each space for General, Q1-LR3 and Other in the Consideration Record Sheet are displayed as they were input.

3 Design Considerations		
General		Other
Describe briefly comprehensive concept of environmental design of the building.		Describe briefly considerations for other than 6 categories above that is not assessed in CASBEE, such as recycling activities at constriction site and preservation of historic buildings.
Q1 Indoor Environment	Q2 Quality of Service	Q3 Outdoor Environment
Describe briefly considerations for Q1 Indoor Environment of the building.	Describe briefly considerations for Q2 Quality of Service of the building.	Describe briefly considerations for Q3 Outdoor Environment (On-site) of the building.
LR1 Energy	LR2 Resources & Materials	LR3 Off-site Environment
Describe briefly considerations for LR1 Energy of the building.	Describe briefly considerations for LR2 Resources & Materials of the building.	Describe briefly considerations for LR3 Off-site Environment of the building.

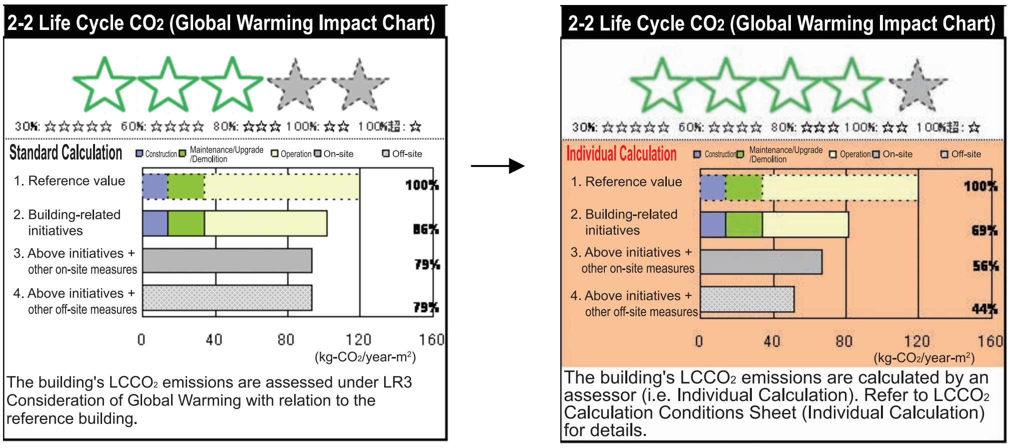
Figure I.3.20 Design considerations

3.9 Points to note concerning the CASBEE for Building (New Construction) assessment software

In addition to the standard calculation, when assessors have gathered more detailed data and performed more accurate $LCCO_2$ calculations as individual calculations, CASBEE for Building (New Construction) can be included as part of the assessment results. Specifically, the calculated values, along with the green star ranking, are shown under "2-2 $LCCO_2$ (Global Warming Impact Chart)" on the Assessment Results Sheet. The results of individual calculations are not reflected in "LR3.1 Consideration of Global Warming" and BEE.
In cases where $LCCO_2$ is obtained by individual calculation, please note the following.

1) On the Main Sheet, the assessor should select "Individual Calculation" in the $LCCO_2$ calculation column under 1) Summary input [2] Assessment implementation.
2) $LCCO_2$ calculation conditions must be clearly stated. In the software, calculation conditions are entered under "$LCCO_2$ Calculation Conditions Sheet (Individual Calculation)."
3) $LCCO_2$ values obtained by an individual calculation are entered by the assessor into the $LCCO_2$ Calculation Conditions Sheet (Individual Calculation). Under each category of the building's life cycle stages (i.e., construction, maintenance/upgrade/demolition and operation), the reference value (Standard building = Level 3 equivalent in all assessment items) and CO_2 emissions of a building subject to the assessment are indicated in kg-CO_2/year-m^2.
4) Lifecycle CO_2 (Global Warming Impact Chart) based on individual calculation has a colored background on the graph to indicate clearly that the result does not come from the standard calculation.

For details regarding calculation for off-site initiatives, please refer to PART III.



(a) Display of standard calculation results (b) Display of individual calculation results

Figure I.3.21 Examples of $LCCO_2$ (Global Warming Impact Chart) display based on individual calculation

PARTⅡ. Scoring Criteria

For hospitals, hotels and apartments, it is important to note that there are assessment items that apply to the building as a whole (Q3, LR1, LR2, LR3) and others (Q1, Q2) that are applied separately to the common properties and to the residential and accommodation sections of the building. Thus for these three building types the user must carry out both assessment (1) of the <Entire Building and Common Properties> and assessment (2) of the <Residential and Accommodation Sections>, which are described on the next and subsequent pages.

Where "no corresponding level" is written in a space in the scoring criteria table, it means that there is no scoring for that item at the level concerned. When the space is blank, it means that scoring is optional at intermediate levels.

The following symbols indicated in individual assessment items represent purposes of buildings subject to the assessment. Where such symbol is indicated, an assessment of the corresponding item is required in terms of the building purpose.

■ Examples

Building type	Applicable	Not applicable
Offices	Off	Off
Schools	Sch	Sch
Retailers	Rtl	Rtl
Restaurants	Rst	Rst
Halls	Hal	Hal
Hospitals	Hsp	Hsp
Hotels	Htl	Htl
Apartments	Apt	Apt
Factories	Fct	Fct

1. Q: Environmental Quality of Building

Q1 Indoor Environment

When evaluating Hsp, Htl and Apt, evaluate the common properties of each building (rooms in Hsp, such as outpatient waiting rooms, medical examining rooms (these are rooms in the general environment for medical examination and treatment, not operation or examination rooms requiring special environmental conditions), lobbies of Htl, entrance halls of Apt, etc.). For private areas, (bedrooms of Hsp, guest rooms of Htl and housings of Apt), base the assessment on <Residential and Accommodation Sections>.

<Assessment of common areas of Hsp>
Assessment may cover both outpatient waiting rooms and medical examining rooms, or only one of the two. For items which evaluate both, evaluate each and use the weighted average, based on floor areas, as the assessment.
<Assessment of Sch>
Assesment of Sch is divided into two building type categories- criteria for elementary, junior high, and high schools; and criteria for universities. Select the appropriate criteria and evaluate accordingly.

1. Sound Environment

1.1 Noise

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
For building types classified as Hal, evaluate building types that particularly require anti-noise measures, such as town hall, auditorium, theaters and movie theaters, excluding the other building types.
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp. Note that the assessment criteria differ between outpatient waiting rooms and medical examining rooms.
For Sch (elementary/junior high/high schools), evaluate classrooms only.

Unit: dB(A)

<Entire Building and Common Properties>		
Building type	Off·Fct·Hsp (Waiting Room)·Htl·Apt	Sch(Universities, etc.)·Hsp (Examination Room)
Level 1	50 < [Background noise level]	45 < [Background noise level]
Level 2	(No corresponding level)	(No corresponding level)
Level 3	45 < [Background noise level] ≦ 50	40 < [Background noise level] ≦ 45
Level 4	40 < [Background noise level] ≦ 45	35 < [Background noise level] ≦ 40
Level 5	[Background noise level] ≦ 40	[Background noise level] ≦ 35

Building type	Rtl·Rst	Hal
Level 1	55 < [Background noise level]	40 < [Background noise level]
Level 2	(No corresponding level)	(No corresponding level)
Level 3	50 < [Background noise level] ≦ 55	35 < [Background noise level] ≦ 40
Level 4	45 < [Background noise level] ≦ 50	30 < [Background noise level] ≦ 35
Level 5	[Background noise level] ≦ 45	[Background noise level] ≦ 30

Building type	Sch (Elementary/Junior High/High Schools)
Level 1	60 < [Background noise level]
Level 2	50 < [Background noise level] ≦ 60
Level 3	45 < [Background noise level] ≦ 50
Level 4	35 < [Background noise level] ≦ 45
Level 5	[Background noise level] ≦ 35

Unit:dB (A)

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	45 < [Background noise level]
Level 2	(No corresponding level)
Level 3	40 < [Background noise level] ≦ 45
Level 4	35 < [Background noise level] ≦ 40
Level 5	[Background noise level] ≦ 35

☐**Commentary**

Generally, indoor background noise is affected by the noise from service equipment for the building and external noise such as traffic. Evaluate the noise level based on these noise factors.

For preliminary and execution design stages, evaluate the target noise level. Use actual measurement data for assessment after completion of construction. Noise levels and corresponding intrusiveness and impact on conversation (in person and over the telephone) are shown next page for reference.

For noise assessment after completion of the building, measure noise levels while service equipment is in operation during after hours. A standard sound level meter can be used for steady noise. For fluctuating noise, use an integrating sound level meter to determine equivalent noise levels.

For an apartment building, measure noise levels with one measurement point per unit. Noise measurement is conducted in the room with the largest opening. Measure noise levels with no sound generated from TV sets or voices. If the building is equipped with a 24-hour ventilation system, measure noise levels with the system in operation.

In assessment criteria for Sch (elementary/junior high/high schools), each level corresponds to a specific guideline: Level 5 based on the WHO Environmental Noise Guideline (1995), level 3 based on the School Sanitation Standards (MEXT 2009 Directive 60) and level 1 based on the Grant Guidelines for Building Safe Schools (June 18, 2009; MEXT Policy 21, No. 6124).

■Reference: Allowable indoor noise levels

dB (A)	20	25	30	35	40	45	50	55	60
NC-NR	10～15	15～20	20～25	25～30	30～35	35～40	40～45	45～50	50～55
Intrusiveness	Silent —		Very quiet —		Not significantly noticeable —		Perceived noise —	Noise cannot be ignored	
Impact on conversation			A whispering voice is audible from 5 m away —		Possible from 10 m apart — Telephone use (normal) —		Possible from 3 m apart — Telephone use (bearable) —		Loud conversation (3 m) Telephone use (unbearable)
Studios	Silent room	Announcement studio	Radio studio	Television studios	Miximg room	General offices			
Venues and halls		Music hall	Theater (medium)	Stage theaters	Movie theater and planetarium		Hotel lobbies		
Hospitals		Hearing test room	Special sickrooms	Operating rooms and bedrooms	Examining room	Laboratories	Waiting rooms		
Hotels and residentials				Reading rooms	Bedrooms	Banquet halls	Lobbies		
General offices				Executive rooms and large meeting	Reception rooms	Meeting rooms			Typing and accounting rooms
Public buildings				Auditorium	Museums	Library	Auditorium /gymnasiu	Indoor sports facilities	
Schools and churches				Music classroom	Chapels	Research rooms and classrooms		Corridors	
Commercial buildings					Music cafes	Bookshops	Banks and restaurants	Canteens	

■ Bibliography 2), 3), 4), 11)

1.2 Sound Insulation

1.2.1 Sound Insulation of Openings

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).
Exclude if the evaluated room has absolutely no openings.

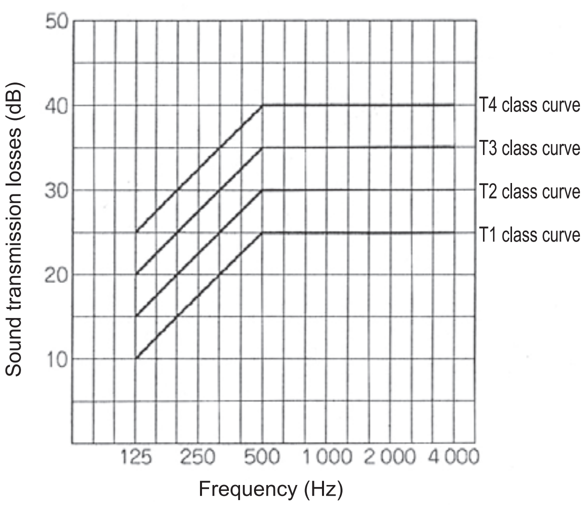
<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Less than T-1
Level 2	(No corresponding level)
Level 3	T-1
Level 4	(No corresponding level)
Level 5	T-2 or above

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	Lower than T-1
Level 2	(No corresponding level)
Level 3	T-1
Level 4	(No corresponding level)
Level 5	T-2 or higher

☐Commentary

Evaluate sound insulation of building openings based on the peformance levels of sash windows and other fixtures. The higher the performance, the more effective it is in preventing propagation of external noise (e.g. sound of traffic). In cases where multiple openings exist, evaluate based on the lowest performance level.
Sound insulation grade T is utilized as an assessment index. T classification is used in the assessment of sound insulation performance of sash windows and similar fixtures. Names and performance curves, based on the sound transmission loss at each frequency band, are standardized (see the diagram). In this method, the transmission loss value at each frequency is plotted on the sound insulation curve. Grade is determined by all values exceeding the corresponding classification curve.
In the basic design phase, the target performance is subject to the assessment.

■Reference: Sound insulation classification curves for sash windows, etc. (JIS A 4706)



■Bibliography 3)

1.2.2 Sound Insulation of Partition Walls

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition

For Hsp, Evaluate only medical examining rooms as common areas of Hsp.

<Entire Building and Common Properties>		
Building type	Off · Sch · Rst · Fct	Hsp (Examining Room)
Level 1	Less than Dr-30	Less than Dr-35
Level 2	Dr-30	Dr-35
Level 3	Dr-35	Dr-40
Level 4	Dr-40	Dr-45
Level 5	Dr-45 or more	Dr-50 or higher

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Less than Dr-40
Level 2	Dr-40
Level 3	Dr-45
Level 4	Dr-50
Level 5	Dr-55 or more

☐**Commentary**

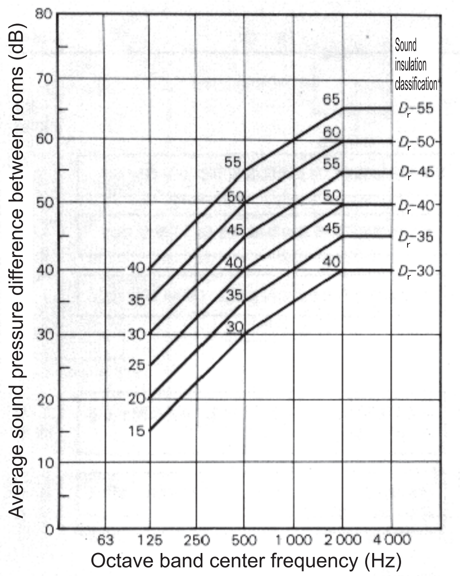
In assessing the sound insulation performance of partition walls, evaluate levels of sound insulation between rooms. Retail stores generally do not have partitions between sales areas. As such, this assessment is not applicable. Some building types under the meeting hall category are also excluded, as a higher sound insulation performance is required for partition walls in these buildings than in other general-use buildings.

Inter-room sound pressure level difference grade Dr value is utilized as an index for sound insulation between different rooms in the assessment. Dr values are used in the assessment of sound insulation performance of walls. Names and performance curves, based on the sound pressure difference between rooms at each frequency band, are standardized (see the diagram on the right). For this evaluation, apply either predictive values or the actual values obtained from the measurement.

When obtaining measurement data, follow the methods described in JIS A 1417: Field Measurement of Airborne Sound Insulation in Buildings. Determine the Dr value by applying the data to the classification curves provided in JIS A 1419-1 Assessment Method for Sound Insulation in Buildings and Building Elements (Part I: Airborne Sound Insulation Performance). Up to 2 dB below the standard curve is allowed at each frequency. When using predictive figures, the method referred to in the Information on Sound Insulation Design in Buildings (Architectural Institute of Japan, 1988) may be followed. In this case, the Dr-value is determined by applying the predictive sound pressure difference between rooms.

In the basic design phase, the target performance is subject to the assessment.

■Reference: Frequency characteristics and classification for airborne sound insulation performance （JIS A 1419-1）



■Bibliography 3)

1.2.3 Sound Insulation Performance of Floor Slabs (light-weight impact source)

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>	
Building type	Sch
Level 1	Worse than Lr-65
Level 2	Lr-65
Level 3	Lr-60
Level 4	Lr-55
Level 5	Lr-50 or better

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	Worse than Lr-55
Level 2	Lr-55
Level 3	Lr-50
Level 4	Lr-45
Level 5	Lr-40 or better

☐Commentary

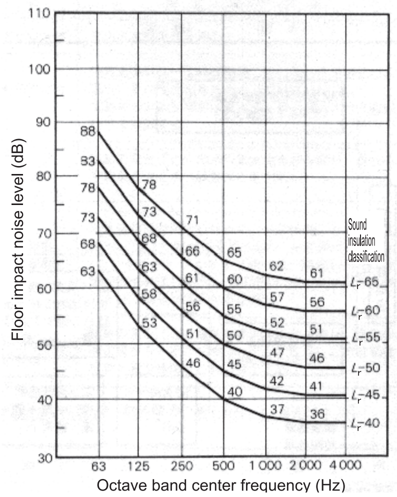
Examples of lightweight impact sounds include chairs being dragged over the floor or hard lightweight objects (e.g. spoons, forks) dropped on the floor. Basic characteristics of lightweight impact sound insulation depend on the floor structure, but elasticity of the flooring materials significantly affects performance level.

Sound insulation grade Lr is utilized in the assessment. At the execution design stage and after completion of construction, apply the Lr-value classification as the performance indicator. Lr-value classification is used in assessment of sound insulation performance for floor impact sound. Names and performance curves, based on the sound level at each frequency band, are standardized (see the diagram on the right). For this evaluation, apply either predictive Lr-values or the actual measurement values.

When obtaining measurement data, follow the methods described in JIS A 1418-1: Field Measurement of Floor Impact Sound Insulation in Buildings (Part I: Standard Light Impact Source). Determine the Lr-value by applying the data to the classification curves provided in JIS A 1419-2: Assessment Method for Sound Insulation in Buildings and Building Elements (Part II: Floor Impact Sound Insulation Performance). When using predictive figures, the method referred to in the Floor Impact Sound Insulation Design in Buildings (Architectural Institute of Japan, 2009) may be followed. In this case, calculate the basic performance level using this method. Lr-values are then determined by applying these calculation results and impact sound reductions of the flooring materials, which are measured based on methods specified under JIS A 1440-2. We should note that ΔL grades indicated in product brochures for floor materials refer to the performance of individual members, which is different from the CASBEE standard Lr (the space performance).

In the basic design phase, the target performance is subject to the assessment.

■eference: Frequency characteristics and classification for impact sound insulation performance of floors (JIS A 1419-2)



■Bibliography 3)

1.2.4 Sound Insulation Performance of Floor Slabs (heavy-weight impact source)

Off･Sch･Rtl･Rst･Hal･Fct･Hsp･Htl･Apt

<Entire Building and Common Properties>	
Building type	Sch
Level 1	Worse than Lr-65
Level 2	Lr-65
Level 3	Lr-60
Level 4	Lr-55
Level 5	Lr-50 or better

<Residential and Accommodation Sections>	
Building type	Hsp･Htl･Apt
Level 1	Worse than Lr-60
Level 2	Lr-60
Level 3	Lr-55
Level 4	Lr-50
Level 5	Lr-45 or better

☐ **Commentary**

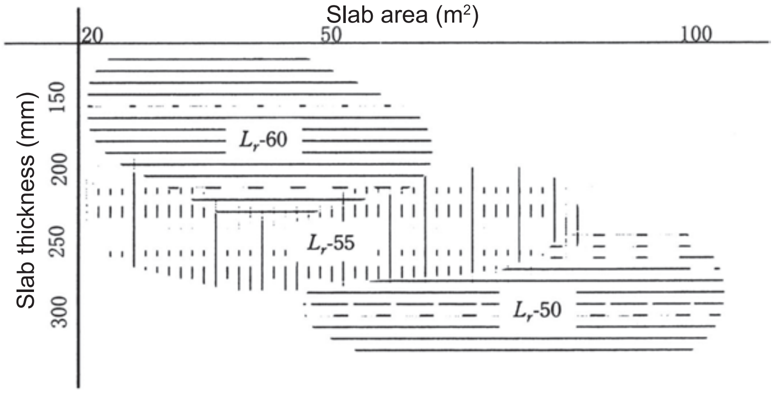
Examples of heavy impact sounds include noise generated in the room(s) by vibration from the floor above, due to a heavy but soft impact (e.g. child jumping). Basic characteristics of heavy impact sound insulation depend on the floor structure. Therefore, performance improvement using flooring materials is often difficult to achieve.

Sound insulation grade Lr may be obtained by measurements or use of predicted values.

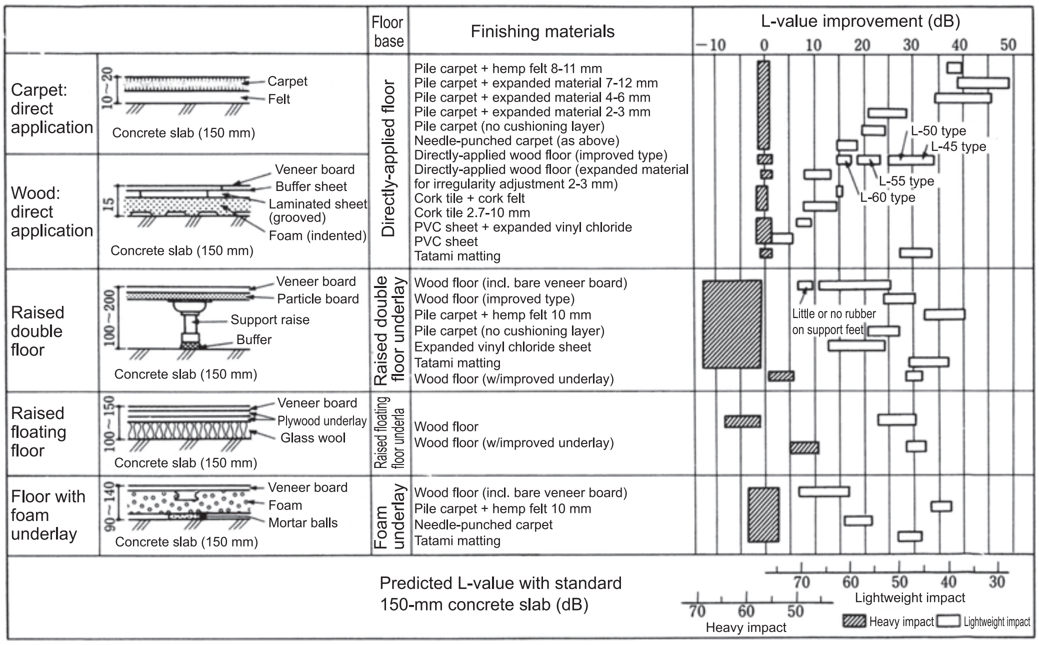
When obtaining measurement data, follow the methods described in JIS A 1418-2: Field Measurement of Floor Impact Sound Insulation in Buildings (Part II: Standard Heavy Impact Source). Determine the Lr value by applying the data to the classification curves provided in JIS A 1419-2: Assessment Method for Sound Insulation in Buildings and Building Elements (Part II: Floor Impact Sound Insulation Performance). When using predictive figures, the method referred to in the Floor Impact Sound Insulation Design in Buildings (Architectural Institute of Japan, 2009) may be followed. In this case, calculate the basic performance level using this method. Lr-values are then determined by applying these calculation results and impact sound reductions of the flooring materials, which are measured based on the method specified under JIS A 1440-2. Characteristics of heavy impact sound insulation depend on several slab-related variables, including type, flexural rigidity, mass, and restraint conditions. Additionally, performance is also affected by flooring materials and acoustic absorption characteristics of the sound receiving room. Sound insulation performance levels for heavy impact (Reference 1) and Lr-value improvement data for each type of floor finish (Reference 2) are shown for reference. We should note that ΔL grades indicated in product brochures for floor materials refer to the performance of individual members, which is different from the CASBEE standard Lr (the space performance).

In the basic design phase, the target performance is subject to the assessment.

■ Reference 1: Sound insulation classification for heavy impact on bare slab based on slab thickness and surface area values



■Reference 2: Lr-value improvement per floor finish



■Bibliography 3), 7)

1.3 Sound Absorption

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).
For building types classified as Hal, evaluate building types which especially require acoustic absorption measures, such as concert halls, meeting halls, and performance and movie theaters, excluding the other building types.

<Entire Building and Common Properties> <Residential and Accommodation Sections>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl
Level 1	Sound absorbing materials are not used
Level 2	(No corresponding level)
Level 3	Sound absorbing materials are used in one of the following areas (walls, floor or ceiling)
Level 4	Sound absorbing materials are used in two of the following areas (walls, floor or ceiling)
Level 5	Sound absorbing materials are used in all of the following areas (walls, floor or ceiling)

☐**Commentary**

In assessing the sound absorption performance, evaluate levels of sound absorption of a room which includes the interior finish materials.
The higher the level of in-room sound absorption, the more effective reverberation control is, so that a conversation can be easily carried out without voices being raised. Furthermore, noise propagated into or generated within the room is also attenuated, thereby improving the acoustic environment. An average rate of in-room sound absorption can be obtained based on the absorption rate of finishing materials. In this assessment, however, simply evaluate whether sound absorbing materials are used in walls, floor or ceiling.

The assessment criteria for the use of sound absorbing materials are as follows:
- Ceiling and floor: at least 70% of the area is covered with sound absorbing materials
- Walls: the total area which is covered with sound absorbing materials of all four walls account for more than 70% of the area of the largest wall.

The sound absorbent materials shall be those stipulated under JIS A6301, or other construction materials with the same or better sound absorption performance, but carpets or tatami matting are permitted as sound absorbent materials for floors. The following are examples of sound absorbent materials.

■Reference 1) Examples of sound absorbent materials

Ceilings	Walls	Floors
Rockwool-type sound absorbent ceiling material Glasswool-type sound absorbent ceiling material Gypsum board type sound absorbent ceiling material, etc.	Rockwool-type sound absorbent wall material Glasswool-type sound absorbent wall material, etc.	Carpet, tatami matting, etc.

■Bibliography 8)

2. Thermal Comfort

2.1 Room Temperature Control

2.1.1 Room Temperature

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

In the <Residential and Accommodation Sections> of Apt, air conditioning equipment is excluded from assessment if it is installed by occupants.
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp. Note that the assessment criteria differ between outpatient waiting rooms and medical examining rooms.

<Entire Building and Common Properties>		
Building type	Off	Fct·Hsp (Waiting Room)·Htl·Apt
Level 1	Not adequate for Level 2.	Minimum equipment capacity to achieve room temperatures of 20˚C in winter and 28˚C in summer with some occupant discomfort
Level 2	Minimum equipment capacity to achieve temperatures of 20˚C in winter and 28˚C in summer with some occupant discomfort	
Level 3	Sufficient equipment capacity to achieve a general room temperatures of 22˚C in winter and 26˚C in summer	Sufficient equipment capacity to achieve a general room temperatures of 22˚C in winter and 26˚C in summer
Level 4		
Level 5	Sufficient equipment capacity to achieve room temperatures of 24˚C in both winter and summer	Sufficient equipment capacity to achieve room temperatures of 24˚C in winter and 24˚C in summer
Building type	Hsp (Examining Room)	Sch (Universities, etc)
Level 1	Minimum equipment capacity to achieve room temperatures of 21˚C in winter and 28˚C in summer with some occupant discomfort	The minimum equipment capacity is provided to achieve temperatures of 10˚C or more in winter and 30˚C or less in summer, which require tolerance of some discomfort
Level 2		
Level 3	Sufficient equipment capacity to achieve a general room temperature of 23˚C in winter and 26˚C in summer	Sufficient equipment capacity for achieving commonly-applied room temperatures of 20˚C in winter and 27˚C in summer
Level 4		
Level 5	Equipment capacity is provided to achieve temperatures of 24˚C in winter and 24˚C in summer.	Equipment capacity is provided to achieve temperatures of 24˚C in winter and 24˚C in summer.

Building type	Sch (Elementary/Junior High/High Schools)	Rtl·Rst·Hal
Level 1	(No corresponding level)	Minimum equipment capacity to achieve room temperatures of 18˚C in winter and 28˚C in summer with some occupant discomfort
Level 2	(No corresponding level)	
Level 3	Minimum equipment capacity to achieve room temperatures of 18˚C or higher in winter and 28˚C or lower in summer	Sufficient equipment capacity to achieve general room temperatures of 20˚C in winter and 26˚C in summer
Level 4	Sufficient equipment capacity to achieve room temperatures of 20˚C or higher in winter and 25˚C or lower in summer	
Level 5	Sufficient equipment capacity to achieveg room temperatures of 22˚C or higher in winter and 24˚C or lower in summer	Sufficient equipment capacity to achieve room temperatures of 22˚C in winter and 24˚C in summer

※ In cases where it is difficult to determine between the above levels, select an intermediate level (e.g. level 2 or 4).

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	Minimum equipment capacity to achieve room temperatures of 20˚C in winter and 28˚C in summer with some occupant discomfort	Minimum equipment capacity to achieve room temperatures of 18˚C in winter and 28˚C in summer with some occupant discomfort
Level 2		
Level 3	Sufficient equipment capacity to achieve general room temperatures of 22˚C in winter and 26˚C in summer	Sufficient equipment capacity to achieve general room temperatures of 22˚C in winter and 26˚C in summer
Level 4		
Level 5	Sufficient equipment capacity to achieve room temperature of 24˚C in both winter and in summer	Sufficient equipment capacity to achieve room temperature of 24˚C in both winter and in summer

※ In cases where it is difficult to determine between the above levels, select an intermediate level (e.g. level 2 or 4).

□Commentary

Room temperature is one of the most representative indicators for an indoor thermal environment. As such, characteristics of an indoor thermal environment are determined largely by temperature settings for the room. In this assessment, evaluate the capacity of the air conditioning equipment to maintain comfortable room temperature levels under peak load conditions.

For an apartment, apply the target values for a representative room of the building (i.e. equivalent to the standard floor of an office building). In the basic design phase, the target performance is subject to the assessment.

Assessment levels are set as below:

Level 1: Mandatory level under the MEXT School Sanitation Standards (applicable to Sch (universities, etc.))
Level 2: Level as referred to in the MLIT specifications[*1]
Level 3: Level as referred to in the MLIT specifications[*1], community-based standards, the Sanitation Standards for Tokyo Municipal Schools, general recommended values (applicable to Sch (universities, etc.)) and the MEXT School Sanitation Standards (applicable to Sch (elementary/junior high/high schools))
Level 5: POEM-O optimal level[*2]

*1 Room temperatures of 19 to 22°C in winter and 26 to 28°C in summer
*2 Room temperatures of 24 to 26°C in summer and 22 to 24°C in winter (for Rtl, Rst and Hal, 20 to 22°C in winter)

■ Bibliography 9), 10), 11), 12), 13), 14)

2.1.2 Perimeter Performance

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	No attention has been paid to the infiltration of heat through window systems, outside walls, roof and floor (particularly where piloti are used), and insulation performance is poor. (Window system SC: around 0.7, U = 6.0 (W/m^2K), outer walls and others: U = 3.0 (W/m^2K)[*1]
Level 2	
Level 3	Attention has been paid to the infiltration of heat to the interior through windows, outside walls, roof and floor (particularly where piloti are used), and there is no practical problem with insolation blocking and insulation performance. (Window system SC: around 0.5, U = 4.0 (W/m^2K), outer walls and others: U = 2.0 (W/m^2K)[*1]
Level 4	
Level 5	Close attention has been paid to the infiltration of heat to the interior through windows systems, outside walls, roof and floor (particularly where piloti are used), and the building has the highest level of insolation blocking and insulation performance. (Window system SC: around 0.2, U = 3.0 (W/m^2K), outer walls and others: U = 1.0 (W/m^2K)[*1]

* When it is difficult to decide, choose an intermediate level (level 2 or 4).

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	No attention has been paid to the infiltration of heat through window systems, outside walls, roof and floor (particularly where piloti are used), and insulation performance is poor. (Window system SC: around 0.7, U = 6.0 (W/m^{2}K), outer walls and others: U = 3.0 (W/m^{2}K)*1	Requirements for Grade 1 in 5-1 Energy Saving Countermeasure Grade of the Japan Housing Performance Standard are satisfied.
Level 2		Requirements for Grade 2 in 5-1 Energy Saving Countermeasure Grade of the Japan Housing Performance Standard are satisfied.
Level 3	Attention has been paid to the infiltration of heat to the interior through windows, outside walls, roof and floor (particularly where piloti are used), and there is no practical problem with insolation blocking and insulation performance. (Window system SC: around 0.5, U = 4.0 (W/m^{2}K), outer walls and others: U = 2.0 (W/m^{2}K)*1	Requirements for Grade 3 in 5-1 Energy Saving Countermeasure Grade of the Japan Housing Performance Standard are satisfied.
Level 4		(No corresponding level)
Level 5	Close attention has been paid to the infiltration of heat to the interior through windows systems, outside walls, roof and floor (particularly where piloti are used), and the building has the highest level of insolation blocking and insulation performance. (Window system SC: around 0.2, U = 3.0 (W/m^{2}K), outer walls and others: U = 1.0 (W/m^{2}K)*1	Requirements for Grade 4 in 5-1 Energy Saving Countermeasure Grade of the Japan Housing Performance Standard are satisfied.

* When it is difficult to decide, choose an intermediate level (level 2 or 4).
*1 :SC represents(Insolation) Shading Coefficient, U represents Thermal conductivity

☐Commentary

Evaluate ability to block thermal infiltration from the surroundings.
Evaluate whether window systems and exterior walls have been selected to exclude outside disturbances as far as possible, in order to maintain room temperature. Even with inferior perimeter performance, it is possible to meet the temperature setting at the thermostat position, provided the temperature setting is not unreasonable and the equipment has sufficient capacity, but if there are windows and walls that have extremely low or high surface temperatures there will be inconsistencies in temperature within the room. Vertical temperature difference and radiation from exterior walls and windows will cause localized discomfort to occupants. Also, the use of internal blinds, air barriers, airflow windows, double skins and other window systems should not be evaluated for their individual performance, but rather for the combined shading coefficient and heat transfer coefficient of the systems they form.
Assessments of Level 3 and below may be based on the set specification. Higher levels require confirmation of verified performance values based on sufficiently reliable materials including surveys, experiments and public institutions' approvals. Regarding the actual method for confirming the performance, refer to Reference 2).
In the basic design phase, the target performance is subject to the assessment.

The assessment of Apt is carried out in accordance with 5-1 Energy Saving Countermeasure Grade (to be enacted in April 2015) in the assessment method provided in the Japan Housing Performance Standard (revised in February 2014) prescribed under the Housing Quality

Assurance Act (Refer to Reference 4).). Further, the assessment of Apt to which the Housing Performance Standard before the 2014 revision is applied is conducted according to CASBEE 2010 Edition.

■Reference 1) Consideration of regional differences

Window performance: Peak insolation varies by time and season, but there is little regional difference, so shading coefficient (SC) can be used for assessment without consideration of regional differences.

Outer wall performance: As values to indicate the impact of thermal loads on the interior, there is effective temperature difference in summer and room interior-exterior temperature difference in winter, but effective temperature difference depends on insolation and outer wall insulation performance, which means it is independent of regional differences. The room interior-exterior temperature difference in winter is influenced by differences in design outside air conditions, so it should be evaluated as below.

The scoring criteria consider the allowable values for uneven radiation and vertical temperature distribution, which are assessment items for the interior environment, with the temperature differences from the interior set temperature and the interior surface temperature of the outer wall substituted as judgement standards. There are three levels of temperature difference Δt, being level 5 ($\Delta t <= 3$˚C), level 3 ($\Delta t <= 6$˚C) and level 1 ($\Delta t > 6$˚C). It is calculated from the overall heat transfer coefficient U, interior temperature setting Tr, and winter design outdoor air temperature To for the region, in order to determine the level.

Temperature difference Δt [˚C] = $(U/\alpha i) \times (Tr-To)$ αi: interior heat transfer coefficient (around 9 W/m^2K).

The perimeter normally comprises outer wall and window glass, so the level should be determined with reference to the transfer coefficients and the ratio of areas between wall and window.

The content of the table is based on the assumption of a typical combination of 24˚C as the indoor temperature setting of and outside air temperature of 0˚C.

■Reference 2) Performance confirmation method

Exterior wall: If the existing material composition can be confirmed, allow calculation-based checking and assessment of performance values (from set specifications).

Windows: If multilayer glass (Low-e glass, etc.) is used, the glass performance can be used as it stands as the performance value, so the glass and blind specifications can be checked and the assessment based on the manufacturer catalog values or the values used in the PAL calculation. (Windows in an ordinary office can be evaluated on the set specification.)

It is, however, difficult to evaluate window systems, such as airflow windows and double skins, which function as systems and raise the performance of the building skin.

[1] If the performance of the window system was confirmed in experiments or related materials including technical reports issued by public institutions before the construction is completed, the assessment is deemed possible based on a survey for confirming whether the appropriate air flow is secured during operation in accordance with the design plan.

[2] If there is no basis for assessment,

Thermal conductivity: It is possible to calculate thermal conductivity by measuring the airflow volume, the difference between interior and exterior air temperatures, and the amount of heat conduction, using heat flow meters.

Shading coefficient: It is difficult to measure shading coefficient accurately at the direct measurement level (refer to "Standardization of Performance Measurement Systems for Building Services Systems," SHASE), so if there is no assessment data and performance cannot be confirmed, it is not possible to go beyond calculation of performance value (minimum performance value) using the specifications of the components, excluding effects such as air movement.

■Reference 3) Commentary on perimeter performance

Heat penetration from the outside must be minimized in order to maintain a comfortable internal environment. The overall heat transfer coefficient U, which represents the level of heat flow for a given temperature difference, and shading coefficient SC, which represents the entry of daylight to the interior, are of reference as indicators for perimeter performance. The smaller the values of overall heat transfer coefficient U and shading coefficient SC, the better the entry of heat is being suppressed.

(1) Overall heat transfer coefficient U

Example values of overall heat transfer coefficient for exterior walls, roofs, floors and other elements are presented below.
(Quoted from "Standards and Procedures for Building Equipment Design" (partially modified), MLIT.)

Examples of heat transfer coefficient U for walls

No.	Exterior wall	Material	t (mm)	U W/m²℃ Thickness of RC 150	180
1		1. Additional concrete 2. RC 3. Mortar (Same for multi-layer patterned spraying)	20 20	3.5	3.3
2		1. Additional concrete 2. RC 4. Air layer 5. Gypsum board (Same for multi-layer patterned spraying	20 12	2.4	2.3
		3. Polystyrene foam	25 30	0.93 0.81	0.93 0.81
3		1. Additional concrete 2. RC 4. Air layer 5. Gypsum board (Same for multi-layer patterned spraying)	20 12×2	2.09	1.97
		3. Polystyrene foam	25 30	0.93 0.81	0.93 0.81

Examples of heat transfer coefficient U for roof

No.	Roof structure	Ceiling material	t (mm)	U W/m²℃
1	1. Additional concrete 80 2. Asphalt 5 3. Polystyrene foam 25 4. Asphalt 5 5. RC 130 6. Air layer 7. Ceiling material	Gypsum board	9	0.8
		Gypsum board Rockwool accoustic board	9 9	0.7
		Gypsum board Rockwool accoustic board	9 12	0.7
2	1. Additional concrete 80 2. Asphalt 5 3. Polystyrene foam 50 4. Asphalt 5 5. RC 130 6. Air layer 7. Ceiling material	Gypsum board	9	0.6
		Gypsum board Rockwool accoustic board	9 9	0.5
		Gypsum board Rockwool accoustic board	9 12	0.5

Examples of heat transfer coefficient U for floors

No.	Floor structure	Ceiling material	t (mm)	U W/m²℃
1	1. Vinyl floor tiles 3 2. Mortar 27 3. RC 120 4. Air layer 5. Ceiling materfal outside	Aluminum sheet	0.8	2.9
		Steel sheet	0.4	2.9
2	1. Vinyl floor tiles 3 2. Mortar 27 3. RC 120 4. Ceiling material outside	Rockwool spraying	10	2.0
			15	1.6
		Polystyrene foam	15	1.5
			20	1.3
			25	1.0
			30	0.9
			50	0.8

(2) Shading coefficient SC and heat transfer coefficient U for window systems

These are approximate values of shading coefficient and heat transfer coefficient, based on differences in the glass used.
3 mm glass : Shading coefficient SC = 1.0, heat transfer coefficient around 6.0 (W/m²K)
Transparent multi-pane glass, High-performance single-pane glass: Shading coefficient SC = 0.8-0.6, heat transfer coefficient around 4.0-5.0 (W/m²K)
High-performance multi-pane glass: Shading coefficient SC = 0.5, heat transfer coefficient around 3.0 (W/m²K).

■Reference 4) Assessment standard based on the average perimeter heat transfer coefficient and the solar radiation heat gain coefficient during the time in which refrigerated air conditioning is used in residential buildings

	Standard value U_A of the average perimeter heat transfer coefficient (Unit W/ m^2K)							
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
レベル1	0.72＜U_A	0.72＜U_A	1.21＜U_A	1.47＜U_A	1.67＜U_A	1.67＜U_A	2.35＜U_A	—
レベル 2	0.72	0.72	1.21	1.47	1.67	1.67	2.35	—
レベル 3	0.54	0.54	1.04	1.25	1.54	1.54	1.81	—
レベル 4	—	—		—	—	—	—	—
レベル 5	0.46	0.46	0.56	0.75	0.87	0.87	0.87	—
	Standard value η_A of the solar radiation heat gain coefficient during the time in which refrigerated air conditioning is used							
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
レベル1	—	—	—	—	—	—	—	4.5＜η_A
レベル 2	—	—	—	—	4.0＜η_A	3.8＜η_A	4.0＜η_A	—
レベル 3	—	—	—	—	4.0	3.8	4.0	4.5
レベル 4	—	—	—	—	—	—	—	—
レベル 5	—	—	—	—	3.0	2.8	2.7	3.2

* In each level in the table, individual values are assumed to be below the standard value, depending on the area classification.
* The area classification here is in accordance with the regional classification provided in the Evaluation Standards for Clients and Owners of Specified Buildings Concerning the Rational Use of Energy (Notification No. 1 of METI and MLIT).

■Bibliography 9), 10), 11), 12), 13), 14), 15), 16)

2.1.3 Zoned Control

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off · Fct · Hsp · Htl
Level 1	No distinction is made between orientation directions, or between perimeter and interior, and only one air conditioning system is planned*[1], which must be switched between heating and cooling for each season
Level 2	
Level 3	There are air conditioning zoning*[1] that differentiates between orientation directions, between perimeter and interior, and between internal load distributions. The air conditioning system can provide either heating or cooling separately to each zone.
Level 4	There is air conditioning zoning at around the standard of level 3*[1], and the system also allows selection between cooling and heating for each zone.
Level 5	There are separate air conditioning systems for each orientation direction, and for perimeter and interior*[1], allowing more detailed zoning (broadly, zones of 40 m^2 or less). The air conditioning system can provide either heating or cooling separately to each zone.
Building type	Rtl · Rst · Hal
Level 1	There is no zoning of heating and cooling within a single floor, and a single-circuit air conditioning system is planned. Switching between heating and cooling is required for the selection of air conditioning modes.
Level 2	
Level 3	Each floor is divided into multiple zones according to their thermal loads, and the air conditioning system is planned to allow either heating or cooling in each zone.
Level 4	There is air conditioning zoning at around the standard of level 3, and the planned system also allows selection between cooling and heating for each zone.
Level 5	Each floor is divided into many small zones for individual sales areas or tenants, and the air conditioning system is planned to allow either heating or cooling in zone units.

NOTE) When it is difficult to decide, choose an intermediate level (level 2).

*1 In cases where airflow windows are used to make the space perimeterless, or in small offices with little depth, the first half of the description, concerning the distinction between perimeter and interior, may be ignored.

<Residential and Accommodation Sections> Inapplicable

☐**Commentary**

Evaluate whether a finely-zoned air conditioning system is used to eliminate temperature variations and create a comfortable environment in the interior.

Furthermore, even if the applicable system is not adequate, a high level can be evaluated if operation is managed manually, or receives planned consideration, and the internal environment is maintained with an adequate degree of success.

The following are examples of air conditioning systems corresponding to each level.

Level 1: Single duct system, two-pipe FCU system (no zoning, switching between heating and cooling).

Level 3: Single duct system, two-pipe FCU system (zoning grade assessment, switching between heating and cooling).

Level 4: Double duct system (4 pipes for AHU), four-pipe FCU system, task/ambient air conditioning system (evaluate both the zoning grade and simultaneous heating and cooling).

Level 5: Multi-unit heat pump system (simultaneous heating and cooling), double duct system (4 pipes for AHU), and four-pipe FCU system level with more detailed zoning than levels 3 and 4 (zones of around 40 m^2).

2.2 Humidity Control

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

In the <Residential and Accommodation Sections> of Apt, air conditioning equipment is excluded from assessment if it is installed by occupants.

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<table>
<tr><th colspan="3"><Entire Building and Common Properties></th></tr>
<tr><th>Building type</th><th colspan="2">Off·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt</th></tr>
<tr><td>Level 1</td><td colspan="2">Not adequate for level 3.</td></tr>
<tr><td>Level 2</td><td colspan="2"></td></tr>
<tr><td>Level 3</td><td colspan="2">Humidification equipment is available, and equipment capacity is generally sufficient to keep humidity to 50% in summer and 40% in winter.*1</td></tr>
<tr><td>Level 4</td><td colspan="2"></td></tr>
<tr><td>Level 5</td><td colspan="2">Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.*2</td></tr>
<tr><th></th><th>Sch (Universities, etc)</th><th>Sch
(Elementary/Junior High/High Schools)</th></tr>
<tr><td>Level 1</td><td>Not adequate for level 3.</td><td>Not adequate for level 3.</td></tr>
<tr><td>Level 2</td><td></td><td></td></tr>
<tr><td>Level 3</td><td>Humidification equipment is also available, and equipment capacity is generally sufficient to keep humidity to 40-70% in winter and 50-65% in summer.</td><td>Sufficient equipment capacity to achieve general indoor humidity of 30 to 45% in winter and 55 to 80% in summer.</td></tr>
<tr><td>Level 4</td><td></td><td></td></tr>
<tr><td>Level 5</td><td>Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.</td><td>Sufficient equipment capacity with humidifier/dehumidifier to achieve humidity of 45 to 55%.</td></tr>
</table>

* In cases where it is difficult to determine between the above levels, select an intermediate level (e.g. level 2 or 4).

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	Not adequate for level 3.	No consideration given.
Level 2		(No corresponding level)
Level 3	Sufficient equipment capacity with humidifier to achieve general humidity of 50% in summer and 40% in winter.	Appropriate ventilation functions are provided, and anti-condensation measures have been taken on elements that can act as heat bridges, such as insulation reinforcement, humidity barriers and permeable layers.
Level 4		Dehumidification functions are provided, and anti-condensation measures have been taken on elements that can act as heat bridges, such as insulation reinforcement, humidity barriers and permeable layers.
Level 5	Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.	Dehumidification and humidification functions are provided and set to a comfort range of 45-55%, and anti-condensation measures have been taken on elements that can act as heat bridges, such as insulation reinforcement, humidity barriers and permeable layers.

* When it is difficult to decide, choose an intermediate level (level 2 or 4).
*1 In winter it will be relieved somewhat from the maximum level.
*2 Normal air conditioning equipment is assumed to provide dehumidification by refrigeration coil in summer, and humidification by humidifier in winter.

☐Commentary

Evaluate according to the set target value for humidity.Dehumidification and humidity control intended to provide comfort in summer, and humidification for health reasons in winter are regarded as important services.
In the basic design phase, the target performance is subject to the assessment.

Level settings are based on the following sources.

Level 1: Satisfy 40-70% of standards stipulated in the Law for Maintenance of Sanitation in Buildings (Building Sanitation Law), based on "Sanitation Management Standards for Buildings" of MEXT (applicable to Sch (universities, etc.))

Level 3: An equivalent level as referred to in the MLIT specifications, community-based standards, the Sanitation Standards for Tokyo Municipal Schools, general recommended values (applicable to Sch (universities, etc.)) and the MEXT School Sanitation Standards (applicable to Sch (elementary/junior high/high schools))

Level 5: POEM-O comfort zone: 45-55%.

■Bibliography 9), 10), 11), 12), 13), 14), 16), 17)

2.3 Type of Air Conditioning System

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

In the <Residential and Accommodation Sections> of Apt, air conditioning equipment is excluded from assessment if it is installed by occupants.
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp. Note that the assessment criteria differ between outpatient waiting rooms and medical examining rooms.

<Entire Building and Common Properties>		
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp (Waiting Room) ·Htl·Apt	Hsp (Examining Room)
Level 1	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.	Air conditioning system designed without specific consideration of vertical temperature variation and air flow in occupied areas
Level 2		
Level 3	The air conditioning system is normal, but the air supply and extraction plan considered the vertical temperature distribution and airflow speed in occupancy zone.	The air conditioning system is normal, but the air supply and extraction plan considered the vertical temperature distribution and airflow speed in occupancy zone, and the partitions in the medical examing rooms.
Level 4		
Level 5	The air conditioning system*1 was chosen to mitigate the vertical temperature distribution and airflow speed in the room.	The air conditioning system*1 was chosen to mitigate the vertical temperature distribution and airflow speed in occupancy zone, and to consider the partitions of the medical examining rooms.

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.	Air conditioning system designed without specific consideration of vertical temperature variation and air flow in air-conditioned occupied areas, or of temperature difference between air-conditioned and non-air-conditioned areas
Level 2		
Level 3	The air conditioning system is normal, but the air supply and extraction plan considered the vertical temperature distribution and airflow speed in occupancy zone.	Air conditioning system designed in consideration of vertical temperature variation and air flow in air-conditioned occupied areas, or of temperature difference between air- conditioned and non-air-conditioned areas
Level 4		
Level 5	The air conditioning system*1 was chosen to mitigate the vertical temperature distribution and airflow speed in occupancy zone.	Air conditioning system designed to in consideration of minimizing vertical temperature variation and air flow in air-conditioned occupied areas, or the temperature difference between air-conditioned and non-air-conditioned areas

* When it is difficult to decide, choose an intermediate level (level 2 or 4).
*1 This refers to, for example, ceiling and floor radiant heating and cooling systems, or floor-vented systems, etc.

☐**Commentary**

Evaluate whether the air conditioning was chosen to mitigate the vertical temperature distribution and airflow speed (residual wind speed) in the room.

The design stage of air conditioning equipment involves consideration of various air conditioning methods to choose the system that will best avoid causing localized discomfort to room occupants. Therefore it is not possible to name an air conditioning system that will always create a comfortable environment, but the air conditioning system should be evaluated on the basis of past results existing experience and design policies. The space for which vertical temperature distribution and airflow speed are evaluated should be the occupancy zone, and the evaluated points should be the vertical temperature distribution and airflow speed in the space occupied by humans. The temperature difference evaluated should be that between heights of 0.1 m and 1.7 m (around 2.0 m) with zone of uniform temperature as the target standard.

In the basic design phase, the target performance is subject to the assessment.

<u>Examples of air conditioning systems</u>

The system types below are not categorized by air conditioning types, such as single-duct, but by the venting methods.

Level 1: Methods which do not allow free design of airflow forms in the interior, such as cassette-type interior units, extensive use of dampers with poor diffusion, such as line diffusers, etc.

Level 3: Diffusion methods which employ dampers with good diffusion, such as anemostat or pan types.

Level 5: Cooling/heating system equipped with floor diffusers or radiant ceiling panels to minimize vertical temperature variation and air flow that cause occupant discomfort, or an air conditioning system with appropriate diffusers and layout to achieve performance of vertical temperature variation of approximately 2˚C or less and an air flow rate of 0.15 m/s.

■Bibliography 9), 10), 11), 12), 14)

3. Lighting & Illumination

3.1 Daylight

3.1.1 Daylight Factor

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off·Sch·Fct·Hsp·Htl·Apt
Level 1	[Daylight factor] < 1.0%
Level 2	1.0% ≦ [Daylight factor] < 1.5%
Level 3	1.5% ≦ [Daylight factor] < 2.0%
Level 4	2.0% ≦ [Daylight factor] < 2.5%
Level 5	2.5% ≦ [Daylight factor]

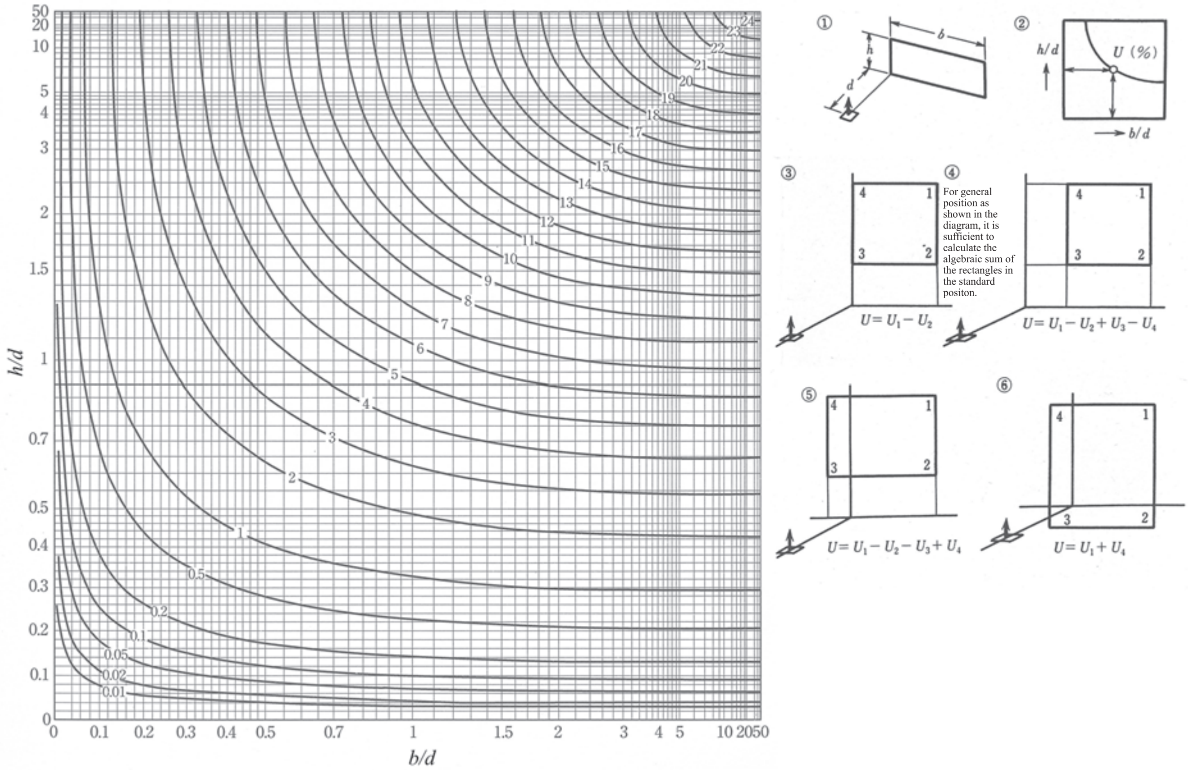
<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	[Daylight factor] < 0.5%	[Daylight factor] < 0.5%
Level 2	0.5% ≦ [Daylight factor] < 0.75%	0.5% ≦ [Daylight factor] < 1.0%
Level 3	0.75% ≦ [Daylight factor] < 1.0%	1.0% ≦ [Daylight factor] < 1.5%
Level 4	1.0% ≦ [Daylight factor] < 1.25%	1.5% ≦ [Daylight factor] < 2.0%
Level 5	1.25% ≦ [Daylight factor]	2.0% ≦ [Daylight factor]

☐Commentary
Daylight factor is the ratio of outdoor illuminance (full-sky illuminance) to the illuminance of a measurement point in the room, excluding direct daylight. It is an indicator of the potential for use of daylight. Daylight is always variable, but a stable value can be obtained for daylight factor, because it is a ratio.

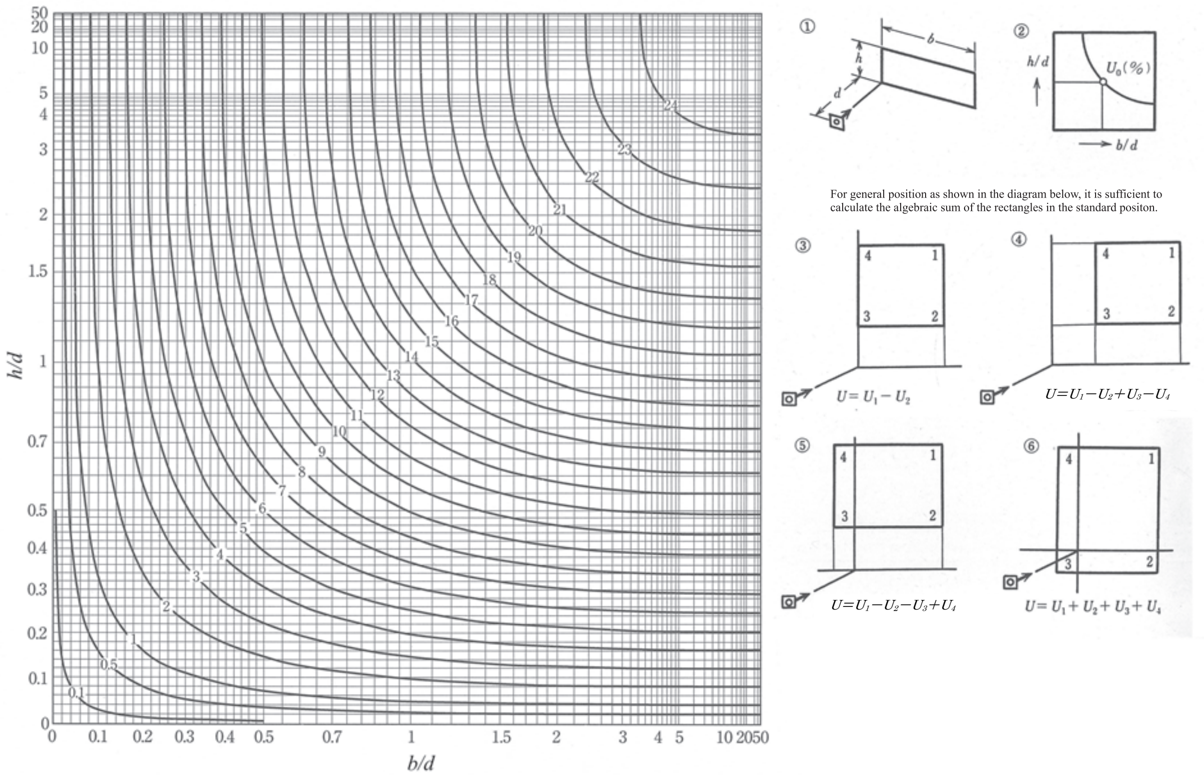
Utilizing the height of the central desktop surface in the room concerned as the calculation point, the calculation is carried out based on the size and position of the opening in terms of 2 calculation charts: "Cases in which windows on the wall are subject to the assessment" and "Cases in which skylight windows are subject to the assessment." Reference 1 is the chart for a window in a wall, and Reference 2 is for toplights and other forms. The types of rooms for evaluation are expected to be standard administrative Off, classrooms in Sch, and lobbies and other common areas in Apt, Hsp and Htl.

In order to simplify the procedure as much as possible, the calculation of the daylight factor in this section utilizes the direct daylight factor and adopts a method that treats the configuration factor as the daylight factor equivalent. The transmittance of windows and the reflectance of the ceiling are not taken into consideration. If other methods (see "Daylight Lighting Calculation Methods" by the Architectural Institute of Japan) have been employed for detailed examination, the resulting values can be used.

■Reference 1) Calculation chart for a window in one wall



■Reference 2) Calculation chart for a skylight



■ Bibliography 19)

■Reference 3) Calculation method for the daylight factor used in reference 1 and 2

It is extremely difficult to find an accurate value of daylight factor by calculation, so here we have used a method employing the three-dimensional angular projection factor, which is relatively easy to find. The three-dimensional angular projection factor is the proportion occupied by the projected area S" on the base circle of a face with a given three-dimensional angle within the area of that base circle. It can be regarded as being broadly equal to daylight factor. The three-dimensional angular projection factor U can be expressed by the following formula.

$$U = \frac{S''}{\pi \cdot r^2} \times 100 \quad (\%)$$

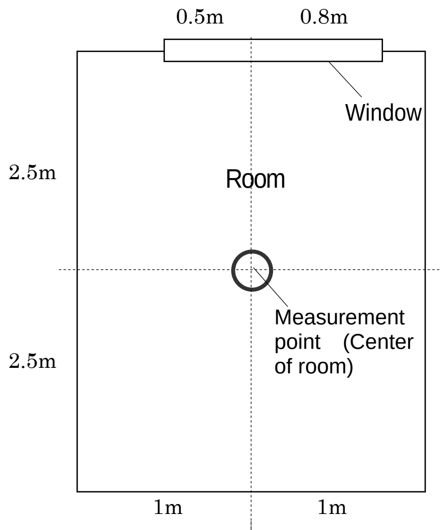
Where

U: Three-dimensional angular projection factor ≒ daylight factor (%)

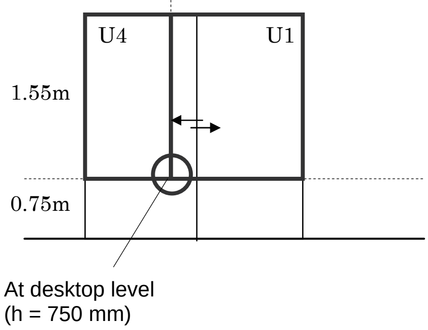
r : Radius of the base circle (normally r = 1)

π : Pi

S'': Area of S projected onto the base circle



▲Plan



▲Elevation
(Image view from inside the room)

Reference figures 1 and 2 are graphs from which values for three-dimensional angular projection factor, which is an approximation for daylight factor, can be read directly. They express the cases in which the light source and the illuminate surface are perpendicular and parallel to each other. Thus the chart in Reference 1 can be used to find the daylight factor on a horizontal surface such as a floor or desk top when the light source is a window in a wall, and the chart in Reference 2 does the same for a toplight.

To find daylight factor, use b (window width), d (distance from the window, and h (window height) to find b/d on the horizontal axis, and h/d on the vertical axis, then read the value at the intersection.

However, the calculation method varies according to the positional relationship between the window and the measurement face. The diagrams next to the graph represent the differences in calculation method depending on the measurement position. In the diagrams on the right, U = U1 + U4, and the daylight factor is the total of the two areas.

Calculating the daylight factor for area U1 in the diagram on the right

b1/d1 = 0.8/2.5 = 0.32, and h1/d1 = 1.55/2.5 = 0.62,

so reading from the graph, U1≒1.4.

Similarly for U4, b4/d4 = 0.5/2.5 = 0.2, and h4/d4 = 0.62, so U4 ≒ 0.9.

Therefore, the calculated daylight factor is

U = 1.4 + 0.9 = 2.3.

Similarly, if the positional relationship between the window and the measurement plane differs, the calculation method for the total value can understood from the diagrams.

Even when the window and the measurement plane are parallel, as in Reference 2, the method is the same as above. The measurement plane is the height of the desk top, and the measurement position is in the center of the room.

For a dwelling within Apartments, calculate for the room with the largest openings (the living room, etc.).

■Bibliography 18), 19), 20)

3.1.2 Openings by Orientation

Off･Sch･Rtl･Rst･Hal･Fct･Hsp･Htl･Apt

! Application condition

Not applicable other than Apt.

<Entire Building and Common Properties> Inapplicable

<Residential and Accommodation Sections>	
Building type	Apt
Level 1	No south-facing windows
Level 2	(No corresponding level)
Level 3	South-facing windows
Level 4	(No corresponding level)
Level 5	South and east-facing windows

□**Commentary**

Evaluate whether the positions (orientations) of openings make efficient use of daylight.

For a dwelling with the most common room layout on the standard floor, make a total assessment of the one dwelling. The Housing Performance Indication System calculates numerical opening ratio in each direction, but for this assessment it will be sufficient to say whether there are openings in each direction.

■Bibliography 17)

3.1.3 Daylight Devices

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>		
Building type	Off · Sch · Fct	Rtl · Rst · Hsp · Htl · Apt
Level 1	(No corresponding level)	(No corresponding level)
Level 2	(No corresponding level)	(No corresponding level)
Level 3	There are no daylight devices.	There are no daylight devices.
Level 4	There is one type of daylight device.	(No corresponding level)
Level 5	There are two or more types of daylight device, or they have advanced functions.	There are some daylight devices.

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	There are no daylight devices.
Level 4	(No corresponding level)
Level 5	There are some daylight devices.

☐Commentary
Evaluate the openings according to the planned installation of daylight devices.
Daylight devices optimally utilize daylight in addition to windows installed in the exterior walls. Specifically, such devices include light harvesting or guiding devices which carry light into the room interior, such as light shelves, light ducts, light condensers and optical fibers. Devices with advanced functions, for example, devices which have the two functions of collecting light and guiding it to the interior of a room, such as those which combine light condensers and optical fibers.
Buildings in which daylight devices are widely used are highly rated. However, we should note that effects of daylight devices are more likely to be expected in rooms with a low daylight factor, and therefore, with a low feasibility of lighting.
For toplights, if they were provided with the deliberate intention of using daylight they can be considered as daylight devices, but in the residential and accommodation portions of Hsp, Htl and Apt, the assessment applies to a representative private area of the standard floor, so toplights cannot be evaluated when present only on the top floor. For the <Entire Building and Common Properties>, toplights are evaluated if they were deliberately provided for the purpose of using daylight in common portions.

3.2 Anti-glare Measures

3.2.1 Daylight Control

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off·Sch (Universities, etc.)·Fct·Hsp·Htl·Apt
Level 1	Nothing.
Level 2	Glare control using screens, awnings and eaves.
Level 3	Glare is controlled with blinds, or by a combination of any two among screens, awnings and eaves.
Level 4	Glare is controlled with blinds, together with any of one among screens, awnings and eaves.
Level 5	Glare is controlled by automatically-controlled blinds.
Building type	Sch (Elementary/Junior High/High Schools)
Level 1	Nothing.
Level 2	(No corresponding level)
Level 3	Glare control using screens, awnings and eaves.
Level 4	Glare control using blinds or any combination of two or more fixtures including curtains, screens, awnings and eaves
Level 5	Glare control using blinds and at least one other fixture, including curtains, screens, awnings and eaves

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	Nothing.
Level 2	(No corresponding level)
Level 3	Glare control using curtains, screens, awnings and eaves.
Level 4	Glare is controlled with blinds, or a combination of any two among curtains, screens, awnings and eaves.
Level 5	Glare is controlled with blinds, together with any of one among curtains, screens, awnings and eaves.

☐Commentary

The assessment is carried out regarding glare countermeasures at window portions exposed to direct daylight or high brightness from outside, focusing on whether there are eaves around the opening, awnings (shading tents and window shades), screens, curtains, sunblinds, shading and the like. Buildings are highly rated when they have a high degree of control over direct sunlight according to the position of the sun (sunshine control performance) or brightness control performance. Especially in terms of rooms having a high daylight factor, the daylight control needs to be taken into consideration. Moreover, daylight devices that also have daylight control effects such as a light shelf may be evaluated with respect to both aspects.

Further, automatically regulated blinds and the like include those that control the angle of individual blades of a sunblind depending on the position of the sun, and those that adjust the transmittance

of windows automatically according to the temperature and other factors in order to control the level of brightness.
For evaluating housing portions of Apartments, most curtains, screens, awnings, blinds, shades and similar elements are installed by the residents, but curtains, but curtains should be included in assessment if there are installed curtain rails (boxes). For eaves (including balconies), a condition for assessment is that they should be present on all floors.

3.2.2 Reflection Control

This category is excluded from assessments in CASBEE for Building (New Construction).

3.3 Illuminance Level

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
In the <Residential and Accommodation Sections> of Apt, lighting equipment is excluded from assessment if it is installed by occupants.
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp. Note that the assessment criteria differ between outpatient waiting rooms and medical examining rooms.

<Entire Building and Common Properties>			
Building type	Off·Hsp (Examining Room)·Fct	Sch	Hsp(Waiting Room)
Level 1	(No corresponding level)	[Illuminance] < 300 lx	[Illuminance] < 150 lx
Level 2	[Illuminance] <300 lx, or 1,000 lx ≦ [Illuminance]	(No corresponding level)	(No corresponding level)
Level 3	Overall lighting system: 300 lx ≦ [Illuminance] < 500 lx; In cases of the task/ambient lighting system or its equivalent, and the task illuminance is more than 300 lx and less than 500 lx, or the ambient illuminance is less than 1/3 or more than 2/3 of the task illuminance	300 lx ≦ [Illuminance] < 500 lx, or 750 lx ≦ [Illuminance]	150 lx ≦ [Illuminance]
Level 4	Overall lighting system: 500 lx ≦ [Illuminance] < 1,000 lx; In cases of the task/ambient lighting system or its equivalent, the task illuminance is more than 500 lx and less than 1,000 lx, and the ambient illuminance is more than 1/3 and less than 2/3 of the task illuminance	500 lx ≦ [Illuminance] < 750 lx	Equivalent to level 3 and 100 lx ≦ [vertical illuminance] for walls
Level 5	In cases of the task/ambient lighting system or its equivalent, the task illuminance is more than 500 lx and less than 1,000 lx, the ambient illuminance is more than 1/3 and less than 2/3 of the task illuminance, and the illuminance of vertical surfaces of the walls or horizontal surfaces of the ceiling is more than 100 lx	(No corresponding level)	(No corresponding level)

Building type	Htl	Apt
Level 1	[Illuminance] < 100 lx	[Illuminance] < 100 lx
Level 2	(No corresponding level)	(No corresponding level)
Level 3	100 lx ≦ [Illuminance]	100 lx ≦ [Illuminance]
Level 4	(No corresponding level)	Equivalent to level 3 and 100 lx ≦ [vertical illuminance] for walls
Level 5	(No corresponding level)	(No corresponding level)

<Residential and Accommodation Sections>		
Building type	Hsp	Htl·Apt
Level 1	[Illuminance] < 150 lx	[Illuminance] < 100 lx
Level 2	(No corresponding level)	(No corresponding level)
Level 3	150 lx ≦ [Illuminance]	100 lx ≦ [Illuminance]
Level 4	Equivalent to level 3 and a [vertical illuminance] for walls of 100 lx or higher	(No corresponding level)
Level 5	(No corresponding level)	Equivalent to level 3 and individual controls of multiple devices*[1]

☐**Commentary**

The assessment focuses on the indoor brightness on desktop surfaces (approximately 80 cm above the floor), according to the illuminance of horizontal surfaces (Lux).
In cases where facility use is limited to daytime hours, such as Sch, apply lux values based on a minimum daylight levels.
Level 3 and Level 4 given to Off, Hsp (examination rooms) and Fct are evaluated based on, in cases of general lighting, the illuminance of horizontal surfaces on the desktop surface inside the room. In cases of the task/ambient lighting system (a system in which a necessary level of brightness for visual working spaces is secured by task lighting and in terms of non-visual working spaces, lighting having a lower level of illuminance compared to the one used for the visual working spaces is provided with ambient lighting) or its equivalent (a system in which the task illuminance may be adjusted according to the work contents or preferences of the user), the assessment is based on the level of task illuminance and ambient illuminance. Level 4 is given when the appropriate range of task illuminance and ambient illuminance is provided. Level 3 is given when the level of illuminance does not fall within such range. Level 5 is given when the appropriate range of illuminance in the task/ambient lighting system or its equivalent is provided as well as when the lighting plan aims to secure brightness by illuminating walls and the ceiling that account for a major part of the visual field[*2].
In this assessment, task illuminance level is the horizontal illuminance on desk surfaces and ambient illuminace level is the horizontal illuminance of non-task areas surrounding task zones (approximately 80 cm above the floor).

For the <Entire Building and Common Properties> of Hsp (waiting rooms) and Apt and <Residential and Accommodation Sections> of Hsp, level 4 is awarded where the lighting system provides an appropriate horizontal illuminance and also allows individual on/off controls of multiple lighting devices*[3)]. For the <Residential and Accommodation Properties> of Apt, evaluate based on the most principal room of the unit.
Furthermore, when using an overall lighting system, illuminance exceeding 1,000 lx for Off and 750 lx for Sch is considered too high, and not appropriate. For a task/ambient lighting system where illuminance does not correspond to level 4 and 5, award level 3 with respect to illuminance balance.

*1 In the assessment of balanced illuminance contrast, evaluate the average illuminance value of the task and ambient zones.
*2 Evaluation of the vertical illumminance of walls and horizontal illuminance of ceilings in level 4 to 5 using an illuminance distribution map is recommended. Such illuminance distribution diagram may be derived by using any of the commercial or free software.
*3 In hotels and apartments, a system that creates a detailed illuminance environment specific to in-room activities by placement of multiple devices with low power consumption is referred to as a multi-lighting system in the Technical Guidelines for Housing Illumination.

■Bibliography 22), 23), 24), 25), 26)

3.4 Lighting Controllability

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

In the <Residential and Accommodation Sections> of Apt, lighting equipment is excluded from assessment if it is installed by occupants.

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>		
Building type	Off·Sch (Universities, etc.)·Rtl·Fct·Hsp·Htl·Apt	Sch (Elementary/Junior High/High Schools)
Level 1	Lighting control is not zoned and no control panel/devices are available for adjustment	Lighting control is not zoned in accordance with illuminance levels and learning methods
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Lighting control per four-task unit is available or control panel/devices are available for adjustment	Lighting control is zoned in accordance with illuminance levels and learning methods, and on/off control by the occupants is available
Level 4	(No corresponding level)	(No corresponding level)
Level 5	Lighting control per task unit is available and adjustment via computer terminal/remote contol or automatic control is available	Level 3 is satisfied and automatic lighting adjustment is partially available

<Residential and Accommodation Sections>		
Building type	Hsp	Htl·Apt
Level 1	No lighting control is available	No lighting control is available
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Lighting control per multi-bed unit is available or control panel/devices for adjustment are available	Control panel/devices are available for broad lighting adjustment for the entire room
Level 4	(No corresponding level)	(No corresponding level)
Level 5	Detailed lighting control per bed is available	Detailed lighting control per multi-zone unit is available via computer terminal/remote control OR automatic control system

☐**Commentary**

Lighting controllability refers to the level of control over brightness, color, temperatures and lighting positions in a room by on/off switching and light adjustment. In this assessment, evaluation is based on the minimum area in a room for which lighting control is available and on methods of control (manual/automatic). A higher assessment level is awarded for detailed lighting control or automatic control systems.

In Off, a task unit refers to an area consisting of connected desks for a single task, or a single span where the task boundary is difficult to determine based on desk layout. In Apt, a multi-zone unit is used for an area where partial lighting is available in accordance with the location and movements of occupants. For Hsp, level 1 is awarded where lighting can only be turned on/off or adjusted for the whole area despite the need for partial lighting control.

For Sch (Universities, etc.), assessment criteria equivalent to Off are applied, assuming large-capacity classrooms. Sch (Elementary/Junior High/High Schools) have smaller classrooms. As such, evaluate lighting control systems based mainly on daylight control.

In the basic design phase, the target performance is subject to the assessment.

■Bibliography 26)

4. Air Quality

It is clearly important to maintain healthy indoor air in rooms, but achieving that aim requires careful consideration of aspects such as materials selection, ventilation and construction methods. The level of such consideration is evaluated here.
The basic approach to maintaining healthy indoor air in rooms is simple in itself, namely to first avoid the emission of pollutants as far as possible, and then to use ventilation to expel those pollutants which have been emitted. This approach is combined with operation and management aspects and divided into three items (source control, ventilation and operation plan and management) for assessment.

4.1 Source Control

Cutting off pollutants at source is a sure and effective way of maintaining healthy indoor air. Thus, the first consideration is to minimize the emission of pollutants from the building and its equipment. In that sense, source control is more important than ventilation and operation plan and management.

4.1.1 Chemical Pollutants

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Satisfies the Building Standard Law.
Level 4	The Building Standard Law is satisfied and building materials not regulated under the Building Standard Law (i.e. materials not included in its directives and materials with JIS/JAS F-4 star rating) are used in at least 70% of the total area of floors, walls, ceilings and attics.
Level 5	The Building Standard Law is satisfied and building materials not regulated under the Building Standard Law (i.e. materials not included in its directives and materials with JIS/JAS F-4 star rating) are used in at least 90% of the total area of floors, walls, ceilings and attics; most material used has a low level of formaldehyde and other VOC emissions.

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Satisfies the Building Standard Law.
Level 4	The Building Standard Law is satisfied and building materials not regulated under the Building Standard Law (i.e. materials not included in its directives and materials with JIS/JAS F-4 star rating) are used in at least 70% of the total area of floors, walls, ceilings and attics.
Level 5	The Building Standard Law is satisfied and building materials not regulated under the Building Standard Law (i.e. materials not included in its directives and materials with JIS/JAS F-4 star rating) are used in at least 90% of the total area of floors, walls, ceilings and attics; most material used has a low level of formaldehyde and other VOC emissions.

☐**Commentary**

Evaluate whether adequate measures have been taken to avoid air pollution by chemical pollutants.
Since the 1980s, Sick Building Syndrome has become a major problem in Europe and North America. It was triggered by changes in the materials used in buildings and a rapid reduction in the volume of air ventilation, which was intended to save energy in offices. In Japan the existence of the Law for Maintenance of Sanitation in Buildings Building Environmental Health Law has prevented Sick Building Syndrome from becoming such an extreme phenomenon. Instead, Sick House Syndrome has become a major problem in houses which rely on natural ventilation, and the problem has even emerged in "sick schools." The Ministry of Health, Labor and Welfare (MHLW) has responded by publishing concentration guideline values for chemical pollutants and pursuing various avenues of research, leading to the revision of the Building Standard Law.

For this assessment, an ordinary level of design that satisfies the Building Standard Law, which is mainly derived from consideration of chemical pollutants, receives a level 3 score. More strenuous efforts will be awarded higher scores. Level 4 will be awarded in cases where nearly all construction materials not subject to regulation under the Building Standard Law (construction materials not covered by directives and having F☆☆☆☆ JIS/JAS standard rating) throughout (at least 70% by area of floors, walls, ceilings and ceiling voids) are used. Level 5 requires a level closer to perfection, using construction materials not subject to regulation under the Building Standard Law (construction materials not covered by directives and having F☆☆☆☆ JIS/JAS standard rating) throughout (at least 90% by area of floors, walls, ceilings and ceiling voids). The materials must also have low emission levels of VOCs other than formaldehyde.
Calculate ceiling void area as below.

Area of ceiling void = Area of wall surface facing the ceiling void
+ Area of ceiling material facing the ceiling void (doubled because the ceiling material on the room interior side is also counted)
+ Area of the roof or underside of the next floor

■Bibliography 27), 28), 29), 30), 31), 32)

4.1.2 Asbestos

This is excluded from assessment in CASBEE for Building (New Construction).

4.2 Ventilation

The most effective method for maintaining healthy indoor air is to totally minimize the emission of pollutants from the building and its equipment, but in many cases that ideal must be balanced against cost and design considerations to permit some level of emission. In such cases, adequate ventilation can be planned to improve the air quality. Rather than conveniently relying on operation and management or automatic control, it is important to give careful consideration to the baseline quality of the outside air, the volume of outside air, zoning and other issues. It is also important to give the occupants some degree of scope for controlling their own ventilation.

4.2.1 Ventilation Rate

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>		
Building type	Off·Sch (Universities, etc.)·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt	Sch (Elementary/ Junior High/High Schools)
Level 1	Not adequate for level 3.	(No corresponding level)
Level 2	(No corresponding level)	(No corresponding level)
Level 3	For rooms equipped with a centrally-controlled air mixing system, a ventilation rate of 25 m^3/h per person or higher; or if not centrally controlled, a ventilation rate as required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.	Ventilation rate required in the Building Standard Law (including measures for sick house syndrome) and the School Sanitation Standards.
Level 4	For rooms equipped with a centrally-controlled air mixing system, a ventilation rate of 30 m^3/h per person or higher; or if not centrally controlled, a ventilation rate 20% higher than required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.	Ventilation rate that is 20% higher than required in the Building Standard Law (including measures for sick house syndrome) and the School Sanitation Standards.
Level 5	For rooms equipped with a centrally-controlled air mixing system, a ventilation rate of 35 m^3/h per person or higher; or if not centrally controlled, a ventilation rate 40% higher than required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.	Ventilation rate that is 40% higher than required in the Building Standard Law (including measures for sick house syndrome) and the School Sanitation Standards.

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	For rooms equipped with a centrally-controlled air mixing system, a ventilation rate of 25 m^3/h per person or higher; or if not centrally controlled, a ventilation rate required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.
Level 4	For rooms equipped with a centrally-controlled air mixing system, a ventilation rate of 30 m^3/h per person or higher; or if not centrally controlled, a ventilation rate 20% higher than required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.
Level 5	For rooms equipped with a centrally-controlled air mixing system, aventilation rate of 35 m^3/h per person or higher; or if not centrally controlled, a ventilation rate 40% higher than required in the Building Standard Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings.

☐Commentary

Evaluate according to whether there is an adequate volume of ventilation.

Level 3 satisfies the ventilation rates required in the Building Standard Law, the Law for Maintenance of Sanitation in Buildings and the School Sanitation Standards. Level 4 is awarded when a centrally-controlled air mixing system with a ventilation rate that satisfies the SHASE-S102-2003 Ventilation Standard and Commentary (generally 30 m^3/h or higher per person) is installed. A higher level is awarded when air quality improvement measures are actively undertaken. While this assessment is based on ventilation rates, a localized air exhaust system at pollution sources is also important in practice. In an office building, for example, zones which generate pollutants (e.g. cafeteria, graphic production area, printing room) require a fully-segregated ventilation system.

■Bibliography 27), 34)

4.2.2 Natural Ventilation Performance

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Level 3 is awarded in cases where only mechanical ventilation is available, with fixed windows and no valid opening for natural ventilation.

<Entire Building and Common Properties>		
Building type	Off·Sch (Universities, etc)·Fct	Sch (Elementary/ Junior High/High Schools)
Level 1	Not adequate for level 3.	Not adequate for level 3.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Fixed windows and no valid opening for natural ventilation; or fixed windows and valid opening area for natural ventilation of less than 25 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/50 of the total floor space of an occupied room.	Valid opening area for natural ventilation of at least 1/20 of the total floor space of an occupied room.
Level 4	Fixed windows and valid opening area for natural ventilation of at least 25 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/30 of the total floor space of an occupied room; or where in-room air quality improvement is expected with use of outdoor air cooling system which can use more than double the required outdoor air volume.	Valid opening area for natural ventilation of at least 1/15 of the total floor space of an occupied room.
Level 5	Fixed windows and valid opening area for natural ventilation of at least 50 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/15 of the total floor space of an occupied room; or valid opening area for natural ventilation is equivalent to Level 4, and in-room air quality improvement is expected with use of outdoor air cooling system that can use more than double the required outdoor air volume.	Valid opening area for natural ventilation of at least 1/10 of the total floor space of an occupied room.

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	Not adequate for level 3.	Not adequate for level 3.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Fixed windows and no valid opening for natural ventilation; or fixed windows and valid opening area for natural ventilation of less than 50 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/20 of the total floor space of an occupied room.	Area of openable windows at least 1/10 of floor space of occupied room.
Level 4	Fixed windows and valid opening area for natural ventilation of at least 50 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/15 of the total floor space of an occupied room; or where in-room air quality improvement is expected with use of outdoor air cooling system which can use more than double the required outdoor air volume.	Area of openable windows at least 1/8 of floor space of occupied room.
Level 5	Fixed windows and valid opening area for natural ventilation of at least 100 cm^2/m^2; or openable windows and valid opening area for natural ventilation of at least 1/10 of the total floor space of an occupied room; or valid opening area for natural ventilation is equivalent to Level 4, and in-room air quality improvement is expected with use of outdoor air cooling system that can use more than double the required outdoor air volume.	Area of openable windows at least 1/6 of floor space of occupied room.

☐**Commentary**

Evaluate whether enough openable windows are provided.

It is basically a precondition that air conditioning and ventilation equipment should provide the necessary volume of outside air. Nevertheless, there are still cases where the usage of a room causes pollutant emission to temporarily exceed expectations, or where the pollutant concentration is no problem, but occupants' physical condition or other factors make them want to temporarily improve air quality by bringing in outside air. Opening windows to bring in natural ventilation is important, as it gives occupants the power to control ventilation for their own needs at will. Smoke vents are designed to operate on natural ventilation, so if they can be opened and shut easily and the occupants can use that at will at any time, they can be regarded as natural ventilation openings for this purpose. Furthermore, an outdoor air cooling system is mainly intended for energy efficiency. However, level 4 is awarded when the system can also be used to improve in-room air quality.

In assessing openable windows referred to in residential sections, evaluate the area of non-fixed windows. In this way the area of sliding windows does nto need to be halved. Also, assessment of an Apt building is based on a representative dwelling unit. Evaluate individual rooms in the unit and award the appropriate level based on the room with the lowest performance. For other building types, evaluate the entire standard floor or another representative floor.

■Bibliography 35), 36)

4.2.3 Consideration for Outside Air Intake

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition

Exclude from assessment if there is no ventilation equipment in the building.
For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents or positioned at least 3 m away.
Level 4	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also positioned at least 6 m away from extraction vents.
Level 5	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents and positioned at least 6 m away.
Building type	Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site.
Level 4	(No corresponding level)
Level 5	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents or positioned at least 3 m away.

<Residential and Accommodation Sections>	
Building type	Hsp · Htl
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents or positioned at least 3 m away.
Level 4	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also positioned at least 6 m away from extraction vents.
Level 5	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents and positioned at least 6 m away.
Building type	Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site.
Level 4	(No corresponding level)
Level 5	The air intakes are oriented away from pollution sources, considering conditions in areas surrounding the site. They are also oriented away from extraction vents or positioned at least 3 m away.

☐**Commentary**

Outside air intakes should be designed to take in the best outside air available. Pollution sources should be taken to mean cars, factories, waste heat and air collected from adjacent buildings or the subject building, cooling towers, garbage collection areas, and other sources based on other circumstances specific to the site concerned. Consider also the positional relationships between waste air vents and outside air intakes on each floor and in each dwelling of the subject building. Exclude from assessment if there is no ventilation equipment in the building (window ventilation).

■Bibliography 37)

4.3 Operation Plan

4.3.1 CO_2 Monitoring

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Exclude from assessment if the Law for Maintenance of Sanitation in Buildings does not apply to the subject building.

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The system is based on manual measurement, with the minimum necessary level of recording.
Level 4	The system is based on manual measurement, a management manual, etc. has been provided for properly maintaining air quality, and it functions effectively.
Level 5	The system has constant central monitoring of CO_2. Also, a management manual, etc. has been provided for properly maintaining air quality, and it functions effectively.

<Residential and Accommodation Sections> Inapplicable

☐**Commentary**
Evaluate whether a system has been instituted for properly maintaining air quality, and whether the system functions effectively. Under the Law for Maintenance of Sanitation in Buildings, CO_2 monitoring is to consist of regular manual monitoring, but that should be regarded as minimum management. There are variations over time and between seasons in the quality of indoor and outside air, and temporary malfunctions of the equipment can also occur. Therefore a constant monitoring system for CO_2 is desirable wherever possible.

■Bibliography 38)

4.3.2 Control of Smoking

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

For Hsp, evaluate only outpatient waiting rooms as common areas of Hsp.

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Hsp(Waiting Room)·Htl
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	There is a minimum level of measures, such as smoking booths, to avoid exposing non-smokers to smoke.
Level 4	(No corresponding level)
Level 5	Smoking is confirmed to be prohibited in the entire building. Alternatively, there is an adequate level of measures, such as smoking booths, to avoid exposing non-smokers to smoke.

<Residential and Accommodation Sections> Inapplicable

☐**Commentary**

Evaluate whether thorough measures, such as a building-wide smoking ban or the installation of smoking booths, have been taken to avoid passive smoking.
Tobacco smoke contains many pollutants, including nicotine, carbon monoxide and particulates, causing the problem of passive smoking of smoke from smokers and their cigarettes. At the same time, there is the problem of the odor of tobacco smoke. Therefore as a minimum measure there should be smoking booths with direct extraction of smoke to the outside, with no recirculation to other indoor spaces. For level 5, smoking must be prohibited in the entire building, or, if there are smoking booths, they must be entirely isolated from other spaces, including via ceiling voids, to prevent any smoke dispersion to other space, with a constant negative pressure maintained in them.

■Bibliography 38)

Q2 Quality of Service

In assessing Hsp, Htl and Apt under Q2.1 Service Ability, evaluation is based on common properties of each building (e.g. examination rooms in Hsp, public areas in Htl, common-use areas for Apt, etc.). For private areas (e.g. in-patient rooms in hospitals, guest rooms in hotels, dwelling units in apartments), apply criteria for <Residential and Accommodation Sections>.

1. Service Ability

Evaluate the service functions of the building for the functionality and usability of its spaces and, in a more positive sense, how pleasant and comfortable it is. Also, evaluate the consideration for daily maintenance.

1.1 Functionality & Usability

1.1.1 Provision of Space & Storage

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>	
Building type	Off·Fct
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Working space* per person is at least 6 m^2.
Level 4	Working space* per person is at least 9 m^2.
Level 5	Working space* per person is at least 12 m^2

* Working space refers to floor area allocated within the effective floor area of the office for ordinary workers to go about their daily duties. It does not include common spaces such as canteens, medical rooms, conference rooms, meeting rooms, private executive offices, filing rooms, space for refreshment (see 1.2.2) and similar spaces. Therefore the working space includes meeting spaces (spaces for day-to-day discussions), OA equipment spaces, management spaces, circulation spaces, etc.

<Residential and Accommodation Sections>		
Building type	Hsp	Htl
Level 1	Not adequate for level 3.	Not adequate for level 3.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Private rooms at least 8 m^2/bed, multi-bed rooms at least 6 m^2/bed.	Single room at least 15 m^2, twin room at least 22 m^2.
Level 4	(No corresponding level)	Single room at least 22 m^2, twin room at least 32 m^2.
Level 5	Private rooms at least 10 m^2/bed, multi-bed rooms at least 8 m^2/bed.	Single room at least 30 m^2, twin room at least 40 m^2.

☐**Commentary**

The primary aspect of interior service ability functionality and ease of use concerns spaciousness and storage capacity. The spaciousness used here as an assessment indicator is not necessarily directly linked to functionality and storage space, but its effects, such as giving more freedom in layout of fixtures and allowing enough space for storage, can easily be imagined. Level 3 is the bare minimum currently required by related regulations in normal circumstances, while level 5 is regarded as extremely spacious, with reference to past examples.
Use the effective measurements (internal dimension) to calculate the area subject to assessment.

■Bibliography 1), 36), 39), 40)

1.1.2 Use of Advanced Information System

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>	
Building type	Off·Fct
Level 1	Not adequate for level 2.
Level 2	Measures such as OA floors* accommodate layout changes, and electrical sockets for OA equipment have at least 30 VA/m^2 socket capacity. In addition, optical fiber is routed into the building for communications.
Level 3	Measures such as OA floors accommodate layout changes, and electrical sockets for OA equipment have at least 30 VA/m^2 socket capacity. Also, level 2 is satisfied for communications, and communications lines with capacity for one data communications device per 8 m^2 (one phone, one PC) is routed onto each floor.
Level 4	Measures such as OA floors accommodate layout changes, and electrical sockets for OA equipment have at least 40 VA/m^2 socket capacity. Also, level 3 is satisfied for communications, lines for multiple communications carriers are routed into the building, and space is provided for each communications carrier to lay cables onto each floor.
Level 5	Measures such as OA floors accommodate layout changes, and electrical sockets for OA equipment have at least 50 VA/m^2 socket capacity. Also, level 4 is satisfied for communications, Gigabit communications lines are routed onto each floor, and tenant EPS is ensured for communications between floors.

<Residential and Accommodation Sections>	
Building type	Htl·Apt
Level 1	Not adequate for level 2.
Level 2	Communications lines able to carry telephone and broadcasting are routed into each dwelling or guest room.
Level 3	Level 2 is satisfied, and Internet services not adequate for level 4 are provided.
Level 4	Each dwelling or guest room is equipped with a communications environment able to use 100 Mbit-class broadband.
Level 5	Each dwelling or guest room is equipped with a communications environment able to use Gbit-class broadband.

* OA floors refer to raised-access system floors. Structures with equivalent functions can be included in this category.

☐**Commentary**

In a highly computerized society, the installation of IT equipment is essential for all functional space in buildings. Measures in offices should go beyond just increasing the capacity of the sockets. As much consideration as possible should be given to the building and its services to facilitate the addition of IT equipment, and the relocation of such equipment for layout changes. Level 3 is the level currently demanded in normal circumstances, while level 5 requires a more active approach. For communications in office buildings, level 3 or better requires vertical cabling within the building, and level 5 requires capacity for Gigabit communications. The communications media corresponding to these levels are optical fiber and LAN cables. Guidelines for optical fibers have been written by the NPO Optical Fiber Promotion Council.

Since June 2005, it has become permissible to install optical fiber cable within service shafts.

■Bibliography 1), 39), 41), 42)

1.1.3 Barrier-free Planning

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>		
Building type	Rtl·Rst·Hal·Hsp·Htl (building with a total floor space of more than 2,000 m^2)	Off·Sch·Fct·Apt AND Rtl·Rst·Hal·Hsp·Htl (building with a total floor space of less than 2,000 m^2)
Level 1	Not adequate for level 3.	Not adequate for level 3.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	The building satisfies the standard for easing building use (the minimum level) under the New Barrier-free Building Law.	At least half of the building satisfies the standard for easing building use (the minimum level) under the New Barrier-free Building Law.
Level 4	The building satisfies the standard for easing building use (the preferred level) under the New Barrier-free Building Law.	The building satisfies the standard for easing building use (the minimum level) under the New Barrier-free Building Law.
Level 5	The building exceeds the standard for easing and guiding building use (the preferred level) under the New Barrier-free Building Law, achieving the universal design level.	The building satisfies the standard for easing building use (the desirable level) under the New Barrier-free Building Law.

<Residential and Accommodation Sections> Inapplicable

☐Commentary

Functional building must be open to all people who have the possibility of using it.
The New Barrier-free Building Law (the Law for Promoting Mobility and Accessibility for the Aged and the Disabled and Others) sets mandatory minimum standards for easing and guiding building use (the preferred level) for all Rtl, Rst, Hal, Hsp, Htl, and similar facilities of 2,000 m^2 or more that are used by the general public.
As a mandatory goal to work towards, there is also the standard for easing and guiding building use (the preferred level), which is intended to allow the use of the building without significant impediment.
For this item, evaluate compliance with the New Barrier-free Building Law in the Entire Building and Common Properties.
When determining whether at least half of the building satisfies criteria specified in the Building Standards for Mobility Facilitation, use the criteria checklist to determine if at least half of the items are applicable by the appropriate consideration during building planning.

■Bibliography 43), 44), 45)

1.2 Amenity

1.2.1 Perceived Spaciousness & Access to View

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

<Entire Building and Common Properties>		
Building type	Off · Fct	Rtl · Rst
Level 1	Not adequate for level 3.	Not adequate for level 3.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Ceiling height of at least 2.5 m in office space and windows provide all occupants with sufficient awareness of the outside environment.	Ceiling height at least 3.0 m in sales area.
Level 4	Ceiling height of at least 2.7 m in office space and windows provide all occupants with sufficient awareness of the outside environment.	Ceiling height at least 3.3 m in sales area.
Level 5	Ceiling height of at least 2.9 m in office space and windows provide all occupants with sufficient awareness of outside the environment.	Ceiling height at least 3.6 m in sales area.
Building type	Sch (Universities, etc)	Sch (Elementary/ Junior High/High Schools)
Level 1	Not adequate for level 2.	Not adequate for level 3.
Level 2	Ceiling height of at least 2.7 m in classrooms.	(No corresponding level)
Level 3	Ceiling height of at least 3.0 m in classrooms.	Ceiling height at least 2.7 m in most classrooms.
Level 4	Ceiling height of at least 3.1 m in classrooms.	(No corresponding level)
Level 5	Ceiling height of at least 3.2 m in classrooms.	Ceiling height exceeding 2.7 m in classrooms.

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Ceiling height at least 2.3 m in residential and accommodation sections.
Level 4	Ceiling height at least 2.5 m in residential and accommodation sections.
Level 5	Ceiling height at least 2.7 m in residential and accommodation sections.

□**Commentary**

Buildings should be evaluated from the point of view that spaces that are perceived as spacious by their users and offer them good views are psychologically comfortable. Evaluate flat ceiling height, taking beam shape into account. The ceiling height indicator used here is not necessarily directly explanatory of comfort, but it appears to be effective in imparting various benefits, such as a sense of space and openness. Level 3 is the bare minimum currently required by related regulations in normal circumstances, while level 5 is regarded as extremely high, with reference to past examples.

If an elementary school has multiple ceiling heights specific to grades, the ceiling height of the highest grade can be applied.

■Bibliography 1), 36), 39), 40)

1.2.2 Space for Refreshment

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

<Entire Building and Common Properties>		
Building type	Off · Fct	Rtl
Level 1	(No corresponding level)	(No corresponding level)
Level 2	There is no refreshment space.	Not adequate for level 3.
Level 3	Refreshment space is less than 1% of the working space.	Rest space is at least 2% of the sales floor area.
Level 4	Refreshment space is at least 1% of the working space.	Rest space is at least 3% of the sales floor area
Level 5	Refreshment space accounts for at least 1% of the working space and refreshment equipment such as a vending machine is provided.	Rest space is at least 4% of the sales floor area.

☐Commentary

Office work is often highly stressful, and with the increasing use of IT there is more time spent concentrating on the computer screen. The ability to go for relaxation and refreshment is essential for comfortable office life.Space for refreshment in offices generate new vitality in occupants. Many users spend extended periods in retail facilities, so a generous allowance of rest space for them would enhance their comfort.

Levels of multi-tenant buildings may be determined as to whether their facility planning and other related factors are on the premise of providing refreshment space (including sports facilities, outdoor terrace spaces, etc.) as well as other refreshment equipment such as vending machines.

The refreshment space includes sports facilities, outdoor terrace spaces and the like. The vending machines refer to facilities that provide drinks and snacks effective for refreshment. Other services and systems that would provide similar functions shall also be included in the assessment.

Note) When refreshment space is divided from working space by partitions, plants or other elements, it must be excluded from the working space floor area evaluated in 1.1.1.

■Bibliography 1), 39), 46)

1.2.3 Décor Planning

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition

For Hsp, evaluate the outpatient waiting rooms and the medical examining rooms as the common areas of the Hsp (assessment criteria are common to both).

<Entire Building and Common Properties>	
Building type	Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Applicable to two of the efforts to be evaluated.
Level 4	Applicable to three of the efforts to be evaluated.
Level 5	Applicable to four of the efforts to be evaluated.
<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Applicable to two of the efforts to be evaluated.
Level 4	Applicable to three of the efforts to be evaluated.
Level 5	Applicable to four of the efforts to be evaluated.

Efforts to be evaluated

No.	Description
1	The concept of the building as a whole is well defined, and specific efforts to reflect the concept are made at the décor planning stage. (For example, shifting to natural and ecological materials in a building with an ecological theme).
2	The functions required of the building have been clarified, and specific measures to encourage those functions are indicated at the décor planning stage. (For example, in Hotels and similar facilities, the interior is perceived as living space, and natural materials such as wood and stone are introduced in deliberate efforts to produce a living room-like atmosphere).
3	Specific measures were taken during décor planning to integrate the lighting design (e.g. effective use of indirect lighting specific to activity type, décor planning in consideration of color temperatures of a light source, etc.).
4	Mockups and interior perspectives are used to verify the décor planning in advance.

☐Commentary

There is no general standard for interior planning, so it is very difficult to evaluate this item. However, it is an essential assessment item for the creation of attractive and pleasant spaces. Evaluate whether or not there are specific efforts here that consider the concept or functions of the entire building.

■Bibliography 1), 46)

1.3 Maintenance

Under the Law for Maintenance of Sanitation in Buildings (Building Sanitation Law), specified buidings are subject to the Sanitation Management Standards for Buildings. Standards require that the specified buildings include measures to maintain a healthy environment, such as air conditioning and water supply management systems. Furthermore, buildings not included in the specified building category but which have many users are also required to have management systems equivalent to the specified buildings. In this assessment, maintenance includes cleaning management (i.e. cleaning inside and outside the building) and public health management (i.e. air environment, water supply/drainage, pest control, waste disposal), as referred to in the Sanitation Management Standards for Buildings.

1.3.1 Design That Considers Maintenance

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	Building plan includes insufficient level of consideration of maintenance. (0-2 applicable measures included)
Level 3	Building plan includes standard level of consideration of maintenance. (3-5 applicable measures included)
Level 4	Building plan includes higher-than-standard level of consideration of maintenance. (6-8 applicable measures included)
Level 5	Building plan includes excellent level of consideration of maintenance. (9 or more applicable measures included)

<Residential and Accommodation Sections> Inapplicable

Efforts to be evaluated

Description
(1) Interior finishes: Interior walls use finish methods, materials, paints or coatings that are highly dirt resistant.
(2) Interior finishes: Floors use finish methods, materials, paints or coatings that are highly dirt resistant.
(3) Décor planning: The design and structure of floors enables washing with water.
(4) Décor design: Design of interior walls and floors avoids creating dust traps and places to leave objects.
(5) Décor design: The first and second doors of windbreak lobbies are distanced so that they are not open at the same time, or are otherwise designed to prevent the entry of dust, etc.
(6) Décor design: Floor materials with very different maintenance methods are not placed close together.
(7) Exterior finishes: Exterior walls and glass are designed with highly dirt resistant construction materials, or with finishes such as weather-resistant paint and hydrophilic properties.
(8) Facade design: exterior walls are designed to maintain clean surface conditions by preventing water pooling and wet-dry effects from rain water by using rain flashing.
(9) Facade design: Measures have been applied to prevent damage from the droppings of birds (pigeons, crows, starlings, etc.).
(10) Facade design: Metal parts exposed on the exterior are plated or otherwise treated against corrosion.
(11) Décor and exterior space design: Movement routes, including outdoor spaces and management areas, are designed to eliminate steps as far as possible (steps not exceeding around 5 mm).
(12) Other: Efforts have been made in areas other than the above, with consideration for maintenance.

☐**Commentary**

(1) Judging from the design documents, choose at least one from 1. Toilets, 2. Elevator halls, 3. Escalators, 4. Rest and smoking rooms, 5. Waste handling spaces, and count that as an effort if consideration has clearly been given to it consistently throughout the building.

* Dirt-prone walls are generally finished in materials that are porous and water-absorbent or water-soluble (for example, cloth wall coverings and water-based paints). However, even if porous and water absorbent materials are used, effort can be judged to have been made if structural measures have been taken to avoid dirt, or if a dirt-preventive coating is applied. Also, avoid using construction materials that are extremely susceptible to deterioration, such as mud walls, plaster and diatom earth, or, if such materials are used, make sure the structure allows easy replacement.

(2) Judging from the design documents, choose at least one from 1. Toilets, 2. Rest and smoking rooms, 3. Food handling spaces, 4. Waste handling spaces, and count that as an effort if consideration has clearly been given to it consistently throughout the building.

* Dirt-prone floors are generally finished in materials that are porous and water-absorbent or water-soluble, mainly carpet, concrete and natural stone. However, even if these materials are used, effort can be judged to have been made if the materials have a water-repellent treatment or dirt-resistant coating. Also, avoid using construction materials that are extremely susceptible to deterioration, such as wood and sandstone, or, if such materials are used, make sure the structure allows easy replacement.

(3) Judging from the design documents, effort can be judged to have been made if such consideration has clearly been given consistently throughout the building.

* The design and structure that allow washing with water assume daily dry cleaning using a wet mop. However, there should be no gaps or joints on the floor surface so it does not remain wet when very polluted or after regular cleaning. In the case of double floors, the materials must permit the use of water, and wiring, etc. must be waterproofed.

(4) Judging from the design documents, effort can be judged to have been made if such consideration has clearly been given consistently throughout the building.

* For design to avoid dust traps and placement of objects, evaluate avoidance of protrusions and indentations wherever possible, and the use of curved finishing between walls and floor, and wall-mounted or movable structures for toilets and other fixtures.

(5) Judging from the design documents, the basis for windbreak lobbies with primary and secondary doors should be to provide a space of at least 1 m in which the automatic doors will not detect movement within the lobby. If the space is less than 1 m, but the windbreak lobby has manual doors, the placement of windbreak walls, etc. can be counted as an effort.

(6) Judging from the design documents, effort can be judged to have been made if such consideration has clearly been given consistently throughout the building.

* Reference examples for the assessment

a) When floor materials for which a large amount of water should not be used for cleaning (flooring, cork, and natural fiber carpet) and those for which a large amount of water may be used for cleaning (vinyl, plastic sheets, stone, and tile carpet) are used in combination, regardless of the size of the area subject to construction, the washing water is expected to soak in from between the joints, which would cause various problems to the floor such as warps, stains and changes in color. However, if the possibility of the infiltration of washing water is taken into consideration, and the joint strip is made as wide as possible (about 5 cm), such efforts shall be included in the assessment.

b) When multiple floor materials, all of which allow water use for cleaning (vinyl, plastic sheets, stone and tile carpet), are used, if different materials are used in combination alongside each other for an extremely small space (about 30 to 50 m^2), since each material requires a different cleaning method, cleaning cycle and detergent, we cannot say that the actual maintenance and management is adequately taken into account. Therefore, ideally, when constructing the floor, a small number of materials should be used to cover as much space as possible.

In addition, the Manual for Facilities Development According to the Ordinance for Town Development in Welfare City Tokyo (2009 edition) indicates that the combined use of multiple floor materials that have a wide range of slip resistance (more than 0.2 in C.S.R.) should be avoided since a sudden change of slip resistance may involve the considerable risk of slipping or tripping over.

http://www.fukushihoken.metro.tokyo.jp/kiban/machizukuri/manu21/kenchiku.files/manu2009-08.pdf

(7) Judging from the design documents, effort can be judged to have been made if consideration has clearly been given consistently throughout the facade design of the building.

* The design should include prevention of acid rain effects and other measures appropriate to the characteristics of the local area of the building (e.g. proximity to the sea, cold climate region).

* Unless the building is located in an area where weather resistance is particularly desirable, when high-level antifouling building materials or paints are used for the outer wall surfaces or glass portions that would save the trouble of cleaning the outer walls as much as possible, such efforts shall be taken into account in the assessment.

(8) Judging from the design documents, effort can be judged to have been made if consideration has clearly been given consistently throughout the facade design of the building.
* With respect to efforts made in the building design, if the building is designed to stay clean and avoid moisture (i.e., weathering at the opening portions or a sloping skylight that would drain rain water), such efforts shall be taken into account in the assessment.
The difference between (7) and (8) is that the former refers to the use of stain-resistant materials and the latter refers to the stain-resistant structure.

(9) Judging from the design documents, effort can be judged to have been made if consideration has clearly been given consistently throughout the cladding design for places where equipment concerned with the Sanitation Management Standard for Building contacts the outside of the building.
* For example, avoid the installation of structural elements above water tanks where birds could shelter from rain, rest and make nests.

(10) Judging from the design documents, effort can be judged to have been made if consideration has clearly been given consistently throughout the facade design of the building.
* Metal elements such as external staircases, air conditioning equipment stands and ladders which are only painted are difficult to protect from corrosion in the long term. It is preferable to use stainless steel, or to apply anti-corrosion treatments such as plating.

(11) Judging from the design documents, effort can be judged to have been made if consideration has clearly been given consistently throughout the décor design and exterior space design within the area under the management of the building.
* A great deal of transportation of goods, devices and equipment is involved in maintenance and management; buildings designed to have as few steps or bumps as possible are rated highly in the assessment.
* With respect to designs that have as few steps and bumps as possible, the JIS T9251 standard (2001) for guide blocks for the visually impaired (*1) specifies that the degree of unevenness should be up to 5 mm.

(12) Unusual efforts not included in (1)-(11) above items should be evaluated as one point.
* When evaluating "Other" efforts, state in the assessment software what kind of effort has been made, and attach documentation clearly comprehensible to a third party.

1.3.2 Securing Maintenance Functions

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

! Application condition
Level 3 is awarded to all buildings with a total floor space of 500 m^2 or less.

<Entire Building and Common Properties>	
Building type	Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt
Level 1	(No corresponding level)
Level 2	Insufficient level of measures have been taken to ensure functionality of maintenance system. (0-8 applicable measures in place)
Level 3	Standard level of measures have been taken to ensure functionality of maintenance system. (4-6 applicable measures)
Level 4	Higher than standard level of measures have been taken to ensure functionality of maintenance system. (7-9 applicable measures)
Level 5	Extensive level of measures have been taken to ensure functionality of maintenance system. (10 or more applicable measures)）

<Residential and Accommodation Sections> Inapplicable

I. Efforts to be evaluated (measures for specified buildings as referred to in the Law for Maintenance of Sanitation in Buildings)

Description
[1] Adequate space has been used for cleaning staff rooms, relative to the floor area.
[2] Adequate space has been used for cleaning equipment rooms, relative to the floor area.
[3] The cleaning equipment rooms have washing areas with drainage channels to safe drainage facilities.
[4] Space is planned for washing and drying mops and rags, for the sake of hygiene.
[5] Adequate space has been provided for sorting waste, materials for recycling, and bulky garbage items, relative to the floor area, and an easy way to move those materials outside has been planned.
[6] Cleaning sinks are installed for each toilet, or for each floor.
[7] Cleaning equipment for each type of floor material has been anticipated, and the layout of electrical receptacles (numbers and spacings) for use in cleaning work has been planned accordingly.
[8] Design ensures that maintenance work can be performed safely on exterior glass and walls, air supply and vent holes, light fixtures and other fixtures in high places.
[9] Suitable levels of lighting for cleaning purposes can be set.
[10] Valves and other devices requiring day-to-day adjustment are installed in positions which allow convenient operation.
[11] Inspection access holes for equipment concealed in ceiling voids are at least 600 x 600 mm.
[12] Equipment that is not in private areas can be accessed from common areas for maintenance.
[13] Other than the above, points related to securing maintenance functions have been identified and implemented.

II.Efforts to be evaluated (measures for buildings other than I.)

Description
[1] Storage space for cleaning materials is included in the design.
[2] Sink for cleaning materials with safe drainage is installed. * Hospital buildings secure, in addition to the above, a space in which washing machines for cleaning materials are installed, depending on the number of beds.
[3] Areas cleaned with water (e.g. washrooms, garbage storage, kitchens) are designed with a 2% gradient.
[4] Adequate space for waste material storage and removal is included in the design.
[5] Dedicated sinks or water taps are installed.
[6] Power outlets for outside/hallway cleaning are included in the design.
[7] Safety of maintenance activities in high places (e.g. exterior glass, vents, lighting fixtures) is addressed in the design.
[8] Water traps under all sinks in washrooms, hot water rooms, and kitchens can be removed for cleaning.
[9] Devices requiring day-to-day adjustment (e.g. valves) are installed in positions which allow convenient operation.
[10] Inspection access holes for equipment concealed in ceiling voids are at least 600 x 600 mm.
[11] Equipment that is not in private areas can be accessed from common areas for maintenance.
[12] Other than the above, points related to securing maintenance functions have been identified and implemented.

☐**Commentary**

For this assessment, evaluate the basic measures for achieving a high level of maintenance.
Verify that established measures correspond to the assessment criteria. Assessment levels are determined by the total number of applicable measures taken.
Note that separate assessment criteria are applied to specified buildings as referred to in the Law for Maintenance of Sanitation in Buildings and other types of buildings.

Ⅰ Framework for evaluating specified buildings in the Law for Maintenance of Sanitation in Buildings

[1] Judging from the design documents, judge an effort to have been made if the area is at least 0.2% of the floor area.
The staff room refers to the area for the cleaning personnel to rest, take a short nap, change clothes, conduct administrative work, or store personal items. Space shared with other occupants of the building for similar use can also be applied.
* The list of management room areas surveyed in 56 buildings in "10 Rules of Design and Construction for Better Maintenance," (Bibliography 48) published by the Building and Equipment Life Cycle Association found the average area of cleaning staff rooms to be 0.15% of floor area.

[2] Judging from the design documents, judge an effort to have been made if the area is at least 0.2% of the floor area.
In buildings where space provided for storage of cleaning equipment or maintenance is inadequate, cleaning materials may have to be delivered in smaller quantities and more frequently, thus increasing transportation-related load.
* The list of management room areas surveyed in 56 buildings in "10 Rules of Design and Construction for Better Maintenance," (Bibliography 48) published by the Building and Equipment Life Cycle Association, found the average area of the room for cleaning materials to be 0.12% of floor area. Cleaning equipment rooms are used to store cleaning chemicals and similar substances, so it is preferable that they be in a sterile location.

[3] Judge from design documents.
* A cleaning utensils storage area requires a space for washing cleaning utensils after use. It also needs to have drainage facilities connecting to the sewer or a septic tank, through which the washing water is properly drained.

[4] Judge from design documents whether space has been provided for washing machines.
* A space, in which washing machines are installed, proportional to the building area, is also taken into account in the assessment.

[5] Judging from the design documents, judge an effort to have been made if the area is at least 0.3% of the floor area.
* Calculate space requirements for waste, recyclable materials and bulky garbage based on the amounts of such materials anticipated in guideline standards set independently by local authorities on installation areas of storage facilities for garbage and recyclables. According to the standard installation area guidelines in some municipalities in Tokyo including Minato Ward, Shinjuku Ward and Shinagawa Ward, the ratio of a storage space to the total floor space shall be 0.29% for 50,000 m^2, taking an office building as an example. (Bibliography 49)

[6] Judge from design documents.
* Performing cleaning work efficiently requires provision of cleaning sinks for every set unit of area, to shorten movement times and distances. Judge whether a cleaning sink has been installed for each toilet (meaning each group of male/female/multi-purpose toilets).

[7] Judge from design documents.
* Use of extension cables to compensate for lack of electrical receptacles increases hazards such as cables melting from overheating and people tripping over cables. It is important to be careful not to interrupt users' ongoing activities inside the building by providing electric outlets

in a different power system at regular intervals for maintenance and management purposes. As electric cords for cleaning devices are usually about 8 m to 15 m long, if a private electric outlet in an independent power system is located within at least a diameter of about 30 m in common passageways, such effort shall be taken into account in the assessment.

[8] Judge from design documents.
* Do not use designs that make work difficult, such as exterior glazing and walls with curves or extreme setbacks from the parapet, and design for safe work by installing a rooftop gondola system in buildings of 10 floors or more. Also judge whether design allows work from the ceiling down with hoist equipment for cleaning and replacing the bulbs, etc. in light fixtures in high places.

[9] Judge from lighting design documents.
* Lighting for cleaning should not use all lights, to save energy, but a minimum level is required to enable safe work, and for checking the results of cleaning, so judge whether a suitable level of lighting has been set for cleaning.
The JIS general lighting standard provisions Z9110-2010 (Bibliography 23) state that the recommended level of illuminance in corridors shall be 100 lx. Further, the JIS general lighting standard provisions Z9110-2011, which supplement the previous edition, state that the range of illuminance in consideration of power saving shall be between 150 lx and 75 lx. Therefore, the desired illuminance is at least 75 lx, the lowest level of the illuminance range.

[10] Judge from design documents.
* For efficient maintenance, valves and other adjustment devices should be positioned where they are easy to operate.

[11] Judge from design documents.
* Adequate space must be provided for tasks such as replacing filters and adjusting humidifiers in equipment installed in ceiling voids.

[12] Judge from design documents.
* For efficient maintenance, a plan is required that allows the work to proceed without impeding the activities of residents.

[13] Unusual efforts not included in items [1]-[12] above should be evaluated as one point.
When evaluating "Other" efforts, state in the assessment software what kind of effort has been made, and attach documentation clearly comprehensible to a third party.
* "10 Rules of Design and Construction for Better Maintenance," (Bibliography 48) published by the Building and Equipment Life Cycle Association recommends that general construction and service engineers, the management company and others should participate from the building concept planning and basic design stages, providing advice on maintenance aspects, to assist effective maintenance and energy saving after completion of the building.

Ⅱ Efforts subject to the assessment in cases of buildings that do not fall under the specified buildings prescribed in the Law for Maintenance of Sanitation in Buildings
[1] Evaluate based on design documents if the described space is included.
In buildings where space provided for cleaning equipment storage and maintenance is inadequate, cleaning materials may have to be delivered in smaller quantities and more frequently, thus increasing transportation-related load. Therefore, building design should include appropriate space for this purpose.
* A dedicated room or locked storage space is recommended in order to prevent unauthorized access or accidental food contamination by cleaning supplies.

[2] Evaluate based on design documents.
* Space for washing the cleaning equipment after use is secure, and the drainage system connects to sewage line or septic tanks where cleaning liquid and waste water can be properly treated.

* Especially in hospitals, from the aspect of in-hospital infection countermeasures, the number of cleaning brushes and cloths required is higher than other buildings. Therefore, a space for washing and drying such cleaning utensils that is proportional to the number of beds is definitely required. For example, a hospital accommodating 200 beds would require at least 2 compact-size (4.5 kg) washing machines.

[3] Evaluate based on design documents if a gradient of approximately 2% is provided for the described areas.
* The sanitation maintenance manual for large cooking facilities (MHLW, March 24, 1997, Appendix of Eishoku (Food hygiene) No. 85, last revised on February 1, 2013, Shokuan (Food Safety) issue 0201, No. 2) (Bibliography 50) states that the building structure should include an appropriate slope (about 2/100 degrees) and drain pipes (having about an ascent of 2/100 to 4/100 degrees) in the portion where water is used on the floor, so that the water is easily drained away.

[4] Evaluate based on design documents if the described space is included.
* A dedicated room or locked storage space is recommended in order to prevent pest damage and to protect the environment of surrounding areas.

[5] Evaluate based on design documents.
* Dedicated sinks placed at a regular interval (every floor) facilitates efficient execution of cleaning tasks by shortening travel time and distance.

[6] Evaluate based on design documents.
* Due to change of functions of buildings that occur over time, availability of power outlets for cleaning equipment tends to become an issue. As such, system-specific power outlets must be included in the building design.

[7] Evaluate based on design documents.
* Exterior glass and walls must be designed to facilitate smooth and safe execution of cleaning tasks. Also, evaluate whether ease of tasks such as cleaning lighting fixtures and bulb changes is addressed in the building design.

[8] Evaluate based on design documents.

[9] Evaluate based on design documents.
* Devices requiring adjustment (e.g. valves) must be appropriately positioned to facilitate an efficient maintenance.

[10] Evaluate based on design documents.
* Adequate space to perform filter changes or humidifier adjustment for equipment in ceiling space must be provided.

[11] Evaluate based on design documents.
* Building design must facilitate efficient maintenance by securing access to equipment without impeding occupant activities.

[12] Award one point to other measures not described above.
Describe the measures in this category in the assessment software and provide documentation that is understandable to third parties.
* In "10 Rules of Design and Construction for Better Maintenance," (Bibliography 48) published by the Building and Equipment Life Cycle Association, it is recommended that collaboration of general construction and service engineers and building management companies begin at the concept planning and primary design stages. Their perspectives provide insight into effective maintenance and energy-efficient systems for proper building operation.

■Bibliography 23), 47), 48), 49), 50)

2. Durability & Reliability

2.1 Earthquake Resistance

Evaluate the building's performance in terms of its seismic capacity and occupant comfort in windy conditions.

2.1.1 Earthquake-resistance

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch (Universities, etc.)·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	The building's earthquake resistance meets the requirements of the Building Standard Law.
Level 4	The building's earthquake resistance exceeds the requirements of the Building Standard Law by a 25% margin.
Level 5	The building's earthquake resistance exceeds the requirements of the Building Standard Law by a 50% margin. Alternatively, damage control design has been used.
Building type	Sch (Elementary/Junior High/High Schools)
Level 1	(No corresponding level)
Level 2	The building's earthquake resistance meets the requirements of the Building Standard Law.
Level 3	The building's earthquake resistance exceeds the requirements of the Building Standard Law by a 25% margin.
Level 4	(No corresponding level)
Level 5	The building's earthquake resistance exceeds the requirements of the Building Standard Law by a 50% margin. Alternatively, damage control design has been used.

☐Commentary

For this assessment, evaluate earthquake safety based on the building's seismic capacity.
The idea of levels is described as follows:
(1) Buildings other than Sch (Elementary/Junior High/High Schools)
Level 3 is equivalent to the seismic capacity that satisfies requirements under the Building Standard Law. Level 1 and 2 are not applicable in practice as they would represent violations of the law. Using the Housing Quality Assurance Act as reference, a 25% or greater increase in seismic capacity compared to level 3 earns a level 4, and a 50% or greater earns a level 5.
(2) Sch (Elementary/Junior High/High Schools)
The Research Study Concerning Earthquake Resistance and Other Related Matters in Educational Facilities (1999 brief version), an appendix to the Promoting Improvement of Earthquake Resistance of Educational Facilities (Notice from the director-general of educational facilities dated April 20, 1999), indicates that it is desirable to consider enhancement of the seismic design force (by 1.25 times). Accordingly, buildings that have a 25% increase in the earthquake resistance prescribed under the Building Standard Law shall be rated as Level 3, and those whose earthquake resistance meets the level required in the Act shall be rated as Level 2. As to Level 5, the same rules as for buildings other than schools (elementary, junior high and high schools) shall apply.

In cases where design includes damage control systems, level 5 is awarded on the basis that a high seismic capacity level is assumed. The damage control systems include use of seismic isolation devices such as elasto-plastic dampers and low-yield steels.
Seismic isolation and vibration damping devices that are mainly intended to improve occupancy comfort by reducing the impact of seismic motion and strong winds are excluded in this category and evaluated under 2.1.2 Seismic Isolation & Vibration Damping Systems (systems that mainly target earthquake impact control are referred to as seismic isolation systems and others as

vibration damping systems).

When determining increased seismic capacity, refer to the following:

(1) Allowable stress design
The judgment is based on the importance factor, seismic story shear coefficient Ci, and other related elements.
When the building proceeds to the secondary design, and the degree of increase is different in the primary design and secondary design, the assessment is based on the secondary design.

(2) Limit load-bearing calculation
Evaluate based on the increase in external force.
When the building proceeds to the secondary design, the assessment shall include both the damage boundary and safety limit.

(3) Time-history response calculation
Analyze the values of seismic ground motion or the inter-story deformation angles. Award level 4 when values exceed the level required in the Building Standard Law by 25%, and level 5 when values exceed 50%.
Further, input values of the seismic motion in accordance with the method prescribed in the Ministry of Construction Notification No. 1461 in 2000 or its equivalent are rated as Level 3. Further, the inter-story deflection angle of 1/100, a value which is often used as a guide for seismic motions occurring in extremely rare situations, is rated as Level 3.

Perform the assessment in consultation with the structural engineer, as some of the building's structural calculation data are required for calculation.

2.1.2 Seismic Isolation & Vibration Damping Systems

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No seismic isolation or vibration damping system is used.
Level 4	A vibration damping system is installed. Improved comfort in strong wind is considered.
Level 5	A seismic isolation system is used.

□Commentary

For this item, evaluate performance in preventing or reducing sway due to strong wind or earthquake. Specifically, consider improved comfort in strong wind and protection of internal equipment and fixtures in earthquakes.
In cases where a seismic isolation system is installed, award level 5 on the basis that protection of indoor service equipment is ensured. Award level 4 when a vibration damping system intended to improve occupancy comfort during strong winds is installed.
Vibration damping elements, such as elastoplastic dampers, can help to improve earthquake resistance of any frame, but they should be evaluated under "2.1.1 Earthquake-resistance," as damage control design (systems that mainly target earthquakes are named "earthquake damping," others are named "vibration damping").
However, when a seismic damping system is used that also prevents sway in warm wind, it can be judged to be an installed seismic damping system and evaluated at level 4.
When designers evaluate this item, they must refer to parts of the structural calculation records, so consultation with the structural engineer is advised.

2.2 Service Life of Components

Evaluate the service life of building components by category (i.e. structural materials, exterior wall finishing materials, main interior finishing materials, ventilation ducts, waterpipes for air conditioning system and plumbing systems, and main service equipment).
In this assessment, service life does not refer to the social lifespan of construction materials. For example, the social lifespan of building materials used in a project which operates for a short time ends at the time when the project is terminated and the building is no longer used. Service life refers to the expected period of life which ends when the material or equipment breaks down or loses its required physical functions.
In achieving the target performance set in the building plan, it is also important to ensure accurate construction. For this assessment, it is assumed the building and the systems were constructed with sufficient accuracy. However, lower grades are given if the intended performance is not realized when the building is in operation.

2.2.1 Service Life of Structural Materials

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off· Sch· Rtl· Rst· Hal· Fct· Hsp· Htl· Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Level equivalent to Grade 1 in the assessment standards for wood, steel frame and concrete structures (MLIT directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)
Level 4	Level equivalent to Grade 2 in the assessment standards for wood, steel frame and concrete structures (MLIT directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)
Level 5	Level equivalent to Grade 3 in the assessment standards for wood, steel frame and concrete structures (MLIT directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)

☐Commentary

In this assessment, evaluate the service life of structural materials, not of the structure itself.
Award appropriate levels in accordance with the grades referred to in the Housing Quality Assurance Act. The Japan Housing Performance System was developed for residential buildings only; however, for this assessment, it was determined to be applicable to other building types since the system only stipulates a minimum level of concrete cover depth (i.e. Grade 1 level that satisfies requirements under the Building Standard Law).
Fibre reinforcement is not included in this category as it is intended mainly to prevent building collapse caused by explosion or rupture in the event of fire.

(Reference) Japan Housing Performance Standard "3.1 Deterioration Countermeasure Grades (structural skeletons, etc.)"

Deterioration Countermeasure grade (structural skeletons etc.)	The level of measures to prolong the period before replacement of materials used in structural skeletons etc. or other large-scale refurbishment work is required.
Grade 3	Measures have been applied as necessary to extend the period before large-scale refurbishment work is required to three generations (around 75-90), under normally-expected natural conditions and maintenance.
Grade 2	Measures have been applied as necessary to extend the period before large-scale refurbishment work is required to two generations (around 50-60), under normally-expected natural conditions and maintenance.
Grade 1	Measures stipulated under the Building Standard Law have been applied.

For more details, refer to the assessment standards under the Japan Housing Performance Standard (MLIT directive No. 151 issued in 2014).

2.2.2 Necessary Refurbishment Interval for Exterior Finishes

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Less than 10 years
Level 2	10 years or more, less than 20 years
Level 3	20 years
Level 4	21 years or more, less than 30 years
Level 5	30 years or more

☐**Commentary**

In this assessment, repair intervals of exterior wall finishes refers to the intervals at which the walls no longer function properly and repair work requiring scaffolding is carried out.

Ideally, service life of components should be determined by a thorough investigation by the assessor with regard to material lifespan catagorically based on the building life cycle plan and should be verified by the manufacturers. Alternatively, however, service life values for exterior walls and curtain walls specified in Appendix 1 can be applied. Further, Appendix 1 consists of 2 parts. In the assessment, figures provided by the Government Buildings Department shall be used. However, in cases where no applicable figures are available, those provided by the BELCA or the Architectural Institute of Japan indicated in the Reference Table may be used instead. As such, the assessor is required to specify the name of the standard being applied and the reasons for such selection.

In cases where the targeted material is not included in Appendix 1, or specific external elements causing deterioration exist (e.g. coastal location with high likelihood of salt damage), verify individually with manufacturers and other sources.
When multiple components are used, evaluate based on the shortest repair interval.

■Bibliography 51)

2.2.3 Necessary Renewal Interval for Main Interior Finishes

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl	Apt
Level 1	Less than 5 years	Less than 10 years
Level 2	5 years or more, less than 10 years	10 years or more, less than 15 years
Level 3	10 years	15 years
Level 4	11 years or more, less than 20 years	16 years or more, less than 25 years
Level 5	20 year or more	25 years or more

☐**Commentary**

In this assessment, renewal intervals of interior finishes refer to the intervals at which reinstallation of finishing materials or replacement of surface components occur.
Ideally, service life of components should be determined by a thorough investigation by the assessor with regard to material lifespan, catagorically based on the building life cycle plan and should be verified by the manufacturers. Alternatively, however, the service life values for floors, interior walls and ceilings specified in Appendix 1 can be applied. Further, Appendix 1 consists of 2 parts. In the assessment, figures provided by the Government Buildings Department shall be used.

However, in cases where no applicable figures are available, those provided by the BELCA or the Architectural Institute of Japan indicated in the Reference Table of Appendix 1 may be used instead. Some items on the lists have multiple values. As such, the assessor is required to specify the name of the standard being applied and the reasons for such selection.
In cases where the targeted material is not included in Appendix 1, or specific external elements causing deterioration exist (e.g. coastal location with high likelihood of salt damage), verify individually with manufacturers and other sources.

When multiple components are used, evaluate based on the shortest renewal interval.
In assessing Hsp, Htl and Apt, evaluate based on the large occupied rooms in the building (i.e. in-patient rooms, or examining rooms if larger, guest rooms, dwelling units).

2.2.4 Necessary Replacement Interval for Air Conditioning and Ventilation Ducts

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Zinc-plated steel sheet used almost throughout.
Level 4	Exposed exterior ducts, kitchen venting ducts, high-humidity venting ducts and similar applications that would have shorter service lives than other applications when made from zinc-plated steel sheet are made from stainless steel or Galvalume to extend service life. Alternatively, appropriate provision has been made for drainage of internal condensation.
Level 5	At least 90% of exposed exterior ducts, kitchen venting ducts, high-humidity venting ducts and similar applications that would have shorter service lives than other applications when made from zinc-plated steel sheet are made from stainless steel or Galvalume to extend service life.

☐Commentary

This item evaluates the longevity of air conditioning and ventilation ducts.
The assessment method is based on the countermeasures used in duct specifications to lengthen the lifespan of ducts likely to have reduced service lives if they were built with standard specification (zinc-plated steel, etc.).

2.2.5 Necessary Renewal Interval for HVAC and Water Supply and Drainage Pipes

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	D or better used in almost all the top three main building types.
Level 4	C or better used in at least two of the top three main building types.
Level 5	B or better used in at least two of the top three main building types, and E is not used.

☐Commentary

This item evaluates the longevity of HVAC and water pipes for water supply and drainage.
The method is to evaluate the materials and jointing methods used in the top three main building

types, and the degree of lifespan extension achieved.

The top three building types are the ones with the largest total weights of pipe in the building, and those should be evaluated. In buildings with only water supply and drainage, apply the above with two building types in place of three, and with one in place of two.

Refer to "Techniques to improve the Durability of Building Services" Building Maintenance & Management Center (1986) to judge types B-D.

First, determine the service life of pipe types B-D based on material and usage. Second, if the method to connect the pipes improves the grade, apply the higher results. However, if the method shows a lower grade, apply the first grade. If pipe material or connection method not included in the list is used, verify with manufacturers and evaluate based on equivalent usage and method.

■ Reference: Assessment criteria for air conditioning and plumbing pipes

Pipe system type		Type												Reference: joining method												
		Sanitation					A/C			Steam		Other		Screwed		Welded				Soldered		Mechanically-jointed			Other	
Pipe materials	Code	Water supply	Hot water supply	Sewage drain	Misc. drainage	Air venting	Cooling water	Hot and cold water	Hot water	Air supply	Water circulation	Fire extinguishing	Oil supply	Plated joints	Pipe-end core	Wrapping flange	Material welding	Electrical welding	TIG welding	Hard solder	Soft solder	Rubber water stop	Pull out resistant	No-hub joint	Adhesive	Lead caulking
Cast-iron pipe for water system	CIP	A		A	A																	B		B		A
Carbon-steel pipe for plumbing (white)	SGP	D		C	C	B	E	D	D			C		E				C				C	C	C		
Carbon-steel pipe for plumbing (white)	SGP							E	E	D	E	D	C					C				C	C			
PVC-lined steel pipe	VLP	B	C				C								E	A						C	C			
Polyethylene powder-lined steel pipe	PLP	B	C				C								E	A						C	C			
Stainless steel pipe for general plumbing	SUS	C	C				B	C	C		C							C	B			C	C			
Copper pipe	CUP	C	D	C	C			C	C			A				A				B	C	C	C			
Lead pipe for drainage	LP			C	C	B										A					A					
Rigid PVC pipe	VP	B		A	A		B										B							C	C	
Heat-resistant PVC pipe	HT		B	B	B	A		B	B								B								C	
Polyethylene pipe for water pipe	PEP	B															B						C		C	

*1 Expected service life: A: 60 years or more, B: 40 years or more, C: 30 years or more, D: 20 years or more, and E: 15 years or more
*2 Assumed setting: use in a general office building
*3 Based on interior conditions only; anticorrosion performance of pipe exterior not considered
*4 Based on pipe performance only; specific water treatment not considered
*5 Copper tubes used for refrigerant pipes shall be set as C. (See Appendix at the end of this manual.)

Source: Service Life Improvement Technology for Building Equipment, published by Building Maintenance & Management Center in 1986 (*5 was added).

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2.2.6 Necessary Renewal Interval for Major Equipment and Services

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Less than 7 years
Level 2	7 years or more, less than 15 years
Level 3	15 years
Level 4	16 years or more, less than 30 years
Level 5	30 years or more

□解　説
In this assessment, evaluate the repair and replacement intervals of main service equipment. Main service equipment refers to the following devices:

(1) For building types other than Apt, this refers to major equipment and services necessary for the building to function, specifically power receiver and transformer equipment, generators, boilers, chillers, air conditioners, water tanks, pumps and other equipment.
(2) For Apt, it refers to the devices necessary for people to live in the building, such as water heaters, room air conditioning, water tank and pumps.

Base data for renewal intervals for main service equipment are not yet complete. As such, a legal service life of 15 years is considered as level 3 in this category, 16 to 30 years as level 4, and 30 years or more as level 5.

Evaluate using the following approach:
(1) Identify the renewal interval of the devices most extensively used for each main service eqipment based on the number of units and equipment capacity.
(2) Of such devices, determine the level based on the device with the shortest interval.
(3) Base the evaluation on the service life values for electrical equipment and mechanical equipment specified in Appendix 1.

* Appendix 1 consists of 2 parts. In the assessment, figures provided by the Government Buildings Department shall be used. However, in cases where no applicable figures are available, those provided by the BELCA or the Architectural Institute of Japan indicated in the Reference Table may be used instead. Some items on the lists have multiple values. As such, the assessor is required to specify the name of the standard being applied and the reasons for such selection.
In cases where subject materials are not included in Appendix 1, or specific external factors causing deterioration exist (e.g. coastal location with high likelihood of salt damage), verify individually with manufacturers and other sources. In assessing service equipment not included in Appendix 1 with no specific external factors causing deterioration, evaluate renewal intervals based on a typical office building operation (approximately 250 operation hours per month).

In cases where renewal work can reasonably be expected to take place when the device with the shortest service life reaches its renewal time, apply its service life value as a representative value. When the renewal of the device with the shortest service life can be postponed until other work becomes necessary, use its service life value as the work time and apply it as a representative value.

■Bibliography 51)

2.3 Appropriate Renewal

Inapplicable under CASBEE for Building (New Construction)

2.4 Reliability

Reliability expresses the ability of the building to maintain its functions in the event of an earthquake, other natural disaster or major accident. The following items (1)-(5) are evaluated here for the extent to which their functions can be maintained in the event of an earthquake or other disaster. (1) HVAC system, (2) water supply and drainage, (3) electrical equipment, (4) support method of machines and ducts, (5) communications and IT equipment.

2.4.1 HVAC System

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Hal·Fct·Hsp·Htl (building with a total floor space of more than 2,000 m^2)	Sch·Rtl·Rst·Apt (building with a total floor space of more than 2,000 m^2)
Level 1	No efforts to be evaluated.	No efforts to be evaluated.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Applicable to one of the efforts to be evaluated. Alternatively, there is no centralized HVAC system.	Applicable to one of the efforts to be evaluated. Alternatively, there is no centralized HVAC system.
Level 4	Applicable to two of the efforts to be evaluated.	(No corresponding level)
Level 5	Applicable to three or more of the efforts to be evaluated.	Applicable to two or more of the efforts to be evaluated.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt (building with a total floor space of less than 2,000 m^2)
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No applicable measure is established
Level 4	One applicable measure is established
Level 5	Two or more applicable measures are established

Efforts to be evaluated

No.	Efforts to be evaluated
1	Circuits are divided according to the importance of their ventilation equipment, and more important circuits are given priority in operation after a disaster. Also, ways of running the ventilation with reduced load capacity have been examined.
2	Dispersion and duplication of heat source types (electricity, gas, etc.), with backups.
3	Countermeasures (such as suspended pipes) have been taken to ensure that overall function can continue even when the building is partially damaged by an earthquake.
4	Circuits are divided according to the importance of their air conditioning equipment, and more important circuits are given priority in operation after a disaster. Also, ways of running the air conditioning with reduced load capacity have been examined.

☐**Commentary**

In this category, the reliability of air conditioning and ventilation systems is evaluated based on the number of reliability improvement measures that have been established.

Assessment is intended for operation management systems for air conditioning and ventilation equipment that covers multiple occupied rooms. Buildings with no such centrally-controlled operation system are awarded level 3.

Most buildings with a gross floor area of less than 2,000 m^2 are equipped with multi-split air conditioning systems. In these cases, redundancy measures for air conditioning systems and key electrical systems for areas such as a small-sized computer section earn additional points.

Measures not listed but which are equivalent to items in the criteria can be included in the assessment.

2.4.2 Water Supply & Drainage

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Hal·Hsp·Htl·Fct·Apt	Rtl·Rst
Level 1	No efforts to be evaluated.	No efforts to be evaluated.
Level 2	Applicable to one of the efforts to be evaluated.	Applicable to one of the efforts to be evaluated.
Level 3	Applicable to two of the efforts to be evaluated.	Applicable to two of the efforts to be evaluated.
Level 4	Applicable to three of the efforts to be evaluated.	(No corresponding level)
Level 5	Applicable to four or more of the efforts to be evaluated.	Applicable to three or more of the efforts to be evaluated.

Efforts to be evaluated

No.	Efforts to be evaluated
1	Water-saving equipment is used. This is limited to cases where it is used on a majority of the installed equipment. Water-saving devices are those approved as Eco Mark products, or those equivalent to water-saving equipment that is the approval standard for Eco Mark products (Toilet bowls: approx. 6 L/use, urinals: approx. 4 L/use).
2	Plumbing systems are separated as far as possible to reduce the portions that become unserviceable in the event of a disaster.
3	The building has a pit for temporary waste water storage, in case mains sewerage is unavailable after a disaster.
4	The building has two separate tanks, one for water reception and one elevated tank.
5	Planning enables the use of well water, gray water, etc.
6	The building is equipped with a simple filtration system allowing conversion of rain water to potable water in the event of a disaster (Not applied to Rtl and Rst).
7	A faucet is provided in the water tank so that the water may be used for drinking in case of a power outage due to a disaster.

☐**Commentary**

In this category, the reliability of water and sanitation systems is evaluated based on the number of reliability improvement measures that have been established.

Unlike assessment under "LR2.1.1 Water Conservation," the use of water-saving devices described in Item 1 of this section is assessed with respect to effective use of potable water in the event of a disaster. Also, a partitioned water receiving tank described in Item 2 is not counted as two units.

Measures not listed but which are equivalent to items in the criteria can be included in the assessment.

2.4.3 Electrical Equipment

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt (building with total floor space of more than 2,000 m^2)
Level 1	No efforts to be evaluated.
Level 2	(No corresponding level)
Level 3	Applicable to one or more of the efforts to be evaluated.
Level 4	Applicable to three of the efforts to be evaluated.
Level 5	Applicable to four or more of the efforts to be evaluated.
Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt (building with total floor space of less than 2,000 m^2)
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No efforts to be evaluated.
Level 4	Applicable to one of the efforts to be evaluated.
Level 5	Applicable to two or more of the efforts to be evaluated.

Efforts to be evaluated

No.	Description
1	Emergency generator is installed.
2	Uninterruptible power supply system is installed
3	Redundant power receiving system for key service equipment is installed.
4	Measures described in Item A and B below have been established in order to avoid power outages or damage to data network caused by flooding in power supply equipment or precision machinery (in apartments, circuit breakers, distribution boards, etc.), or Item C applies. A. Power supply equipment and precision machinery are not installed below ground level. B. Water blocking devices (e.g. waterproof doors and panels, raised mounds, dry ditches) and drainage system (e.g. pumps, etc.) are installed to prevent flooding below ground level. C. No danger of flooding. (Not applicable to buildings with a total floor space of less than 2,000 m^2)
5	Wiring is installed for lighting and other equipment available when connected to a power-supply car.
6	Power supply is secured from two different substations.

☐Commentary

In this category, the reliability of electrical systems is evaluated based on the number of reliability improvement measures that have been established.

As with assessment under "2.4.1 Air Conditioning and Ventilation System," most small-sized buildings are equipped with emergency generators and an uninterruptible power supply system for areas such as a small computer section. In these cases, such measures earn additional points.

Measures not listed but which are equivalent to items in the criteria can be included in the assessment.

2.4.4 Support Method of Machines & Ducts

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Earthquake resistance class[†1] B (Human safety is assured and secondary damage prevented after a major earthquake). Or, the design lateral seismic coefficient KH is more than 1.0 after conducting the dynamic analysis.
Level 4	Earthquake resistance class A (In addition to Class B, important functions can be secured without major repairs). Or, the design lateral seismic coefficient KH is more than 1.5 after conducting the dynamic analysis.
Level 5	Earthquake resistance class S (In addition to Class A, all functions can be secured without major repairs). Or, the design lateral seismic coefficient KH is more than 2.0 after conducting the dynamic analysis.

☐**Commentary**

Support methods for machinery and ducts are also important factors in improving reliability by maintaining functionality in the event of a disaster. In this assessment, evaluate the reliability of such supporting methods.

Level 3, a standard requirement level equivalent to Class-B seismic performance or the design lateral seismic coefficient KH=1.0, is awarded when machinery and duct support measures ensure prevention of injury to occupants in the event of a disaster. Level 4, equivalent to Class-A seismic performance or if the design lateral seismic coefficient KH is more than 1.5, is awarded when such support measures ensure not only occupant safety but also prevent key machinery and ducts from falling and facilitate continuous operation. The highest standard, level 5, equivalent to Class-S seismic performance or if the design lateral seismic coefficient KH is more than 2, applies when all machinery and ducts in the building are protected from falling and continuous operation is ensured. Refer to Seismic Design and Construction Guidelines for Buildings Service Systems, published by the Building Center of Japan, for specific criteria for Class B, A and S.

■Bibliography 52), 53)

[†1] Concept of "earthquake resistance class" is quoted from "Design and Construction Guidelines for Earthquake Resistance in Building Services, 1997 Edition."

2.4.5 Communications & IT Equipment

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	No efforts to be evaluated.
Level 2	Applicable to one of the efforts to be evaluated.
Level 3	Applicable to two of the efforts to be evaluated.
Level 4	Applicable to three of the efforts to be evaluated.
Level 5	Applicable to four of the efforts to be evaluated.

Efforts to be evaluated

No.	Efforts to be evaluated
1	Communications methods are diversified, using optical fiber cable, metal cable, cellular telephone network, PHS network and others.
2	Connections are made from two telephone exchanges to secure two communications links.
3	Countermeasures Item A and B below have been taken or Item C applies, in order to avoid damage to data networks due to water percolation into precision machinery. A. Installation of precision machinery below ground is avoided. B. Devices to prevent the groundwater percolation (waterproof doors, waterproof panels, embankments, dry ditches) and drainage equipment (pumps, etc.) are installed. C. No danger of water percolation.
4	Wire telephones, FAX and community emergency radio systems are installed in case of a disaster.
5	Disaster information is available through a cable TV or other channels in the event of a disaster.
6	An uninterruptible power supply system is installed for network devices.

☐Commentary

In this category, the reliability of communications cables is evaluated based on the number of reliability improvement measures that have been established.
Measures not listed but which are equivalent to items in the criteria can be included in the assessment.

Q2

3. Flexibility & Adaptability

3.1 Spatial Margin

In this category, evaluate the floor-to-floor height and flexibility in floor layout with respects to adaptability to potential change in building use.
In Hsp, Htl and Apt, main occupied rooms on a standard floor are often located in residential or accommodation areas of the building. As such, evaluate those rooms under the residential and accommodation sections in this category. In the case of Hsp, the category includes in-patient rooms. Other rooms such as examination rooms are evaluated under the common properties section.

3.1.1 Allowance for Floor-to-floor Height

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Fct·Hsp (building with total floor space of more than 2,000 m^2)
Level 1	Less than 3.3 m
Level 2	3.3 m or more, less than 3.5 m
Level 3	3.5 m or more, less than 3.7 m
Level 4	3.7 m or more, less than 3.9 m
Level 5	3.9 m or more
Building type	Off·Sch·Rtl·Rst·Fct·Hsp (building with total floor space of less than 2,000 m^2)
Level 1	Less than 3.1 m
Level 2	3.1 m or more, less than 3.3 m
Level 3	3.3 m or more, less than 3.5 m
Level 4	3.5 m or more, less than 3.7 m
Level 5	3.7 m or more

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	Less than 3.3 m	Less than 2.7 m
Level 2	3.3 m or more, less than 3.5 m	2.7 m or more, less than 2.8 m
Level 3	3.5 m or more, less than 3.7 m	2.8 m or more, less than 2.9 m
Level 4	3.7 m or more, less than 3.9 m	2.9 m or more, less than 3.0 m
Level 5	3.9 m or more	3.0 m or more

☐**Commentary**

In this category, evaluate whether the floor-to-floor height is sufficient to facilitate potential change in building use, system changes and/or system reinforcement, or for occupant comfort.

In assessing Off, Hsp, Htl and Apt, evaluate floor-to-floor height of a standard floor. For other building types, evaluate the average value of the entire building.

Determine levels according to the following criteria:

Level 1: Changing building types and equipment is extremely difficult.
Level 2: Changing building types and equipment is difficult.
Level 3: Changing building types and equipment is moderately difficult.
Level 4: Changing building types and equipment is relatively easy.
Level 5: Changing building types and equipment is easy.

3.1.2 Flexibility in Floor Layout

Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Fct
Level 1	0.7 ≦ [Wall length/area ratio]
Level 2	0.5 ≦ [Wall length/area ratio] < 0.7
Level 3	0.3 ≦ [Wall length/area ratio] < 0.5
Level 4	0.1 ≦ [Wall length/area ratio] < 0.3
Level 5	[Wall length/area ratio] < 0.1

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	0.7 ≦ [Wall length/area ratio]
Level 2	0.5 ≦ [Wall length/area ratio] < 0.7
Level 3	0.3 ≦ [Wall length/area ratio] < 0.5
Level 4	0.1 ≦ [Wall length/area ratio] < 0.3
Level 5	[Wall length/area ratio] < 0.1

Wall length/area ratio is calculated by the following equation.

$$\text{Wall length/area ratio} = \frac{\text{Length of perimeter walls (m) + length of bearing walls (m)}}{\text{Exclusive area (m}^2\text{)}}$$

☐**Commentary**

In this category, evaluate the flexibility in the floor layout based on the wall length/area ratio.
The wall length/area ratio indicates a fixed degree of a particular area. Lower values indicate a higher flexibility in the floor layout.
Determine levels according to the following criteria:

Level 1: Scope for planning equipment and spaces is extremely limited by the building structure.
Level 2: Scope for planning equipment and spaces is limited by the building structure.
Level 3: There is freedom for planning equipment and spaces.
Level 4: There is ample freedom for planning equipment and spaces.
Level 5: There is a high level of freedom for planning equipment and spaces.

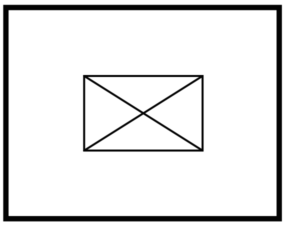
■Points to consider concerning calculation subjects

If the calculation subject is a non-residential building type, calculate for one standard floor. For residential building types, take the main occupied rooms.

■Calculation method for non-residential building types

(1) Equipment spaces (PS, EPS, EV shafts) should be considered to be "areas for which room configuration cannot be altered to accommodate future usage," and excluded from the exclusive area.
(2) The walls of equipment spaces (PS, EPS, EV shafts) could become constraints on "areas for which room configuration can be altered to accommodate future usage (exclusive area)," so enter the length of such walls adjoining exclusive areas into the calculation as "length of load-bearing walls."
(3) The walls around courtyards surrounded by the building should be entered in the calculation as exterior walls.

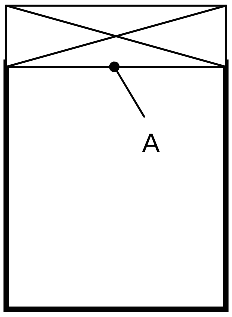
Example 1: For the center core



- Deduct the center core portion from the exclusive area.
- If the center core is surrounded by load-bearing walls, count them as load-bearing walls.
- Count other load-bearing walls, if there are any.
- The length of peripheral walls is the shaded area on the diagram on the left.

* The core is the portion containing staircases, elevators and other elements.

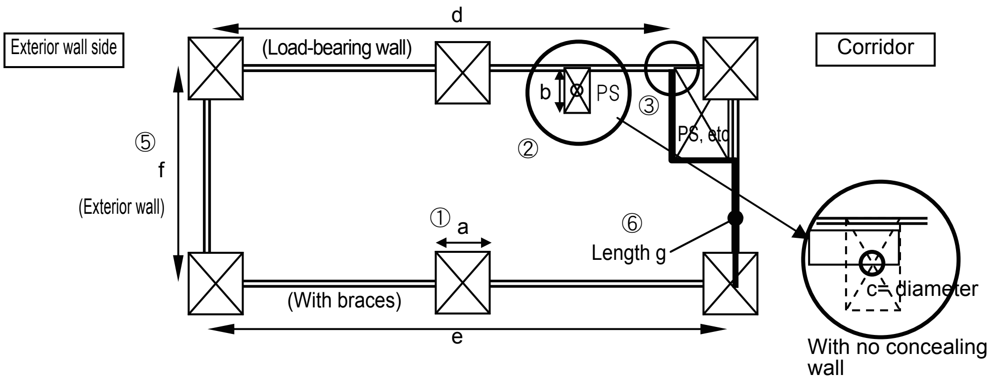
Example 2: For a side core



- Deduct the side core portion from the exclusive area.
- If there are load-bearing walls, count those in area A as load-bearing walls.
- Count other load-bearing walls, if there are any.
- The length of peripheral walls is the shaded area on the diagram on the left.

■Calculation method for residential building types

(1) Columns with attached walls (regardless of whether they are load-bearing walls) or free-standing interior columns should be added to the numerator as the long side x 3 (a x 3).
(2) For apartments, include water supply and drainage pipes in exclusive areas. The calculation method for PS with attached walls or free-standing interior PS is to add the long side x 3 (b x 3) for walls to conceal pipes, or the diameter x3 (c x 3) of the fattest pipe if there is no concealing wall, to the numerator.
(3) If there is PS (or MB) facing outside, count the point of contact with the PS (or MB) as the end of the load-bearing walls (d).
(4) In walls with braces installed, add the distance between centers (e) to the numerator as load-bearing wall. Conversely, do not count party walls that are not load bearing.
(5) Judge the length of exterior walls by the center-to-center length (f).
(6) If there is an open corridor, add the length of the wall side of the corridor as length of exterior wall. However, if there is PS (MB) facing the corridor, add the length of contact between the PS (MB) and the exclusive area, and the lengths of walls of other areas on the corridor side, as shown in the diagram below (g). If there is a middle corridor do not add the length on the corridor side to the length of exterior wall.



Reference diagram for residential building types (Example of an apartment with an open corridor)

3.2 Floor Load Margin

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

The building's floor load margin is evaluated to consider the potential for future changes of building type.
For Htl and Apt, the main areas that correspond to occupied rooms of standard floors are the residential and accommodation sections, so evaluate this item under <Residential and Accommodation Sections>. For Hsp, evaluate for both the main occupied rooms of the standard floor of <Residential and Accommodation Sections> (mainly wards) and the main occupied rooms of the standard floor of <Common Properties> (mainly examination rooms).

<Entire Building and Common Properties>			
Building type	Off·Rtl·Rst·Hal (fixed seatings)·Fct·Hsp	Hal (non-fixed seatings)	Sch
Level 1	(No corresponding level)	(No corresponding level)	(No corresponding level)
Level 2	Less than 2,900 N/m^2	Less than 3,500 N/m^2	Less than 2,300 N/m^2
Level 3	2,900 N/m^2 or more, less than 3,500 N/m^2	3,500 N/m^2 or more, less than 4,200 N/m^2	2,300 N/m^2 or more, less than 2,900 N/m^2
Level 4	3,500 N/m^2 or more, less than 4,500 N/m^2	4,200 N/m^2 or more, less than 5,200 N/m^2	2,900 N/m^2 or more, less than 3,500 N/m^2
Level 5	4,500 N/m^2 or more	5,200 N/m^2 or more	3,500 N/m^2 or more

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	Less than 1,800 N/m^2
Level 3	1,800 N/m^2 or more, less than 2,100 N/m^2
Level 4	2,100 N/m^2 or more, less than 2,900 N/m^2
Level 5	2,900 N/m^2 or more

☐Commentary

If the values specified in administrative ordinances for imposed loads are used, they provide a higher margin of safety than other loads, even for abnormal and unevenly distributed loads, such as during remodeling. Therefore, rather than considering ample allowance for such short-term situations, evaluate whether there is potential for conversion to other building types in future.
For offices, retailers, restaurants, halls, hospitals (common properties), factories and schools, the allowable load for rooms specified under Article 85 of the Order for Enforcement of the Building Standard Law is considered to be level 3. A 20% or greater increase in the allowable load compared to level 3 earns level 4, and a 50% or greater increase earns level 5.
The permissible load for the room concerned, as stated for buildings incorporating residential and accommodation sections (Hsp, Htl, Apt) in article 85 of the enforcement regulations for the Building Standard Law is set as level 2. One rank higher for offices is set as level 5. This allowance for load leaves potential for conversion to other uses. In practice, level 2 or below will be applicable to very few cases. Level 4 is a value interpolated between levels 3 and 5.
In this category, evaluation is based solely on the structural calculation values for floors as referred to in Article 85 with the assumption that an equivalent increase of the allowable load is applicable to principal beams, studs, and basic and seismic structural calculation. If increases in those areas are smaller than the value of the floors, lower the assessed level by one.

3.3 System Renewability

Evaluate system renewability per category with respect to versatility in potential change in building use.
In this category, repair work refers to replacement of components with the same dimension and specification, while renewal work refers to replacement of components with different specifications as part of a system upgrade.

3.3.1 Ease of Air Conditioning Duct Renewal

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Air conditioning ducts cannot be replaced or repaired without damaging structural elements.
Level 2	In some cases the air conditioning ducts can be replaced or repaired without damaging structural elements, if spare sleeves are used, but that method cannot be applied to all ducts.
Level 3	Space and routes for future use (future replacement work) have been provided, so that nearly all air conditioning ducts can be replaced or repaired without damaging structural elements. Alternatively, there is no central air conditioning equipment.
Level 4	Exterior air conditioning ducts are used or ceiling space provided so that ducts can be replaced or repaired without damaging either structural elements or surface finishes.
Level 5	ISS*, equipment floor installation or other measures allow easy replacement or repair of air conditioning ducts without damaging surface finishes.

☐Commentary

In this category, evaluate the renewability of the air conditioning ducts.
Evaluate the specifications for the parts which support the main functions corresponding to the building's function (main parts of the air conditioning pipes themselves).
Cases where there is no plan for renewal of air conditioning ducts, and ducts cannot be replaced or repaired without partial demolition of structural elements such as beam, columns and bearing walls, result in new repair works and generation of solid waste. Such cases are assigned level 1, the lowest level.
If replacement or repair work can be carried out without damage to surface finishes, level 4 or level 5 is assigned, depending on the ease of the work. Buildings with no central air conditioning equipment are assigned level 3.
Buildings where space and routes for future use (future replacement work) have been provided, so that nearly all air conditioning ducts can be replaced or repaired without damaging structural elements, are assigned level 3.

* ISS: Interstitial Space System. System that architecture and facilities are integrated.

3.3.2 Ease of Water Supply and Drain Pipe Renewal

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Repair and replacement are not possible without damaging structural elements and finishes.
Level 2	Repairs can be made without damaging structural elements, but replacements cannot.
Level 3	Repairs can be made without damaging structural elements and finishes, but replacements cannot.
Level 4	Repairs and replacements can be made without damaging structural elements.
Level 5	Repair and replacement are possible without damaging structural elements or finishes.

☐**Commentary**

In this category, evaluate the renewability of the water pipes.
Evaluation is based on specifications of sections which provide key functions required for each type of building use (i.e. the main sections of the building's plumbing system).
Cases where there is no plan for renewal of water supply and drainage pipes, and the pipes cannot be repaired or replaced without partial demolition of structural elements such as beams, columns, load-bearing walls, exterior walls and floor slabs result in new repair works and generation of solid waste. Such cases are assigned level 1, the lowest level. In this case, repair means works to replace water supply and drainage pipes with new pipes of the same dimensions and specifications, while renewal means upgrades, etc. to replace pipes with others of different specifications.
Award level 3 if repair is possible without damaging structural elements and finishes, but renewal is not. Award level 4 or level 5 if spaces and routes have been provided for future use, facilitating renewal, choosing between the two levels according to the amount of repair and waste generation from elements other than water supply and drainage pipes.

Determine levels according to the details of pipe types and positions as shown in the table next page. All criteria from main riser pipes to exterior wall joints for the same level must be satisfied (if these vary, award the lowest level that applies). In cases where special measures have been established (e.g. modified pipe specifications), determine levels solely on such measures.

Level	Pipe types and positions					Evaluation reference			
	Method 1: Determine the level at which all criteria are satisfied * If results vary, award the lowest level that applies * Ignore these criteria if evaluated in Method 2.				Method 2: Determine the level based on this item alone * Applies only when used in more than half of the corresponding area.	Degree of potential damage to building materials during repair		Degree of potential damage to building materials during renewal	
	Main riser pipe	Other pipes	Lateral pipe	Exterior wall joint	Pipe specifications, etc.	Structural material	Finishes	Structural material	Finishes
1	Through-slab (excl. piping in pipe shaft)	Embedded in walls (RC, etc.)	Embedded in structure (slab)	Sleeved	(N/A)	High*2	High	High	High
2	In pipe shaft	Embedded in walls (LGS, etc.)	Embedded in cinder concrete	Sleeved	(N/A)	Low*1	High	High	High
3	In pipe shaft	In pipe shaft	In ceiling voids of the floor spaces below	Sleeved	(N/A)	Low	Low	High	High
4	Spare space	Spare space	In ceiling void of said floor (gyptone boards, rockwool acoustic ceiling panels) or Inside raised floor space	Spare sleeve	(N/A)	Low	Low	Low	High
5	Spare space or Mechanical void	Spare space or Mechanical void	In ceiling voids of said floor or ISS or under floor pipe space	Spare sleeve or Through-panel	Unit-type plumbing or washroom system plumbing	Low	Low	Low	Low

*1 "Other pipes" stands for those that constitute a separate system diverging from the main pipe (in cases where a riser pipe system serving as a sub riser pipe exists).
*2 The degree of potential damage to structural and finishing materials is indicated in "high" and "low" terms of whether solid waste is generated or new repair work required (excluding handling of the pipes necessary for system operation).

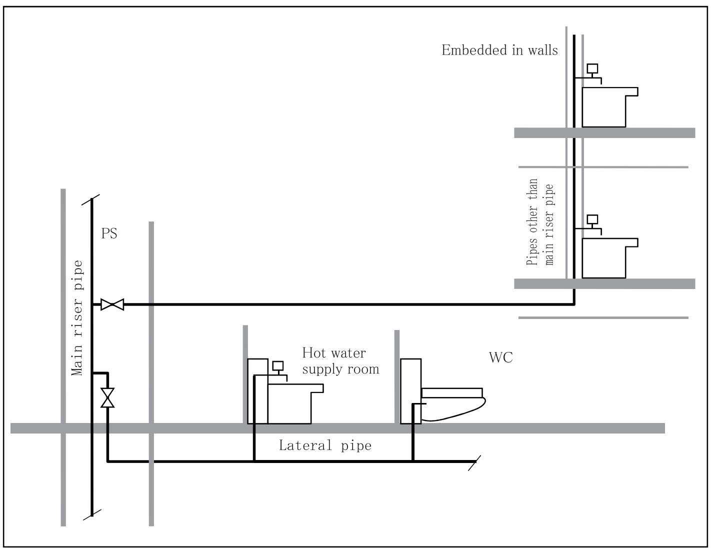


Figure 1: Main riser pipe, other pipes and lateral pipe samples

3.3.3 Ease of Electrical Wiring Renewal

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Wiring cannot be replaced or repaired without damaging structural elements.
Level 2	(No corresponding level)
Level 3	Wiring can be replaced or repaired without damaging structural elements.
Level 4	(No corresponding level)
Level 5	Wiring can be replaced or repaired without damaging structural elements or surface finishes.

☐Commentary

In this category, evaluate the renewability of the electrical wiring.
Evaluation is based on specifications of sections which provide key functions required for each type of building use (i.e. the main sections of the building's wiring system).
Award level 3 when renewal or repair work can be carried out without damage to the structural components.

3.3.4 Ease of Communications Cable Renewal

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Communications cables cannot be replaced or repaired without damaging structural elements.
Level 2	(No corresponding level)
Level 3	Communications cables can be replaced or repaired without damaging structural elements.
Level 4	(No corresponding level)
Level 5	Communications cables can be replaced or repaired without damaging structural elements or surface finishes.

☐Commentary

In this category, evaluate the renewability of the communications cables.
Evaluation is based on specifications of the sections which provide key functions required for each type of building use (i.e. the main sections of the building's communications cables).
As with Section 3.3.3 above, award level 3 when renewal or repair work can be carried out without damage to the structural components.

3.3.5 Ease of Equipment Renewal

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	No machine hatches or routes to accommodate replacement of major service equipment are provided, and building functions cannot be maintained through replacement and repair.
Level 2	(No corresponding level)
Level 3	Machine hatches or routes to accommodate replacement of major service equipment are provided, but building functions cannot be maintained through replacement and repair.
Level 4	A temporary space to accommodate replacement of major service equipment is secured, and building functions can be maintained through replacement and repair.
Level 5	Machine hatches or routes to accommodate replacement of major service equipment are provided, and building functions can be maintained through replacement and repair.

☐Commentary

Evaluate for non-generation of solid wastes and new repair requirements, and the ability to maintain building functions during renewal and repair, using backup equipment.

In this category, the ability to maintain the building's functionality during renewal or repair work refers to when worker access to system routes or machine hatches does not cause disruption in other service functions and when backup devices for use during the work are installed (including multiple devices with divided service loads which can be used as backups during the work).

Evaluate level 3 if there are routes and machine hatches that accommodate renewal and repair, but some destruction of simple partition walls, etc. is required.

The term "major equipment" refers to the following equipment.

(1) For building types other than Apt, this refers to major equipment and services necessary for the building to function, specifically power receiver and transformer equipment, generators, boilers, chillers, air conditioners, water tanks, pumps and other equipment.

(2) For Apt, it refers to the devices necessary for people to live in the building, such as water heaters, room air conditioning, water tank and pumps.

3.3.6 Provision of Backup Space

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	There is no planned provision of space for backup equipment.
Level 4	There is planned provision of space for backup equipment.
Level 5	(No corresponding level)

☐Commentary

In this category, evaluate whether adequate backup space is provided.

Evaluate the specifications for the parts which support the main functions corresponding to the building's function (main building service systems).

If the plan for equipment replacement or repair works secures space to install backup equipment, the building's functions can be maintained while the replacement or repair takes place. Therefore, if plans have been made for securing backup space, the assessment is level 4.

Q3 Outdoor Environment (On-site)

In the assessment under Section Q3, evaluate each criteria item based on the point scoring system. Use the total points in a five-level assessment. Most items included in Section Q3 are assessed qualitatively. As such, provide detailed descriptions and additional comments on actual measurements actually in effect in the "Summary for Design for Environment (DfE)" column included in the scoring software.

☐Scoring method

If the planned content actually applies to the content of each of the efforts to be evaluated, add the corresponding points, and determine the level according to the point total.

* In the "Other" column, points can be added in case of the efforts that do not appear in the Efforts to be evaluated table. When scoring the "Other" column, describe the efforts in the "Summary for Design for Environment (DfE)" column of the software.

1. Preservation & Creation of Biotope

☐Assessment stage Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt
Level 1	No consideration has been given to the conservation and creation of habitat, and efforts are inadequate.(0-3 assessment points)
Level 2	Some consideration has been given to the conservation and creation of habitat, but efforts are still somewhat inadequate.(4-6 assessment points)
Level 3	Consideration has been given to the conservation and creation of habitat, and a standard level of efforts are being carried out.(7-9 assessment points)
Level 4	Consideration has been given to the conservation and creation of habitat, and a relatively high level of efforts are being carried out. (10-12 assessment points)
Level 5	Thorough consideration has been given to the conservation and creation of habitat, and a high level of efforts have been carried out. (13 or more assessment points)

Efforts to be evaluated

Assessment Item	Description	Point
I. Identification of local characteristics and biotope plan policy	1) Local characteristics of the site and surrounding areas regarding habitat are identified and an appropriate biotope plan policy has been established	2
II. Conservation and restoration of biological resources	1) Biological resources on site are protected or restored (e.g. flora and fauna, topsoil, wetland area composition)	2

III. Use of Green Space	1) Green areas account for 10% or more but less than 20% of the total outside property area and mid/high trees are planted. (1 point) Green areas account for 20% or more but less than 50% of the total outside property area. (2 points) Green areas account for 50% or more of the total outside property area. (3 points)	1-3
	2) Building greenery index is measured at 0.05 or higher but less than 0.2. (1 point) Building greenery index is measured at 0.2 or higher. (2 points)	1-2
IV. Quality of Green Space	1) The greenery plan facilitates conservation of native/local species.	1
	2) The greenery plan is appropriate for site and building characteristics.	1
	3) The greenery plan facilitates conservation of natural areas inhabited by small animals.	1
V. Management and use of biological resources	1) Equipment necessary for the maintenance of green areas at the building operation stage have been installed, and management policies have been established.	1
	2) An environment and facilities have been provided in which building users and local people can encounter living creatures and enjoy nature.	1
VI. Other	1) Independent efforts other than the above evaluated items have been implemented to protect and create habitat.	1

☐Commentary

Under this item "Q3.1 Preservation & Creation of Biotope," evaluate the content of efforts made for each of six assessment items (I-VI) for whether consideration has been given to conservation and creation of habitat by the building (the site as a whole, including the building and exterior areas), with a view of protecting and restoring the national natural environment and securing biodiversity. The term "habitat" used here refers to areas inhabited by small wild animals and which support the growth of plants (biotopes).

I. Identification of site characteristics and setting of plan policies

Conservation of the local habitat requires setting conservation goals suitable for the local characteristics of the site, and consideration of conservation policies and related efforts to achieve such goals. From that standpoint, evaluate this item as to whether the habitat-related local area characteristics of the planned site have been identified, and whether the plan policies for conservation and creation of habitat are suitable for the above characteristics.
Award 2 points when an appropriate biotope plan policy has been clearly established based on the local characteristics of the site and surrounding areas. No points are awarded when such characteristics are not identified or reflected in the plan.

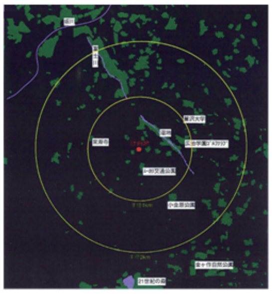
Furthermore, as the spatial scope and targets under assessment in this category vary greatly, establish an appropriate assessment area for the building site.

Provide documentation that supports the relation between the local characteristics of the site and the biotope plan policy. Minimum documentation requirements for third-party verification are as follows:

<Supporting documents>
- Aerial photograph of the site and surrounding area
- Topographic or land usage map covering the photographed area
- Baseline information on existing biotopes and source information (if independent research is carried out, include details of research methods, etc.)
- Plan policy statement that reflects the identified characteristics

<Examples of efforts>

Eco Village Matsudo



Green zone analysis: vibrant green areas are scattered in a 5-km radius around the site (images provided by Taisei Corporation)

Site design was based on ecological planning which included water, vegetation and wind elements based on an extensive environmental analysis. Characteristics of local ecosystems and wind environment are also reflected. Green zone analysis of a 5-km radius around the site found open biotopes consisting of a large green spaces and bodies of water, a linear biotope formed by wetlands along the Fuji River and island biotopes formed by trees belonging to shrines and temples, green slopes and small parks. Site design included a tree sanctuary and a dragonfly pond as point biotopes with the long-term goal of enhancing an extensive ecological network.

An ongoing follow-up study after completion of construction found increased sightings of birds and insects in the area.

II. Conservation and restoration of biological resources

Trees and wetlands on the building site, as well as nutrient-rich topsoil comprised of compost and other organic matter, are local, established ecological elements. As such, handling of these resources should be given priority in the building's biotope conservation plan. From this perspective, this section evaluates the environmental protection measures of such resources on the building site with respect to conservation and restoration.

- Conservation refers to measures to maintain biological resources already existing on the site. In addition to measures to preserve the existing conditions, evaluate resource relocation (replanting) within the site.
- Restoration refers to measures to recreate biological resources within the site that were lost during construction. Also evaluate measures to restore biological resources within the site which were assumed/confirmed to have existed prior to building construction.
- Measures to relocate (or recreate) local biological resources from surrounding areas to the building site are also included in the evaluation.

Provide documentation that supports the conservation and restoration status of the site. Minimum documentation requirements for a third-party verification are as follows:

<Supporting documents>
- Aerial photograph/topographical map indicating past and present land uses of the site and surrounding areas
- Descriptions of biological resources targeted in conservation/restoration measures, plan objectives and details
- Descriptions of current status and locations, as well as planned locations, of biological resources targeted in conservation measures, with an up-to-date photograph
- Descriptions of current status and locations, as well as planned locations, of biological resources targeted in restoration measures, with a photograph

<Examples of efforts>

Case Studies of Preservation of Biological Resources

Aoyama Gakuin University, Sagamihara Campus

Zelkova and other existing tall trees were preserved or relocated to achieve environmental conservation effects.

<Examples of efforts>
Case Study of Restoration (Regeneration) of Biological Resources
The Kansai-Kan of the National Diet Library
The hills and woods that form the original scenery have been restored (recreated) through rooftop planting and tree planting, particularly of blue Japanese oak and quercus serrata.

III. Securing the amount of greenery
Evaluate the efforts to green the site under this item, which considers efforts to provide an amount of greenery, according to the amount of greenery in the exterior of the site and of the building. Assessment in this category includes vegetation targeted in conservation/restoration measures under the previous section and new trees and plants added to the site. Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine sizes of exterior and building green spaces.

[1] Exterior green space: evaluate based on the exterior green space index obtained with the following formula: Award 1 point where exterior planting index is 10% or more but less than 20% and medium/high trees are planted. Exterior planting index is 20% or more, but less than 50%, earns 2 points, while 50% or more earns 3 points.

$$\text{Exterior planting index} = \frac{\text{Exterior planting area (Horizontal projected area of medium and tall trees + area planted with low trees and ground cover etc.)}^{*1}}{\text{Exterior area}^{*2}} \times 100\ (\%)$$

*1 In cases where the horizontal projection area of medium/tall tree canopies and the area planted with low trees and ground covering overlap, apply both area values.
*2 Exterior area = site area – building area (including areas of supplementary facilities)

[2] Building green space: evaluate rooftop and wall greenery based on the building planting index*3 obtained from the following formula. Award 1 point to a building planting index of 5% or more, but less than 20%. A building planting index of 20% or more earns 2 points.

$$\text{Building planting Index} = \frac{\text{Building planting area (total roof planting}^{*3}\text{ + wall planting)}}{\text{Building area}^{*4}} \times 100\ (\%)$$

*3 Regarding the calculation for the rooftop greenery area, in cases where the horizontal projection area of medium/tall tree canopies and the area planted with low trees and ground covering overlap, apply both area values.
*4 Building area = Horizontal projected area of areas occupied by the building (legal construction area)

IV. Quality of green space
High quality green space contributes to habitat conservation and creation, and improved sustainability. From this standpoint, this category evaluates measures to promote the healthy growth of plants and development of green space that supports local biodiversity. Specifically, assess measures which facilitate biological stability of green space (e.g. planting native species, selecting appropriate tree types, attracting small animals such as birds to the area, etc.). Such stability creates sustainable biological resources and eases management burdens (e.g. reduction in agrichemicals).

Award one point each for the following types of measures: planting native species, selecting appropriate tree types, and creating a natural habitat for small animals. Determine levels based on the total points where multiple measures listed above are established.

<Examples of efforts>
[1] Conservation of native species
Evaluate whether trees compatible to the local geographic characteristics are used in development of the building's green space. Ideally, seedlings should also be native to the area

and produced locally with a traceable production process.

* To identify native species, refer to the following process:
1. Refer to a national zoning map to verify the area of the building site.
2. Identify its prefectural authority.
3. Confirm existing plants in the area and identify native species based on published plant-related data for the prefecture. Exclude woodland areas.
4. Based on the published plant-related data for the prefecture, confirm characteristics of the native species identified above.
5. Select suitable native species based on the environmental characteristics of the building site and the green plan policy.
6. Develop green space according to specific characteristics of the selected species.

* Data used for buildings in Tokyo, Chiba, Saitama and Shizuoka areas are shown below as examples for the above process:
1. Map displaying the target area
   - National zoning map
2. Published data that identify types of trees compatible with the local geographic characteristics
   - Plant data for prefecture zone
3. Published data that identify native species of the targeted area
   - Botanical journals
4. Published data that identify the suitable planting environments
   - Landscape Handbook, Japan Institute of Landscape Architecture (Ghihodo Shuppan, 1978)
   - Garden Trees and Green Space Planting, Ryo Iijima and Toshihiro Ahiru (Seibundo Shinkosha Publishing, 1974)
   - Encyclopaedia of Green Environment, Japan Society of Re-vegetation Technology (Asakura Publishing 2005)
5. Local plant data sources
   - Japan Greenery R&D Center
   - Universities, national or prefectural research institutes, etc.

<Example of local plant use>
Japan Highway Public Corporation (highway slope greenery)

Former Japan Highway Public Corporation (currently NEXCO East, NEXCO Central and NEXCO West) created green spaces using local plants on slopes created as part of highway structures. Specifically, seeds from trees native to the areas surrounding the highways were collected and cultivated in containers at nurseries operated by the corporation for two to three years. These second-generation seedlings that contained the area's unique heritage and genetic characteristics were then planted to create green highway slopes.

Aeon Mall Kusatsu

Aeon Mall Kusatsu, built by Lake Biwa, has extensive green space initiatives including planting approximately 68,000 local trees and reintroducing native cogon grass and Elymus humidus, which were previously harvested at the building site prior to construction, to newly-developed biotopes on the site.

[2] Creation of green space appropriate for the planting conditions
- Adaptation to daylight conditions (suitable layout of sun trees and shade trees, etc.).
- Adaptation to space available for growth (planting in spaces that can accommodate future tree growth, etc.).
- Adaptation to growth infrastructure (provision of adequate soil or pots for plants to grow in, etc.).
- Adaptation to environmental pressures (introduction of plants able to resist wind, salt, etc.).

[3] Secure habitat for small animals and birds
- Layout of green space to provide continuity with surrounding habitat.
- Provision of nesting and hiding areas.
- Design of green space with consideration for the introduction of feed plants.
- Provision of green space and water space that encourages natural behavior.

<Case Studies of Provision of Habitat for Small Wild Animals>
Osaka Gas experimental group housing – Next21

This project provides over 1,000 m^2 of three-dimensional space by the deliberate greening of terraces, verandahs and common walkways, as well as rooftops, to attract migrant birds from Osaka castle park, which is approximately 1.5 km to the north. Many wild birds visit the site, and the habitat supports a large insect population. Indigenous plants have also been observed there.

V. Management and use of habitat

Proper management of green space etc. at the building operation stage is essential for maintenance of healthy habitat, and it is important to give thorough consideration in advance, at the planning and design stages, to habitat management and related measures. From that perspective, this item evaluates the efforts for the maintenance of conserved or created habitat.
Award one point if facilities necessary for the maintenance of green space, such as irrigation facilities, and a plan is in place for maintenance of such facilities, and one point if facilities have been provided for enjoying close contact with nature.

<Examples of efforts>
[1] Setting up equipment and management policies for the maintenance of green spaces, etc.
- Appropriate installation of irrigation equipment.
- Provision of planting infrastructure, such as suitable soil volume.
- Annual process plan for supervision patrols, tree pruning, grass cutting, etc.
- Policies for the implementation of countermeasures against insect pest damage.
- Planning for organism monitoring etc., reflected in management.

[2] Provision of facilities for enjoying close contact with nature
- Installation of nature observation trails for observing plants and animals, and exhibition facilities.
- Installation of flowerbeds and tree planting areas that can be used by building users.
- Installation of facilities providing information on nature, and provision of information about organisms etc. through regular events or other channels.
- Installation of plant nameplates and benches.

<Examples of efforts>
Case Study of Management and Use of Habitat
Globe Court Omiya Minami-Nakano

Vegetable patches and fruit orchards were built with a view to coexistence with nature and the community, and dwellings are joined by wooden planters, pergolas and other means. Residents participate voluntarily in proposing ways of building their environment, and in forming project teams for maintaining and improving the environment in biotopes and the central pond. Resident-led environmental improvement efforts are still continuing.

VI. Other

Unusual efforts not included in I to V above items should be evaluated as one point.
When evaluating "Other" efforts, state in the assessment software what kind of effort has been made, and attach documentation clearly comprehensible to a third party.

2. Townscape & Landscape

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

- Evaluate level three if the building is almost entirely unseen from public spaces, or if there is no way to give consideration to urban context and scenery.
- Evaluate level five if scenery is clearly stated as a reason for winning a local scenery prize, or any similar situation indicating the building has gained a certain level of positive assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(0 points)
Level 2	Sufficient level of measures for the surrounding landscape have not established. (1-2 points)
Level 3	Sufficient level of measures for the surrounding landscape have been established. (3 points)
Level 4	More than the sufficient level of measures for the surrounding landscape have been established. (4 points)
Level 5	Extensive level of measures for the surrounding landscape have been established. (or the building has won local landscape-related awards; 5 or more points)

Efforts to be evaluated

Assessment Item	Description	Point
1. Integration with surrounding landscape through positioning and design of the building	Building features are designed in harmony with surrounding landscape (i.e. height, wall positions, color and form of exterior finish, roof, eaves, openings fences, etc.).	2
2. Use of green space to enhance landscape	Aesthetic landscape is created by the building's green space.	1
3. Conservation of historic landscape	Historic landscape is maintained through conservation, restoration or recreation of the exterior of historic buildings and the existing natural environment the area.	1
4. Use of local materials to enhance landscape	Locally-significant materials are used in the building exterior to create aesthetic landscape.	1
5. Aesthetics from main viewpoints of surrounding area	Aesthetic panoramic view of the building and surrounding areas is offered from nearby parks and gathering space or distant viewpoints.	1
6. Other	Describe other measures	1

☐**Commentary**

Local landscape offers a sensory experience of the environment that encompasses the interaction of nature, buildings and people in the area, thus creating a sense of community for both residents and visitors. In the time of globalization, it has become an important cultural medium (social asset) for the expression of local individuality. As such, this category evaluates reduction of the negative impact of the building (including its outside areas) on the surrounding landscape as well as contributions to enhance landscape aesthetics. In this regard, note that the level of aesthetics is not evaluated in CASBEE. Therefore, the visual superiority of buildings and the surrounding environment is not included in the scope of this assessment.

Assessing landscape aesthetics poses the question of who (occupants/users, passersby, etc.) and where (short-, mid-, long-distant views) the viewpoints should be based. In this section, apply the

following approach.
Firstly, evaluate the fundamental aesthetic element, that is, whether the building's location and shape are in harmony with the surrounding area. Then evaluate whether the building contributes to enhancement of landscape in terms of improvement of local green space, heritage conservation and the active use of local materials in the building exterior design. Furthermore, measures to improve aesthetics of the panoramic view of the building and surrounding areas from main viewpoints are also included in the assessment. Evaluate the building as level three if it is almost entirely unseen from public spaces, or if there is no way to give consideration to urban context and scenery. Further, evaluate as level five if scenery is stated as a reason for winning a local scenery prize, or any similar situation, indicating the building has gained a certain level of positive assessment.

The following are examples of matters that should generally be considered and specific measures which could be used for forming good scenery.
State the specific content of the efforts to be evaluated, and append documents that will be comprehensible to a third party.

[1] Harmonize the positioning and form etc. of the building with nearby urban context.
The building's location and shape are the most fundamental elements in integration with the surrounding landscape. Insufficient consideration of these elements creates difficulty in enhancing landscape even with excellent architectural details. In this category, evaluate whether the building's location and shape are in harmony with the surrounding area based on the following criteria:

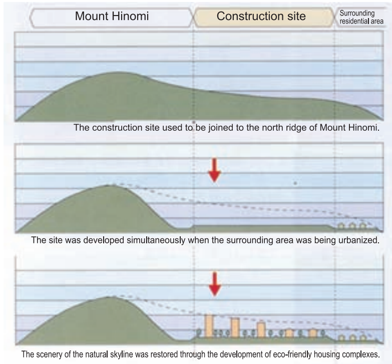
1. Consider the positions of wall lines of adjacent buildings with a view to consistency of wall lines in the urban context.
2. Consider how the building will look from roads, and take measures to avoid creating an oppressive atmosphere, such as reducing the number of floors in roadside portions of the building.
3. Bear in mind that low-rise portions have a more approachable "human scale" when composing the form of the building.
4. Consider roads and other public spaces, and take steps to create an impression of openness from those areas.
5. Consider the skyline formed with surrounding building groups.
6. Make the esthetic design of building rooftops, openings, walls etc. harmonize with the urban context.
7. Consider the effect of the building's color on the surrounding scenery.
8. Avoid harming the urban scenery with the size and coloration of the building itself, or with billboards etc.
9. If there is equipment on the roof or top of the building, consider how it is viewed from the surroundings.

<Examples of efforts>
Examples of building layouts and forms that harmonize with urban context
Globe Court Omiya Minami-Nakano
Arranging blocks with visual depth when seen from the main road reduces the oppressive atmosphere created on the road.


Apartment blocks seen from the approach plaza (Photographer: Isao Saito)

Shimonoseki, Ichinomiya prefectural housing

Placing high-rise blocks on the north side and reducing height to three floors on the east and southwest sides, adjacent to existing residential areas, mitigated the oppressive effect on those adjacent residential areas and restored the original scenery of the natural skyline.



(Diagrams provided by Yamaguchi prefecture Department of Civil Engineering, Housing Section)

[2] Use of green space to enhance landscape

In this category, evaluate measures which offer a soothing green landscape which integrates the planting of trees around the building in order to contribute to the enhancement of the area's natural landscape.

1. Trees are planted along the streets to provide continuity of the green landscape
2. Tree selection is based on symbolic significance and integration with existing trees on adjacent properties and streets
3. Large-sized parking space facing the public roads is landscaped with trees, water features, etc.

<Examples of efforts>

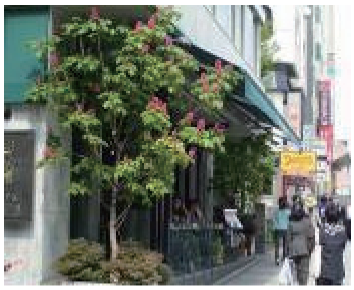
Case Study of Use of Green Space to Form Good Scenery

Green space along roads in a commercial district (Shinjuku)

There is a mixed wood of sakura, quercus serrata and carpinus tschonoskii in the middle of the business district. Together with flagstones and undergrowth, it creates a refreshing scene in early spring. (Keio Plaza Hotel)

Green space along roads in a commercial district (Shirogane)

Small but vivid flowers and foliage of horse chestnut trees color the street, creating a soothing atmosphere that signals the onset of spring.



Green space along roads in an apartment (Yoyogi)

The blazing foliage of the maple trees, placed on corners as symbols of the building, give a feeling of the seasons.

Metropolitan Forest (Nagoya)

A scenic simulation was used to vary ratios of evergreen to deciduous trees, forming a wide range of forest scenery while maintaining a set tree density. For areas such as parking lots, where greenery even in winter is important, the ratio was seven evergreen to three deciduous trees, while the ratio was reversed in areas of bright forest comprising mostly scrub trees. (Noritake no Mori)

Spring

Summer

Autumn

Winter

(Images provided by Taisei Corporation)

[3] Conservation of historic landscape

Evaluate conservation measures for historic landscapes that reflect local history and culture.

1. Historic structures which have contributed to forming the scenery of the region are partially preserved.
2. Existing trees on street corners are preserved for continuity in local scenery.
3. Existing plants, landforms, springs are preserved, restored or recreated in order to conserve historic landscape.

[4] Formation of good scenery with materials of local character

"Materials of local character" are those that are traditionally used locally, or associated with the site. There are examples of exterior wall materials traditionally available in a region being used to make the design harmonize better with the existing urban context. Such materials have relaxed tones and easily become familiar. It is preferable to choose colors that will harmonize with the surroundings. In recent years there has been a trend away from primary colors, and more relaxed earth tones are commonly selected.

1. Locally-significant materials such as stones, roof tiles and lumber are used effectively in the building exterior to create an aesthetic landscape.

[5] Aesthetics from main view points* of the surrounding area

Evaluate the measures to enhance aesthetics from the view points identified in the landscape base plan of the area that includes the building. In cases where no such plan exists, initiatives based on self-established view points can be assessed. Specify the policy and details of such initiatives including descriptions of view point selection, target view areas and building characteristics.

* A view point refers to a specific location that provides an opportunity for viewing the landscape. Generally, it is a point from which an aesthetic panoramic view is offered such as a hilltop, bridge, or a location that involves many people as observers such as a station or wide street. Creating an aesthetic panoramic view from such visual points means conservation and creation of areas that offer excellent views in the community, thus enhancing public benefit of the landscape. View points are established based on a comprehensive analysis of positional relationship with the target area (view angle and distance), landforms, background views and the number of visitors. It is important to develop a building plan that includes consideration of views from such locations with an appropriate verification process.

Reference: Examples of Landscaping Methods and Design Themes (Urban Design Portal on Urban Renaissance Agency website)

[6] Other

Award one point for independent measures other than the above assessment items.

When evaluating "Other" efforts, state in the assessment software what kind of effort has been made, and attach documentation clearly comprehensible to a third party.

3. Local Characteristics & Outdoor Amenity

3.1 Attention to Local Character & Improvement of Comfort

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	No efforts have been made for local characteristics and outdoor amenity. (0 points)
Level 2	Efforts based on local characteristics and outdoor amenity are inadequate. (1 point)
Level 3	Efforts based on local characteristics and outdoor amenity are at a standard level. (2-3 points)
Level 4	Efforts based on local characteristics and outdoor amenity are at a relatively high level. (4 points)
Level 5	Efforts based on local characteristics and outdoor amenity are thorough and extensive. (5 or more points)

Efforts to be evaluated

Assessment Item	Description	Point
I. Continuation of unique local character, history and culture	[1] Conservation of historic built spaces etc. Historic interior and exterior spaces building remains preserved, restored or regenerated, contributing to local culture. (Do not evaluate if measures here overlap with areas evaluated under urban context and scenery.)	1
	[2] Use of locally-significant materials Local materials are partially used in the building's structure, interior finishes or exterior space. (Do not include measures evaluated under the local landscape section.)	1
II. Local contribution through provision of functional spaces and facilities	[1] Local contribution by provision of space Structural measures such as provision of alcoves, piloti and eaves are used to provide amenity for people using urban spaces, in the form of places to shelter from rain or wait for people. Or, space is provided in plazas, paths and side streets to provide amenity for people using the local area, in the form of rest areas and similar spaces.	1
	[2] Local contribution by provision of facilities and functions Part of the building is equipped to provide public facilities and functions, such as meeting rooms, community halls and exhibition spaces, community centers, and community use of schools, contributing to greater activity in the community.	1
III. Formation of rich intermediate zones linking the building interior and exterior	[1] Formation of rich intermediate zones linking the building interior and exterior Open spaces that allow the passage of wind and light, such as courtyards, terraces, balconies, sun rooms, roofed plazas, light and air voids, and atria are skillfully linked to interior spaces. Or, in areas where private and public spaces intersect, such as around entrances and balconies, light and air voids, flower beds, pergolas, deep balconies and similar elements have been built to form rich intermediate spaces which give a lived-in atmosphere.	1

IV. Consideration for crime prevention	[1] Consideration for crime prevention Crime prevention performance is considered, so that in spaces outside the building, such as plazas, trees are placed to avoid blocking lines of sight, nocturnal lighting and security cameras are installed, windows are placed where they will be useful for crime prevention, and other measures are used. Or, if there are no plazas or pedestrian walkways, consideration is given to crime prevention in the form of avoiding the creation of blind spots, such as blind alleys and paths out of lines of sight, placing windows where they will be useful for crime prevention, and other measures. Or, if there are boundary barriers around the site, crime and disaster prevention are considered, in the form of fences or low hedges which afford clear lines of sight, rather than continuous walls or similar barriers which block lines of sight.	1
V. Participation of building users etc.	[1] Participation of building users etc. User satisfaction assessments (POE) are used to involve building users in the design process for cooperative housing etc. Or, residents and occupants work directly on plant management and cleaning activities and formulate operation plans, and are otherwise participating in the maintenance of the building.	1
VI. Other	[1] Other (State content)	1

☐Commentary

The goal under this item is to evaluate efforts such as continuation of local history, contribution to city and district amenities, activities and vitality, formation of rich intermediate spaces on the plot, local crime prevention and participation by building users, for the sake of a living environment with a high level of local amenity.

I. Continuation of unique local character, history and culture

There are many historical and cultural resources which reflect the unique way of life of a region or community. It is important that the building plan should discover such resources and reflect them in various forms while building a modern environment. Local memory, which has been built up in the long course of history on that land, is an important environmental asset, which should be passed down as it is told between generations. Assess how that kind of local context is picked up and reflected in plans.

Examples include the preservation, restoration and regeneration of historic spaces inside and outside existing building, and of building remains, and the use of materials with local character (locally-produced materials, traditional materials of the region or district, other materials associated with the site). It is difficult to judge the range within which locally-produced materials can still be called local, but if efforts to use such materials are related to measures by local authorities to promote the use of locally-produced materials, follow the definition employed by the local authority. Other measures envisaged include use of exterior areas or designs which reflect aspects of local context, such as character, history and culture, or serve to promote local industries by, for example, using local personnel, skills and other resources for building construction and operation. If there are such efforts, state their specific details in the "Other" column.

<Examples of efforts>
Case Studies of Use of Materials with Local Character
Setagaya Fukazawa Symbiotic Housing Project
With replacement houses, the tiles from the old house can be used in the exterior and old wells and trees preserved and reused.

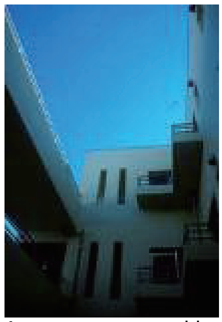
II. Local contribution by provision of spaces, facilities and functions
This item evaluates diverse forms of amenity through use of the building, with the aim of creating a rich local environment.

<Examples of efforts>
Case Studies of Local Contribution through Provision of Space
Public open space at Sumitomo Realty and Development's Shinjuku Oak Tower
This small square, which provides shade in summer, has benches where people can wait for each other or take a lunchtime break.

III. Formation of rich intermediate zones linking the building interior and exterior
Rather than isolating the interior of the building from the exterior, and the site from its surroundings, they can be joined attractively through intermediate and semi-outdoor spaces, with reference to the site's orientation and surrounding environment. Providing such buffer zones alleviates psychological stress for building users and thermal loads for the building, creating expansive and rich spaces.

<Examples of efforts>
Case Studies of Forming Rich Intermediate Spaces Linking Building Interior and Exterior
Setagaya Fukazawa Symbiotic Housing Project
Apartment balconies function as excellent intermediate zones that link the outside environment and the dwelling units. The image on the right shows greenery placed by an occupant which shades the balcony on a sunny summer day. Shading effects and watering of the plants help create a thermal buffer zone. Furthermore, open space created within the building's echelon structure offers a spatial buffer for common-use corridors and dwelling units. The same area also works as a thermal buffer in the summer as it creates a cool air pocket with continuous shade throughout the day.


Deep balconies provide space for ample vegetation


An open space provides both light and air for units on the north side of the building.

IV. Consideration for crime prevention
The goal of considering crime prevention performance is to evaluate the ability of the building to exert an influence to resist crime and disasters in public spaces, to create safe local environments where people will not feel at risk.

V. Ease of participation for building users etc.
Facility user satisfaction assessments accurately identify the needs of facility users and existing problems, and examines those needs before the design stage begins, to evaluate them for use in programming. POE (Pre/Post Occupancy Evaluation) is a kind of facility user satisfaction assessment that evaluates facilities before and after they are occupied. It uses methods such as group interviews and questionnaires to make a scientific investigation and assessment of how easy the facilities are to use.

VI. Other
Award one point for independent measures other than the above assessment items.
When evaluating "Other" efforts, state in the assessment software what kind of effort has been made, and attach documentation clearly comprehensible to a third party.

3.2 Improvement of the Thermal Environment on Site

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	0 points in the table of the efforts to be evaluated.
Level 2	1-5 points in the table of the efforts to be evaluated.
Level 3	6-11 points from the table of the efforts to be evaluated.
Level 4	12-17 points from the table of the efforts to be evaluated.
Level 5	18 points or more in the table of the efforts to be evaluated.

Efforts to be evaluated

Assessment Item	Description	Point
I. Guide wind into the site to relieve the thermal environment	[1] The planned form and layout of buildings guides wind onto the plot.	2
	[2] Secure paths for air movement by providing green spaces of lawn, meadow and bushes etc., and suitable spaces and paths within the plot. Open space ratio is 40% or more, less than 60% (1 point) 60% or more, less than 80% (2 points) 80% or more (3 points)	1～3
II. Shaded space is created during the summer to alleviate thermal impact on pedestrian areas on the site	[1] Shaded areas are created with the use of medium/tall trees, piloti, eaves, pergolas, or other similar measures. Rate of horizontal projection area of medium and tall trees, piloti, etc. is 10% or more, less than 20% (1 point) 20% or more, less than 30% (2 points) 30% or more (3 points)	1～3
III. Green and water spaces are provided to alleviate thermal impact on pedestrian areas on the site	[1] Surface and near-surface temperatures are controlled by establishing green and water spaces. Total rate of green-covered areas, water-covered areas and horizontal projection areas of medium and tall trees is 10% or more, less than 20% (1 point) 20% or more, less than 30% (2 points) 30% or more (3 points)	1～3
	[2] Endeavor to reduce the area of paving on the plot. Percentage of paved area is 20% or more, less than 30% (1 point) 10% or more, less than 20% (2 points) Less than 10% (3 points)	1～3

IV. Exterior finishes of the building promote alleviation of thermal impact on pedestrian areas on the site	[1] The green space plan includes accessible rooftop areas (including artificial base). The building has an accessible rooftop area that is partially covered with plants. (2 points) The building has an accessible rooftop area that is extensively covered with plants. (3 points)	2〜3
	[2] Appropriate exterior wall materials for thermal control are used. Percentage of exterior walls with appropriate materials is Less than 10% (1 point) 10% or more, less than 20% (2 points) 20% or more (3 points)	1〜3
V. Heat vents for service equipment are appropriately located to alleviate thermal impact on pedestrian areas on the site	[1] Heat vents for main service equipment (e.g. air conditioning system) are installed in high locations. At least half of cooling towers or outdoor units generating waste heat are installed 10 meters or higher above ground level. (1 point) Most cooling towers or outdoor units generating waste heat are installed 10 meters or higher above ground level OR no units are installed. (2 points)	1〜2
	[2] High-temperature heat vents for main service equipment (e.g. combustion equipment) are installed in high locations. At least half of high-temperature heat venting units are installed 10 meters or higher above ground level. (1 point) Most high-temperature heat venting units are installed 10 meters or higher above ground level OR no units are installed. (2 points)	1〜2

☐ **Commentary**

Evaluate measures to alleviate thermal impact on pedestrian areas on the site during the summer by creating a wind corridor, shaded space and green and water surfaces, as well as using appropriate exterior materials for thermal control and effective placement of heat vents. Verify measures which have been established and award an appropriate level according to the total number of points. Note that thermal measures to improve the off-site environment are evaluated under "LR3.2.2 Heat Island Effect."

I. Wind corridors which include pedestrian areas on the site are created to alleviate thermal impact

Item 1 in this category evaluates the building's layout and shape with respect to wind corridors which include pedestrian areas on the site. Evaluate qualitatively and award 2 points when any measures are included.

<Examples of efforts>

- Wind corridors which also includes adjacent open spaces are considered in the layout design
- Both daytime and nighttime wind patterns are considered in the layout design

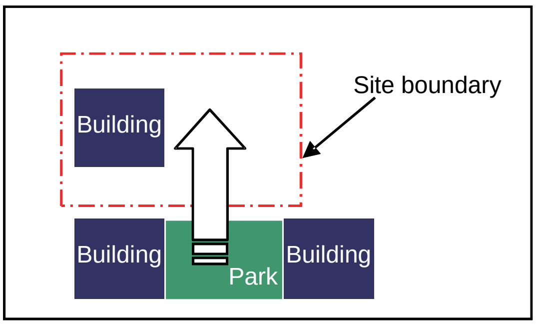


Figure 2 Layout of a wind corridor including the adjacent space

Item 2 in this category evaluates the building's layout plan with respect to wind corridors on the site created by green spaces such as lawns, meadows and shrubs, or open spaces including paths.

- Evaluate based on percentage of open space to the total site area.
  <Open space ratio> = 100 (%) - <Building coverage ratio> (%)
  Piloti and eaves more than 1 m deep are generally included in a building coverage ratio. In this assessment, however, they can be included as open space based on the following formula:
  (<Site area> - <1F Floor area>) / <Site area> x 100 (%)
- When the building accommodates a specified structure prescribed in the Building Standard Law, the floor space thereof shall be included in the calculation of the building coverage ratio or 1F floor area.
- Award 1 point to open space of 40% or more, less than 60%, 2 points for 60% or more, less than 80%, and 3 points for 80% or more.

Provide documentation for third-party verification that supports corresponding measures (e.g. wind pattern analysis of the site and surrounding areas, drawings that includes design measures such as building layout and shapes, green spaces, open spaces, and paths).

II. Shaded spaces are created during the summer to alleviate thermal impact on pedestrian areas on the site

In this category, evaluate measures to alleviate thermal impact on pedestrian areas of the site such as creating shaded spaces, specifically in areas that are under direct daylight (south and west sides of the building), by placing objects such as medium/tall trees, piloti, eaves or pergolas.

- Evaluate effectiveness based on percentage of Horizontal Projection Areas of medium/tall trees, piloti, eaves, or pergolas
- Obtain the percentage of Horizontal Projection Area using the following formula:

<Percentage of Horizontal Projection Area>=

$$\frac{\text{<Horizontal projection areas of medium/tall trees> + <Horizontal projection areas of piloti, eaves, pergolas, etc.>}}{\text{<Site area>}} \times 100(\%)$$

- Horizontal shaded area of medium/tall trees is based on the canopy of the trees. Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine the canopy sizes.
- Horizontal shaded area of piloti, eaves, pergolas, etc. is determined based on the methods shown in Figure 4.
- Award 1 point to a total percentage of horizontal projection areas of 10% or more, less than 20%, 2 points to 20% or more, less than 30%, and 3 points to 30% or more.

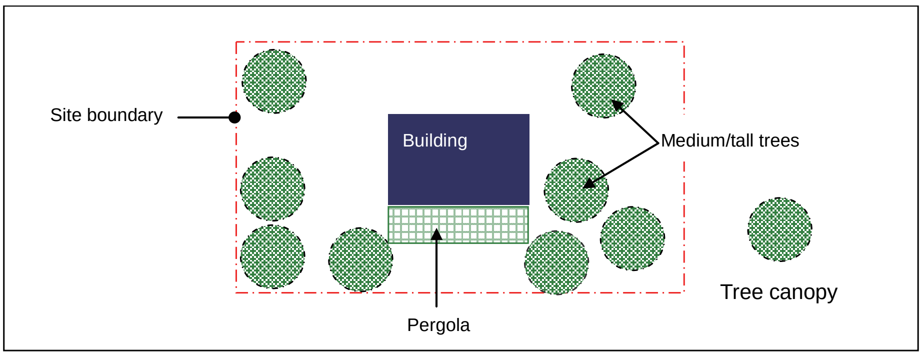


Figure 3 Horizontal projection areas of medium/tall trees and pergola

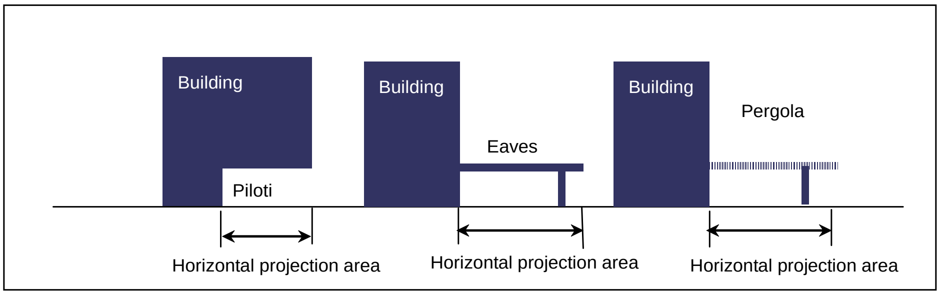


Figure 4 Horizontal projection areas of medium/tall trees, piloti, eaves, pergolas, etc.

III. Green and water spaces are provided to alleviate thermal impact on pedestrian areas on the site
Item 1 in this category evaluates measures to control surface and near-surface temperatures by creating water and green spaces (e.g. lawn, meadows, shrubs, medium/tall trees) in order to alleviate thermal impact on pedestrian areas of the site.

- The assessment is carried out based on the sum of percentages of green-covered area utilizing lawn, meadows and shrubs, water-covered area, and horizontal projection area of medium/tall trees, obtained in the following formulae:

<Sum of the percentages of green-covered area, water-covered area, and horizontal projection area of medium/tall tree> = <Percentages of green-covered area> + 2.0 x <Percentage of water-covered area> + 1.5 x <Percentage of horizontal projection area of medium/tall tree>

* Coefficient values that multiply the percentages of water-covered area and horizontal projection area of medium/tall trees
Water surface has a higher water evaporation rate compared to green-covered space such as a lawn area, thus it is considered to provide a greater temperature control effect. As such, apply the coefficient value of 2. Similarly, leaves on medium/tall trees that spread three-dimensionally has a higher evaporation rate compared to the green space with the same projection area. Thus, apply the coefficient value of 1.5.

- Obtain each percentage using the following formula:
  <Percentage of green-covered area> = <Green area>/<Site area> x 100 (%)
  <Percentage of water-covered area> = <Water surface area>/<Site area> x 100 (%)
  <Percentage of horizontal projection area of medium/tall tree> = <Horizontal projection area of medium/tall tree>/<Site area> x 100 (%)
- Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine sizes of green area and horizontal projection area of medium/tall trees.
-In cases where an evaporation cooling system, such as water misting, is used as a temperature control measure, evaluate by converting the transpiration rate during misting to an equivalent size of green area. Obtain the equivalent green space (lawn) area value using the formula below. The transpiration rate for the lawn space is set as 0.01 L/(min-m^2) on a sunny summer daytime condition.

<Equivalent green space for water misting>
= (Mist volume per nozzle (L/min-unit) x number of nozzles) / (transpiration rate of lawn space (L/min-m^2))

- Evaluate based on a total percentage of green-covered areas (e.g. lawn, meadows, shrubs), water-covered area and horizontal projection area of medium/tall trees. Award 1 point to a total of 10% or more, less than 20%, 2 points to 20% or more, less than 30%, and 3 points to 30% or more.

<Examples of efforts>
Case Studies of Thermal Control Using Water Mister
2005 Aichi Expo Site(photo)

Water mister example:
2005 Aichi Expo

Item 2 evaluates measures to alleviate thermal impact on pedestrian areas of the site such as minimizing paved areas, or more specifically, not placing a large paved space (e.g. parking lots) under direct daylight (south and west sides of the building).

- Obtain the percentage of paved area using the formula below:
  <Percentage of paved area> = <Paved area> / <Site area> x 100 (%)
- Exclude areas with water-retentive paving materials, which provide effective thermal control performance can be excluded.
- Exclude paved areas that are clearly not under direct daylight and piloti areas can be excluded.
- Award 1 point for a percentage of paved area of 20% or more but less than 30%, 2 points to 10% or more but less than 20%, and 3 points to less than 10%.

IV. Exterior finishes of the building promote alleviation of thermal impact on pedestrian areas on the site
Item 1 qualitatively evaluates use of green space in accessible rooftop areas in order to promote alleviation of thermal impact on pedestrian areas. When approximately 80% or more of the rooftop area is covered with greenery, it is considered as extensive.

Item 2 evaluates the use of greenery or water-retentive materials, especially on the south and west sides of the exterior walls, to promote alleviation of thermal impact on pedestrian areas on the site.
- Obtain percentage of the thermal-efficient exterior walls using the formula below. Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine the size of green-covered areas on the exterior walls.

<Percentage of thermal-efficient exterior walls> =

(<Green-covered exterior wall area> + <Exterior wall area with water-retentive materials>) / <Total exterior wall area> x 100 (%)

V. Heat vents for service equipment are appropriately installed in a way to alleviate thermal impact on pedestrian areas on the site
Item 1 evaluates heat vents for main service equipment (e.g. air conditioning system) installed in high locations to alleviate thermal impact on pedestrian areas on the site.
- Evaluate the locations of the cooling towers and external units
- A high location in this assessment refers to 10 meters or higher above ground (generally the height of the 3rd floor or higher).
- Award 2 points where a district heating and cooling system is used.
- Award 2 points for residential sections.
- In apartments, establish appropriate points based on points from non-residential sections and residential sections (i.e. 2 points) using the building's gross floor area ratio.

Item 2 evaluates the high-temperature heat vents for main service equipment (e.g. combustion equipment) that are installed in high locations to alleviate thermal impact on pedestrian areas on the site.
- Evaluate heat vents with chimneys (e.g. co-generation units, absorption refrigerators, boilers).
- High-temperature heat here refers to approximately 100°C or higher.
- A high location in this assessment refers to 10 meters or higher above ground (generally the height of the 3rd floor or higher).
- Award 2 points where a district heating and cooling system is used.
- Award 2 points for residential sections.
- In apartments, establish an appropriate level based on points from non-residential sections and residential sections (i.e. 2 points) using the building's gross floor area ratio.

2. LR: Environmental Load Reduction of Building

LR1 Energy

Assessment of energy is based on methods in accordance with current laws and regulations, such as the 2013 energy conservation standards of the Energy Conservation Law, and the "5-1 Energy Saving Countermeasure Grade" of the Japan Housing Performance Standard under the Housing Quality Assurance Act to be enacted in April 2015.

1. Control of Heat Load on the Outer Surface of Buildings

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

The assessment of all building types except Apt is based on the annual load standard BPI addressed in the 2013 energy conservation standards. Apt is evaluated according to the Energy Saving Countermeasure Grade Classifications under the Housing Quality Assurance Act.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl	
	Assessment based on [BPI]	
	Regions 1-7	Region 8
Level 1	Level 1: [BPI] ≧ 1.03	Level 1: [BPI] ≧ 1.03
Level 2	Level 2: [BPI] ＝ 1.00	Level 2: [BPI] ＝ 1.00
Level 3	Level 3: [BPI] ＝ 0.97	Level 3: [BPI] ＝ 0.97
Level 4	Level 4: [BPI] ＝ 0.90	Level 4: [BPI] ＝ 0.93
Level 5	Level 5: [BPI] ≦ 0.80 Those that fall between the above levels are evaluated based on the BPI, utilizing the linear interpolation to the first decimal place.	Level 5: [BPI] ≦ 0.85 Those that fall between the above levels are evaluated based on the BPI, utilizing the linear interpolation to the first decimal place.
	Assessment based on the Model Building Method [BPIm] (Building with a total floor space of 5,000 m^2 or less)	
Level 1	1.00 < [BPIm]	1.00 < [BPIm]
Level 2	0.97 < [BPIm] ≦ 1.00	0.97 < [BPIm] ≦ 1.00
Level 3	0.90 < [BPIm] ≦ 0.97	0.93 < [BPIm] ≦ 0.97
Level 4	[BPIm] ≦ 0.90	[BPIm] ≦ 0.93
Level 5	(No corresponding level)	(No corresponding level)
Building type	Apt	
Level 1	Corresponding to grade 1 of the Japan Housing Performance Standard "5-1 Energy-saving Countermeasure Grade."	
Level 2	Corresponding to grade 2 of the Japan Housing Performance Standard "5-1 Energy Saving Countermeasure Grades."	
Level 3	Corresponding to grade 3 of the Japan Housing Performance Standard "5-1 Energy Saving Countermeasure Grades."	
Level 4	(No corresponding level)	
Level 5	Corresponding to grade 4 of the Japan Housing Performance Standard "5-1 Energy Saving Countermeasure Grades."	

* Regarding Apt, in cases where each building has different specifications, the assessment may be carried out based on proportions of the total number of dwellings that fall under the grades corresponding to respective levels.

* Apt, to which the Japan Housing Performance Standard prior to its amendment in 2014 applies, are evaluated in accordance with CASBEE 2010 edition.

☐**Commentary**

Evaluate the efforts to improve the reduction of thermal gains and losses due to insolation and interior-exterior temperature gradients, and thermal load control as a means of reducing energy consumed by cooling and heating.

(1) Measures in the building site plan, such as building form and core position, to reduce thermal loads.
(2) Level of use of highly insulative construction methods and materials in walls, roof and elsewhere.
(3) Level of use of louvers, eaves and other sun-shading methods on windows, which should take into account seasonal variations in sun height between winter and summer.
(4) Use of measures such as highly insulative multipane glass windows, airflow windows and double skins.

The assessment of Off, Sch, Rtl, Rst, Hal, Hsp and Htl, is based on the annual thermal load standard BPI†1 converted from the annual thermal load factor PAL* that is calculated according to the evaluation standards of building owners. Buildings having a total floor space of 5,000 m^2 or less may be evaluated based on the annual thermal load standard BPIm in the Model Building Method.
When the PAL* is used in the assessment, based on the annual thermal load standard BPI, levels are determined in a line chart as shown in Figure 5.

BPI=Design PAL* / Standard PAL* (Formula 1),
where, Standard PAL*: Evaluation standard value of the building owner by purpose of the building or by region [MJ/year-m^2]
Design PAL*: PAL value of the subject building [MJ/year-m^2]

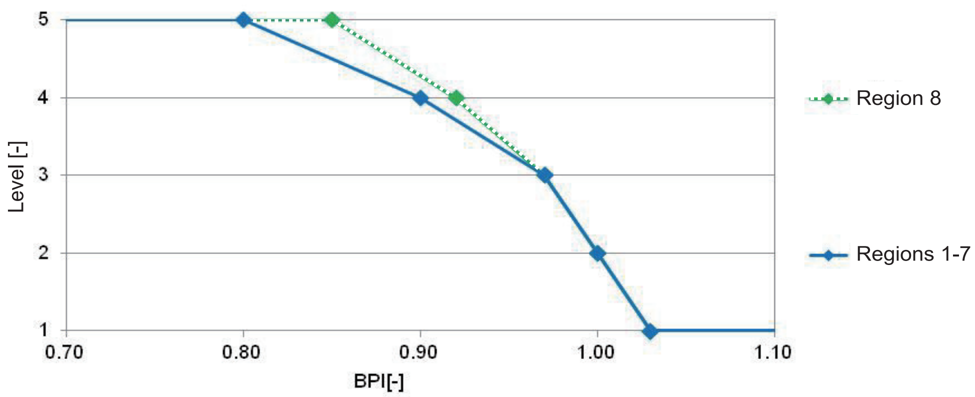


Figure 5: Level evaluation utilizing [BPI]

The annual thermal load standard BPIm[†2] in the brief assessment method is a value obtained by dividing the design value of the Model Building Method by the standard value of the same. In order to differentiate from the BPI calculated in the PAL* calculation program, "m", meaning the Model Building Method, is added.

In Apt, according to the 2013 energy conservation standards and the Japan Housing Performance Standard (revised in February 2014) under the Housing Quality Assurance Act based thereon, the insulation performance of the outer surface is evaluated under the Thermal Load Control of Building Outer Surfaces items.
In cases where the energy conservation standards differs between individual dwellings, in principle, the assessment may be carried out according to proportions of the number of dwellings that fall under the individual grades corresponding to respective levels.

[†2] BPI (Building PAL* Index) is an annual thermal load standard calculated based on the annual load factor PAL* that was established upon the amendment to the Energy Conservation Law in 2013. Conventionally, if the PAL* reduction rate is defined in the same manner as defining the PAL reduction rate that has been used in 1. Thermal Load Control of Building Outer Surfaces, the BPI shall be expressed as follows:

BPI = 1-PAL*Reduction rate = 1-(Standard PAL*-Design PAL*) / Standard PAL* x 100 [%] = Design PAL* / Standard PAL*

[†3] BPIm is an annual thermal load standard in the Model Building Method created upon the amendment to the energy conservation standards in 2013.

■Reference 1) The Standard for Judgment by Owner Regarding the Rational Use of Energy Relating to Buildings

Building type		Regional categories							
		Region1	Region2	Region3	Region4	Region5	Region6	Region7	Region8
Offices		430	430	430	450	450	450	450	590
Hotels	Guest rooms	560	560	560	450	450	450	500	690
	Banquet halls	960	960	960	1250	1250	1250	1450	2220
Hospitals	Medical wards	790	790	790	770	770	770	790	980
	Non-medical wards	420	420	420	430	430	430	440	670
Stores engaged in sale of goods		610	610	610	710	710	710	820	1300
Schools		390	390	390	450	450	450	500	690
Restaurants		680	680	680	810	810	810	910	1440
Halls	Libraries	540	540	540	550	550	550	550	670
	Gymnasiums	770	770	770	900	900	900	900	1100
	Cinemas	1470	1470	1470	1500	1500	1500	1500	2100

■Reference 2) Japan Housing Performance Standard "5-1 Energy Saving Countermeasure Grades"

Energy Saving Countermeasure Grades	Degree of insulation measures in order to prevent heat loss through outer walls, windows and the like
Grade 4	Measures against a great heat loss, the degree of which is equivalent to the Evaluation Standards for Clients and Owners of Specified Buildings Concerning Rational Use of Energy, are taken.
Grade 3	Measures against a certain level of heat loss are taken.
Grade 2	Measures against a slight heat loss are taken.
Grade 1	Others

2. Natural Energy Utilization

Off · Sch · Rtl · Rst · Hal · Fct · Hsp · Htl · Apt

From the 2014 edition, in terms of natural energy utilization, the assessment is based on the direct use only. The converted use is evaluated in 3. Efficiency in Building Service System. Forms of natural energy utilization in CASBEE are defined as follows:

Form of use	Definition	Notes
Direct use of natural energy	Natural energy is used directly as energy, without the use of mechanical force, as in the use of daylight and natural air movement and ventilation.	Evaluated in 2. Natural Energy Utilization
Converted use of natural energy	Photovoltaic generation, solar heat use and other semi-mechanical means are used to convert natural energy to electrical power, hot and cold water and other forms, before it is used as energy.	Evaluated in 3. Efficiency in Building Service System

In principle, the assessment is based on the introduction method and scale in a qualitative manner. In order to obtain Level 5, the quantitative assessment based on the amount used per unit floor space equivalent to the annual primary energy consumption would be required. In this regard, however, the assessment of apartments and schools (elementary and junior high schools) is carried out based solely on the introduction method and scale in a qualitative manner.

Building type	Off · Sch (Universities, etc.) · Rtl · Rst · Hal · Hsp · Htl · Fct	Sch (Elementary/Junior High/High Schools) · Apt
Level 1	(No corresponding level)	(No corresponding level)
Level 2	(No corresponding level)	Natural lighting and ventilation do not meet level 3.
Level 3	No measures of the assessment criteria are implemented. Although some methods are used, their effectiveness, however, has not been examined.	Nearly all private areas (at least 80%) of classrooms or apartments face exterior walls on two sides, ensuring effective natural lighting and ventilation.
Level 4	In some of the methods used as part of the efforts subject to the assessment, their effectiveness has been confirmed. (excluding monument design)	In addition to the above, building measures, such as ventilation voids, have been used to enhance efficacy. They influence a majority (50% or more) of the building.
Level 5	Same as level 4 and direct energy usage of 15 MJ/m^2-yr or more	The above building measures cover at least 80% of the building

Efforts to be evaluated

NO.	Description
1	Use of natural light: Planning for natural light systems that use daylight in place of lighting equipment. (E.g., light shelves, top lights, high side lights[†4], etc.)
2	Use of natural ventilation: Planning for the use of natural ventilation and ventilation systems that are effective in replacing the use of air conditioning equipment and reducing cooling loads. (E.g., automatic dampers, manually operated openings and windows (those with a plan for an operational management method), night purging, ventilation systems linked to atria, solar chimney ventilation towers, etc.)
3	Use of geothermal energy: Planning for the use of geothermal heat usage systems that are effective in replacing the use of heat sources and air conditioning equipment and reducing heating and cooling loads. (E.g., cool and heat tubes and pits, etc.)
4	Other: Planning for the effective use of nature in other systems.

☐Commentary

Evaluate the unconverted use of natural energy, such as light and ventilation. Solar cells, solar panels and other methods for converting natural energy into electricity or heat should be evaluated under "3 Efficiency in Building Service System."

Evaluate measures for direct use of natural energy within the building appropriate to its scale, type and surrounding area. Localized energy use (such as for a monument) does not contribute to effective energy management, and thus is considered to be level 3. Level 4 or 5 is awarded to measures that are expected to achieve a substantial reduction in energy use.

In assessing direct use of natural energy in Apt and Sch (elementary/junior high/high schools), evaluate measures implemented in private areas of apartments or classrooms. Many such buildings have natural lighting and ventilation as basic energy-saving measures. As such, the level 3 standard for these building types requires most of the private areas or classrooms to have natural light and ventilation on at least two sides.

Furthermore, orientation and layout of the building also contribute to natural energy measures and are recognized as level 4 and 5.

[†4] High side light; windows provided by design for the effective use of natural light, installed at high place near ceiling.

☐**Reference**

A sample qualitative assessment of the natural energy utilization required for obtaining Level 5 is provided below.

Use of natural light - Light shelf installation sample

(1) Building outline
Building type: Hall
Total floor space: 10,000 m^2
Light shelf installation area: 1,000 m^2

(2) Calculation conditions
- Through general-purpose simulations, confirming that floor illuminance of more than 200 lx (6 W/m^2) can be secured in the daytime of a sunny day.
- Effective period: 5 h, Number of effective days: 245 days/year
- Assuming that the sunny day rate is 60%.

(3) Calculating the use of natural energy
- Calculation of the annual direct use
  1,000 [m^2] x 0.006 [kW/m^2] x 9.76 [MJ/kWh]* x 5 [h] x 245 [Day/year] x 60 [%] ≒43.0 [GJ/year]
- Calculation of the use of natural energy
  <u>43.0 [GJ/year] ÷ 10,000 [Total Floor m^2] ≒ 4.3 [MJ/m^2-year]</u>

Use of natural ventilation - Introduction example of natural ventilation system

(1) Building outline
Building type: Offices
Total floor space: 5,000 m^2
(including the area in which natural ventilation is introduced: 1,000 m^2)

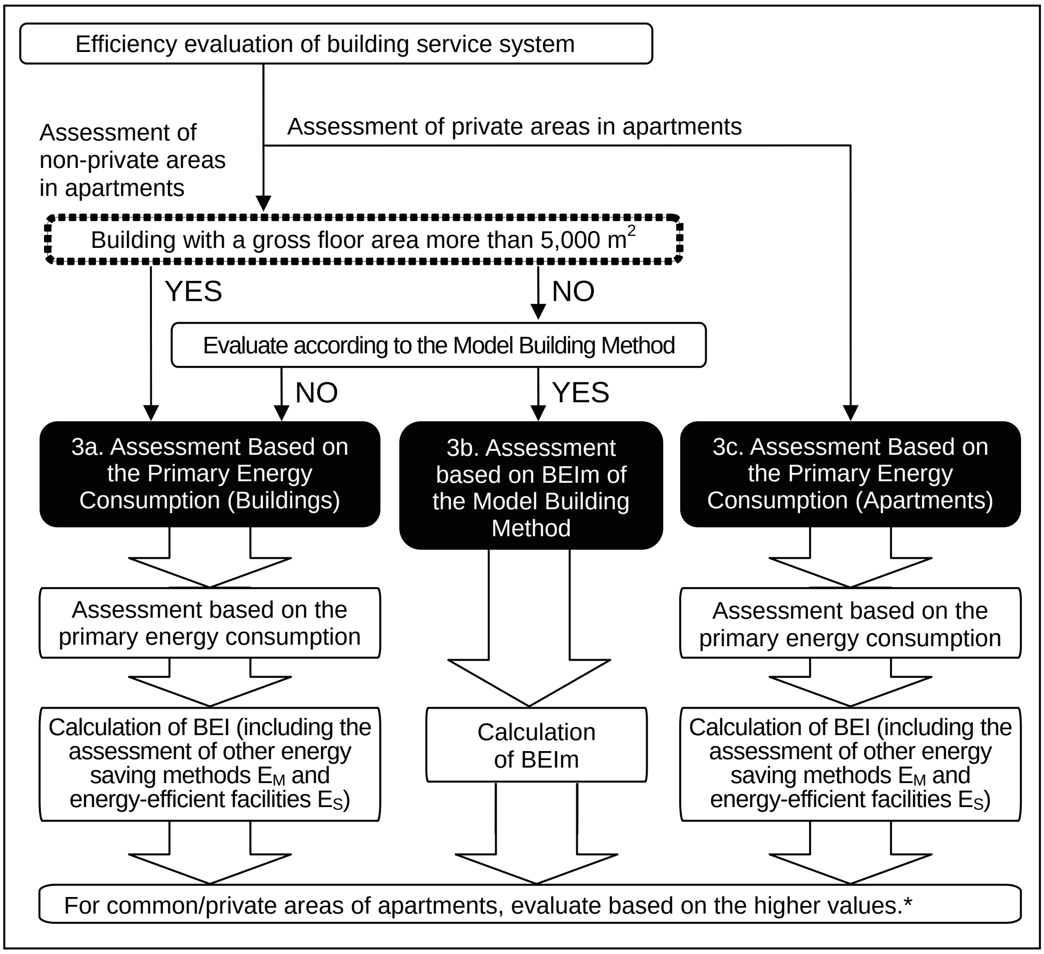
(2) Calculation conditions
- Number of occupants in rooms subject to natural ventilation: 100 people, thermal load per person: 55 W/Person (Sensible heat load)
- Power consumption for lighting during natural ventilation: 12 W/m^2, Power consumption for electric outlets during natural ventilation: 3.0W/m^2
- Assuming that the monthly average system COP (primary) of heat source is 1.0.
- Rated power consumption for air-conditioning fans: 11.0 kW, Number of units: 2, VAV-controlled average air volume ratio for air-conditioning fans: 60%
- Based on the annual thermal load calculation, confirming that effective periods for natural ventilation are in-between periods (April-June, October-November, 10 h during the day).
- Setting the effective periods as 50% in light of the sunny day ratio and other factors.

(3) Calculating the use of natural energy
- Calculation of the annual direct use
  Thermal load: 100 [Person] x 0.055 [kW/Person] + (0.012 [kW/m^2] + 0.003 [kW/m^2]) x 1,000 [m^2] ≒ 20.5 [kW]
  Heat source substitutes: 20.5 [kW] x 3.6 [MJ/kW] ÷ 1.0 [-] x 152 [Day/year] x 10 [h] x 50 [%] ≒ 56.1 [GJ/year]
  Air conditioning substitutes: 11.0 [kW] x 2 [Units] x 60 [%] x 9.76 [MJ/kWh]* x 152 [Day/year] x 10 [h] x 50 [%] ≒ 97.9 [GJ/year]
- Calculation of the use of natural energy
  <u>154.0 [GJ/year] ÷ 5,000 [Total Floor m^2] ≒ 30.8 [MJ/m^2 year]</u>

* In accordance with the Evaluation Standards for Clients and Owners of Specified Buildings Concerning Rational Use of Energy (Notification No. 1 of MLIT and METI in 2013), the primary energy equivalent is set as 9.76MJ/kWh.

3. Efficiency in Building Service System

The assessment of increased efficiency of building service systems is carried out by obtaining the Building Energy Index (BEI) value based on the primary energy consumption of the entire service system prescribed in the 2013 energy conservation standards, or the Building Energy Index for Model Building Method (BEIm), a standard for the primary energy consumption of the entire building based on the Model Building Method.
Select one of the assessment methods stated below (3a, 3b or 3c).



*Apartments require two assessments: 3a for common areas and 3c for private areas. Divide the assessment result (Levels 1-5) proportionately between respective floor spaces of the common and private areas.

3a. Assessment Based on the Primary Energy Consumption (Buildings)

Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)

! Application condition

Apply when the assessment is carried out according to the primary energy consumption of the entire service system prescribed in the 2013 energy conservation standards. (When evaluating in accordance with the Model Building Method, apply 3b.)

For Apt, assess the common areas only. (Private areas of Apt are evaluated in accordance with 3c.)

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)
Level 1	Level 1: [BEI Value] ≧ 1.10 Level 2: [BEI Value] = 1.05 Level 3: [BEI Value] = 1.00 Level 4: [BEI Value] = 0.90 Level 5: [BEI Value] ≦ 0.70 Note: assessment for each level is based on BEI values to one decimal place using linear interpolation
Level 2	
Level 3	
Level 4	
Level 5	

The Building Energy Index (BEI) value is a comprehensive index based on the calculation result of the primary energy consumption of the entire service system in accordance with the 2013 energy conservation standards, which indicates the ratio of the primary energy consumption of the designed service system to that of the standard service system, as expressed in Formula 3.

$$\text{BEI} = \frac{\text{Designed primary energy consumption of the building subject to assessment}}{\text{Standard primary energy consumption of the building subject to assessment}}$$

$$= \frac{E_T}{E_{ST}} = \frac{(E_{AC} + E_V + E_L + E_{HW} + E_{EV} - E_S + E_M) \times 10^{-3}}{(E_{SAC} + E_{SV} + E_{SL} + E_{SHW} + E_{SEV} + E_{SM}) \times 10^{-3}} \quad \text{(Formula 3)}$$

* BEI is expressed with a value rounded off to two decimal places.

In this case,

- E_T= Designed primary energy consumption (GJ/year)
- E_{AC}= Designed primary energy consumption of air conditioning (MJ/year)
- E_V= Designed primary energy consumption of mechanical ventilation facilities other than air conditioning (MJ/year)
- E_L= Designed primary energy consumption of lighting (MJ/year)
- E_{HW}= Designed primary energy consumption of hot water supply equipment (MJ/year)
- E_{EV}= Designed primary energy consumption of elevators (MJ/year)
- E_M= Designed primary energy consumption (everything other than air conditioning, ventilation, lighting, hot water supply and elevators) (MJ/year)

  Note: In cases where energy-saving measures, such as a DC distribution system, are included in the building plan and the basis for calculation of the corresponding reductions in energy consumption is identified, the reductions can be reflected in the assessment.
- E_S= Reduction of designed primary energy consumption due to the use of energy-efficient facilities (MJ/year)

  Note) When energy saving methods other than solar power generation facilities and co-generation systems that are subject to the calculation in the 2013 energy conservation standards are planned, and if evidence is sufficiently provided, the reduction effect may be included in the scope of assessment.

- E_{ST}= Standard primary energy consumption (GJ/year)
- E_{SAC}= Standard primary energy consumption of air conditioning (MJ/year)

E_{SV}= Standard primary energy consumption of mechanical ventilation facilities other than air conditioning (MJ/year)
E_{SL}= Standard primary energy consumption of lighting (MJ/year)
E_{SHW}= Standard primary energy consumption of hot water supply equipment (MJ/year)
E_{SEV}= Standard primary energy consumption of elevators (MJ/year)
E_{SM}= Standard primary energy consumption (everything other than air conditioning, ventilation, lighting, hot water supply and elevators) (MJ/year)

Note) Symbol key
E= Primary energy consumption (GJ/year) (MJ/ year)

[*subscripts*] Indicate energy applications;
AC = Air conditioning application, V = Ventilation application, L = Lighting application, HW = Hot water supply application, EV = Elevator application, S = Equipment for improving energy efficiency, M = Other applications (electrical outlets, water supply and drainage, and other applications. Thus, it includes all applications other than air conditioning, ventilation, lighting, hot water supply and elevators.)

□**Commentary**
When the assessment is based on the primary energy consumption of the entire service system, the level assessment expressed in a line chart as shown in Figure 6 is carried out, utilizing the BEI value that integrates assessment results of individual facilities.

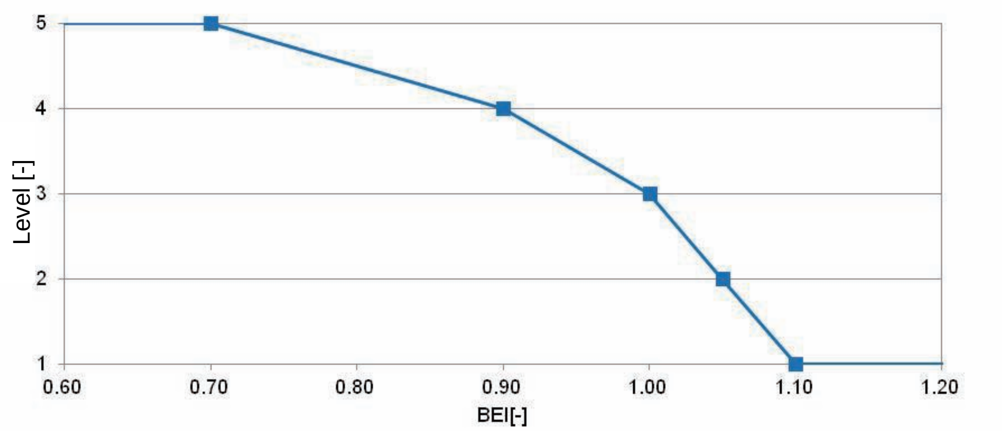


Figure 6 Levels for system evaluation based on the primary energy consumption [BEI] only

1) Other energy consumption assessment
The 2013 energy conservation standards includes assessment of seven systems: air conditioning, ventilation, lighting, hot water supply, elevators, others and energy efficiency improvement systems. CASBEE, in principle, covers all applications of energy consumption. However, in other applications, in terms of the primary energy consumption of EM: Others (any applications other than air conditioning, ventilation, lighting, hot water supply and elevators) in the calculation formula of the BEI, a calculation method with no difference, Denominator = Numerator (=EM), is adopted. On the other hand, when energy saving measures such as a DC distribution system are implemented, and the corresponding reduction in energy consumption is certainly expected, such effect may be included in the EM in the numerator (specify the basis for energy reduction calculations).

2) Assessment of energy efficiency improvement systems
Energy efficiency improvement systems in the 2013 energy conservation standards are only applicable to solar power generation systems and co-generation systems. Installation of such systems would enable efficient energy use in the entire building, and therefore, a certain energy saving effect can be expected.
When measures other than such systems that would positively affect the energy consumption in the entire building are used, based on the assessment in accordance with the primary energy

standard, such efforts may be included in the scope of assessment by calculating ES: Reduction of the designed primary energy consumption due to the introduction of energy-efficient facilities (specify the basis for energy reduction calculations).

3) Common areas in apartments
Regarding common areas in apartments, facilities which are subject to assessment in the 2013 energy conservation standards, such as air conditioning, ventilation, lighting, hot water supply, elevators, others and energy efficiency improvement systems, are evaluated just like other types of buildings. Private areas of apartments (See 3c.) are also subject to assessment. The results of the BEI assessment in common areas and private areas are divided proportionately in accordance with the respective total floor spaces, which would serve as the final assessment values for apartments.

3b. Assessment based on BEIm of the Model Building Method

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Apply when the assessment of service systems is based on the Model Building Method. Buildings having a total floor space of more than 5,000 m^2 are evaluated in accordance with 3a.
The assessment based on the Model Building Method is only applicable to non-residential buildings having a total floor space of 5,000 m^2 or less. Therefore, Apt is excluded from the assessment. (Private areas and common areas of Apt are evaluated in accordance with 3a and 3c, respectively.)

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct
Level 1	1.05 < [BEIm value]
Level 2	1.00 < [BEIm value] ≦ 1.05
Level 3	0.90 < [BEIm value] ≦ 1.00
Level 4	[[BEIm value] ≦ 0.90
Level 5	(No corresponding level)

☐Commentary
The assessment of this item is carried out based on the calculation result of the BEIm of the target building utilizing the Model Building Method in the primary energy consumption calculation program (hereinafter referred to as "the calculation program") in the energy conservation standards for non-residential buildings (announced in January 2013). (The BEIm is a value obtained by dividing the design value based on the Model Building Method by the standard value based on the same. In order to differentiate from the BEI calculated in the primary energy consumption calculation program, "m", meaning the Model Building Method, is added.)

For more details of the calculation program and its commentaries, please refer to the website of the Building Research Institute.
http://www.kenken.go.jp/becc/index.html

1) For other energy consumption
The Model Building Method is a calculation method in which the primary energy consumption is not calculated. Therefore, buildings, in which energy saving measures including a DC distribution system are applied and even the reduction of energy consumption is certainly expected, are excluded from the assessment.

2) Assessment of energy efficiency improvement systems
Energy efficiency improvement systems in the Model Building Method are only applicable to solar power generation systems. Installation of such systems would enable efficient energy use in the entire building, and therefore, a certain energy saving effect can be expected. Further, as the primary energy consumption is not calculated in the Model Building Method, energy efficiency improvement systems other than solar power generation systems are excluded from the assessment.

3c. Assessment Based on the Primary Energy Consumption (Apartments)

Off･Sch･Rtl･Rst･Hal･Hsp･Htl･Fct･Apt (Private Areas)

! Application condition

Evaluate the service system in private areas in Apt. In the 2014 edition, the reduction ratio of the primary energy consumption for purposes other than home electronics and cooking is evaluated in accordance with the calculation method specified in the 2013 energy conservation standards.

Building type	Apt (Private Areas)
Level 1	Levels of this assessment item are expressed as a value to the first decimal place converted from the primary energy consumption ratio (Design value/Standard value). The corresponding levels are defined as the following consumption ratios: Level 1: The primary energy consumption ratio is more than 130%. Level 2: The primary energy consumption ratio is more than 120%. Level 3: The primary energy consumption ratio is 110%. Level 4: The primary energy consumption ratio is 100%. (Equivalent to the 2013 standard) Level 5: The primary energy consumption ratio is less than 90%. (Equivalent to the low carbon standard)
Level 2	
Level 3	
Level 4	
Level 5	

L R 1

☐**Commentary**

In this item, the assessment is carried out based on the calculation result of energy consumption of the residential building subject to the assessment, utilizing the primary energy consumption calculation program (hereinafter referred to as "the calculation program") in the energy conservation standards for residential buildings (announced in January 2013).

For more details of the calculation program and its commentaries, please refer to the website of the Building Research Institute.
http://www.kenken.go.jp/becc/index.html

1) Setting assessment levels

Assessment levels are defined in accordance with 5-2 Primary energy consumption grades (to be enacted in April 2015) specified under the Japan Housing Performance System (revised in February 2014). Grades 5 and 4 correspond to Levels 5 and 4, respectively, whereas the assessment is proportionally distributed from Levels 3 to 1.

Primary energy consumption grades	
Grade 5	[Equivalent to the low carbon standard]
Grade 4	[Equivalent to the 2013 energy conservation standards]
Grade 1	Other

Levels of this assessment item are determined depending on the ratio (consumption ratio) of the standard primary energy consumption and the design primary energy consumption (both of which exclude the energy consumption due to home electronics), as shown in the following formula.

Consumption ratio (%) = Design primary energy consumption (excluding home electronics) / Standard primary energy consumption (excluding home electronics) x 100

Level of LR1.3c = -0.1 x Consumption ratio + 14 (The lowest level is 1 and the highest is 5.)

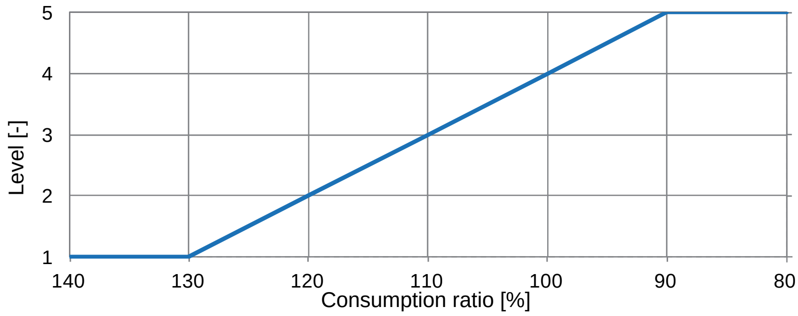


Figure 7: Relationship between the assessment level of LR1.3c and consumption ratio

Regarding the assessment of service systems in private areas, as one of the assessment methods that do not utilize the calculation program, the following method may be used.

Level 1: Not adequate for Level 4

Level 4: Both the Standard Concerning Prevention of Heat Loss through Outer Walls and Windows and the Standard for the Primary Energy Consumption prescribed in the Guidelines for Design, Construction, Maintenance and Conservation Concerning Rational Use of Energy in Housing (Notification No. 907 of MLIT in 2013) (hereinafter referred to as "the Guidelines for Design and Construction") are fulfilled.

4. Efficient Operation

4.1 Monitoring

Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition

The assessment of all building types except Apt is carried out in terms of ongoing monitoring of energy consumption in the operational phase of the building after its construction is completed, and subsequent efforts to establish measurement and qualification systems that would lead to more efficient operation. Apt is evaluated in accordance with "LR_{HU}1.3.2 Management and Control of Energy" in CASBEE for Dwelling Unit.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	It must be possible to identify the annual consumption of each kind of energy used in the building and use the base unit for energy consumption, or other means, for benchmark comparison.
Level 4	Beyond level 3, the breakdown of energy consumption*1 for each major building type must be identified, trends in consumption identified and analyzed, and their appropriateness confirmed.
Level 5	Beyond level 4, the system efficiency*2 of major equipment systems must be evaluated in order to evaluate the performance of the systems.
Building type	Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No efforts to be evaluated.
Level 4	Equipment that indicates the amount of energy consumed, environmental-load-reducing devices and the like, are employed.
Level 5	A system for managing energy is established and efforts for reducing energy consumption are made therein.

*1 Broadly, monitoring must be planned which will be able to identify the breakdown, by application, of a majority of the total energy consumption.

*2 Broadly, efficiency assessment must be performed on at least four of the types listed in table 1. If there are many systems, such as air conditioning, lighting and ventilation, it is permissible to estimate the whole from the assessment of representative systems.

☐Commentary

"Monitoring" evaluates ongoing monitoring of energy consumption quantities use in the operation of the building in the Construction Completion Stage, and subsequent efforts to establish measurement and quantification systems that would lead to more efficient operation.

In evaluating the level of these kinds of monitoring, award higher levels to systems that are capable of more detailed assessment and analysis for the objectives (1)-(3) below.

(1) It must be possible to identify the annual consumption of each kind of energy used in the building and use the base unit*3 for energy consumption, or other means, for benchmark comparison.

(2) Furthermore, the breakdown of energy consumption*4 for each major building type must be identified, trends in consumption identified and analyzed, and their appropriateness confirmed.

(3) BEMS or a similar tool must be introduced so that the system efficiency*5 of major equipment systems can be evaluated in order to evaluate the performance of the systems. Assessment of four or more systems, such as the examples in table 1, must be possible.

*3 Primary energy consumption per unit floor area for each building type, based on statistical data.

*4 Breakdown of primary energy consumption. The breakdown should include items that account for particularly large shares of consumption, such as heat sources, air conditioning motor power, lighting, receptacles and hot water supply.
*5 It must be possible to compare the energy-saving effects of introducing various methods, using the COP of heat source systems, system COP (of compound equipment), the WTF of pumped conveyance and the ATF of air movement (see table).

However, if district heating and cooling has been introduced, it is possible to evaluate according to a well-defined system COP, so evaluating efficiency is sufficient.
Furthermore, data obtained by devices with control sensors can also be applied in the efficiency assessment.

Table 1 Efficiency Assessment Examples

Equipment Item		Assessment Item	Assessment Summary	Notes
1	Heat source equipment	Heat source machine COP assessment	Amount of generated heat/energy consumed by the heat source (based on primary energy))/Available heat of heat storage tank/Utilization efficiency of heat storage tank	
		COP assessment of heat source systems	Amount of generated heat/energy consumed by the heat source and related equipment (based on primary energy)	Includes introduction of district heating and cooling
		Heating medium conveyance WTF	Amount of heat carried/energy consumed by pump (based on secondary energy)	
2	Air conditioning equipment	Air conditioner conveyance ATF	Amount of heat carried/energy consumed by fan (based on secondary energy)	
		Total enthalpy heat exchange effect	Amount of heat reduced, amount of energy	
		Cooling effect by external air	Amount of heat reduced, amount of energy	
		Multi-COP assessment for buildings	Efficiency in multi-split A/C system	
3	Ventilation equipment	Assessment of variable air volume control		
4	Lighting equipment	Assessment of various types of control	Amount of energy saved by the use of daylight, occupant sensors, etc.	
5	Hot water supply equipment	Heat source machine COP assessment	Amount of generated heat/energy consumed by the heat source (based on primary energy)	
		COP assessment of heat source systems	Amount of generated heat/energy consumed by the heat source and related equipment (based on primary energy)	
		Heating medium transmission WTF	Amount of heat carried/energy consumed by pump (based on secondary energy)	
6	Elevator	Individual control operation effect	Reduced energy	
7	Other	Assessment of solar power generation facility	Power generation efficiency/Rating efficiency/Annual efficiency	
		CGS assessment	Electricity generation efficiency, overall efficiency, energy saving rate	
		Coordinated controls	Lighting/ventilation on/off control linked with security sensors	
		Other	A/C CO_2 control effect, Ventilation CO_2 control effect, Task ambient A/C effect, Task ambient lighting effect, etc.	

In Apt, the assessment is carried out in accordance with "LR_{HU}1.3.2 Management and Control of Energy" in CASBEE for Dwelling Unit.

Level 4 is given when one of the following measures (a-c) is taken.

a. Equipment that indicates the amount of energy consumed is installed for one of the following services: electricity, gas or water. (The energy consumption may be expressed as the amount of energy consumed, energy costs, or any other related forms.)
b. Devices that indicate the amount of electricity or gas consumed are installed, which are connected to terminals such as electric plugs and gas valves rather than connected directly to the devices.
c. A distribution board having a function of breaking the branch circuit (a distribution board with a peak-cut function) depending on the use of power-consuming devices is installed.

Level 5 is given when, in terms of the information concerning the energy consumption of the dwelling, the amount of electricity for air conditioning, lighting and the like, used by the building owner or occupant, is individually measured, the related information may be accumulated and provided as necessary, and the Home Energy Management System (HEMS), which has a control function in order to adjust the power use, is installed. The standard for the HEMS is in accordance with the low-carbon building certification manual issued by the Housing Performance Assessment and Indication Association, and the Japan Sustainable Building Consortium.

(Reference) HEMS (Home Energy Management System)
All of the following (1) to (4) should be satisfied.
(1) Power consumption data is obtained, and its measurement and retrieval occur every 30 minutes or less, in terms of the entire residential block as well as one of the following: every branch circuit, room, equipment, power generation, power storage and discharge.
(2) Measured electric consumption data is available inside the dwelling unit.
(3) The period for storing data measured by HEMS devices is one of the following:
- More than 1 month when the predetermined time unit of power consumption indicated is less than 1 hour
- More than 13 months when the predetermined time unit of power consumption indicated is less than 1 day

(4) Power consumption adjusting functions of ECHONET Lite (control functions for adjusting power use through automatic control, remote control and the like) are available.

4.2 Operation & Management System

Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
The assessment of all building types except Apt, the operation and management system is not, in itself, design content, but rather a system that would be applied by the building owner. Therefore, the assessment is carried out based on how far the designer went for proposing the establishment of the Operation and Management System in relation to the reduction of environmental loads to the building owner. Apt is evaluated in accordance with "LR_{HU}1.3.1 Presentation of Lifestyle Advice" in CASBEE for Dwelling Unit.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct
Level 1	No operation and management has been planned.
Level 2	Organizations, systems or management policies have been planned for operation and management.
Level 3	In addition to level 2, there must be an organized operation and management system, designated manager.
Level 4	In addition to level 3, target values for energy consumption in the whole buildings have been planned and presented to the building owner, based on calculation of annual energy consumption.
Level 5	In addition to level 4, there must be regular verification of equipment performance during building operation, with specific actions planned for repair of malfunctions etc. (commissioning system)
Building type	住
Level 1	No efforts to be evaluated.
Level 2	(No corresponding level)
Level 3	User manuals for individual facilities are provided to the occupants.
Level 4	In addition to satisfying the requirements for Level 3, general instructions regarding an energy-saving way of living are given to the occupants.
Level 5	In addition to satisfying the requirements for Level 3, appropriate instructions regarding the facilities and specifications installed in the subject dwelling unit, suitable for the respective building and life style, are given to the occupants.

☐**Commentary**

The operation and management system is not, in itself, design content, but rather a system that would be applied by the building owner. Therefore, this assessment should examine how far the designer went in preparing such a system, for cutting environment loads, and proposing it to the building owner.

The assessment should cover management systems and goal setting for planned and organized operation, maintenance and preservation of the building, the setting of target values for annual energy consumption, and the implementation of a target management plan to achieve the goals and targets. Level 5 is for "target management is applied to energy consumption," with marks allocated for the anticipated final targets. Evaluate energy-saving efforts in the area of operation and management, such as the use of data gained from various monitoring systems to reduce energy consumption through testing and verification of equipment performance in operation, equipment diagnostics, and support for optimum operation.

In Apt, even if the building or facility focuses on energy saving, the expected effects may not be achieved depending on how they are used. In this section, the assessment is carried out as to whether information for promoting an energy-saving way of living is available to the occupants.

Sample effort required in Level 3:
The assessment is carried out as to whether user manuals for built-in facilities of the building including a water heater and air conditioning are provided to the occupants. User manuals would enable the occupants to conduct appropriate maintenance work, which would contribute to maintaining facilities' performance such as energy consumption efficiency.

Sample effort required in Level 4:
An explanation of an energy-saving way of living is provided in a manual for the subject apartment. Alternatively, an explanation of an energy-saving way of living based on leaflets that are publicly available, including the Smart Living Guide issued by the Energy Conservation Center, Japan, is provided. The Smart Living Guide can be downloaded from the website below (As of October 2013).
http://www.eccj.or.jp/pamphlet/living/06/index.html

Sample effort required in Level 5:
Appropriate explanations of facilities and specifications installed are provided to the extent of how they actually work or their effective use, depending on the individual conditions. For instance, when an inventive approach to ventilation as part of a passive system is applied, the design concept of the subject dwelling unit is described and an explanation regarding when and which opening should be used in order to achieve effective ventilation is provided, depending on the geographical conditions.

LR2 Resources & Materials

1. Water Resources

1.1 Water Saving

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	No systems for saving water.
Level 2	(No corresponding level)
Level 3	Major faucets are equipped with water-saving valve.
Level 4	In addition to water-saving valve, other water-saving equipment (such as flush-mimicking sound systems, water-saving toilets) is used.
Level 5	(No corresponding level)

☐**Commentary**

Evaluate the water-saving methods installed on the building's water supply equipment.

In this context, "major faucets" refers to faucets in everyday use. For example, in a home the term would refer to those in the kitchen, bathroom, restrooms, etc. This also depends on the level of water-saving effect, but it is generally necessary to have water-saving measures attached to a majority of faucets.

■Reference) Examples of water-saving equipment

Faucets	(1) Save water by regulating water flow volume	Water- saving valve
		Fixed flow volume valves
		Foaming faucets etc.
	(2) Simplify operation of the equipment to save water by reducing wasteful flow.	Automatic faucets
		Fixed flow faucets (self-closing faucets)
Water-saving toilets	(1) Toilet bowls (Approx. 6 L/use)	Water-saving appliances (Improvements to water supply routes and bowl and trap shapes secure waste evacuation performance while saving water).
		Water-saving flush valves (Continuous flush prevention mechanism, with regulatable discharge volume).
	(2) Urinals (Approx. 4 L/use)	Flushing in response to usage, with user sensor.
		Fixed-time control system (Combination with lighting, fan switch linkage and 24-hour timers).
Other		Privacy noise generators, etc.

1.2 Rain Water & Grey Water

1.2.1 Rain Water Use System

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No systems for using rain water.
Level 4	Rain water is used.
Level 5	Rain water usage brings the rain water usage rate to at least 20%.

☐Commentary

Evaluate the level of rain water use based on the system and usage rates.

The rain water usage rate specified in level 5 is calculated by the formula below.

$$\text{Rain water usage rate} = \frac{\text{Rain water use } (m^3)}{\text{Potable water use } (m^3) + \text{Rain water use } (m^3) + \text{Waste water use } (m^3)}$$

In this case,

Waste water use (m^3) = grey water use (m^3) + sewage water use (m^3) + industrial water use (m^3)

The denominator indicates the overall water demand in the formula. Apply annual values for calculation.
In areas where a recycled water/grey water infrastructure is provided, use of such system is considered as industrial water use.

Groundwater use is included in rain water use except in the cases below:

(1) Groundwater is used only as heat source water
Ground water used only in a water heat pump system is excluded from this assessment since it does not contribute to reduction of regular domestic water use. However, ground water can be included if it is recycled for domestic use after it is used as a heat source.

(2) Groundwater used for disaster response
Such groundwater use is limited to emergency situations and does not affect regular domestic water use and is thus excluded from this assessment.

(3) Groundwater is stored but not utilized.

(4) Use of groundwater may cause land subsidence, or the amount of water pumped may exceed the limit prescribed in the regulations.

1.2.2 Grey Water Use System

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Small buildings with a gross floor area of less than 2,000 m^2 are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No systems for reusing grey water.
Level 4	Grey water is reused.
Level 5	More than two types of waste water are used

☐Commentary

In CASBEE for Building (New Construction), evaluate utilization of grey water, sewage water and industrial water (collectively referred to as waste water) based on how many types of waste water are being used. Level 5 is awarded where more than two types of waste water are used.

In areas where recycled water/grey water infrastructure is provided, the use of such systems is considered as industrial water use.

2. Reducing Use of Non-renewable Resources

2.1 Reducing Use of Materials

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Buildings with wood as the main structural component are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	Major structural elements are made of non-wood materials (RC/SRC/S), and earned 0 points in the table of the efforts to be evaluated.
Level 3	Major structural elements are made of non-wood materials (RC/SRC/S), and earned 1 point or more in the table of the efforts to be evaluated.
Level 4	Major structural elements are made of non-wood materials (RC/SRC/S), and earned 3 points or more in the table of the efforts to be evaluated.
Level 5	Major structural elements are made of non-wood materials (RC/SRC/S), and earned 5 points or more in the table of the efforts to be evaluated.

Efforts to be evaluated

Point	Measures subject to assessment
Concrete strength F_C and main rebar strength F of main structure (unit: N/mm^2)	
1 point	More than Fc = 36, and less than F = 390
3 points	More than Fc = 60, and less than F = 490
4 points	More than Fc = 100, and less than F = 590
Steel frame strength F in main structure frame (unit: N/mm^2)	
1 point	F = 325 or more but less than 355
3 points	F = 355 or more but less than 440
4 points	F = 440 or more
Other measures related to major structural elements	
1 point	Use of pre-stressed concrete (which reduces material cross section, thereby reducing materials used).
1 point each	Equivalent measures.

☐Commentary

High-strength materials contribute to a reduction in overall material use. As such, evaluate use of various components in RC, S and other structures. Apply the assessment criteria to all building types, as it may be difficult to determine the type of structure in some cases. In cases where multiple methods are combined, such as SRC, evaluate each structure and combine all points to determine the result for the entire building.
In cases where more than two types of materials are used, evaluate the material that is used most. Exclude assessment of CFT structures as reduction in the use of steel material is not clearly demonstrated.

<Examples of other structural measures>
- Use of BCPs (cold-press-formed rectangular steel tubes)
- Reduction in steel reinforced using specific embedding methods, etc.

In cases of multiple measures, combine all points earned for each measure.
Exclude measures intended mainly to prevent building collapse caused by explosion or rupture in the event of a disaster or to reduce overall material use during the entire life cycle of the building.

2.2 Continuing Use of Existing Structural Frame, etc

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Recycled use of existing building frames in temporary buildings is excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	The existing building frame is not reused.
Level 4	(No corresponding level)
Level 5	Existing building frame is reused.

☐**Commentary**

Usually the weight of the existing building skeleton of non-wooden structures consists of about 90% of the entire building, and about 70% in case that it is the energy consumption rate of the material production. Therefore, when construction is to be carried out on a site with an existing building, the resource productivity of the new building will differ greatly depending on whether the skeleton of the existing building is reused or entirely removed in favor of a completely new building. This item evaluates the level of reuse of existing building structural elements, such as reuse of existing piles and preservation of existing building perimeter walls, from the point of view of resource productivity.

Further, reuse, removal and reconstruction of parts of the frames used for a building located on-site or off-site are included in the assessment of the reuse of the existing building frames.

It is natural that existing buildings cannot be reused unconditionally, considering their earthquake resistance and state of deterioration, but if the existing building skeleton is not used for such reasons, the new building should be able to achieve a high level on the Q (Quality) item.

Further, parts of the reused existing building frames used for temporary-use purposes are excluded from the assessment.

LR2

2.3 Use of Recycled Materials as Structural Materials

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No recycled materials are used in the main parts for structural strength.
Level 4	(No corresponding level)
Level 5	Recycled materials are used in the main parts for structural strength.

☐Commentary

Evaluate whether recycled materials are used in the building's main structure.

This category covers recycled materials used for building structure listed as the Eco Mark Products by the Japan Environment Association and the Designated Procurement Items under the Law Concerning the Promotion of Procurement of Eco-Friendly Products in Public Projects or the Green Procurement Law, enacted in May 2000. Wooden materials produced from sustainable forests, such as timbers from forest thinning, are evaluated in "2.5 Timber from Sustainable Forestry."

Unless the quantity is extremely limited, include all materials used.

Recycled materials used in the foundation of wooden structures are deemed used in the main parts for the building's structural strength in the assessment.

Examples of recycled materials

(1) Green procurement items (public works)
- Blast furnace slag aggregate
- Ferronickel slag aggregate
- Copper slag aggregate
- Electric furnace oxidized slag aggregate
- Blast furnace cement
- FA cement
- Eco cement
- Lumber

(2) Wood board with Eco Mark (Product Category No. 111)

(3) Products using thinned lumber, reused and unused wood materials, etc., with Eco Mark (Product Category No. 115)

Since the list of the Designated Procurement Items under the Green Procurement Law and information regarding the Eco Mark Products are constantly updated, it is advisable to refer to the following websites prior to the assessment.

- Green Procurement Law: designated item information (MOE, temporarily unavailable as of April 2014)
  http://www.env.go.jp/policy/hozen/green/g-law/gpl-db/material.html
- Eco Product Net (Green Purchasing Network)
  http://www.gpn.jp/econet/
- Eco Mark Products Search Site (the Japan Environment Association)
  http://www.ecomark.jp/search/search.php

2.4 Use of Recycled Materials as Non-structural Materials

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	No recycled materials are used.
Level 2	(No corresponding level)
Level 3	One type of recycled material is used.
Level 4	Two types of recycled material are used.
Level 5	Three or more types of recycled material are used.

☐Commentary

Evaluate the use of recycled materials in non-structural applications.

This category covers recycled materials used for non-structural materials listed as the Eco Mark Products by the Japan Environment Association and the Designated Procurement Items under the Law Concerning the Promotion of Procurement of Eco-Friendly Products in Public Projects or the Green Procurement Law, enacted in May 2000.

Assessment method

- The assessment is based on the number of items used as recycled materials. When multiple materials belonging to the same category are used, count them all as one item. Further, though timbers from forest thinning are included in the Designated Procurement Items, they are evaluated in 2.5 Timber from Sustainable Forestry. Therefore, they are excluded from the assessment in this section.
- When a product is recognized as both an Eco Mark Product and a Designated Procurement Item, count it as one item.
- Unless it is a very small quantity, include all materials used.
- Since the list of the Designated Procurement Items under the Green Procurement Law and information regarding the Eco Mark Products are constantly updated, it is advisable to refer to the following websites prior to the assessment.
  Green Procurement Law: designated item information (MOE, temporarily unavailable as of March 2014)
  http://www.env.go.jp/policy/hozen/green/g-law/gpl-db/
  - Eco Product Net (Green Purchasing Network)
    http://www.gpn.jp/econet/
  - Eco Mark Products Search Site (the Japan Environment Association)
    http://www.ecomark.jp/search/search.php

Examples of applicable targeted recycled materials and calculation methods are shown below as reference.

Examples of recycled materials

Assessment subjects	Material name
Designated Procurement Items under the Green Procurement Law	Recycled soil processed from construction sludge Granulated blast furnace slag for earthworks Caisson filler using copper slag Caisson filler using ferronickel slag Steelmaking slag for ground improvement Recycled heated asphalt mixtures Asphalt mixtures with added ferrous slag Roadbed material with added ferrous slag Steel slag blocks Sprayed concrete using FA Paving blocks (fired) using recycled materials Paving blocks (precast, non-reinforced concrete) using recycled

Assessment subjects	Material name
	materials Ceramic tile Lumber Laminated wood Plywood Laminated veneer lumber Flooring Particle board Wooden-type cement panels Vinyl flooring
Tiles and blocks that have been awarded the Eco Mark (Product category No. 109)	Tile Block Brick
Boards using wood materials that have been awarded the Eco Mark (Product category No. 111)	Boards
Products using thinned lumber, reused and unused materials, etc. that have been awarded the Eco Mark (Product category No. 115)	Outdoor materials (Civil engineering and construction materials: Small logs) Exterior materials (Civil engineering and construction materials: Laminated wood) Exterior materials (Civil engineering and construction materials: Plywood) Exterior materials (Exterior) Interior materials (Floor materials) Interior materials (Wall materials) Interior materials (Sliding door frames) Interior materials (Doors) Activated carbon (for moisture regulation) Soil improvement materials
Construction products (for interior decorating finishes) that have been awarded the Eco Mark (Product category No. 123)	Wood flooring Paper screens and sliding partitions Paper to cover paper screens and sliding partitions Board Tatami matting Wallpaper Thermal insulation Acoustic absorption materials and anti-vibration mats Vinyl floor covers Staircase anti-slip treatment Braille nails Free access floor Accordion doors
Construction products (cladding and exterior parts and materials) that have been awarded the Eco Mark (Product category No. 137)	Roofing Roof materials Cladding materials Plastic decking materials Composite materials of recycled wood and plastic
Construction products (material-type parts and materials) that have been awarded the Eco Mark (Product category No. 138)	Construction stone Hard PVC pipes for drainage and ventilation Sumps for residential land

Calculation example: Brick products A and B (Eco Mark Product category No. 109) and ceramic tile product C (a Green Procurement Item) are used.
→ Both brick products A and B are counted as one item, and combined with ceramic tile product C counted also as one item for a total of two items used. Award level 4.

2.5 Timber from Sustainable Forestry

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Inapplicable if no timber is used.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	Timber from sustainably managed forests is not used.
Level 3	Timber from sustainably managed forests supplied less than 10% of timber usage, or no timber is used, even in the structural skeleton.
Level 4	Timber from sustainably managed forests supplies 10-50% of timber usage.
Level 5	Timber from sustainably managed forests supplies 50% or more of timber usage.

Use the formula below to calculate the proportion of timber used.

$$\text{Proportion of timber used} = \frac{\text{Total quantity of timber used from sustainable forests (volume)}}{\text{Total quantity of timber used in the building (volume)}}$$

☐Commentary

Timber is a material that should be renewable, and this item expresses the level of timber use in a building. However, when timber comes from tropical rainforests or illegally logged forests, it cannot be described as renewable. Therefore, the level of use of timber from sustainably managed forests is evaluated here. The assessment procedure is as provided in (1) and (2) below.

(1) Method for determining timbers produced in sustainable forestry
Wooden materials and timbers from forest thinning accompanied by a certificate of origin that guarantees their places of origin as sustainable forests are treated as timbers from sustainable forestry.
Further, coniferous woods are most likely from sustainable forests. Therefore, in principle, they are also treated as timbers from sustainable forestry. However, those which obviously seem otherwise are not treated as timbers from sustainable forestry.
Wooden materials including laminated wood and plywood made from wood that conforms to the above definition may also be treated as timbers from sustainable forestry. However, molding materials and frame members are excluded from the assessment.

■ Methods for verifying wooden materials with a certificate of a sustainable forest as their place of origin
The verification procedure is in accordance with the following: (1) Verification method utilizing the forest certification system and chain of custody certification system, (2) Verification by companies authorized by related associations or institutions in forestry and timber industry, and (3) Verification by individual companies utilizing their original measures, under the Guideline for Verification on Legality and Sustainability of Wood and Wood Products (Forestry Agency of Japan, April 2006). (Figures 8-10, Source: Guideline for Verification on Legality and Sustainability of Wood and Wood Products, Forestry Agency of Japan, April 2006)

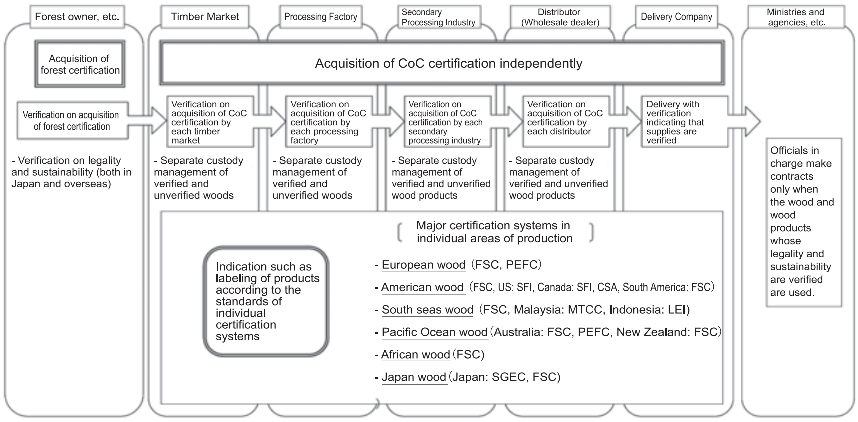


Figure 8: Schematic view of Verification Method based on the Forest Certification System and Chain of Custody Certification System

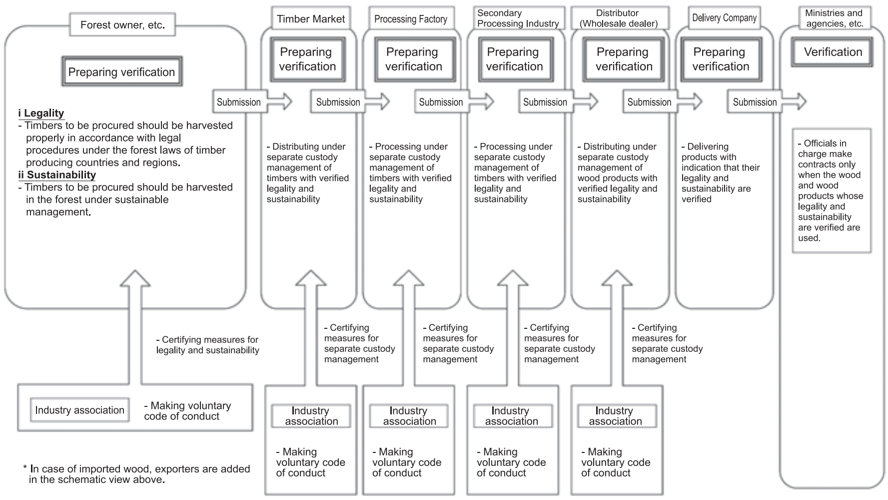
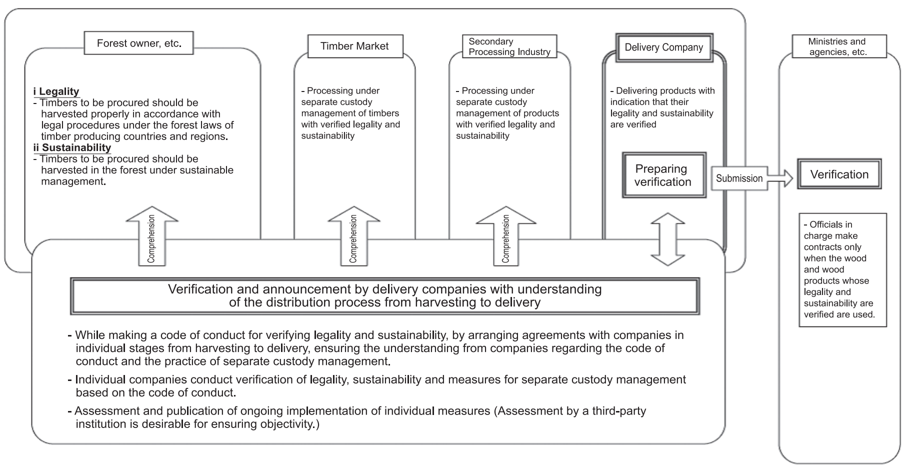


Figure 9: Schematic view of Verification by Companies Authorized by Related Associations or Institutions in Forestry and Timber Industry



* In case of imported wood, exporters are added in the schematic view above.

Figure 10: Schematic view of Verification by Individual Companies Utilizing Their Original Measures

(2) Method for calculating the proportion of timbers used

1. Identify building condition
2. List the timber materials used, by position and tree type.
3. Identify the volumes of wood materials user, by position and type.
4. Calculate the total volume of timber used.
5. Use the formula below to calculate the proportion of timber used that is produced from sustainable forests.

$$\frac{\text{Total quantity of timber used from sustainable forests (volume)}}{\text{Total quantity of timber used in the building (volume)}}$$

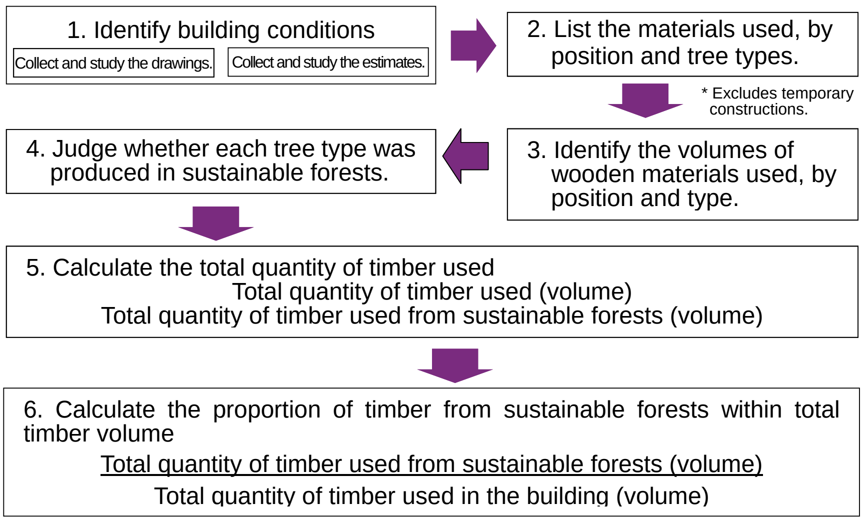


Figure 11: Method for calculating the proportion of timbers used

■Bibliography 54)

2.6 Efforts to Enhance the Reusability of Components and Materials

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No measures, as the efforts to be evaluated, to encourage recycling of materials on demolition has been used.
Level 4	One point of measures to be evaluated, which are taken as efforts to promote material recycling on demolition, has been used.
Level 5	Two points or more of measures to be evaluated, which are taken as efforts to promote material recycling on demolition, have been used.

Point	Efforts to be evaluated
1 point	The structure of finishing materials can be separated easily.
1 point	Interior finishes and equipment are not entangled, and each can easily be removed separately for demolition, refurbishment and remodeling.
1 point	Reusable unit materials are used.
1 point	Structural materials or their units can easily be disassembled and reused.

☐Commentary

"2.3 Use of Recycled Materials as Structural Materials" and "2.4 Use of Recycled Materials as Non-structural Materials" expresses the degree of reused materials in the building at the time of its new construction or refurbishment, as the starting point of its life cycle. This item evaluates measures such as easier recycling which can promote recycling at the demolition and disposal stage, which is the end of the building lifecycle. In this category, evaluate measures to facilitate recycling at the end of the building lifecycle (i.e. demolition and disposal stage) such as material segregation.

"The structure and finishing materials can be separated easily" for this assessment means that structural materials and internal finishes, including underlay materials, can be separated easily. Therefore, S structures with cement panels, or RC structures with curtain walls, are not evaluated under this item.

The following are specific examples. In these examples, measures indicated as "easy separation," "relatively easy separation" and their equivalent may be included in the scope of assessment.

<Examples of easy separation>

(1) Structural frames with painted finishes

(2) Structural frames + light steel + finishing materials (FP panels used for insulation)

<Examples of relatively easy separation>

(3) GL construction method (Sprayed insulation (urethane etc.) used)

<Examples of difficult separation>

(4) Plastered walls

(5) Mortar and tile

"Interior finishes and equipment are not entangled" means cases designed for changing interior décor, such as SI (skeleton/infill) methods, and cases in which pipes and wires are no embedded in structural frames and finishing materials, as with the GL method and others. Conversely, do not evaluate in cases with mortar and tile or plastered walls on the structure.

"Reusable unit materials" include OA floors and movable partitions.

In "Reusable structural materials or their units," the assessment is carried out regarding design efforts in which structural materials and their units can be easily detached from each other and reused, the examples of which include a case where beam-column joints of a steel construction are all replaced with bolted connections.

3. Avoiding the Use of Materials with Pollutant Content

3.1 Use of Materials without Harmful Substances

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	There is no building materials to be evaluated without substances specified in the Pollutant Release and Transfer Register Law. Or the inspection has not been carried out.
Level 4	There are 1-3 building materials to be evaluated without substances specified in the Pollutant Release and Transfer Register Law.
Level 5	There are 4 or more building materials to be evaluated without substances specified in the Pollutant Release and Transfer Register Law.

Category	Building materials to be evaluated	Category	Building materials to be evaluated
Adhesives	For vinyl tile floors and seating	Paints	For fittings (wooden and metal)
	For tile		For wooden parts (frames for floor and ceiling)
	For wallpaper		For structural materials
	For floor board		For walls
Sealants	For sash	Anti-corrosion treatment	For frames
	For glass		For materials other than frames
	For tile joint	Undercoats	For materials for coated floors
	For wall joint	Floor coverings	For finishing wax
Waterproofing materials	Primer for waterproofing	Preservatives	For wooden parts
	For paint (surface coating)		

☐Commentary

In this assessment, evaluate the reduction of chemicals which may affect interior air quality and also the overall environment.

Various materials are used in buildings and these contain various chemical substances. These chemicals may have a harmful impact on human health and cause problems such as sick house syndrome and endocrine disruption due to environmental hormones. Materials with a low risk of causing health problems (except for sick house syndrome caused by VOCs) are considered as materials with no harmful substances in this assessment.

Targeted substances include Class I and II chemicals referred to in the law governing improved reporting and management of specific chemicals released into the environment. Class I designated chemical substances are defined as follows:

(1) The chemical substance concerned threatens to harm human health, or to impair the lives or growth of animals.

(2) Condition (1) is applicable to chemical substances which can easily be generated from the substance concerned through the action of nature.

(3) The chemical substance concerned depletes the ozone layer, harming human health through

the increased penetration of ultraviolet radiation to the surface.

In addition to any one of the above, the following condition must apply to designated substances.

(4) The physical or chemical state of the chemical substance and the conditions of its manufacture, import, use and generation are recognized to result in its continuing presence in the environment over a wide area.

■ Reference: Examples of class I designated chemical substances and class II designated chemical substances

Volatile organic compounds	Benzene, toluene, xylene etc.
Organochlorines	Dioxins, trichloroethylene etc.
Agrochemicals	Methyl bromide, fenitrothion, chlorpyrifos etc.
Metallic compounds	Lead and its compounds, organic tin compounds
Ozone-depleting substances	CFCs, HCFCs etc.

In evaluating the level of usage of materials which do not contain harmful substances, it is logical to indicate the total volumes of each substance type covered by the PRTR Law that are used in the evaluated building. However, that is not practically possible, for the following reasons.

(1) As of August 2011, (Japanese) government ordinances have designated 462 types under "Type one designated chemical substances" alone.
(2) The Material Safety Data Sheets (MSDS) have not been written for the chemical substances used in buildings that must be managed.
(3) It would be a huge task to calculate the volumes of materials used in the building.
Instead, it is more practical to consider applications where there is a certain probability of these substances appearing, and count the number of such categories of building materials that are free of substances designated under the PRTR Law.

The categories of materials which have at least a certain probability of containing materials with health risks are adhesives, resilient sealants, parting agents, waterproofing agents, anti-corrosion treatments, paints and undercoats. For this assessment of the use of materials which do not contain harmful substances, the number of those categories (materials to be evaluated) which are free of chemical substances designated under the PRTR Law should be counted.

In principle, MSDS should be used for this assessment, but in some cases it could be difficult to judge what is covered by the assessment in practice. In such cases, check with the manufacturer and judge accordingly.

■ Bibliography 55)

3.2 Elimination of CFCs and Halons

Atmospheric emissions of CFCs and halons pose a global threat to the ozone layer. In the construction field, such substances have been used frequently as flame retardants, foaming agents (insulation materials, etc.) and refrigerants. In Japan, current regulations allow only the use of low ozone-depleting potential (ODP) CFCs and halons; however, careful handling is still required due to high global warming potential (GWP).
In this assessment, evaluate use of low-ODP and GWP CFCs and halons in flame retardants, foaming agents (insulation materials, etc.) and refrigerants.
ODP, or ozone depletion potential, is a relative scale which compares the global loss of ozone caused by 1 kg of a given substance with the global loss of ozone due to 1 kg of CFC-11, which is fixed at an ODP of 1.0. A substance with absolutely no potential for ozone depletion has an ODP of zero.
GWP (Global Warming Potential), or global warming potential, is a relative scale which compares the gas in a given substance with that of the same mass of carbon dioxide, which is fixed at a GWP of 1.

3.2.1 Fire Retardant

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Buildings that have no fire-extinguishing equipment or have sprinklers only, and those having no gas fire extinguishing facilities are excluded from the assessment. A foam extinguisher is also excluded from the assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Halon flame retardants with high ODP/GWP are used (incl. critical uses).
Level 2	Halogenated flame retardants are used.
Level 3	(No corresponding level)
Level 4	Inert gas flame retardants are used. Or, flame retardants with 0 ODP and less than 50 GWP are used.
Level 5	(No corresponding level)

☐**Commentary**
Evaluate flame retardants based on ODP/GWP impacts. In this assessment, chemicals in flame retardants are evaluated. Thus, buildings with absolutely no fire-extinguishing system or which contain only a fire sprinkler system are excluded.

Assessment levels are defined as follows:
Level 1: high ODP/GWP
Level 2: very low ODP/high GWP
Level 4: zero-ODP/very high GWP

Halon flame retardants have been banned in principle since 1994. However, exception has been made for applications deemed essential to public safety, termed as critical use. Critical use of halon in designated/non-designated flame retardant materials is permitted as stated in notices issued by the Fire and Disaster Management Agency (Fire Prevention Notice 87 and Hazard Notice No.84, issued on April 28, 2005). In this assessment, however, critical and non-critical uses of halon are both evaluated as level 1 from the standpoint of their impact on the global environment.

■Reference: Critical-uses for which halon fire retardants may be used.

Types of facility		Examples of facility
Communications equipment etc.	Communications equipment rooms etc.	Communications equipment rooms, wireless equipment rooms, telephone exchange rooms, magnetic disk rooms, computer rooms, telex rooms, telephone exchange switching rooms, communications equipment control rooms, data print rooms
	Broadcasting studios etc.	TV relay rooms, remote centers, studios, lighting control rooms, musical equipment rooms, adjustment rooms, monitor rooms, broadcasting equipment rooms
	Control rooms etc.	Electrical power control rooms, operation rooms, control rooms, management rooms, disaster prevention centers, dynamometer rooms
	Film storages etc	Film storage rooms, lighting control rooms, relay desks, VTR rooms, tape rooms, projector rooms, tape storerooms
	Measurement equipment rooms in hazardous material handling facilities	Measurement equipment rooms in hazardous material handling facilities
Historical assets	Exhibition rooms etc.	Important cultural assets, artwork repositories, exhibition rooms, showrooms
Other	Workshops etc.	Print rooms containing rotary presses
Car parks	Car parks, etc.	Automated parkade, mechanical parkade (where drivers enter fire-protected areas))

Excerpts from Fire Prevention Notice No. 87, Hazard Notice No. 84 (issued on April 28, 2005)

3.2.2 Foaming Agents (Insulation Materials, etc.) Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Insulation foaming materials with ODP = 0.2 or above are used.
Level 2	Insulation foaming materials with ODP = 0.01-0.2 are used.
Level 3	Insulation foaming materials with ODP = 0.0-0.01 are used.
Level 4	Insulation foaming materials with ODP=less than 0.01 and low GWP (less than 50, 100-year value) are used.
Level 5	Insulation foaming materials with zero-ODP and low GWP (100-year value is 1 or less) are used; or, no insulation foaming material used.

☐Commentary

Evaluate foaming agents (insulation materials, etc.) based on ODP/GWP impacts.

Insulation materials are classified into mineral fiber materials (e.g. glass wool, rock wool and asbestos), expanded plastic materials (e.g. polyurethane, polystyrene and polyethylene) and natural materials (e.g. carbonized cork, cellulose fiber and wool). Of these, CFCs and HCFCs have been used in the expanded plastic materials listed below in Reference 1.

■ Reference 1) Foaming agents used in expanded plastic insulating materials

Types of expanded insulation materials	Period of use	Foaming agent name	ODP	GWP (100-year value)
Urethane foam	Before 1995	CFC-11	1	4,750
	Start of 2000s	HCFC-141b	0.11	725
Urethane modified isocyanurate foam	Next generation	HFC-134a	0	1430
		HFC-245fa	0	560
		Cyclopentane C_5H_{10}	0	3
Styrene olefin foam	Before 1995	CFC-12	1	10,900
	Start of 2000s	HCFC-142b	0.065	2,310
	Next generation	HFC-134a	0	1,430
Phenol foam	Before 1995	CFC-113	0.8	6,130
	Since 2000	Dichloromethane CH_2Cl_2	0	

Only expanded insulation materials of extremely low ODP are commercially available in Japan, thus ODP = 0-0.01 is considered standard and defined as level 3. However, GWPs of currently-used foaming agents are not necessarily low. Therefore, materials with ODP = 0 and a very low GWP are considered level 5. ODPs and GWPs of various foaming agents are shown below in Reference 2.

■Reference 2) ODP and GWP values of foaming gases

Substance	Persistence in atmosphere	ODP (CFC standard)	GWP (CO_2 standard) 100 years
CFC−11	50	1.0	4,750
CFC−12	120	1.0	10,900
CFC−113	85	0.8	6,130
CFC−114	300	1.0	10,000
CFC−115	1700	0.6	7,370
HCFC−22	13.3	0.055	1,810
HCFC−123	1.4	0.02～0.06	77
HCFC−124	5.9	0.022	609
HCFC−141b	9.4	0.11	725
HCFC−142b	19.5	0.065	2,310
HCFC−225ca	2.5	0.25	122
HCFC−225cb	2.6	0.033	595
HFC−23	264	0	14,800
HFC−32	5.6		675
HFC−125	32.6		3,500
HFC−134a	14.6		1,430
HFC−143a	48.3		4,470
HFC−152a	1.5		124
HFC−227ea	36.5		3,220
HFC−236fa	209		9,810
HFC−245ca	6.6		560
FC−14	50000	0	6500
FC−116	10000		9200
FC−218	2600		7000
FC−C318	3200		8700

In addition to the data above, ODPs and GWPs can be verified using the following documents.
- MOE 2008 Annual Report on Ozone Layer Monitoring, volume 4 appendix, P. 139-147, issued August 2009 (http://www.env.go.jp/earth/report/h21-02/full.pdf)

3.2.3 Refrigerants

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Exclude from assessment if no refrigerant gases are used.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	HCFC is used as the refrigerant.
Level 3	Refrigerant of ODP = 0 is used as the refrigerant.
Level 4	Natural refrigerants and new chilling systems (ODP = 0) with GWP less than 50 are used.
Level 5	(No corresponding level)

☐Commentary
Exclude all specified CFC refrigerants, and evaluate the use of CFC substitutes.
Due to the widespread use of CFC substitutes as refrigerants, zero-ODP is considered as level 3.

Natural refrigerants and new chilling systems in level 4 include the following items:
(1) Natural refrigerants are CO_2 and hydrocarbons such as ammonia, propane and butane.
(2) New chilling systems (MH chilling systems) are those using hydrogen-occluded alloy (MH alloy). MH alloy is able to store up to 1,000 times its own volume of hydrogen. When it absorbs hydrogen, it emits heat, and absorbs heat when it emits hydrogen, and these properties are used for refrigeration.

LR3 Off-site Environment

In evaluating LR3, employ a point system for individual efforts indicated in the "Efforts to be evaluated" which are the scoring items, and derive a five-level assessment from the total score. As most of the assessment items under LR3 are qualitative, the scoring software includes the "Summary for Design for Environment (DfE)" column, which should be used to describe the content of the efforts to be evaluated and make other comments.

☐Scoring method
If the planned content actually applies to the content of each of the efforts to be evaluated, add the corresponding points, and determine the level according to the point total.
* Some points can be selected as "Not Applicable," according to factors such as the building types and site conditions. The cases which are to be excluded are stated in the commentary for each point. Select "Not Applicable" on the scoring software, and the item concerned will be automatically excluded from the scoring subjects.
* The "Other" column contains arbitrarily added items, which are special efforts that do not appear in the scoring table. When scoring the "Other" column, describe the efforts in the "Summary for Design for Environment (DfE)" column of the software.

1. Consideration of Global Warming

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1-5	The level for this item is expressed by the value of the lifecycle CO_2 emission rate converted to a 1-5 score (rounded to 1 decimal point). Levels 1, 3 and 5 are defined by the following emission rates. Level 1: Lifecycle CO_2 emission rate is 125% or more of the reference value. Level 3: Lifecycle CO_2 emission rate is 100% of the reference value. Level 5: Lifecycle CO_2 emission rate is 75% or less of the reference value.

☐**Commentary**
Use lifecycle CO_2 as the index for evaluating the level of effort for consideration of global warming. Among the global environmental problems, global warming causes the greatest concern. In general the level of impact on global warming is expressed by converting to the equivalent amount of CO_2, as the representative GHG. Lifecycle CO_2 ($LCCO_2$) is the total amount of that kind of CO_2 emission generated by the building in its entire lifespan.
Calculation of $LCCO_2$ for a building is normally a very large task, but CASBEE uses an approximate calculation method (i.e. Standard Calculation) in order to simplify the process. For details of the calculation procedure and conditions, refer to Part III 2.3 Assessment Method. Specifically, a reference $LCCO_2$ emission for each building application is set based on the $LCCO_2$ emission of a standard building that satisfies the evaluation criteria for building owners as referred to in the Energy Conservation Law. Using the reference values, calculation is performed more-or-less automatically based on the CO_2-related assessment results (scores) at each stage of a building lifecycle (i.e. construction, operation, maintenance/upgrade/demolition).

1) Construction stage
LR2 Resources & Materials evaluates "Continuing Use of Existing Structural Frame, etc." and "Use of Recycled Materials." The CO_2 related to the manufacture of construction materials (embodied CO_2), which is considered in relation to these measures, is approximately calculated from the usage rate of existing structural skeletons and the blast furnace cement usage rate.

2) Operation stage
Use BEI, the primary energy consumption ratio, which is evaluated under LR1 Energy, to make a

simple estimate of the CO_2 emission at the operation stage.

3) Maintenance/Upgrade/Demolition
Extension of service life by improving longevity is evaluated under "Q2 Quality of Service." However, it is difficult to estimate the actual extension of service life with sufficient precision to use it as a calculation condition for $LCCO_2$. Therefore, take service life as a constant for all non-residential buildings for $LCCO_2$ estimation.

- Offices, hospitals, hotels, schools and halls: Fixed 60 years
- Retailers, restaurants and factories: Fixed 30 years
- Apartments: 30, 60 or 90 years, according to the deterioration countermeasure grades in the Japan Housing Performance System.

There are many other measures that affect CO_2 emissions, but here we have focused on those with relatively large impacts, which are also relatively easy to set assessment conditions for. Therefore, narrow the assessment subjects to a certain range of efforts and do not evaluate others. Also, the precision of the process may not be high, because the assessment results for other scoring items are only calculated simply. However, for the promotion of global warming countermeasures, it is important to widely publicize CO_2 emissions, their values and reduction effects, so we have decided to present approximate figures.
If the assessor personally makes more detailed calculations (individual calculation), they are not to be reflected in the scores for this item.

2. Consideration of Local Environment

2.1 Air Pollution

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Evaluate as level 5 if absolutely no atmospheric pollution is generated on the site.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Gas and dust concentrations at sources of NOx, SOx and dust exceeds the emission standards set by the Air Pollution Control Law, the Guidelines for Small Capacity Low NOx Combustors (MOE) or local ordinances.
Level 2	(No corresponding level)
Level 3	Gas and dust concentrations at sources of NOx, SOx and dust are reduced to below the emission standards*1 set by the Air Pollution Control Law, the Guidelines for Small Capacity Low NOx Combustors (MOE) or local ordinances.
Level 4	Gas and dust concentrations at sources of NOx, SOx and dust are considerably reduced to below the emission standards*2 set by the Air Pollution Control Law, the Guidelines for Small Capacity Low NOx Combustors (MOE) or local ordinances.
Level 5	No incineration equipment is used, and absolutely no atmospheric pollutants leave the virtual enclosed space boundary of the building to the outside.

Note) The criterion for concentration level is the Air Pollution Control Law, the Guidelines for Small Capacity Low NOx Combustors (MOE) or the local ordinance, whichever is more stringent.

*1 For level 3, the concentration level should be limited to below the standard value and over 90% of the standard value.

*2 For level 4, the emission concentration should be limited to below 90% of the standard value.

☐**Commentary**

Evaluate NOx, SOx and soot reductions using performance values of the equipment, relative to the corresponding emission standards stipulated in the Air Pollution Control Law, the Guidelines for Small Capacity Low NOx Combustors (MOE) or local ordinances. Refer to Reference 2 for facilities regulated under the Air Pollution Control Law and Reference 3 for others (e.g. small boilers). In cases where specification/performance values are not yet established, evaluate based on the equipment intended for use or on target performance values of equipment in operation.

If absolutely no atmospheric pollutants are generated on site, level 5 should be awarded (evaluated as no load is emitted from the virtual enclosed space boundary to space outside). Accordingly, level 5 may be given when no combustion equipment is used on-site. If combustion equipment is used, evaluate at level 3 or 4, according to the reduction rate. In the above scoring criteria, level 4 is for 90% or less of the standard value, but that figure will be revised as appropriate in future, to take into account future trends in technical development and cost. Emergency generation equipment and other devices which are not normally in operation are not evaluated under this item.

■Reference 1) Calculation method for multiple devices

If there are multiple types of relevant devices, emitting differing concentrations of atmospheric pollutants, take a weighted average of the standard outputs of each installed device.

Calculation method for multiple devices (with sample values)

(1) Specifications	(2) Combustion capacity of equipment (kW)	(3) Coefficient	(4) = (1) x (3)
Concentration level 80%	300	300/450＝0.67	0.536
Concentration level 85%	100	100/450＝0.22	0.187
Concentration level 100%	50	50/450＝0.11	0.11
	450	Total	0.833（83%）

■Reference 2) Assessment of facilities regulated under the Air Pollution Control Law

1. Facilities regulated under the Air Pollution Control Law

The following facilities are regulated under the Air Pollution Control Law.

	Building name	Size conditions
1	Boilers	- Heat transfer area at least 10 m^2 - Combustion capacity at least 50 l/hr
2	Boilers	- Raw material processing capacity 20 t/day - Combustion capacity at least 50 l/hr
3	Garbage furnace, sintering furnace	- Raw material processing capacity at least 1 t/day
4	(For refining metals) Blast furnace, converter, open-hearth furnace	
5	(For refining and casting metals) Blast furnace	- Grate area at least 1 m^2 - Tuyere area at least 0.5 m^2 - Combustion capacity at least 50 l/hr - Transformer rated capacity at least 200 kVA
6	(For metal casting, rolling and heat treatment) Heating furnace	
7	(For the manufacture of petroleum products, petrochemical products, coal tar products) Heating furnace	
8	(For oil refining) Catalyst regeneration tower of a fluid catalytic cracking unit	- Capacity for combustion of carbon with adhering catalyst, at least 200 kg/hr
8-2	Combustion furnace of a sulfur recovery unit for an oil gas cleaner	- Combustion capacity at least 6 l/hour
9	(For manufacture of ceramics) Sintering furnace, blast furnace	- Grate area at least 1 m - Transformer rated capacity at least 200 kVA - Combustion capacity at least 50 l/hour
10	(For manufacture of inorganic chemical industrial products or foodstuffs) Reacting furnace (including fuel combustion equipment for manufacturing carbon black) Direct heating furnace	
11	Dry kiln	
12	(For the manufacture of iron, steel, ferrous alloys, carbide products) Electric furnace	- Transformer rated capacity at least 1,000 kVA
13	Waste incinerator	- Grate area at least 2 m^2 - Incineration capacity at least 200 kg/hr
14	(For refining copper, lead, zinc) Roasting furnace, sintering furnace (Including pellet sintering furnaces) Blast furnace, converter, melting furnace, dry kiln	- Raw material processing capacity 0.5 t/hr or more - Grate area at least 0.5 m^2 - Tuyere area at least 0.2 m^2 - Combustion capacity at least 20 l/hr
15	(For manufacturing cadmium-based pigments or cadmium carbonate products), drying kiln	- Volume at least 0.1 m^3
16	(For manufacturing ethylene chloride) Rapid chlorine freezing equipment	- Chlorine processing capacity at least 50 kg/hr
17	(For manufacturing ferric chloride) Dissolution bath	
18	(For manufacturing activated carbon (using zinc chloride)) Reacting furnace	- Combustion capacity at least 3 l/hour
19	(For manufacturing chemical products) Chlorine reaction facilities, chlorine – hydrogen reaction facilities, chlorine hydrogen absorption facilities	- Chlorine processing capacity at least 50 kg/hr
20	(For aluminum refining) Electrolytic furnace	- Current capacity at least 30 kA
21	(For manufacturing phosphorus, phosphoric acid, phosphate fertilizers, and compound fertilizers (using phosphate rock)) Reaction facilities, concentration facilities, sintering furnaces, blast furnace	- Phosphate ore processing capacity at least 80 kg/hr - Combustion capacity at least 50 l/hr - Transformer rated capacity at least 200 kVA

22	(For manufacturing hydrofluoric acid) Concentration facilities, absorption facilities, distillation facilities	- Heat transfer area at least 10 m^2 - Pump power at least 1KW
23	(For manufacturing sodium tripolyphosphate (using phosphate ore as raw material)) Reaction, drying and sintering facilities	- Raw material processing capacity at least 80 kg/hr - Grate area at least 1 m^2 - Combustion capacity at least 50 l/h
24	(Secondary refining of lead (including manufacture of lead alloys, lead pipe, sheet and wire)) Blast furnace	- Combustion capacity at least 10 l/h - Transformer rated capacity at least 40 kVA
25	(For manufacturing lead accumulator batteries) Blast furnace	- Combustion capacity at least 4 l/h - Transformer rated capacity at least 20 kVA
26	(Manufacturing lead-based pigments) Blast furnace, air furnace, reaction furnace, drying facilities	- Volume at least 0.1 m^2 - Combustion capacity at least 4 l/h - Transformer rated capacity at least 20 kVA
27	(Manufacturing nitric acid) Absorption facilities, bleaching facilities, concentration facilities	- Nitric acid synthesis, bleaching, concentration capacity at least 100 kg/hr
28	Coke oven	- Raw material processing capacity at least 20 t/hr
29	Gas turbine	- Combustion capacity at least 50 l/hour
30	Diesel engines	
31	Gas engine	- Combustion capacity at least 35 l/hour
32	Gasoline engine	

2. Standards and outlines of atmospheric pollutants from factories and other business operation sites (excerpt)

The Air Pollution Control Law sets specific emission standards for NOx, SOx and soot particles from soot/smoke-generating facilities (e.g. boilers) based on type and capacity of the facility (selected excerpts for the assessment reference).

Category		Substance	Main source	Standard/outline
Soot and smoke		Sulfur oxides (SOx)	Fuels and mineral ores used in combustion process of boiler/waste incinerator	. Standard value (volume) set based on height of emission outlet (He) and regional constant value K Allowable emission (Nm^3/h) = K x 10^{-3} x He^2 General emission standard: K = 3.0 - 17.5 Special emission standard: K = 1.17 - 2.34 2. Fuel use standard based on the season Standard of sulfur in fuels set regionally Sulfur content: 0.5-1.2% or less 3. Overall emission standard Regional/facility-specific standard set based on overall emission reduction plan
		Soot	Same as above and use of electric furnace	Emission standard (concentration) per facility/capacity General emission standard: 0.04-0.7 g/Nm^3 Special emission standard: 0.03-0.2 g/Nm^3
	Harmful substances	Nitrogen oxide (NOx)	Combustion, synthesis, or decomposition process of boiler/waste incinerator	1. Emission standard per facility/capacity New facilities: 60-400 ppm Existing facilities: 130-600 ppm 2. Overall emission standard Regional/facility-specific standard set based on overall emission reduction plan

■Reference 3: Assessment of NOx/SOx/soot-generating combustion facilities (e.g. small boilers) not subject to regulation under the Air Pollution Control Law

A combustion facility that is not subject to regulation under the Air Pollution Control Law but generates NOx, SOx and soot is evaluated in this assessment. This applies to small boilers and individual water heaters in apartments. In such case, award level 3 to emission concentrations equivalent to the standard value as referred to in the Guidelines for Small Capacity Low NOx Combustion equipment issued by MOE; award level 4 to concentrations of 90% or less than the guideline standard. Evaluation is based on performance assessment of individual equipment. Determine the appropriate level where the majority of the equipment satisfies criteria at the given level.

Reference data: Guidelines for Small Capacity Low NOx Combustors (MOE, 2009 edition)

Combustion Equipment type		Guideline standard value (ppm, conversion: O_2 = 0%)	
Device	Capacity*[1]	Fuel*[2]	Guideline standard (ppm)*[3]
Boiler	Fuel consumption capacity of less than 50 l/hr (heavy oil equivalent) and heat transfer area of less than 10 m^2	Gas	50
		Kerosene	80
		Type A heavy oil	100
Absorption chiller	Fuel consumption capacity of less than 50 l/hr (heavy oil equivalent) and heat transfer area of less than 10 m^2	Gas	60
		Kerosene	80
		Type A heavy oil	100
Consumer gas water heater specified below: - Gas-fueled on-demand water heater (end stop type) - Gas-fueled hot water supply/space heater (water supply section only) - Gas-fueled bath tub system with hot water supply (water supply section only)		Gas	60
Gas engine (excluding GHP)	Fuel consumption of less than 35 l/hr (heavy oil equivalent)	Gas	300*[4]
Gas heat pump (GHP)	Fuel consumption of less than 10 l/hr (heavy oil equivalent)	Gas	100*[5]

*1 Conversion of heavy oil and gas is obtained based on conversion coefficients set by the municipal governments.
*2 Gas includes 12 A/13 A town gas and LPG. Other types of town gas and biogas are not included in the guideline.
*3 NOx concentration is based on 0% oxygen concentration equivalent.
*4 Guideline standard for gas engines (excluding GHP) is based on NOx concentration at the factory setting level.
*5 Guideline standard for GHP is the 12-mode value obtained in accordance with the method specified in JIS B 8627-1 Appendix I.

2.2 Heat Island Effect

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Total score for assessment criteria: 0 points
Level 2	Total score for assessment criteria: 1-5 points
Level 3	Total score for assessment criteria: 6-12 points
Level 4	Total score for assessment criteria: 13-19 points
Level 5	Total score for assessment criteria: 20 points or higher

Efforts to be evaluated

Assessment Item		Description	Point
I. Preliminary investigation of heat environment	1) Preliminary investigation of the local heat environment	[1] Existing data such as data from nearby meteorological stations and regional meteorological observation data (AMEDAS data) was used to identify the wind environment, including directions, speeds and prevailing direction. (1 point)	1 - 2
		[2] In addition to [1] above, on-site measurements were taken, or a supplementary detailed investigation was performed using a wide-area environmental forecasting system based on wide-area meteorological data and topographical data. (2 points)	
II. Thermal impact reduction in surrounding area	2) Thermal impact reduction in surrounding area by facilitating the flow of air toward downwind areas	[1] Position and shape of the building are arranged in the planning to promote the flow of air downwind. The building has no practical impact on the flow of air downwind: 1 point The building does not obstruct the flow of air downwind: 2 points	1 - 2
		[2] Exposed area of the building facing the prevailing summer winds is reduced. Exposed area facing the prevailing wind direction is: 60% or more but less than 80%: 1 point 40% or more but less than 60%: 2 points Less than 40%: 3 points	1 - 3
		[3] Height, shape and spacing of building are arranged to recover the flow of air. Building spacing index Rw is: 0.3 or more but less than 0.4: 1 point 0.4 or more but less than 0.5: 2 points 0.5 or more: 3 points	1 - 3
	3) Consider ground surface coverage to reduce thermal impact beyond the site	[1] Ground covering materials are used to reduce thermal impact. Percentage of ground covered with appropriate materials is: 15% or more but less than 30%: 1 point 30% or more but less than 45%: 2 points 45% or more: 3 points	1 - 3

	4) Consider the building cladding materials to reduce thermal impact beyond the site	[1] Rooftop greenery system or high reflective roof material is used to reduce thermal impact. Percentage of roof covered with appropriate system/material is: Less than 20%: 1 point 20% or more but less than 40%: 2 points 40% or more: 3 points	1～3
		[2] Appropriate exterior wall materials are used to reduce thermal impact. Percentage of exterior walls covered with appropriate material is: Less than 10%: 1 point 10% or more but less than 20%: 2 points 20% or more: 3 points	1～3
	5) Reduce atmospheric emission of heat from building equipment	[1] Appropriate measures to prevent heat loss via exterior walls/windows and to improve energy efficiency for A/C systems have been implemented. Score (results) in the "LR1 Energy" assessment is: 3.0 or more but less than 4.0: 1 point 4.0 or more but less than 4.5: 2 points 4.5 or more: 3 points	1～3
		[2] Air temperature increase is reduced by measures such as cooling of waste heat emitted from building service systems. Measures established to control air temperature increase are: at standard level: 1 point at intermediate level: 2 points at advanced level: 3 points	1～3
III. Confirmation of effects	6) Use simulations or other means to confirm effects in mitigating deterioration of the heat environment	[1] Building form and positioning, relative to wind direction, were considered at the desk plan stage (desktop prediction). (1 point) [2] Numerical simulation of fluid flow, or other methods, was used for the current situation and the planned building, considering topography of the site area, the building and surrounding green space, to predict impact. (2 points)	1～2

☐Commentary

Evaluate measures that contribute to reduction in off-site thermal load such as due to heat island. Verify measures are implemented and award the appropriate level according to the point total. Note that the corresponding on-site measures are evaluated in the assessment under "Q3.3.2 Improvement of the Thermal Environment on Site."

I. Preliminary investigation of heat environment

1) Preliminary investigation of the local heat environment

Appropriate implementation of a preliminary survey is a necessary beginning to devising measures to reduce thermal impact beyond the site. Evaluate according to the level of the preliminary survey.

For Item [1], award 1 point in cases where a preliminary analysis of wind characteristics (directions, velocity and prevalence) is conducted using existing data from nearby meteorological stations or regional meteorological observation data (AMEDAS).
For Item [2], award 2 points in cases where, in addition to the preliminary analysis, wind characteristics are identified more thoroughly based on field measurements or are supplemented with a wide-area atmospheric environment forecasting system based on wide-area metrological/topographical data.

Provide documentation or drawings to support the analysis for third party verification.

II. Thermal impact reduction in surrounding areas

2) Thermal impact reduction in surrounding areas by promoting the flow of air to downwind areas

To ensure effective airflow to downwind/surrounding areas, a structure's wind resistance requires review from a broader perspective. For Item [1], evaluate whether the building obstructs the flow of air to surrounding areas. For Items [2] and [3], evaluate the building's wind resistance from a broader perspective.

For Item [1], perform a qualitative evaluation on how the positioning of the building affects the airflow to surrounding areas (e.g. residential areas, parks, schools, greenbelt, etc.). Award two points for effective positioning, such as the example shown in Figure 12, which does not obstruct flow. Award zero points where the building seems to obstruct flow and one point where the building has no practical impact on airflow.

In analyzing wind conditions of the building's surroundings, collect and review all available data such as local wind characteristics (e.g. Figures 12 and 13). Refer to CASBEE for Heat Island for details regarding the wind characteristics database.

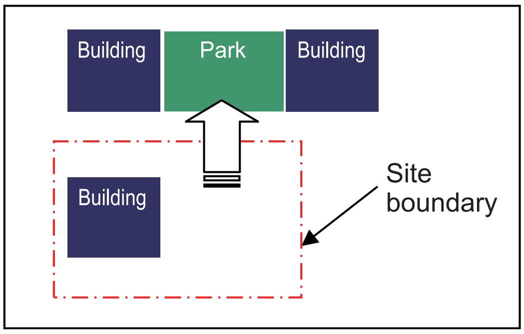


Figure 12 Example of building position for unobstructed air flow

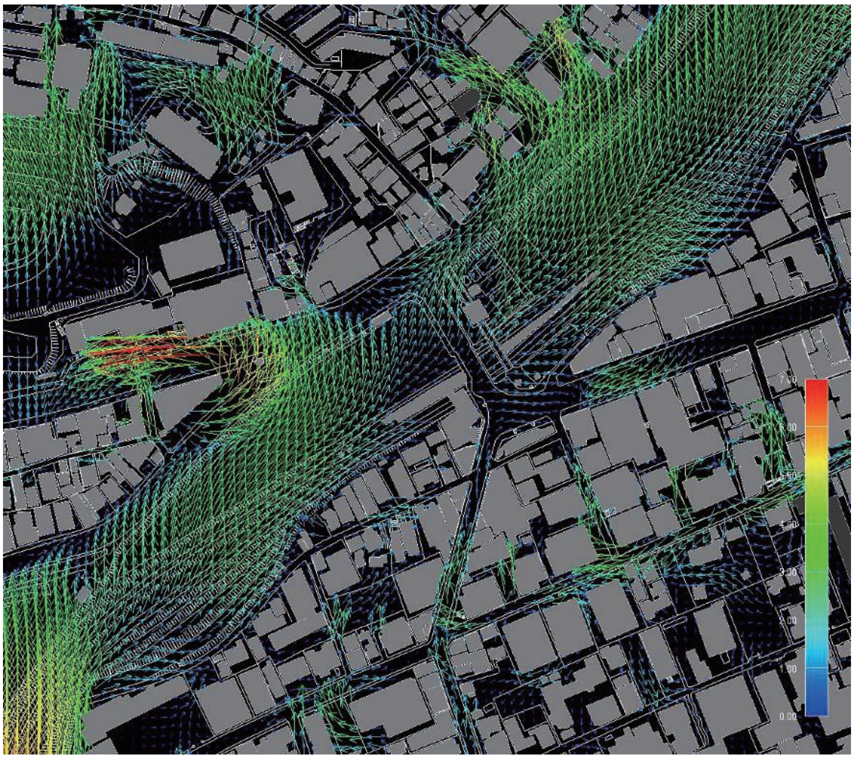


Figure 13-1 Wind characteristics database for Tokyo: pedestrian-level wind velocity distribution

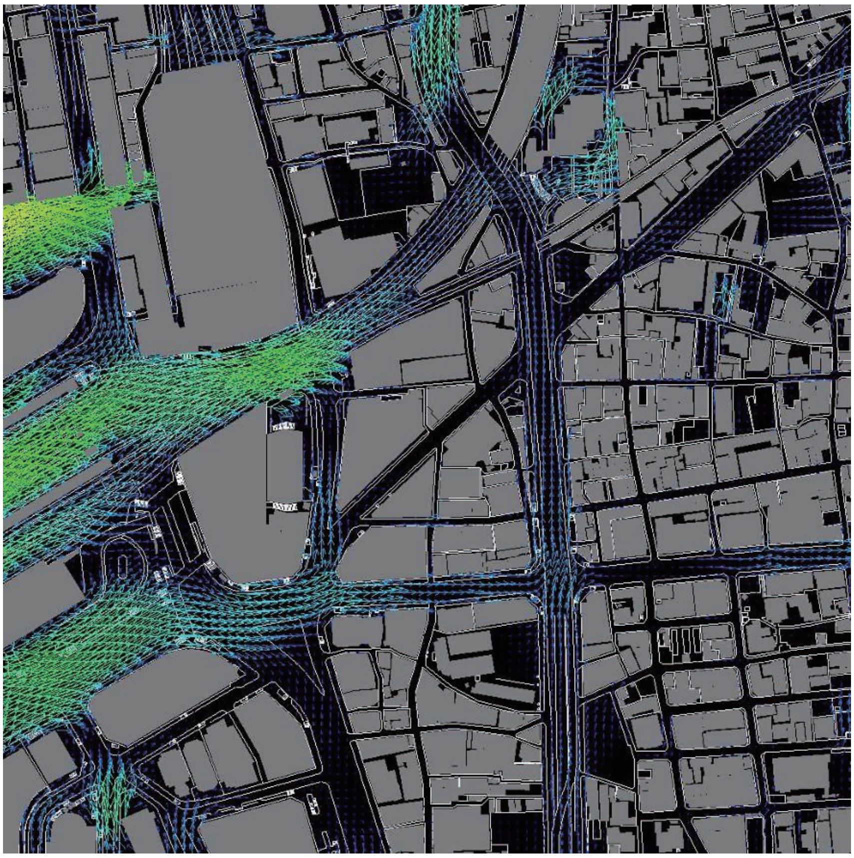


Figure 13-2 Wind characteristics database for Osaka: pedestrian-level wind velocity distribution

For Items [2] and [3], evaluate the building's effectiveness in promoting airflow to downwind areas from a broader perspective.

- A decrease in wind velocity occurs in downwind areas due to building wind resistance. Impact can thus be greatly reduced by ensuring that the smallest possible exposed area faces the prevailing wind. For Item [2], evaluate exposed area of the building facing the prevailing wind.
- At the same time, decreased wind velocity due to a building is expected to regain somewhat on the site if the space between buildings is wider (i.e. building units are positioned sparingly in the direction of the prevailing wind). Thus, for Item [3], evaluate recovery wind velocity based on building spacing.
- In cases where the maximum floor space ratio of the subject site is not specified according to any of the following: urban planning, the width of the frontal road, or ordinances, 1 point is given to [2] and [3].

For Item [2], evaluate based on percentage of exposed area of the building facing the prevailing wind in summer months. This type of assessment normally requires review impacts from adjacent buildings: in this particular assessment, however, base the evaluation on the assumption that the adjacent area is vacant.

- Percentage of exposed area of the building facing the prevailing wind direction is calculated by using the following formula (refer to Figure 14).

  <Percentage of exposed area> = Sb / (Ws x Hb) x 100(%)

- Exposed area Sb of the building facing the prevailing wind is the upper front area above the ground level of the building front (Article 2, Paragraph 1, Item 6 of the Ordinance, and Article 2, Paragraph 2 of the Ordinance).
- When the building has the designated structures specified in the Building Standard Law, their exposed areas should be included in the calculation. However, retaining walls for adjusting the height difference on-site may be excluded from the calculation of exposed areas.
- Standard height Hb is expressed as [(Standard floor space ratio) / (Standard building coverage ratio)] x (Average floor height above the ground).
- The standard floor space ratio is the lowest value of the maximum floor space ratios of the subject site based on one of the following: urban planning due to the designation of zoning, the width of the frontal road, or ordinances. However, when eased values for individual floor space

ratios apply, the eased maximum floor space ratios shall be used in the assessment.
- The standard building coverage ratio is the lowest value of the maximum building coverage ratios of the subject site based on either of the following: urban planning due to the designation of zoning or ordinances. However, when eased values for the building coverage ratios apply to buildings on a corner location, the eased maximum building coverage ratios shall be used in the assessment.
- The floor height above the ground is the number of stories of the subject building excluding the basement.

- When the prevailing wind direction is not perpendicular to the property line, base the evaluation on the orthogonal-oriented wind closest to the prevailing wind.
- In cases where the site consists of several buildings, evaluate based on the overall exposed area of all buildings.
- In cases where the site is irregularly shaped, determine the maximum site width according to the method shown in Figure 15.

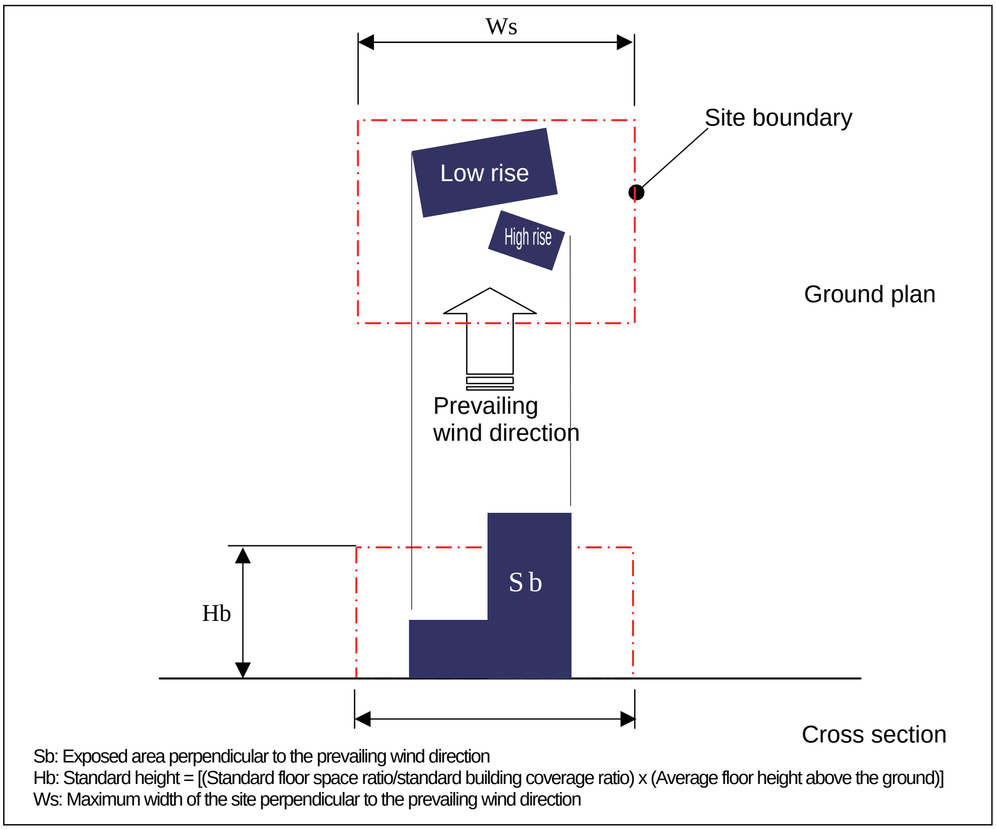


Figure 14 Percentage of exposed area of the building that faces the prevailing wind

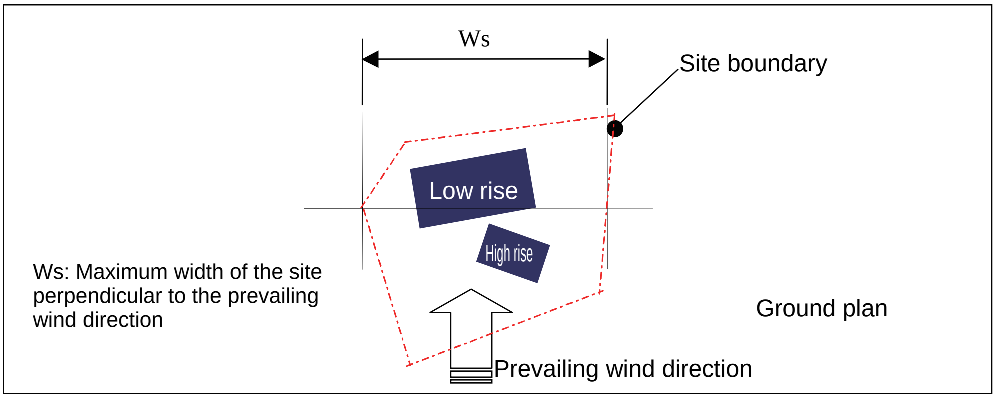


Figure 15 Ws of an irregularly-shaped site

- When the subject building is located on a slope, the exposed area Sb above the average ground level (Article 2, Paragraph 2 of the Ordinance, the horizontal surface at the average height of positions that make contact with the surrounding ground) is calculated (Figure 16).
- When multiple buildings are located on a slope, the exposed area Sb is calculated in the following procedure (Figure 17).
  1) The height of individual buildings is the height from the average ground level of such buildings.
  2) The exposed area Sb is calculated assuming that the site is a horizontal ground level (The average ground levels of the individual buildings are all at the same height.) on which buildings having the height defined in Item [1] are located.

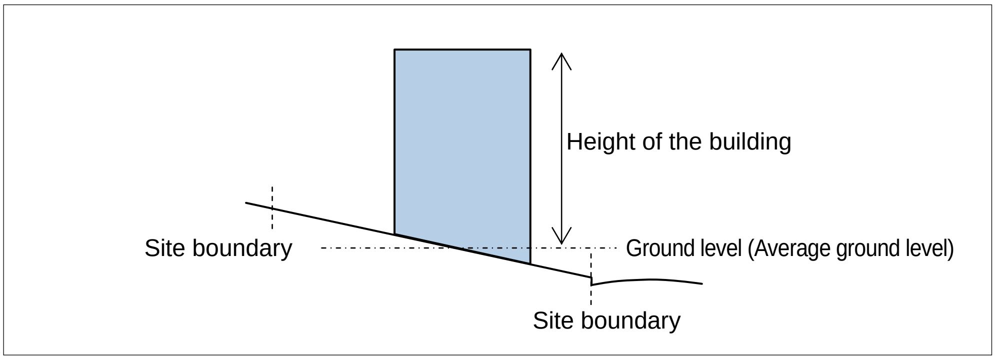


Figure 16: Calculation of the height of a building located on a slope

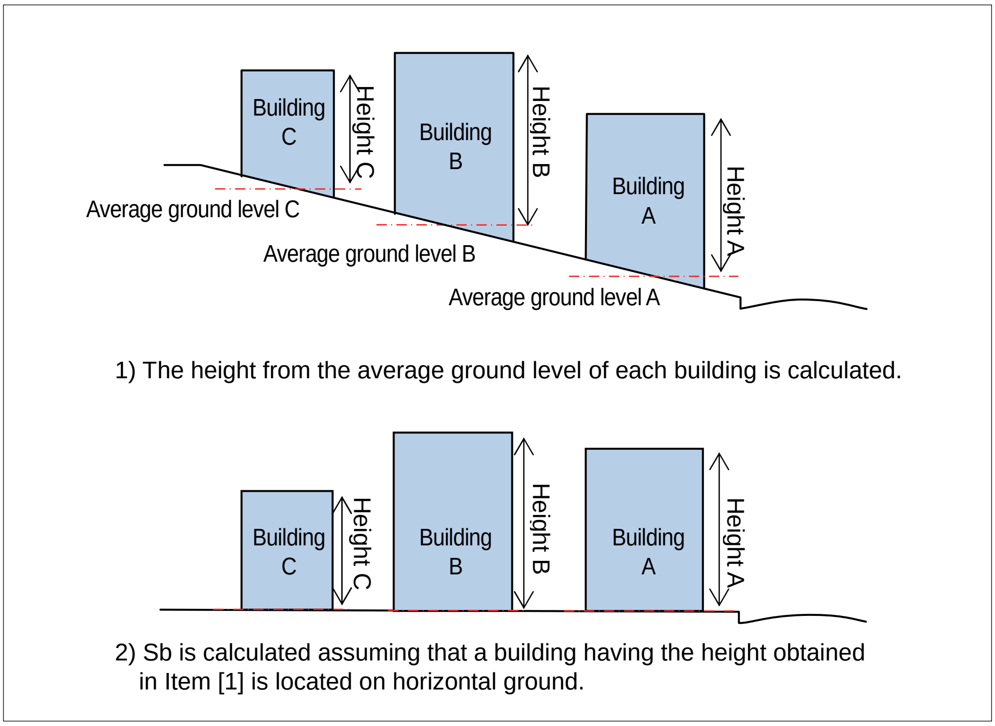


Figure 17: Calculation of the exposed area in cases when multiple buildings are located on a slope

For Item [3], in order to promote wind recovery in the area downwind from the building, the assessment is based on the building spacing index (Rw), which is the ratio of the setback distance from the site boundary in the direction of the prevailing wind in summer relative to the building height (H) and the distance from the adjacent building.

- When the height of the building is more than 50% of the standard height Hb, points are given depending on the building spacing index Rw. Buildings whose height is less than 50% of the standard height Hb are given 3 points.

- Standard height Hb: [(Standard floor space ratio) / (Standard building coverage ratio)] x (Average floor height above the ground) (same as Item [2])
- The site boundary that provides the maximum site width (Wd) against the direction of the prevailing wind is determined in order to evaluate the setback distance in the direction of the prevailing wind (W1 and W2).
- Obtain the building spacing index Rw using the formula below:

$$Rw = (W_1 + W_2) / H = \underbrace{W_1 / H}_{\text{Value of upwind side}} + \underbrace{W_2 / H}_{\text{Value of downwind side}}$$

- When the prevailing wind in summer is not perpendicular to the property line, base the evaluation on the orthogonal-oriented wind closest to the prevailing wind instead.
- In cases where the site is irregularly shaped, determine the maximum site width W_d according to the method shown in Figure 19.
- In cases where the higher portion of the building has a setback, calculate the setback distance according to the method shown in Figures 20 and 21.
- In cases where the site consists of several units, calculate according to the method shown in Figure 22. Apply the method in Figure 23 where two units with a significant height difference are closely positioned.
- In cases where the site is irregularly shaped and also consists of several units, determine the maximum site width W_d according to the method shown in Figure 24.

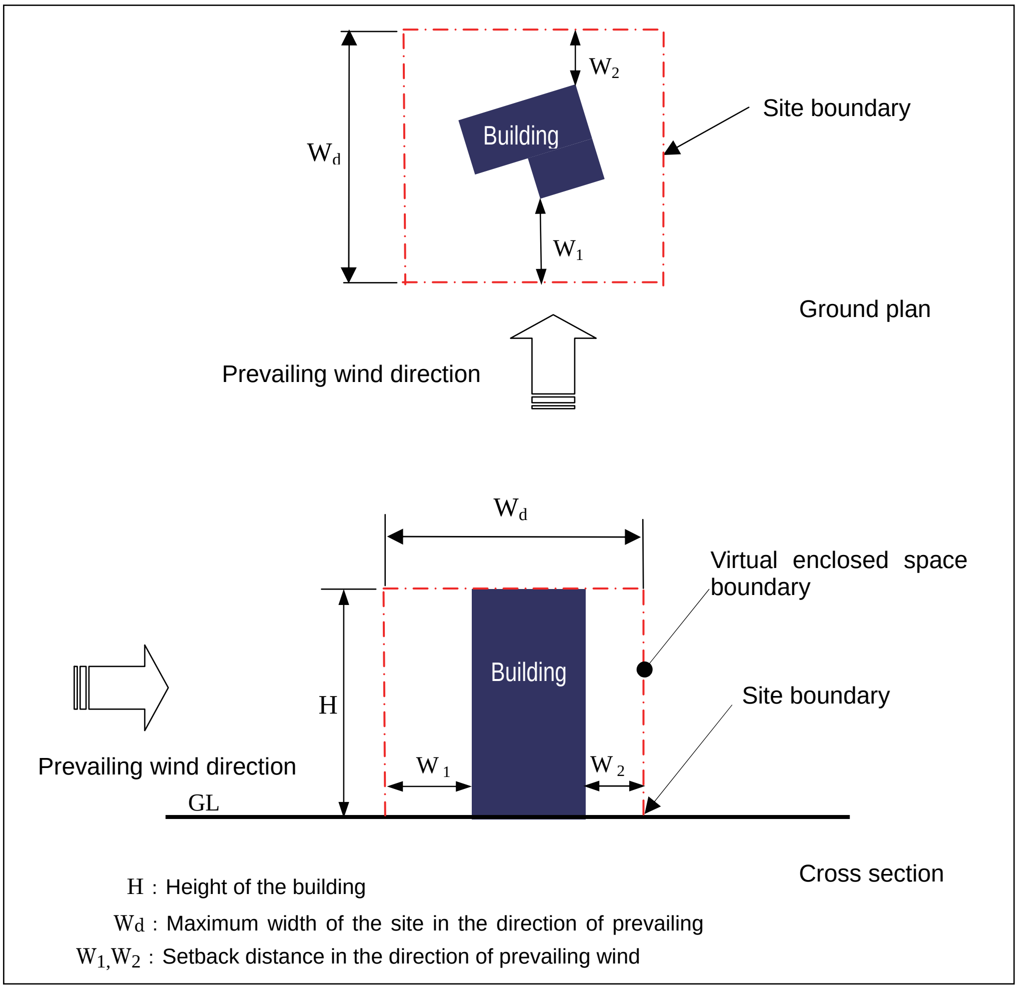
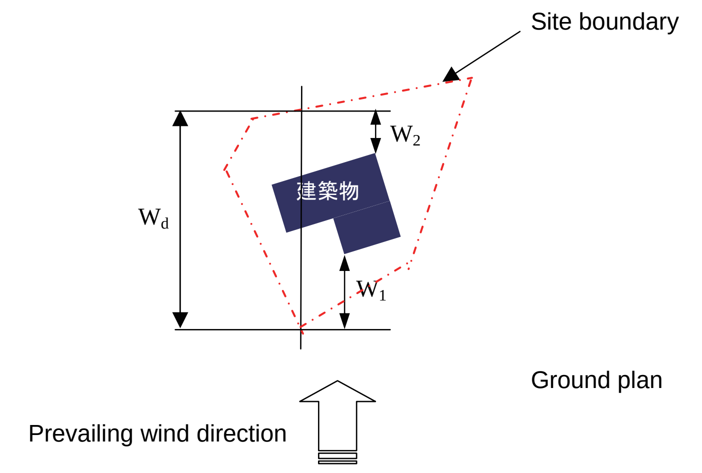
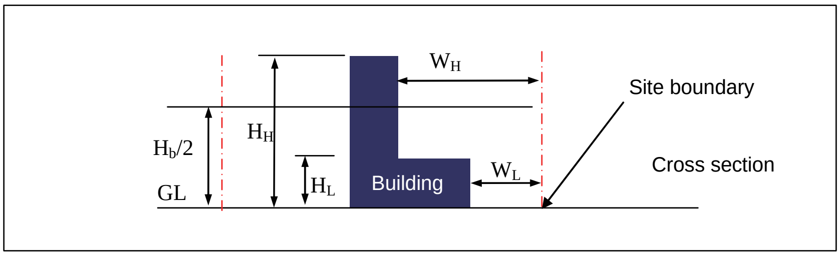


Figure 18 Setback distance from site boundary W_1/W_2 and building height H



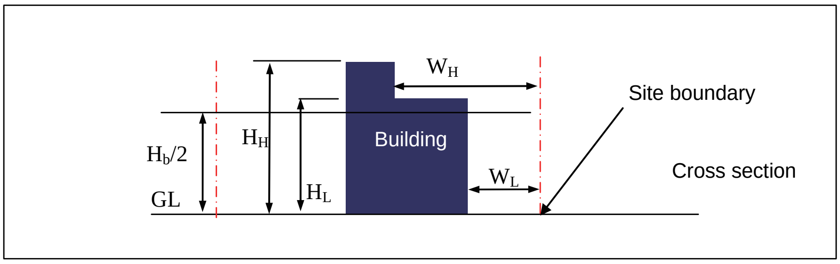
W_d: Maximum width of the site in the direction of prevailing wind
W_1, W_2: Setback distance in the direction of prevailing wind

Figure 19 Maximum site width W_d and setback distance W_1 and W_2 on an irregularly-shaped site



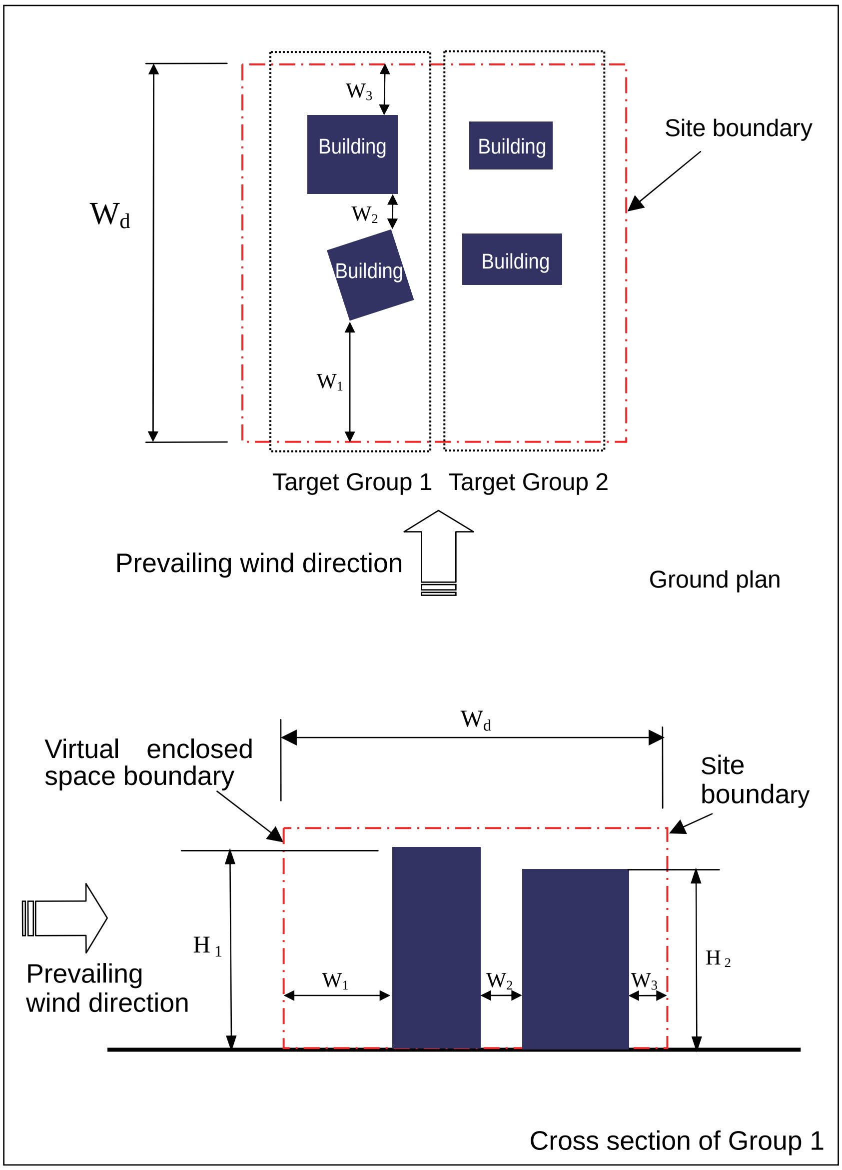
If the setback of the higher portion of the building is located below $H_b/2$, apply the setback distance of the portion W_H/H_H regardless of whether it is downwind or upwind.

Figure 20 W/H calculation method in cases where the higher portion of the building has a setback: 1



If a setback is located at $H_b/2$ or higher, regardless of whether it is downwind or upwind, the value of the side of the building that has the setback is calculated in $(W_H+W_L)/2H_H$.

Figure 21 W/H calculation method in cases where the higher portion of the building has a setback: 2



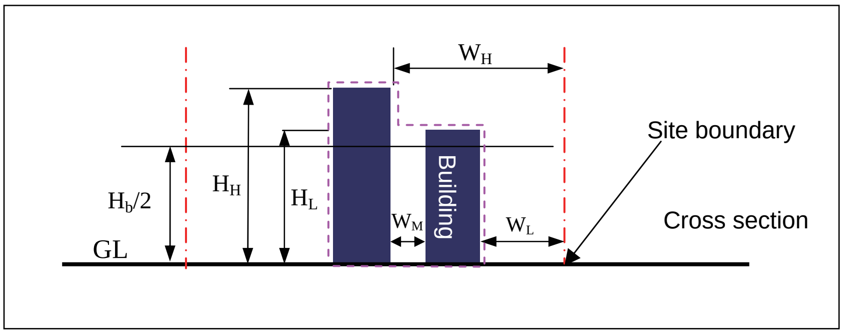
- In cases where multiple groups of building units on the site are in the direction of prevailing wind, evaluate each group individually.
- Apply the setback distance and the spacing (W) of the narrowest portion.
- Apply the height of the unit located on the upwind side as height (H) which corresponds to the spacing between two units with different heights.
- When two units with a significant height difference are closely positioned, evaluate according to the method shown in Figure 23.
- In cases where the higher portion of the building has a setback, evaluate according to the methods shown in Figures 20 and 21.
- Obtain the building spacing index Rw of a group of building units using the formula below (example: subject building units shown in Figure 20):

$$Rw = (W_1/H_1 + W_2/H_1 + W_3/H_2 + \cdots + W_{N+1}/H_N)/N$$

(N=number of building units)

- In cases where multiple groups of building units are on the site, obtain individual Rw for each group and average the value.

Figure 22 Assessment method for sites with multiple building units



- When two units, with a significant height difference at Hb/2 or higher, are closely positioned, the two units are considered as one building with a setback (refer to Figure 21).
- In this case, the building must satisfy the following condition: (H_H - H_L) > W_M
- Apply (W_H + W_L)/2/H_H as the value of the side of the building which has the setback.

Figure 23 W/H calculation method in cases where two units with a significant height difference are closely positioned

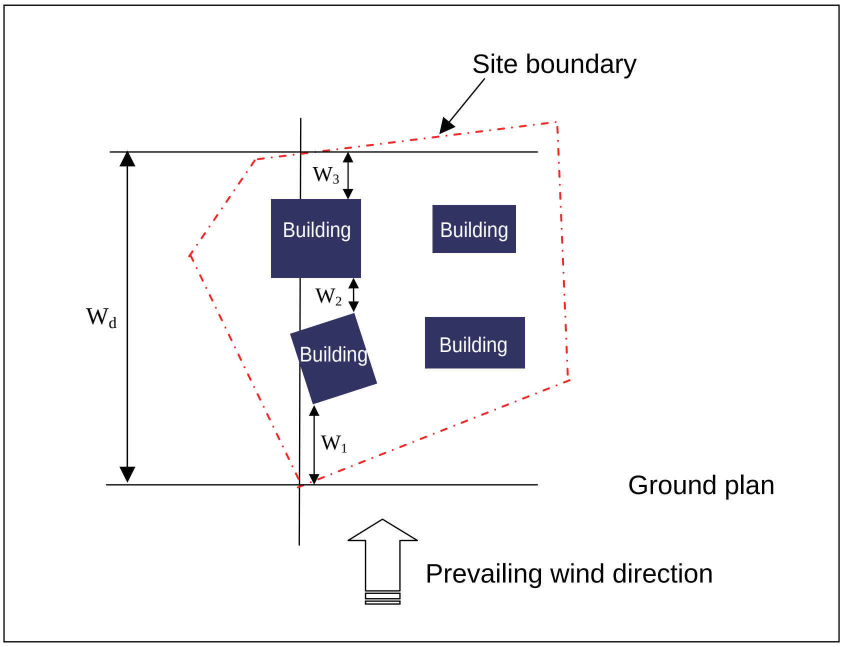


Figure 24 Maximum site width W_d and setback distance for multiple units on irregularly-shaped lot

3) Consider ground surface coverage to reduce thrmal impact beyond site

Evaluate thermal impact reduction measures, namely the use of ground covering materials with a high evaporative cooling capacity or solar reflectance. Both types of ground covering measures are included in this assessment.

- Base evaluation on the percentage of ground covered with appropriate materials. Obtain the percentage using the formula below:

<Percentage of ground covered with appropriate materials>
= <Percentage of ground covered with evaporative materials> +
<Percentage of ground covered with highly reflective material>

- Each percentage is obtained using the corresponding formula below:

A. Percentage of ground covered with evaporative materials

Evaluate effectiveness of thermal impact reduction based on ground area with a high evaporative cooling capacity. The assessment is based on the total value of evaporative cooling effects for applicable areas (i.e. covered with lawn, grass or shrubs, water area, area with mid/high trees and water retention area) in lawn area equivalent.

<Percentage of ground covered with evaporative materials>
= <percentage of green-covered area> + 2.0 x <percentage of water-covered area>
+ 3.0 x <percentage of horizontal projected area of medium and tall trees>
+ <percentage of water retention area>

- Obtain each of the above percentages using the following formulas:
<Percentage of green-covered area> = <Green area>/<Site area> x 100 (%)
<Percentage of water-covered area> = <Water surface area>/<Site area> x 100 (%)
<Percentage of horizontal projection area of mid-height/tall tree> = <Horizontal projection area of mid-height/tall tree>/<Site area> x 100 (%)
<Water retention area> = <Area with water-retentive materials>/<Site area> x 100 (%)

- Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine sizes of green area and horizontal projection area of mid-height/tall trees.
- Materials with a high water retention capability are those referred to in Appendix 3 "High Water Retention Materials" or equivalent materials.
- Areas covered with water-permeable materials are considered as without evaporative cooling effects and are thus excluded from the total water-retentive area.

B. Percentage of ground covered with solar reflective materials

Evaluate effectiveness of solar energy reflected outward based on the percentage of ground covered with materials with high solar reflectance capability.

<Percentage of ground covered with high solar reflectance materials>
= <Area covered with high solar reflectance materials>/<Site area> x 100 (%)

- Evaluate effectiveness of thermal impact reduction based on the use of ground covering materials with high solar reflectance.
- Materials with high solar reflectance are coating materials (JPMS27), water-proofing sheets (KRKS-001), or equivalent materials, as listed in Appendix 4 "High Solar Reflectance Materials."
- Ground covering materials with high solar reflectance used in areas accessible by people and cars (sidewalk, roadway, parkade, parks, rooftop, etc.) have lower reflectance values than those used in inaccessible areas of rooftop (approximately 25-35% lower) in order to minimize solar reflection impacts on people (heat and light).

4) Consider the building cladding materials to reduce thermal impact beyond site

Evaluate thermal impact reduction measures, namely use of effective exterior materials, in individual areas (i.e. roof and walls).

For Item [1], evaluate roof area covered with evaporative cooling materials (e.g. rooftop greenery) or with materials with a high solar reflectance.

- Obtain the percentage area of such materials with respect to the total roof area, using the formula below:

<Percentage of roof area with applicable materials>
= <Percentage of roof area covered with evaporative materials> +
<Percentage of roof area covered with materials with high solar reflectance>

- Each percentage is obtained using the corresponding formula below:

A. Percentage of roof area covered with evaporative materials

- Evaluate effectiveness of thermal impact reduction based on the use of rooftop greenery.
- Obtain the percentage roof area with evaporative materials using the formula below.
- Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine sizes of green area on the roof and horizontal projection area of mid-height/tall trees.

<Percentage of roof covered with evaporative materials>
= <percentage of green-covered area> + 2.0 x <percentage of water-covered area> + 3.0 x <percentage of horizontal projected area of medium and tall trees> + <percentage of water retention area>

- Obtain percentages of green-covered area, water-covered area, horizontal projected area of medium-height and tall trees and water retention area on the rooftop, using the formulae below.

<Percentage of green-covered area> =<Green area>/<Total roof area> x 100 (%)
<Percentage of water-covered area> =<Water surface area>/<Total roof area> x 100 (%)
<Percentage of horizontal projected area of medium-height/tall trees> = <Horizontal projected area of medium-height/tall trees>/<Total roof area> x 100 (%)
<Percentage of water retention area> = <Water retention area>/<Total roof area> x 100 (%)

B. Roof area with high solar reflectance materials

- Evaluate effectiveness of thermal impact reduction based on the use of roof covering materials with high solar reflectance.

<Percentage of roof area covered with high solar reflectance materials>
= <Roof area covered with high solar reflectance materials>/<Total roof area> x 100 (%)

- Materials with a high solar reflectance are coating materials (JPMS27), water-proofing sheets (KRKS-001), or equivalent materials, as listed in Appendix 4 "High Solar Reflectance Materials."
- A high rate of long-wave radiation promotes radiative cooling during the night, thus contributing to A/C load reduction in the evening.

For Item [2], evaluate effectiveness of thermal impact reduction based on the use of green or water-retentive materials for exterior walls.

- Obtain the percentage of applicable areas for the total exterior wall area (including window areas).
- Percentage of the applicable exterior wall area is calculated using the formula below, as described in IV-2. Appropriate Exterior Wall Materials under "Q3.3.2 Improvement of the Thermal Environment on Site." Refer to Appendix 2 "Calculation of Tree Canopy Size and Green Area" to determine the size of green-covered areas on the exterior walls.

<Percentage of exterior wall area with applicable materials>

= (<Green-covered exterior wall area> + <Exterior wall areas with water-retentive materials>)/<Total exterior wall area> x 100 (%)

5) Reduce atmospheric emission of heat from building equipment

For Item [1], evaluate reduction of atmospheric thermal emissions from building service systems based on effective energy use. Effective measures include the following:

- Building thermal load control
  Sun shielding structures (e.g. mid/tall trees, eaves, louvers); control of waste heat from A/C system via insulation reinforcement
- Improved efficiency in the building service system
  Use of an energy-efficient system (e.g. A/C, lighting, ventilation, elevators)
- Natural energy utilization (optimal use of natural energy potential of the surrounding areas)
  Use of natural airflow and daylight
- Untapped energy utilization (optimal use of urban waste heat from surrounding areas)
  Use of waste heat from garbage incineration facility
  Use of seawater, river water, groundwater, etc.
- Introduction of high-efficiency infrastructure
  Regional heating/cooling systems

For overall evaluation of the measures above, apply the score results obtained in the "LR1 Energy" assessment. Award 1 point for a score of 3.0 or higher but lower than 4.0, 2 points for a score of 4.0 or higher but lower than 4.5, and 3 points for a score of 4.5 or higher.

For Item [2], evaluate reduction of atmospheric thermal emissions from A/C external units (i.e. sensible heat emissions) that directly affect air temperature.

- Standard-level measures refer to methods such as maintaining waste heat temperature as low as possible (e.g. effective positioning of A/C exterior units away from intake vents to avoid recirculation of diffused air).
- Advanced-level measures refer to methods that control/reduce sensible heat emission by approximately 80% or more[*1], such as latent heat conversion (e.g. water misting, evaporative cooling[*2], use of river water and sewage water as a heat sink, and waste heat recovery.
- Award 3 points for residential buildings.
- In apartments, establish appropriate points based on points from non-residential and residential sections (i.e. 3 points) using the building's gross floor area ratio.

*1 Examples: absorption chillers, centrifugal chillers, etc.
*2 Include waste heat from both A/C system and power generation system when calculating the rate.

III. Confirmation of effects

6) Use simulations or other means to confirm effects in mitigating deterioration of the heat environment

Evaluate if simulations or similar means are used to confirm the effects of various measures. Evaluate according to the level of the confirmation method used.

(1) Award 1 point if a desktop study (desktop forecast) has been made on the form and layout of the building relative to the wind direction, and the study found that thermal impact beyond the site is being thoroughly reduced.
(2) Award 2 points if numerical simulation of fluid flow, or other methods, were used on the current situation and the planned building, considering topography of the site area, the building and surrounding green space, to predict impact, and the study found that thermal impact beyond the site is being thoroughly reduced.

Append documents and diagrams so that the above effects can be confirmed by a third party.

2.3 Load on Local Infrastructure

2.3.1 Reduction of Rain water Discharge Loads Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
Exclude from assessment if the region concerned has no administrative guidelines for rain water flow suppression.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt	
	If there are administrative guidelines	If there are no administrative guidelines
Level 1	(No corresponding level)	Inapplicable
Level 2	(No corresponding level)	
Level 3	Rain water flow suppression measures are implemented at the instructed scale.	
Level 4	The instructed scale is satisfied, and other rain water treatment measures have been implemented.	
Level 5	(No corresponding level)	

☐**Commentary**
Under this item, evaluate groundwater permeation measures and temporary storage measures, in order to evaluate performance in limiting rain water runoff flow. The assessment of rain flow control measures follows the scale of measures specified in administrative instructions concerning the methods and sizes of countermeasures, which have been set by local authorities with reference to the state of urbanization in the area, and conditions in rivers and sewers. Areas which do not have administrative instructions should be excluded from assessment.
If administrative instructions exist in the region concerning rain water flow suppression measures, award level 3 if the specified scale of measures has been met, and level 4 if he specified scale has been met and further measures have also been implemented (If rain water percolation and similar measures were implemented voluntarily).

2.3.2 Sewage Load Suppression Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	The Water Pollution Control Law, the Sewerage Law or the discharge standards set by local authorities etc., whichever is the most stringent, is satisfied.
Level 4	Discharge standards are satisfied, and further special measures have been used for better control of sewage loads.
Level 5	(No corresponding level)

Note) Emission standards used for this assessment on facilities subject to the Water Pollution Control Law, should be the most stringent, between the values stipulated by the Water Pollution Control Law and by local authority discharge standards. For facilities subject to the Sewerage Law, apply the most stringent, between the values stipulated by the Sewerage Law and by local authority discharge standards.

☐**Commentary**
Award level 3 if the discharge standards of the Water Pollution Control Law, the Sewerage Law or standards specified by local authorities are satisfied. Award level 4 if the discharge standards are satisfied, and special measures or targets have been adopted for more advanced efforts.

■Reference 1) Standards for discharge to public sewers under the Sewerage Law

1. Ordinance standards for the building of exempted facilities
   The standards are stipulated for sewerage water within the following water quality ranges.

Item	Range of standard values stipulated in ordinances
Temperature	Discharges at 45°C or above
pH	5 and below, or 9 and above
n-hexane extracts	
Mineral oils	Discharges exceeding 5 mg/l
Vegetables oils and fats	Discharges exceeding 30 mg/l
Iodine consumption	Discharges at or exceeding 220 mg/l

2. Water quality standards for restriction of sewerage discharge from specific places of business

Item	Standard value
Cadmium	Not exceeding 0.1 mg/l
Cyanide	Not exceeding 1 mg/l
Organophosphate	Not exceeding 1 mg/l
Lead	Not exceeding 0.1 mg/l
Hexavalent chromium	Not exceeding 0.5 mg/l
Arsenic	Not exceeding 0.1 mg/l
Total mercury	Not exceeding 0.005 mg/l
Alkyl mercury	Must not be detected
PCB	Not exceeding 0.003 mg/l
Trichloroethylene	Not exceeding 0.3 mg/l
Tetrachloroethylene	Not exceeding 0.1 mg/l
Dichloromethane	Not exceeding 0.2 mg/l
Carbon tetrachloride	Not exceeding 0.02 mg/l
1,2-dichloroethane	Not exceeding 0.04 mg/l
1,1-dichloroethylene	Not exceeding 1 mg/l
Cis-1,2-dichloroethylene	Not exceeding 0.4 mg/l
1,1,1-trichloroethane	Not exceeding 3 mg/l
1,1,2-trichloroethane	Not exceeding 0.06 mg/l
1,3-dichloropropene	Not exceeding 0.02 mg/l
Thiuram	Not exceeding 0.06 mg/l
Simazine	Not exceeding 0.03 mg/l
Thiobencarb	Not exceeding 0.2 mg/l
Benzene	Not exceeding 0.1 mg/l
Selenium	Not exceeding 0.1 mg/l
Phenols	Not exceeding 5 mg/l
Copper	Not exceeding 3 mg/l
Zinc	Not exceeding 2 mg/l
Soluble iron	Not exceeding 10 mg/l
Soluble manganese	Not exceeding 10 mg/l
Chromium	Not exceeding 2 mg/l
Fluorine (non-marine area)	Not exceeding 8 mg/l
(marine area)	Not exceeding 15 mg/l
Boron (non-marine area)	Not exceeding 10 mg/l
(marine area)	Not exceeding 230 mg/l
Dioxins	Not exceeding 10 pg-TEQ/l

3. Ordinance standards which stipulate water quality standards for restriction of sewerage discharge from specific places of business
Standards are set by ordinances for the following items. The standards are more lax than the figures below.

Substance	Range of standard values stipulated in ordinances	Range of standard values stipulated in ordinances
PH BOD SS n-hexane extracts Mineral oils Vegetables oils and fats	Exceeding 5, less than 9 Less than 600 mg/l Less than 600 mg/l Not exceeding 5 mg/l Not exceeding 30 mg/l	
Ammoniac nitrogen Nitrite nitrogen and nitrate nitrogen	Less than 380 mg/l	If discharge standards are set under ordinances applicable to the water discharged from the sewer concerned, take 3.8 times the discharged water standard value.
Nitrogen Phosphorous	Less than 240 mg/l Less than 32 mg/l	If discharge standards are set under ordinances applicable to the water discharged from the sewer concerned, take 2 times the discharged water standard value.

Administrative ordinances for the Sewerage Law
(Ordinance No.147, 22nd April 1959, final revision ordinance No. 27, 8th February 2002)

2.3.3 Traffic Load Control

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	0 points in the table of the efforts to be evaluated.
Level 2	1 point in the table of the efforts to be evaluated.
Level 3	2 points in the table of the efforts to be evaluated.
Level 4	3 points in the table of the efforts to be evaluated.
Level 5	4 points or more in the table of the efforts to be evaluated.

Efforts to be evaluated

Assessment Item	Description	Point
I. Efforts related to use of bicycles (use of alternative means of transport)	(1) Provision of an appropriate number of cycle parking spaces (including motorcycle spaces) for building users, and consideration for the convenience of cycle park users (ease of entry and egress, placement in a convenient location, etc.).	1
	(2) Other (state content)	1
II .Efforts to provide car parking space	(1) Provision of an appropriate number of car parking spaces (as a measure to avoid parking on roads, and congestion of nearby roads).	1
	(2) Provision of parking facilities for unloading goods vehicles (residential buildings are not applicable).	1
	(3) Consideration of the position, form and number of parking lot approach roads (entry and exit) (to contribute to relieving congestion of local roads).	1
	(4) Other (state content)	1

☐ **Commentary**

Evaluate the content of efforts made to control traffic loads (congestion etc.) caused by automobile traffic generated by the building's operation.

I. Efforts related to use of bicycles (use of alternative means of transport)

Under (1), evaluate measures to encourage use of bicycles, as a means of restricting the use of cars by building users.

Under (2), evaluate efforts other than those for bicycles, such as creation of new circulating bus routes.

<Examples of efforts>

- Bicycle station in an office district

The facility offers amenities to bicycle commuters (e.g. parking space, showers, lockers)

(Image provided by Fun Ride Station/Run Station)

II. Efforts to provide car parking space.

Under (1), evaluate the provision of appropriate numbers of parking spaces, to avoid building users parking on roads outside the site.

Under (2), evaluate the provision of appropriate numbers of car parking spaces for service vehicles involved in the operation of the building (maintenance and service vehicles, delivery and pickup vehicles, package delivery vehicles, garbage collection vehicles, etc.) to avoid parking outside the site for service visits.

Under (3), evaluate efforts to facilitate smooth vehicle movement in and out of the building parking lots, avoiding vehicle congestion around the entrances and exits.

2.3.4 Waste Treatment Loads

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	1 point or less in the table of the efforts to be evaluated.
Level 2	2 points in the table of the efforts to be evaluated.
Level 3	3 points in the table of the efforts to be evaluated.
Level 4	4 points in the table of the efforts to be evaluated.
Level 5	5 points or more in the table of the efforts to be evaluated.

Efforts to be evaluated

Assessment Item	Description	Point
I. Estimation of types and quantities of waste	(1) The types and quantities of waste generated on the site (interior and exterior) on a day-to-day basis have been estimated to assist in planning measures to reduce the waste processing load.	1
II. Provision of space and equipment to encourage separate collection	(2) Interior and exterior stock space has been planned that will allow sorted collection of many varieties of waste.	1
	(3) Interior and exterior waste sorting and collection containers and boxes have been planned.	1
	(4) Planned collection of valuable materials has been planned (group collections, etc.).	1
III. Installation of equipment for waste reduction, compaction or composting	(5) Measures are planned to reduce, compact and compost organic garbage (home processing and composting etc. of organic waste).	1
	(6) Reduction and compaction of bottles, cans etc. are planned.	1

☐Commentary

Evaluate efforts to reduce the generation of waste when the building is in operation, and to sort, reduce and compact that waste.

I. Estimation of types and quantities of waste
(1) It is important to keep track of the actual garbage output situation and manage it in order to reduce the amount of waste output from inside the building. Evaluate whether the types and quantities of waste produced on a day-to-day basis have been investigated and identified.

II. Provision of space and equipment to encourage separate collection
(2) Various types and quantities of waste are generated inside the building. Evaluate provision of adequate space for proper sorting and stocking under (2), provision of containers, boxes, racks etc. for sorting and stocking under (3), and planning for regular planned collections for valuable materials under (4).

III. Installation of equipment for waste reduction, compaction or composting
(5) For organic waste generated in the course of building operation, evaluate planning for reduction, compaction and composting by disposers composters and similar equipment.
(6) For bottles, cans and other non-organic wastes, evaluate planning for equipment to reduce and compact waste.

3. Consideration of Surrounding Environment

3.1 Noise, Vibration & Odor

3.1.1 Noise

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

The assessment is carried out regarding buildings that have designated facilities regulated within the designated area under the Noise Regulation Law and buildings subject to the regulation under the Large-Scale Retail Stores Location Law. All other buildings are considered as level 3.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Noise level exceeds the current regulation standard*1 specified under the Noise Regulation Law or the Large-Scale Retail Stores Location Law.
Level 2	(No corresponding level)
Level 3	Noise level is at or below the current regulation standard*1 specified under the Noise Regulation Law or the Large-Scale Retail Stores Location Law.
Level 4	(No corresponding level)
Level 5	Noise level is significantly below*2 the current regulation standard*1 specified under the Noise Regulation Law or the Large-Scale Retail Stores Location Law.

*1 Take the current values of the regulation standard, and evaluate facilities accordingly, even if they were installed before the current values came into effect (evaluate for day, morning, evening and night).

*2 Level 5 applies to noise level at or below [current standard value -10 dB] throughout the day.

☐**Commentary**

The assessment item in this section covers buildings that have designated facilities subject to the regulation within the designated area under the Noise Regulation Law (■see Reference 2) and buildings subject to the regulation under the Large-Scale Retail Stores Location Law. All other buildings shall be uniformly rated as Level 3. If, however, more active measures have been used in buildings other than the above, they may be evaluated according to their level. When using CASBEE for Construction (New Construction), it is sufficient to evaluate according to the design specification. However, a condition of assessment is that the standards must be satisfied for all the measurement times stipulated in the Noise Regulation Law and the Large-Scale Retail Stores Location Law, namely day (8am - 7pm), morning and evening (6am - 8am, 7pm - 10pm) and night (10pm - 6am).

When rating as Level 5, evidence indicating that the level of noise is substantially below the current regulation standard (less than 10 dB) must be provided for the third-party inspection.

■Reference 1) Standard noise levels specified under the Noise Regulation Law

Zone categories and standards are applied according to those stipulated by corresponding Prefectural governors. Level 3 in the following examples is set at the noise regulation level for factories and designated workshops under the Tokyo metropolitan government environmental quality standards.

(1) Type 1 zones (Dedicated type 1 low-rise residential zone, Dedicated type 2 low-rise residential zone, AA zone, etc.)

Zones in which it is particularly important to preserve tranquility, for the sake of maintaining a good residential environment.

	Day	Morning and evening	Night
Level 1	Not adequate for level 3.	Not adequate for level 3.	Not adequate for level 3.
Level 2			
Level 3	Not exceeding 45 dB	Not exceeding 40 dB	Not exceeding 40 dB
Level 4			
Level 5	Not exceeding 35 dB	Not exceeding 30 dB	Not exceeding 30 dB

(2) Type 2 zones (Dedicated type 1 medium-and-high-rise residential zone, Dedicated type 2 medium-and-high-rise residential zone, Type 1 residential zone, Type 2 residential zone, quasi-residential zone, etc.)

Zones in which tranquility must be preserved because the land was provided for residential use.

	Day	Morning and evening	Night
Level 1	Not adequate for level 3.	Not adequate for level 3.	Not adequate for level 3.
Level 2			
Level 3	Not exceeding 50 dB	Not exceeding 45 dB	Not exceeding 45 dB
Level 4			
Level 5	Not exceeding 40 dB	Not exceeding 35 dB	Not exceeding 35 dB

(3) Type 3 zones (adjacent commercial zones, commercial zones, quasi-industrial zones, etc.)

Zones provided for commercial, industrial and other use, as well as for residential use, in which it is important to prevent noise, to secure the living environment for local residents.

	Day	Morning and evening	Night
Level 1	Not adequate for level 3.	Not adequate for level 3.	Not adequate for level 3.
Level 2			
Level 3	Not exceeding 60 dB	Not exceeding 55 dB	Not exceeding 50 dB
Level 4			
Level 5	Not exceeding 50 dB	Not exceeding 45 dB	Not exceeding 40 dB

[4] Type 4 zones (industrial zones, etc.)
Zones in which extreme noise must be prevented, to avoid degrading the living environment for local residents.

	Day	Morning and evening	Night
Level 1	Not adequate for level 3.	Not adequate for level 3.	Not adequate for level 3.
Level 2			
Level 3	Not exceeding 70 dB	Not exceeding 60 dB	Not exceeding 55 dB
Level 4			
Level 5	Not exceeding 60 dB	Not exceeding 50 dB	Not exceeding 45 dB

■ Reference 2) Facilities subject to regulation under the Noise Regulation Law
The designated facilities under the Noise Regulation Law, which are subject to quantitative assessment under this item, are stated below.

1. Metal machining machinery a. Rolling equipment (limited to that with power plant rated output of 22.5 kW or more). b. Pipe-making machinery c. Bending machines (limited to roller-type machines with rated motor output of 3.75 kW or more). d. Hydraulic presses (excluding correction presses). e. Mechanical presses (limited to those with nominal press capacity of at least 294 kN). f. Shear cutters (limited those with rated motor output of 3.75 kW or more). g. Forging machines h. Wire forming machines i. Blasting equipment (other than {ton?} blasting equipment, and excluding sealed types). j. Tumblers k. Cutters (only those using grind wheels).
2. Pneumatic compressors and blowers (limited those with rated motor output of 7.5 kW or more).
3. Stone or ore crushers, grinders, sieving and grading equipment (limited those with rated motor output of 7.5 kW or more).
4. Looms (only those with motors)
5. Construction material manufacturing machinery a. Concrete plant (excluding aerated concrete plants, and limited to those with mixer mixing capacity of at least 0.45 m^3). b. Asphalt plants (limited to those with mixer mixing weight of at least 200 kg)
6. Grain milling machines (limited to roller-type machines with motor rated output of 7.5 kW or more).
7. Timber cutting machinery a. Drum barkers b. Chippers (limited those with motor rated output of 2.25 kW or more). c. Wood grinders d. Belt saws (used for cutting lumber, with rated motor output of at least 15 kW, or for carpentry, with rated motor output of at least 2.25 kW). e. Circular saws (used for cutting lumber, with rated motor output of at least 15 kW, or for carpentry, with rated motor output of at least 2.25 kW). f. Planers (limited those with rated motor output of 2.25 kW or more).
8. Paper machines
9. Printing presses (only those with motors).
10. Plastic injection molding machinery
11. Casting foundry equipment (only jolt-type equipment).

■ Reference 3) Examples of noise prevention measures

Content							Acoustical insulation effect
Physical methods	Technical measures against sound sources	The source of the sound must be removed	Prevention of direct pressure variation	Prevention of vortices, flow disturbances, explosions etc.			Estimate on the basis of experience and experiments etc.
			Reduction of object vibration	Reduction of agitative force		Eliminate impact, collision, friction and imbalance. Put in balance.	〃
				Vibration isolation		Place anti-vibration devices between the vibrating body and the stationary body to put the vibration transfer rate below 1.	〃
				Damping processes		Paint or affix damping materials to raise the loss coefficient to 5% or more. Use anti-vibration steel plates.	Estimate on the basis of experiments normally at around 10 dB.
	Transmission reduction	Reduction of the transmission of sound that has been generated	Reduction of sound transmission	Sound absorption treatment		Apply sound absorbent material to locations struck by sound to give the necessary absorption rate.	Determined bydesign
				Acoustic isolation	Sealed type	Surround the sound source with materials having the necessary transmission losses (covers, hoods, structures).	〃
					Partial	Erect barriers (walls, building) sound reduction index of at least 10 dB from the source volume.	〃 25 dB is the limit.
					Open type	Attach mufflers along the sound route with the necessary sound reduction index.	Determined by design
			Use of phenomena which reduce sound transmission	Distance attenuation		Move the sound source as far as possible away from the problem point.	0-6 dB double distance
				Attenuation by directionality		Do not orient directions of strong sound radiation towards the problem point.	Normally around 10 dB
				Attenuation by absorption in air		Effective with long distances and high-frequency sources.	0.6 dB/100 m (at 1 kHz) Around 5 dB/100 m (at 8 kHz)
				Attenuation by air temperature and wind		Place the sound source downwind.	Differs with wind speed and air temperature distribution
				Attenuation by absorption in ground surfaces		Make the ground surface sound absorbent.	0.7 dB/10 m for grass 30 cm high (at 1 kHz)
				Attenuation by trees		A row of trees will have no effect.	Around 10 dB/50 m for trees with high leaf density
Sensory methods	Masking			Generate a noise to mask the offending noise. Effective against low noise levels.			
Psychological methods	Greetings, compensation etc.			Consider psychology in dealing with the situations of the offended and offending parties.			

■Bibliography 56)

3.1.2 Vibration

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

The assessment is carried out regarding buildings that have designated facilities regulated within the designated area under the Vibration Regulation Law. All other buildings are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Vibration level exceeds the current regulation standard*1 specified under the Vibration Regulation Law.
Level 2	(No corresponding level)
Level 3	Vibration level is at or below the current regulation standard*1 specified under the Vibration Regulation Law.
Level 4	(No corresponding level)
Level 5	Vibration level is significantly below*2 the current regulation standard*1 specified under the Vibration Regulation Law.

*1 Take the current values of the regulation standard, and evaluate facilities accordingly, even if they were installed before the current values came into effect (evaluate for both day and night).

*2 For level 5, vibration should be limited to below [current standard value -5 dB] (for both day and night).

☐**Commentary**

For this item, evaluate the impact of vibration generated within the site on adjacent sites and the surrounding area.

The assessment item in this section covers buildings that have designated facilities subject to the regulation within the designated area under the Vibration Regulation Law (see Reference 2). All other buildings are excluded from the assessment.

When using CASBEE for Building (New Construction), it is sufficient to evaluate according to the design specification. However, a condition of assessment is that the standards must be satisfied for all the measurement times stipulated in the Vibration Regulation Law and the Large-Scale Retail Stores Location Law, namely day (8am - 7pm), morning and evening (6am - 8am, 7pm - 10pm) and night (10pm - 6am).

When rating as Level 5, evidence indicating that the level of vibration is substantially below the current regulation standard (less than 5 dB) must be provided for the third-party inspection.

■Reference 1) Standard Values from the Vibration Regulation Law

The following are standard values for each zone type under the Vibration Regulation Law. Follow zone categories and standards stipulated by the Prefectural governor. The following examples take the vibration regulation standard for factories and designated workshops under Tokyo municipal environmental standards ordinances as level 3.

(1) Type 1 zones (type 1 low-rise residential exclusive zone, type 2 low-rise residential exclusive zone, AA zone, type 1 medium-to-high-rise residential exclusive zone, type 2 medium-to-high-rise residential exclusive zone, type 1 residential zone, type 2 residential zone, sub-residential zone and unspecified zone)
- Zones in which it is particularly important to preserve tranquility, for the sake of maintaining a good residential environment

	Day	Night
Level 1	Not adequatefor level 3.	Not adequatefor level 3.
Level 2		
Level 3	Not exceeding 60 dB	Not exceeding 55 dB
Level 4		
Level 5	Not exceeding 55 dB	Not exceeding 50 dB

(2) Type 2 zones (adjacent commercial zones, commercial zones, quasi-industrial zones, industrial zones, etc).
- Zones provided for residential, commercial, industrial and other use.
- Zones which are mainly provided for industrial and similar use, in which the residents' living environment is conserved.

	Day	Night
Level 1	Not adequatefor level 3.	Not adequatefor level 3.
Level 2		
Level 3	Not exceeding 65 dB	Not exceeding 60 dB
Level 4		
Level 5	Not exceeding 60 dB	Not exceeding 55 dB

■ Reference 2) Designated facilities under the Vibration Regulation Law

1. Metal machining machinery a. Hydraulic presses (excluding correction presses). b. Mechanical presses c. Shear cutters (limited to those with rated motor output of 1 kW or more). d. Forging machines e. Wire forming machines (limited those with motor rated output of 37.5 kW or more).
2. Compressors (limited to those with motor rated output of 7.5 kW or more)
3. Stone or ore crushers, grinders, sieving and grading equipment (limited to those with power plant rated output of 7.5 kW or more).
4. Looms (only those with motors).
5. Concrete block machines (limited to those with power plant rated output of 2.95 kW or more), concrete pipe manufacturing machinery, and concrete column manufacturing machinery (limited to those with power plant rated output of 10 kW or more).
6. Timber cutting machinery a. Drum barkers b. Chippers (limited those with motor rated output of 2.2 kW or more).
7. Printing presses (limited those with motor rated output of 2.2 kW or more).
8. Rollers for rubber mixing and plastic mixing (limited to those other than calendar rollers having motor rated output of 30 kW or more).
9. Plastic injection molding machinery
10. Casting foundry equipment (only jolt-type equipment).

3.1.3 Odor

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Evaluate buildings within the regulated areas as specified under the Offensive Odor Control Law and buildings in which designated malodorous substances are handled. Buildings in which such substances are not handled are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	Odor level is below the allowable limit for odor index, and for the concentrations of currently designated malodorous substances under the Offensive Odor Control Law.
Level 2	(No corresponding level)
Level 3	Odor level satisfies the allowable limit for odor index, and for the concentrations of currently designated malodorous substances under the Offensive Odor Control Law.
Level 4	(No corresponding level)
Level 5	(No corresponding level)

☐**Commentary**

For this item, evaluate whether the allowable limit values under the Offensive Odor Control Law are satisfied.

For CASBEE for Building (New Construction), evaluate whether the design specification has the performance necessary to adequately clear standard values under the Offensive Odor Control Law. As it is difficult to set threshold values for odor below the regulation value, the scoring criterion for the time being is to evaluate at level 1 or 3.

Assessment under this item covers buildings in zones regulated under the Offensive Odor Control Law, which handle designated malodorous substances. All other buildings are excluded.

■Reference 1) Regulation standards under the Offensive Odor Control Law

The regulation standard is set under article 2, table 1 of the Enforcement Regulations to the Offensive Odor Control Law, and elsewhere, but Prefectural governors can classify regulated zones as necessary, based on their natural and social conditions, and set regulation standards for each type of designated malodorous substance. Follow the standard values set for each zone when evaluating.

	Site boundary line	Chimney or other gas outlet					Discharged water
		Outlet height less than 15 m			Outlet height 15 m or more		
		Outlet diameter less than 0.6 m	Outlet diameter 0.6 m or more, but less than 0.9 m	Outlet diameter 0.9 m or more	Outlet height is less than 2.5 times the height of the tallest nearby building	Outlet height is at least 2.5 times the height of the tallest nearby building	
Type 1 Zone	Odor index 10	Odor index 31	Odor index 25	Odor index 22	qt=275 x H_0^2	qt= 357/Fmax	Odor index 26
Type 2 zone	Odor index 12	Odor index 33	Odor index 27	Odor index 24	qt=436 x H_0^2	qt = 566/Fmax	Odor index 28
Type 3 zone	Odor index 13	Odor index 35	Odor index 30	Odor index 27	qt=549 x H_0^2	qt= 712/Fmax	Odor index 29

Enforced from July 1, 2002

Note)
1) Odor index is the common logarithm for the odor concentration (the number of times the odor in the air would have to be diluted before becoming imperceptible, found using the triangle odor bag method), multiplied by ten. (Odor index = 10 x log odor concentration)
2) qt indicates the odor discharge intensity of the gas emission (unit: m^3N/min).
qt=(odor concentration) x (dry weight of gas emission)
3) H_0 is the actual height of the outlet (unit: m).
4) Fmax is the maximum value of ground level odor concentration per unit odor emission intensity (in sec/m^3N), calculated by the method stipulated in article six, clause 2-1 of the Enforcement Regulations to the Offensive Odor Control Law.
5) The largest nearby building is the tallest of the buildings within a distance equal to ten times the building's height from the outlet within the site of the place of business concerned.

3.2 Wind/Sand Damage & Daylight Obstruction

3.2.1 Restriction of Wind Damage

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition
In the absence of a mandate based on law, regulation of administrative instruction, or of demands from the local area, building which apply no particular measures should be awarded level 3.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	No preliminary study or was performed about the creation of strong wind spots*1 and no countermeasures*2 were taken against wind hazard.
Level 2	A preliminary study has been performed and measures taken to avoid or reduce wind hazard, but there has been no assessment. Alternatively, wind strength grade has been evaluated on the basis of a desktop forecast*3, and wind strength has been worsened in some areas, or there are measurement points at which the wind environment rank for the sight has been lowered.
Level 3	A preliminary study has been performed and measures taken to avoid or reduce wind hazard*4. Then, the wind strength grade has been evaluated on the basis of a desktop forecast*3, and the results show that wind strength has not worsened. Alternatively, rank assessment has been performed on the basis of wind environment assessment indices*5, and the results indicate that a wind environment with suitable rank for the location has been achieved.
Level 4	A preliminary study or prevention planning has been performed and measures taken to avoid or reduce wind hazard, followed by a rank assessment*5 has been performed on the basis of wind environment assessment indices. Results indicate that the wind environment in some parts is better than usual for the location.
Level 5	A preliminary study or prevention planning has been performed and measures taken to avoid or reduce wind hazard, followed by a rank assessment*5 has been performed on the basis of wind environment assessment indices. Results indicate that the wind environment is better than usual for the location.

*1 Preliminary study: See Reference 1
*2 Wind hazard reduction measures: See Reference 1
*3 Desktop forecast: See Reference 2
*4 Prevention plan and reduction and avoidance countermeasures: See Reference 1
*5 Rank assessment on the basis of wind environment assessment indices: See Reference 3

☐Commentary
Under this item, evaluate measures against wind hazard. When evaluating, append the following documents, to allow a third party to confirm the content of the measures.

<Supporting documents>
- Wind environment data, such as wind directions, speeds, and prevailing winds, based on the preliminary study.
- Assessment documents using wind strength grades, based on the desktop forecast.
- Rank assessment documents, based on the wind environment assessment indices.

As Reference 1 shows, the wind hazard control process generally works through a preliminary study, wind hazard control countermeasures and wind hazard assessment, but for this item, evaluate whether there was a preliminary study, whether there was a preventive plan addressing building layout and form, whether reduction and avoidance measures such as tree planting and windbreak fences were used, whether there was an assessment, and its accuracy, and results for the level of impact from strong wind (ranking by wind strength grade or wind environment assessment indices).

■Reference 1) Wind Hazard Control Process

Item	Content
I. Preliminary study	Identify aspects of the wind environment, such as wind speed, wind direction and prevailing winds to predict wind hazard. Existing data, such local meteorological data and regional meteorological observation data (AMEDAS data) are generally used. To improve accuracy, take on-site measurements and use a wide-area atmospheric environment forecasting system based on wide-area meteorological data and topographic data.
II. Wind hazard control countermeasures	(1) Prevention plan using building layout and form The prevention plan using building layout and form is a plan for making a broad assessment at the initial design stage, as a planned way of preemptively preventing the generation of wind hazards. It follows a process of examining wind directions and speeds on the site and studying various alternative proposals for the building layout and form. It is very important, because it can prevent potential wind hazards, and is the starting point for countermeasures. (2) Reduction and avoidance countermeasures using tree planting, windbreak fences, etc. These are countermeasures to reduce or avoid wind hazards generated by the building through the use of tree planting, windbreak fences, eaves, arcades and similar elements. Predictions and assessments for studying (1) and (2) use predictive methods such as desktop forecasting, numerical fluid flow simulation and wind tunnel tests, and assessment methods such as using wind strength grades and wind environment assessment indices.
III. Assessment of wind hazard	(1) Assessment using wind strength grade Assessment using wind strength grade evaluates the impact of wind strength from the usual main wind directions on the site. It is less accurate than assessment using wind environment assessment indices. Wind strength grades use the Meteorological Agency Beaufort Scale. (2) Rank assessment using the wind environment assessment indices Assessment using the wind environment assessment indices predicts the impact of strong wind from 16 directions, analyzing the incidence of strong winds. It is more accurate than assessment using wind strength grade. There are the following wind environment assessment indices. - The assessment yardstick based on wind environment assessment index produced by Murakami et al. - The assessment yardstick produced by the Wind Engineering Institute. Assessment using wind environment assessment indices requires topography of the area around the site, the current state of buildings and green space, and numerical fluid simulations and wind tunnel tests for the planned building, to produce a forecast assessment.

■Reference 2) Desktop forecast method

1. Ascertain the meteorological situation.
   [1] Calculate the incidence for each wind direction and wind strength grade
      Find the annual number of occurrences for each wind direction, and identify characteristics of the region, such as prevailing wind.

[2] Calculate annual average wind speed for each wind direction
Find the average wind speed for each wind direction in the area, and identify what strength of wind blows.

2. Selection of the forecast wind direction

[1] Deciding the forecast wind direction
Identify the wind direction that causes the highest incidence (select the wind direction for which building wind impact occurs most often)

3. Forecast

[1] Select applicable data from standard model experiment results which correspond to the shape of the targeted building

[2] Create a zone chart indicating wind increases for each forecasted wind direction

4. Assessment

(Note that assessment using desktop forecasting judges the amount of change caused by changes of wind speed at a given location, it does not produce absolute assessments).

(1) Forecast results are collated in the table below

Forecast wind direction	Before construction		After construction		
	Convert to wind speed at 10 m above ground (a)	Beaufort wind strength grade	Rate of increase (b)	Wind speed (a) x (b)	Beaufort wind strength grade
North (example)	1.2		1.3 (example)		
NNW (example)					
South (example)					

(2) Evaluate by comparing wind strength grades before and after construction

If the rate of wind speed increase between before and after construction is around 1.1-1.2, the range of change is likely to fall within the same Beaufort scale grade, so evaluate increase rates of 1.3 or more. Also, according to Penwarden, a wind strength grade of 5 represents "the allowable limit on land," so it is necessary to make sure wind strength does not exceed that grade.

■Reference 3) Rank assessment using wind environment assessment index

Rank assessment using wind environment assessment index judges whether a building plan will cause wind impact. It starts with a preliminary study to investigate wind directions, speeds and incidence rates, and then uses either "The assessment yardstick based on wind environment assessment index by Murakami et al." or "The assessment yardstick by the Wind Engineering Institute" for the assessment. Either one defines relationships between wind speeds and incidences, tailored to the site. The former categorizes subjects as rank 1 - unranked and the latter uses Range A to Range D.

Once the category (rank or range) corresponding to the location of the assessment subject has been confirmed, the next step is to check which category (rank or range) the wind speed and incidence belongs to, and evaluate according to the result. If the result is lower than the category (rank or range) corresponding to the location, which means the wind speed has got substantially worse, award level 2. Award level 3 it is the same as the category for the location, and level 4 or level 5 if it is better (meaning the environment is good, with a reduced wind speed).

1. The assessment yardstick based on wind environment assessment index produced by Murakami et al.

The subject is categorized into ranks 1-3 according to the purpose the space is used for, in order of increasing vulnerability to wind impact, and peak daily gust speeds of 10 m/sec, 15 m/sec and 20 m/sec are used as the evaluated levels of strong winds, to give the probability of the allowable wind speed being exceeded by each combination. (See the table below).

For example, in a residential district, which is a rank 2 application, it is permissible for the daily gusts to exceed 10 m/sec on 22% of days (approximately 80 days per year). Even if the incidence of peak daily gust speed exceeding 10 m/sec is below 22%, the situation is still unacceptable if 15 m/sec is exceeded for 3.6% or more of days (approximately 13 days per year) Thus, each rank has three allowable incidence rates, and if even one of those is not satisfied, the situation is unsuitable for the rank.

The incidence of wind speeds (probability of a speed being exceeded) can be calculated using a Weibull distribution formula. In this case, the Weibull coefficient is based on not the average wind speed but the peak daily gust speed. if the peak daily gust speed is not obtained, the gust factor can be used to convert to the peak daily gust speed as a yardstick for the assessment, but in that case the Weibull coefficient based on the peak daily gust speed is used to calculate the excess wind probability. The gust factor value used is in the range 1.5 to 3.0, based on the surroundings of the site, specifically whether it is a built-up area and near to high-rise buildings. The common range for a built-up area is between 2.0 and 2.5.

For details, refer to "New Knowledge of Building Winds," edited by the Wind Engineering Institute and published by Kajima Institute Publishing.

Degree of strong wind impact		Examples of corresponding uses of space	Permissible strong wind level and permissible incidence of gusts surpassing that level		
			Peak daily gust speed (m/s)		
			10	15	20
			Peak daily average speed (m/s)		
			10/G.F.	15/G.F.	20/G.F.
Rank 1	Places with applications most easily affected by wind	-Shopping street in residential area -Outdoor restaurant	10% (37 days)	0.9% (3 days)	0.08% (0.3 days)
Rank 2	Places with applications easily affected by wind	-Parks -Residential areas	22% (80 days)	3.6% (13 days)	0.6% (2 days)
Rank 3	Places with applications less likely to be affected by wind	-Office district	35% (128 days)	7% (26 days)	1.5% (5 days)
Unranked	Wind environment in excess of rank 3		-		

Source: "Knowledge of Building Winds - New Edition," edited by the Wind Engineering Institute and published by Kajima Institute Publishing.

■Bibliography 53)

Note 1) Peak daily gust speed: Assessment time 2-3s. Peak daily average speed: Average wind speed over ten minutes. The wind speeds defined here are at 1.5 m above ground level.
Note 2) Peak daily gust speed
- 10 m/s: Garbage flies in the wind. Laundry is blown down.
- 15 m/s: Freestanding street signs and bicycles, etc. blow over. Difficult to walk
- 20 m/s: Phenomena such as people close to being blown away are certain to occur.
Note 3) G.F.: Gust factor (1.5 m above ground, assessment duration 2-3s).
- Dense urban districts: 2.5-3.0 (Wind disturbance is strong, but average speed is not high)
- Normal urban district: 2.0-2.5
- Places of particularly high wind speed: 1.5-2.0 (areas of increased wind near high-rise buildings, etc.)
Note 4) How to use this table
E.g. In a rank 1 application, the wind environment is permissible if the incidence of daily peak gusts above 10 m/s does not exceed 10% (approximately 37 days per year).

2. The assessment yardstick produced by the Wind Engineering Institute
Rather than calculating cumulative incidence for all wind speeds, find the wind speed corresponding to cumulative incidence values of 55% and 95%.
Use the table below to determine the index wind speed for each area. The wind speed with a cumulative incidence of 55% is the average wind speed in each wind environment, and the wind speed with a cumulative incidence of 95% is largely equivalent to the annual average value of daily peak wind speed (a relatively high wind speed that blows around once a week). If this assessment

method is used, the subject is reduced to the next range if either of the assessment index wind speeds is not satisfied. That means that if the 55% cumulative incidence wind speed is 1.7 m/sec, and the 95% cumulative incidence wind speed is 4.5 m/sec, the wind environment of that place would be evaluated as range C.

Cumulative incidence means the incidence of a given wind speed, added to the incidences of all lower wind speeds.

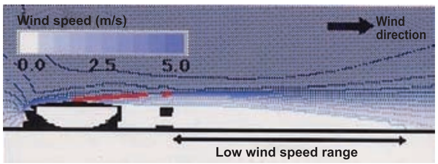
Assessment height: 5 m above ground

		Wind speed with 55% cumulative incidence	Wind speed with 95% cumulative incidence
Range A	Equivalent to residential district	≦1.2m/s	≦2.9m/s
Range B	Equivalent to low and medium-rise built-up area	≦1.8m/s	≦4.3m/s
Range C	Equivalent to medium and high-rise built-up area	≦2.3m/s	≦5.6m/s
Range D	Equivalent to area of strong wind	> 2.3m/s	> 5.6m/s

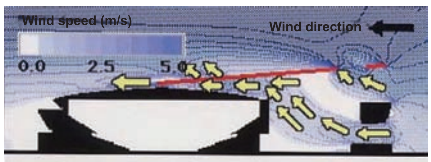
Notes) Range A: Wind environment seen in residential districts
Range B: Wind environment seen in districts in between ranges A and C
Range C: Wind environment seen in office districts
Range D: Undesirable wind environment

■Bibliography 57)

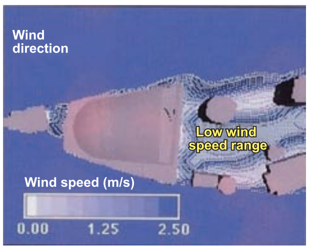
■Reference 4) Conduct a preliminary survey of wind sped and direction and related factors in the area
<Saitama Super Arena>
The building roof configuration and its plan form were determined on the basis of the results of a wide-area atmospheric simulation, as countermeasures against the north wind, which is the prevailing wind in winter. The wind from the sea in summer is deliberately drawn in through the front opening of the arena, to vent through the opening on the north side, making efficient use of natural airflow and securing pleasant airflow through the streets of the area.



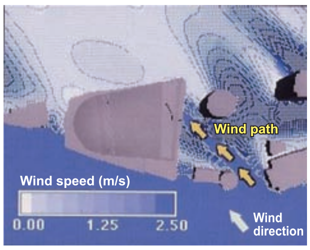
Results of analysis of wind conditions due to prevailing winter wind (cross section)



Results of analysis of wind conditions due to prevailing summer winds (cross section)



Results of analysis of wind conditions due to prevailing winter wind (plan)



Results of analysis of wind conditions due to prevailing summer winds (plan)

Saitama Super Arena
Design: MAS2000 Design Team(Leader: Nikken Sekkei)
In association with: Ellerbe Becket, Flack+Kurtz Consulting Engineers
Technical cooperation: Taisei Corporation(Documentation provided by Taisei Corporation)

■Bibliography 57), 58)

3.2.2 Sand and Dust

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Evaluate schools (elementary/junior high/high schools) with a schoolyard. In cases where no other buildings (residential or otherwise) are in the school's surrounding area, award level 3 as dust pollution is not expected to affect living conditions.

Building type	Sch (Elementary/Junior High/High Schools)
Level 1	(0 points)
Level 2	Insufficient level of measures for schoolyard dust control are established. (1 point)
Level 3	Standard level of measures for schoolyard dust control are established. (2 points)
Level 4	More than sufficient level of measures for schoolyard dust control are established. (3 points)
Level 5	A high level of measures for schoolyard dust control are established. (4 points or higher)

Efforts to be evaluated

Assessment Item	Description	Point
I. Measures to control airborne dispersion of dust from schoolyard	(1) Dust shield trees or nets surrounding the school perimeter.	1
	(2) Structures surrounding the school perimeter.	2
II. Dust-proofing measures for schoolyard surface	(1) Sprinkler system	1
	(2) Dust-proof paving	2
	(3) Dust-proof paving/lawn covering	4

☐**Commentary**

Evaluate elementary/junior high/high schools with a schoolyard in terms of dust control measures (anti-dust generation/dispersion) at the newly-constructed stage or when dust control measures are planned and established after completion of construction.

3.2.3 Restriction of Daylight Obstruction

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

! Application condition

Evaluate level 3 if there are no shade regulations in the region.

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Shade regulations are satisfied, or there are no shade regulations applicable to the site.
Level 4	A standard one rank* above the shade regulations is satisfied.
Level 5	(No corresponding level)

☐**Commentary**

Under this item, evaluate measures against daylight obstruction.

* "One rank above" for daylight obstruction means that, for example, in an area where the shade regulation limits shade on adjacent commercial areas to 5 hours/3 hours (at 5 m, 10 m), the next higher standard is for residential areas, set at 4/2.5 hours.
  If the strictest level or regulation is already applied, one rank above should be taken to mean one hour/0.5 hours (5 m, 10 m) higher than the regulation standard.

3.3 Light Pollution

3.3.1 Outdoor Illumination and Light that Spills from Interiors

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt
Level 1	0 points in the table of the efforts to be evaluated.
Level 2	1 point in the table of the efforts to be evaluated.
Level 3	2 points in the table of the efforts to be evaluated.
Level 4	3 points in the table of the efforts to be evaluated.
Level 5	4 points in the table of the efforts to be evaluated.

Efforts to be evaluated

Content	Point
(1) Outdoor illumination and light that spills from interiors Only some of the checklist points of the "Light Pollution Countermeasure Guidelines" are satisfied. (1 point) A majority of the checklist points of the "Light Pollution Countermeasure Guidelines" are satisfied. (2 points)	1～2
(2) Countermeasures against light pollution from billboard lighting Billboard lighting satisfies some of the considerations in "Considerations for Billboard Illumination." (1 point) A majority of the considerations in "Considerations for Billboard Illumination" are satisfied, or there is no billboard lighting. (2 points)	1～2

☐Commentary

Evaluate light pollution caused by buildings includes exterior lighting at night, light spill from the interior, lighting for advertising displays, and glare reflecting from the building. MOE published its Light Pollution Countermeasure Guidelines in March 1998; and local governments are adopting their own Local Illumination Environment Plan in accordance with the guidelines. For this item, the basic approach should be to use the level of compliance with the Light Pollution Countermeasure Guidelines or Local Illumination Environment Plan as the judgment criterion.

* The Light Pollution Countermeasure Guidelines set by MOE were revised in December 2006, and this manual reflects the content of that revision. If a Local Illumination Environment Plan has been adopted by a local authority, the level of compliance with that plan may also be used as the judgment standard.

(1) Outdoor illumination and light that spills from interiors

Evaluate according to the level of compliance with the "Checklist (check sheet) on exterior illumination and similar fixtures" in the Light Pollution Countermeasure Guidelines or Local Illumination Environment Plans (of one has been adopted for the region concerned,

0 points: Almost no points satisfy the checklist.
1 point: Only some of the checklist points are satisfied.
2 points: A majority of the checklist point are satisfied.

■Reference 1) "Checklist for a good lighting environment" in the Light Pollution Countermeasure Guidelines

Check item	Approach and examples of measures
0. Was the examination system appropriate?	
☐ Did any lighting specialist participate in the examination system?	→Add a person with specialist knowledge of light and illumination to the examination system. →If it is difficult to put such a person into the examination system, get the expert's advice as an advisor.
1. Is energy used effectively?	
☐ Are illumination levels set appropriately for purposes? Is the brightness too high or too low, relative to the JIS brightness standard or other lighting-related standards?	→Set brightness to match the purpose of the lighting, with reference to the JIS brightness standard or other lighting-related standards. If brightness is too high, change to a lower-wattage light source.
☐ Is the illuminated range appropriate? Is it wider than necessary?	→Reconsider the illuminated range.
☐ Does the chosen light source have high overall efficiency?	→Reference 2) Choose overall efficiency higher than that in the Guide to outdoor lighting equipment.
☐ Was the installation of lighting equipment with high coefficient of utilization, or of equipment for increasing coefficient of utilization, considered?	→Reconsider the lighting patterns and installation positions of the lighting equipment.
2. Have measures been devised to diminish the impact on human activities?	
☐ Has lighting equipment been chosen that leaks little light upwards or towards the surroundings? Also, have measures been considered to reduce light leakage? Is reference 2), upward light output ratio in the "Guide to outdoor lighting equipment" satisfied.	→Select lighting equipment which satisfies upward light output ratio in the "Guide to outdoor lighting equipment" Reference 2). Alternatively, consider installation of the following.
☐ Have glare and extreme contrast been restricted? Have target values been considered for restriction of luminosity and luminance from lighting equipment in directions that cause problems?	→Reconsider the selection of lighting equipment and the direction of light projection. If necessary, use louvers and hoods, etc. for shading.
☐ Could lighting that is excessive in brightness, brilliance, hue or other changes over time causes discomfort or impede daily activities? Have target values been considered for luminance of illuminated surfaces or the brightness of windows due to leaked light been considered?	→Reconsider the settings for brightness (luminance) and operation methods. Lower the set brightness (luminance) if necessary. Alternatively, use louvers and hoods, etc. to shade lighting equipment.

3. Have measures been devised to diminish the impact on flora and fauna (ecosystems)? ☐ Was harmony with the surroundings considered? Does the lighting plan involve lighting that is far brighter than the surrounding environment? ☐ Has a survey been conducted of flora and fauna that should be protected in the environment surrounding the lighting equipment? Have measures been considered to avoid impact on flora and fauna that should be protected?	→Reconsider the set brightness. If brightness is too high, change to a lower-wattage light source. →Reinvestigate impact on the surrounding environment, and reconsider whether lighting equipment should be installed, and the appropriateness of the set brightness, the lighting equipment used, the operating methods and other aspects.
4. Have operation and management methods been considered? ☐ Is there an operating plan with specifications for each time bracket, tailored to the surrounding environment? ☐ Have periodic cleaning and lamp replacement been considered?	→Consider adjustable brightness, or turning off some or all lights, at night. →Consider performing periodic inspection, cleaning and lamp replacement.
5. Has care been taken over application to district development? ☐ Was there overall coordination? ☐ Was lighting design considered that incorporated public, semi-public and private spaces? ☐ Were the targets of measures selected appropriately? ☐ Were safety and peace of mind considered?	→Have a district development coordinator check impact on cooling loads, scenic appearance, and other aspects. →Lighting design should address lighting of plots on both sides of roads, and spaces that face the street. →Consideration of parking lots, used car lots and outdoor golf driving ranges, which can be expected to have a strong impact. →Consideration of lighting that is suitable for crime prevention, etc.

■Reference 2) "Guide to outdoor lighting equipment" in the Light Pollution Countermeasure Guidelines

<table>
<tr><th>Regulations</th><th>Assessment</th><th>Content</th></tr>
<tr><td>Overall efficiency</td><td>Evaluate for overall efficiency. Lamp output/(lamp power + power losses in the lighting circuit)</td><td>If lamp input power is 200W or more, we recommend at least 60 [lm/W], and at least 50 lm/W for lamps below 200W.</td></tr>
<tr><td>Overall efficiency</td><td>Coefficient of utilization = effective used output/total lamp output = (lit area x average brightness)/total lamp output</td><td>Coefficient of utilization is the proportion of the light generated by the lamp which reaches areas or objects which require illumination.</td></tr>
<tr><td rowspan="4">Upward light output ratio</td><td rowspan="4">Evaluate according to ULOR (upward light output/lamp output).</td><td>Lighting environment I*: 0%</td></tr>
<tr><td>Lighting environment II*: 0-5%</td></tr>
<tr><td>Lighting environment III*: 0-15%</td></tr>
<tr><td>Lighting environment IV*: 0-20%</td></tr>
<tr><td rowspan="2">Glare and impact on human activities</td><td colspan="2">"Standard for Exterior Public Illumination for Pedestrians" by the Illumination Engineering Institute of Japan.</td></tr>
<tr><td colspan="2">Following the points under "Glare restriction" in the Basically, follow existing JIS and technical guidance.</td></tr>
<tr><td>Impact on flora and fauna</td><td colspan="2">Improve the light distribution characteristics and mounting of lighting equipment, or place light screens, etc. in the environment to limit, as far as possible, the artificial light shining into the natural environment.</td></tr>
</table>

* Reference 3) shows the classifications of lighting environments I-IV.

■Reference 3) "4 types of lighting environment" in the Light Pollution Countermeasure Guidelines

(1) Lighting environment I	These are natural parks or rural communities, in which the density of installation of outdoor lighting equipment is relatively low. Such areas are basically dark.
(2) Lighting environment II	These are residential areas in villages or suburbs, with the main lighting behind street lamps and anti-crime lamps, etc., with low brightness in surrounding areas.
(3) Lighting environment III	These are urban residential areas, with road and street lighting and some distribution of objects such as billboards, with moderate brightness in surrounding areas.
(4) Lighting environment IV	These are busy urban districts and the centers of major cities, with a high density of outdoor illumination and billboards, and with high brightness in surrounding areas.

(2) Light pollution from billboard lighting
Evaluate lighting used on all outdoor advertising (spotlights, neon lights and other lighting of advertising surfaces) and outdoor advertising activities (moving signs, vending machines, searchlights, etc.).
Evaluate according to the proportion of the considerations that have been implemented among those listed in Reference 4) "Matters to consider in billboard illumination" in the Light Pollution Countermeasure Guidelines.

0 points: Almost none of the considerations in "Matters to consider in billboard illumination" are satisfied.
1 point: Some of the considerations in "Matters to consider in billboard illumination" are satisfied.
2 points: A majority of the considerations in "Matters to consider in billboard illumination" are satisfied.

■ Reference 4) "Matters to consider in billboard illumination" in the Light Pollution Countermeasure Guidelines

Main matters to consider	Content
(1) Consideration of light leakage ☐ Set the range receiving brightness and luminance to a suitable extent.	→In particular, do not use searchlights, lasers or other equipment which leak light over a wide area and have a strong impact.
☐ Select the shining directions appropriately.	→Take care when placing internally-illuminated signs and exposed fluorescent tubes.
☐ Apply detailed measures to reduce the total usage of artificial lighting.	→Apply design measures for contrast, in order to reduce the total usage of artificial light.
(2) Considerations related to the quality of light ☐ Light must not flash.	→ Do not allow flashing at light sources and in the range illuminated.
☐ Light must not move.	→Do not move the range illuminated by the light source.
☐ Projected light must not be colored.	→Do not pass the light of floodlights through filters, or otherwise tint it. (Excluding the use of filters out of consideration for the environment).
(3) Considerations related to energy conservation ☐ Encourage the use of light sources of high efficiency. ☐ Manage lighting times appropriately.	

■Bibliography 59)

3.3.2 Measures for Reflected Solar Glare from Building Walls

Off·Sch·Rtl·Rst·Hal·Fct·Hsp·Htl·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Not adequate for Level 4.
Level 4	Measures for reducing reflected glare from building walls (including glass surfaces) are taken.
Level 5	In addition to efforts required for Level 4, further advanced measures such as confirming a significant reduction effect due to simulation practice are taken.

For this item, as the countermeasures for light pollution caused by buildings, evaluate measures to mitigate the glare cast on the surround area by reflection of daylight from walls. Glare caused by reflection of daylight from buildings can cause unanticipated impact, particularly in office buildings with large areas of glass. Therefore, this is a matter that must be considered with great care.

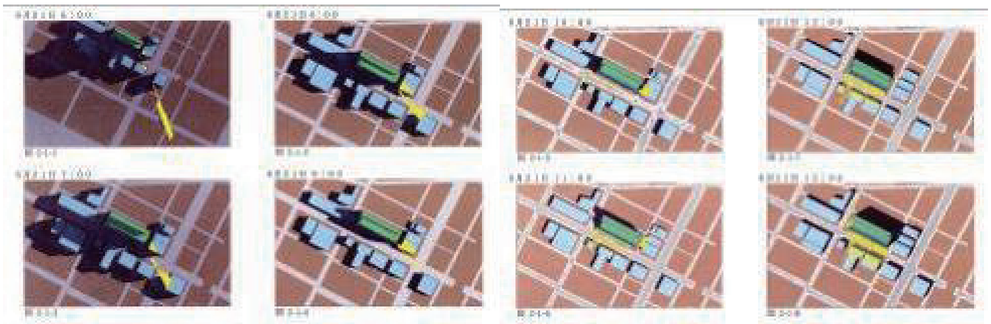
Major measures against reflected glare evaluated as Level 4 are as follows:

Measure	Method	Content
Counter measures on building walls	Reduced reflectance	Application of anti-reflection film on the inner side of the reflecting surface, or a coating applied to the glass, can cut reflectance.
	Diffuse reflection	Measures such as surface treatments and template glass can make the reflection more diffuse.
	Adjusted reflection angle	The angle at which the glass is mounted can be adjusted to reduce the impact of reflections.

(Note) Glass may become prone to thermal cracking due to higher solar absorbance rate. Glass with surface treatment is limited by wind pressure strength consideration.

Measures evaluated as Level 5 include, in addition to implementing those rated as Level 4, performing a simulation in order to ensure a significant reduction of glare or elimination of almost all glare due to the measures.

■Reference) Countermeasures against light pollution by reflected glare from buildings
It is particularly important to consider light reflecting on the surrounding area if the building has a glass facade. If the facade is curved or inclined, it can extend light pollution effects in a surprisingly wide range, so light pollution must be thoroughly considered in advance. Recently, computers have been able to run simulations as shown below, so it is easy to identify the impact of reflected light.



(Documentation provided by Nihon Sekkei)

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Appendix

1. Table of durability (years) of building elements (Use values in table below for the assessment).

Classification		By construction type	Service life	Specifications, etc.	Source	Notes
Structural skeleton		Steel reinforced concrete	65	Slump 18	Gov.Bld.Dept.	Planned years to renewal
Building Exterior	Roof	Asphalt Waterproofing	30	Counterweight concrete (thickness 80)	Gov.Bld.Dept.	
		Tile	30		Gov.Bld.Dept.	Service life is 10 years -10% repair for the waterproof course, mortar bed and tiles.
		Aluminum coping	40		Gov.Bld.Dept.	
	Outer walls	Stones	65	Granite	Gov.Bld.Dept.	Inada type or equivalent Polished finish
		Tiling	40	Embedded porcelain tile	Gov.Bld.Dept.	
		Synthetic resin spraying	15	Mortar setting bed	Gov.Bld.Dept.	Emulsion finish
	Curtain wall	PC sheet	65	Embedded mosaic tiles	Gov.Bld.Dept.	
	Exterior ceilings (Eaves)	Aluminum Moulding	30		Gov.Bld.Dept.	
		Stainless steel Moulding	40		Gov.Bld.Dept.	
		Boarding	20	Flexible board	Gov.Bld.Dept.	EP Finish
	Exterior fittings	Steel fittings	30		Gov.Bld.Dept.	OP coating
		Aluminum fixtures	40		Gov.Bld.Dept.	
		Stainless steel entry/ exit doors	40	4,400 x 2,500	Gov.Bld.Dept.	Automatic staineless steel double-opening doors
		Synthetic resin on steel(Painting)	5		Gov.Bld.Dept.	
	Exterior Misc	Roof railings (Steel)	30		Gov.Bld.Dept.	Painted every 5 years
		Roof railings (Stainless steel)	65	H = 1,100	Gov.Bld.Dept.	
		Roof railings(Aluminum)	40	H = 1,100	Gov.Bld.Dept.	
Building Interior	Floors	Granite	65	Inada type or equivalent	Gov.Bld.Dept.	
		Marble	65		Gov.Bld.Dept.	
		Terrazo block	65		Gov.Bld.Dept.	
		Tiling	65	Ceramic tile	Gov.Bld.Dept.	
		Mortar finish	30	Mortarboard	Gov.Bld.Dept.	
		PVC tiling	20	Mortar setting bed	Gov.Bld.Dept.	Semi-hardened
		Vinyl flooring sheet	20	Mortarboard	Gov.Bld.Dept.	Polyvinyl chloride sheet (LONLEUM) or equivalent
		Carpet	20	Mortar setting bed	Gov.Bld.Dept.	Tile carpet
	Inner walls	Granite	65	Inada type or equivalent	Gov.Bld.Dept.	
		Marble	65		Gov.Bld.Dept.	
		Terrazo block	65		Gov.Bld.Dept.	
		Tiling	65	Porcelain tile	Gov.Bld.Dept.	
		Mortar finish	65	EP coating	Gov.Bld.Dept.	Repainted every 10 years
		Multi-layer painted finish	20	Mortar setting bed	Gov.Bld.Dept.	Service life, including undercoat (repainted every 10 years (60%))
		Vinyl wallpaper	20	Plywood underlay	Gov.Bld.Dept.	Service life of underlays (replaced every 10 years)
			20	GL construction method, PB T = 12	Gov.Bld.Dept.	Service life of underlays (replaced every 10 years)
		Walnut veneering	20	T = 9, with furrring strips	Gov.Bld.Dept.	
		Melamine-faced board	30	T = 9, with furrring strips	Gov.Bld.Dept.	
	Ceilings	Aluminum Moulding	30	Light steel underlay	Gov.Bld.Dept.	
		Boards	30	Faced plasterboard	Gov.Bld.Dept.	
		Vinyl wallpaper	30	PB underlay, T = 9	Gov.Bld.Dept.	Service life of underlays (replaced every 10 years)
		Synthetic resin spraying	20	Concrete underlay	Gov.Bld.Dept.	
	Interior fixtures	Aluminum fixtures	40		Gov.Bld.Dept.	
		Steel fixtures	30	OP Coating	Gov.Bld.Dept.	
		Wooden fixtures	30		Gov.Bld.Dept.	Flush door
	Misc. other	Toilet screens	65	Terrazo block panel	Gov.Bld.Dept.	
		Toilet screens	30	Faced sheet steel panel	Gov.Bld.Dept.	
		Suspended shelves				

Classification		By construction type	Service life	Specifications, etc.	Source	Notes
		Sinks	(30)		Gov.Bld.Dept.	From documents calculating refurbishment costs for government buildings.
		FRP bathtubs	15		Gov.Bld.Dept.	
		Stainless steel bathtubs	25		Gov.Bld.Dept.	
Electrical Equipment	High -pressure devices	High-voltage power input equipment Distribution board	25	Interior cubicles	Gov.Bld.Dept.	
			25	Exterior cubicles	Gov.Bld.Dept.	
		Transformer	25		Gov.Bld.Dept.	
		Condenser	30		Gov.Bld.Dept.	
		High-voltage power input equipment				
	Home electrical appliances equipment	Private generators (Diesel-engines)	30		Gov.Bld.Dept.	25 years for the engine
	DC power supply devices	Storage batteries(Lead)	7	Sealed lead (HS)	Gov.Bld.Dept.	
		Storage batteries(Alkaline)	25	Sealed, AHH	Gov.Bld.Dept.	
	Boards	Power control board	25		Gov.Bld.Dept.	
		Lighting distribution board	25		Gov.Bld.Dept.	
		Terminal board	30		Gov.Bld.Dept.	
	Lighting fixtures	Fluorescent light fixtures	20		Gov.Bld.Dept.	
		Incandescent light fixtures	20		Gov.Bld.Dept.	
		Guide lamps	20		Gov.Bld.Dept.	
	Light electrical appliances	Telephone switchboard	15	Electronic pushbutton telephone	Gov.Bld.Dept.	
		Amplifier	20	Rack type	Gov.Bld.Dept.	
		Speakers	20	Embedded in ceiling	Gov.Bld.Dept.	
		Intercom	20	Base and satellite system	Gov.Bld.Dept.	
		Electric clocks	20	Base and satellite system	Gov.Bld.Dept.	
		TV antennae	10		Gov.Bld.Dept.	20 years for masts
		TV amplifiers	20		Gov.Bld.Dept.	
		Mergers and splitters	20		Gov.Bld.Dept.	
	Automatic fire detection	Sensors	20	Differential type	Gov.Bld.Dept.	
		Receivers	20	50L	Gov.Bld.Dept.	
	Wiring Appliances	Switches	(30)	Tumbler switch	Gov.Bld.Dept.	From documents calculating refurbishment costs for government buildings.
		Sockets	(30)		Gov.Bld.Dept.	From documents calculating refurbishment costs for government buildings.
	Wiring and plumbing	Electrical wiring	30		Gov.Bld.Dept.	
		Pipes	65	Thin steel cable duct	Gov.Bld.Dept.	
		Cable racks	65	Steel	Gov.Bld.Dept.	
Mechanical Equipment	Heating and cooling sources Equipment	Steel plate boilers	15		Gov.Bld.Dept.	
		Cast iron boilers	30	Steam	Gov.Bld.Dept.	
		Smoke tube boilers	20		Gov.Bld.Dept.	
		Turbo chillers	20		Gov.Bld.Dept.	
		Reciprocating chillers	15		Gov.Bld.Dept.	
		Absorption chillers	20		Gov.Bld.Dept.	
		Hot air heating pump chillers	15		Gov.Bld.Dept.	
		Cooling tower	13	FRP counterflow	Gov.Bld.Dept.	
	Air conditioning equipment	Compressed air handling unit	20		Gov.Bld.Dept.	
		Packaged air conditioning system (Water-cooled type)	20		Gov.Bld.Dept.	
		Packaged air conditioning system (Hot air heat pump)	15		Gov.Bld.Dept.	
	Heating and cooling	Fan coil unit	20		Gov.Bld.Dept.	
		Fan convector	20		Gov.Bld.Dept.	
	Total enthalpy heat exchanger	Total enthalpy heat exchanger	20	Rotating	Gov.Bld.Dept.	
		Heat exchanger unit	20	Embedded in ceiling	Gov.Bld.Dept.	
	Air supply and venting equipment	Blower	20	Centrifugal	Gov.Bld.Dept.	
		Smoke extractor	25		Gov.Bld.Dept.	
	Pumps	Lifting pump	20		Gov.Bld.Dept.	
		Hot and cold water pump	20		Gov.Bld.Dept.	

Classification		By construction type	Service life	Specifications, etc.	Source	Notes
		Hot water supply and recirculating pump	20		Gov.Bld.Dept.	20 years for the motor
		Cooling water pump	20		Gov.Bld.Dept.	
		Misc. waste water pump	15		Gov.Bld.Dept.	
		Fire extinguishing pump	20	Unit-type	Gov.Bld.Dept.	
	Water tanks	Water intake tanks, elevated water tanks (Steel plate)	20	Panel-type	Gov.Bld.Dept.	
		Water intake tanks, elevated water tanks (FRP)	25	Panel-type	Gov.Bld.Dept.	
		Water intake tanks, elevated water tanks (Stainless steel)	30	Panel-type	Gov.Bld.Dept.	
	Tanks	Oil tanks (Underground)	30		Gov.Bld.Dept.	
		Hot water tank (Steel plate)	20		Gov.Bld.Dept.	
		Hot water tank (Stainless steel)	25		Gov.Bld.Dept.	
	Pipes	Carbon steel pipes (White) (Water supply)			Gov.Bld.Dept.	
		Carbon steel pipes (White) (Water drainage and ventilation)	30		Gov.Bld.Dept.	
		Carbon steel pipes (White) (Firefighting)	30		Gov.Bld.Dept.	
		Carbon steel pipes (White) (Hot and cold water)	20		Gov.Bld.Dept.	
		Carbon steel pipes (Black) (Steam)	20		Gov.Bld.Dept.	
		PVC-lined steel pipes (Water supply)	25		Gov.Bld.Dept.	
		Copper pipes (Hot water)	30	M	Gov.Bld.Dept.	
		Copper pipes(Coolant)	30	L	Gov.Bld.Dept.	
		Stainless steel pipes (Cold and hot water supply)	30		Gov.Bld.Dept.	
		Vinyl pipes (Water supply)	20	HIVP	Gov.Bld.Dept.	
		Vinyl pipes (Water drainage)	30	VP	Gov.Bld.Dept.	
		Cast iron pipes (Water drainage)	40		Gov.Bld.Dept.	
		Fume pipes (Water drainage)	28		Gov.Bld.Dept.	
			40		Gov.Bld.Dept.	
	Air ducts	Air conditioning ducts	30		Gov.Bld.Dept.	
		Pan-type air vent	30		Gov.Bld.Dept.	
		Universal-type air vents	30		Gov.Bld.Dept.	
	Water boilers	Gas water heaters	10		Gov.Bld.Dept.	
		Electric water heaters	10		Gov.Bld.Dept.	
	Fire extinguishers	Indoor fire hydrants	30		Gov.Bld.Dept.	
		Siamese connection	30		Gov.Bld.Dept.	
		Halogen fire extinguisher spray head	20		Gov.Bld.Dept.	
		Halogen fire extinguisher trigger system	20		Gov.Bld.Dept.	
	Hygienic equipment	Toilet bowl	30	Japanese-style	Gov.Bld.Dept.	
		Urinal	30		Gov.Bld.Dept.	
		Wash basins	30		Gov.Bld.Dept.	
		Vanity wash basin				
		Faucets	15		Gov.Bld.Dept.	
	Amc contro equipment	Sensors	15	Electronic, temperature	Gov.Bld.Dept.	
		Regulators	15	Electronic, temperature	Gov.Bld.Dept.	
		Controllers	12	Electronic	Gov.Bld.Dept.	
		Control panels	10		Gov.Bld.Dept.	
		Central monitoring board	10		Gov.Bld.Dept.	
Elevators	Elevators	Elevators	30	General	Gov.Bld.Dept.	

Source for the table: Values of Government Building Department contained in the service life table of "Building's LC Assessment database, 4th Revised Edition (the first edition published March 1st 2008)," Building and Equipment Life Cycle Association.

[Reference table](Only use the value from this table if there is no applicable value in the previous table.)

Classification		By construction type	Service life	pecifications, etc.	Source	Notes
Structural skeleton		Steel reinforced concrete	At least 75 years		Yoda	From a 1969 survey of the Yokohama Mitsui & Co. Building (construction completed in 1969)
			117 years		Iizuka	Estimated from a survey of wear reduction in telephone exchange buildings (building maintenance).
			At least 50 years		Shinozaki	Survey of reinforced concrete structures aged approximately 50 years (AIJ anthology of convention speeches '74)
			At least 60 years		Kasino	Durability can be secured in ordinary concrete design when the progress of neutralization is used as an indicator (Basic Observations on Long-Life Construction)
Building Exterior	Roof	Asphalt Waterproofing	20	Counterweight concrete	AIJ	
			25	Counterweight cinders	NTT	
			25	With protective layer	Kobayashi	
			30	Counterweight concrete	BELCA	
		Waterproof sheet	20		Kobayashi	Polymer waterproof sheet
			20	Exposed	NTT	Synthetic polymer waterproof roofing sheet
			15	Exposed,silver coating	BELCA	Ronloop or equivalent, T = 20
		Painted waterproofing	15		Kobayashi	Polymer coating waterproofing
			20		NTT	Urethane-type x 1
		Mortar finish	15	Double coating	AIJ	Mortar service life
			15	Double coating	NTT	Mortar service life
			15		Kobayashi	Mortar service life
		Tile	10		AIJ	Tile service life
			10		NTT	Tile service life
			10		Kobayashi	Tile service life
			30		BELCA	Service life is 10 years -10% repair for the waterproof course, mortar bed and tiles.
		Aluminum coping	40		BELCA	
	Outer walls	Stones	25	Granite	AIJ	
			25	Granite	NTT	
			25	Granite	Kobayashi	
			60	Granite	BELCA	Inada type or equivalent Polished finish
		Tiling	50	Dry, rectangular, biscuit fired	AIJ	Including partial terracotta finish
			60	4.7 cm square tiles	NTT	
			50	Porcelain	Kobayashi	
			60	Embedded porcelain tile	BELCA	40 years for floating method construction
		Synthetic resin spraying	25		AIJ	Lysin finish
			25	Mortar setting bed	NTT	Lysin finish
			25		Kobayashi	Lysin finish
			30	Mortar setting bed	BELCA	Acrylic lysin
		Epoxy-type sprayed tile	15	Concrete setting bed	BELCA	
		Sealant	10		JASS8	Values for reference service life
	Curtain wall	Aluminum	40		Kobayashi	
			40		BELCA	Panel mounting
		PC sheet	60	Small embedded tiles	BELCA	
	Exterior ceiling (Eaves)	Aluminum Moulding	40		BELCA	
		Stainless steel Moulding	40		BELCA	
		Boarding	25	Plasterboard	AIJ	
			25	Flexible board	BELCA	EP Finish
	Exterior fittings	Steel fittings	35		AIJ	
			50		NTT	
			30		Kobayashi	
			35		BELCA	Ready-mixed synthetic resin paint
		Aluminum fixtures	40		Kobayashi	
			40		BELCA	
		Stainless steel entry/exit doors	60	4,334 x 2,800	BELCA	Stainless steel entrance unit
		Synthetic resin on steel Painting	5		NTT	
			6		Kobayashi	
			3		BELCA	

Classification		By construction type	Service life	pecifications, etc.	Source	Notes
	Exterior Misc	Roof railings (Steel)	25	Wire mesh	AIJ	Steel columns
			25	Wire mesh	Kobayashi	
		Roof railings (Steel)	25		BELCA	Painted every 3 years
		Roof railings (Stainless steel)	60	H = 1,100	BELCA	
		Roof railings (Aluminum)	40	H = 1,100	BELCA	
		Steel fire escape staircase	30	Aluminum	Kobayashi	
Building Interior	Floors	Granite	60	Inada type or equivalent	BELCA	
		Marble	60		BELCA	
		Terrazo block	30		AIJ	
			30		NTT	
			30		Kobayashi	
			50		BELCA	
		Tiling	30	Hard	AIJ	
			30		NTT	
			30		Kobayashi	
			50	Ceramic tile	BELCA	
		Mortar finish	20	Mortarboard	AIJ	
			25	Mortarboard	NTT	
			20	Mortarboard	Kobayashi	
			30	Mortarboard	BELCA	
		PVC tiling	20	Mortar setting bed	NTT	Semi-hardened
			20	Mortar setting bed	Kobayashi	
			30	Mortar setting bed	BELCA	Semi-hardened
		Vinyl flooring sheet	18	Mortarboard	AIJ	
			20	Mortarboard	NTT	
			30	Mortarboard	BELCA	Polyvinyl chloride sheet (LONLEUM) or equivalent
		Carpet	15	Mortar setting bed	Kobayashi	Needle-punched carpet
			30	Mortar setting bed	BELCA	Contract carpet
	Inner walls	Granite	60	Inada type or equivalent	BELCA	
		Marble	60		BELCA	
		Terrazo block	40		AIJ	
			50		BELCA	
		Tiling	30	White narrow tile	AIJ	
			10		NTT	
			50		Kobayashi	
			50	Ceramic tile	BELCA	
		Mortar finish	20		AIJ	
			36		NTT	
			30	EP coating	BELCA	Repainted every 5 years
		Multi-layer painted finish	10		NTT	Service life for paint only
			30	Mortar setting bed	BELCA	Service life, including undercoat (repainted every 10 years (90%))
		Vinyl wallpaper	10		NTT	Service life for wallpaper only
			30	Plywood underlay	BELCA	Service life of underlays (replaced every 10 years)
			20	GL construction method, PB T = 12	BELCA	Service life of underlays (replaced every 10 years)
		Walnut veneering	20	T = 9, with furrring strips	BELCA	
		Melamine-faced board	30	T = 9, with furrring strips	BELCA	
	Ceilings	Aluminum fixtures	60	Light steel underlay	BELCA	
		Boards	25	Plasterboard	AIJ	
			25		NTT	
			25		Kobayashi	
			30	Faced plasterboard	BELCA	
		Vinyl wallpaper	30	PB underlay, T = 10	BELCA	Service life of underlays (replaced every 10 years)
		Synthetic resin spraying	60	Concrete underlay	BELCA	

Classification		By construction type	Service life	pecifications, etc.	Source	Notes
	Interior fixtures	Aluminum fixtures	50		Kobayashi	
			50		BELCA	
		Steel fixtures	45		AIJ	
			40	OP Coating	BELCA	
		Wooden fixtures	28		AIJ	Flush door
			30		NTT	
			28		Kobayashi	
			30		BELCA	Flush door
	Misc. other	Toilet screens	40	Terrazo block panel	AIJ	
			30	Terrazo block panel	BELCA	However, related finishes have a large influence
			40	Faced sheet steel panel	BELCA	
		Bath units	20		Kobayashi	From refurbishment costs for apartments (equipment and management No.8804)
		Suspended shelves	20	Faced sheet steel panel	BELCA	
		Sinks	20		BELCA	
Electrical Equipment	High-pressure devices	High-voltage power input equipment	25		AIJ	
			25		Kobayashi	
			30	Interior cubicles	BELCA	
			20	Exterior cubicles	BELCA	
		Distribution board	25		AIJ	
			25		Kobayashi	
			30		BELCA	
		Transformer	25		AIJ	
			25		Kobayashi	
			30		Kuboi	
			30		BELCA	Interior
		Condenser	20		AIJ	
			20		Kobayashi	
			25		Kuboi	
			25		BELCA	
		Breaker	20		Kuboi	
			25		BCS	
	Homeelectrical appliances equipment	Private generators (Diesel-engines)	30	For emergency use	AIJ	25 years for the engine
			30	For emergency use	Kobayashi	
			20	For emergency use	Kuboi	
			30	For emergency use	BELCA	
	DC power supply devices	Storage batteries (Lead)	10		AIJ	
			10		Kobayashi	
			7		Kuboi	
			13	Sealed lead (HS)	BCS	
			7	Sealed lead (HS)	BELCA	
		Storage batteries (Alkaline)	15		Kuboi	
			15	Pocket alkaline	BCS	
			15	Pocket alkaline	BELCA	
	Boards	Power control board	25		AIJ	
			25		Kobayashi	
			20		Kuboi	
			30		BELCA	
		Lighting distribution board	30		BELCA	
		Terminal board	60		BELCA	
	Lighting fixtures	Fluorescent light fixtures	10		AIJ	
			10		Kobayashi	
			30		BELCA	
		Incandescent light fixtures	15		AIJ	
			15		Kobayashi	
			30		BELCA	
		Guide lamps	30		BELCA	
	Light electrical appliances	Telephone switchboard	30		BELCA	
		Amplifier	17		AIJ	
			25	Rack type	BELCA	Broadcasting amplifier
		Speakers	18		AIJ	

Classification		By construction type	Service life	pecifications, etc.	Source	Notes
			25	Embedded in ceiling	BELCA	
		Intercom	20	Base unit	AIJ	
			20	Base unit	Kobayashi	
			20	Base and satellite system	BELCA	
		Electric clocks	20	Base unit	AIJ	
			20	Base and satellite system	Kobayashi	
			15	Base and satellite system	Kuboi	
			25	Base and satellite system	BELCA	
		TV antennae	15	With mas	BELCA	
		TV amplifiers	15		BELCA	
		Mergers and splitters	20		BELCA	
	Automatic fire detection	Sensors	20	Distributed	AIJ	
			20	Differential type	Kobayashi	
			20	Differential type	BELCA	
		Receivers	20	Distributed	AIJ	
			20		Kobayashi	
			20	P-1 grade, 50 L	BELCA	
	Wiring Appliances	Switches	5		AIJ	
			6		Kobayashi	
			17		BCS	
			20	With P	BELCA	
		Sockets	6		AIJ	
			6		Kobayashi	
			16		BCS	
			20	With P	BELCA	
	Wiring and plumbing	Electrical wiring	20		AIJ	
			20		Kobayashi	
			40	With P	BELCA	
		Pipes	20		AIJ	
			20		Kobayashi	
			60	Thin steel cable duct	BELCA	
		Cable racks	60	Steel	BELCA	
Mechanical Equipment	Heating and cooling sources Equipment	Steel plate boilers	25		AIJ	
			15		BCS	
			15		BELCA	
		Cast iron boilers	10	Sectional boiler	Kobayashi	
			20		Kuboi	
			21.1	Sectional boiler	BCS	
			25	Steam	BELCA	
		Smoke tube boilers	15		Kuboi	
			18.9		BCS	
		Turbo chillers	25		Kobayashi	
			20		Kuboi	
			21.1		BCS	
			20		BELCA	
		Reciprocating chillers	15		Kuboi	
			15		BCS	
			15		BELCA	
		Absorption chillers	15		Kuboi	
			17.5		BCS	
			20		BELCA	
		Hot air heating pump chillers	15		BELCA	
		Cooling tower	20		Kobayashi	
			13	FRP	Kuboi	
			14.4		BCS	
			15	FRP	BELCA	
	Air conditioning equipment	Compressed air handling unit	15		Kobayashi	
			18		Kuboi	
			17.5		BCS	

Classification	By construction type	Service life	pecifications, etc.	Source	Notes
		15		BELCA	
	Packaged air-conditioning system (Water-cooled type)	15	Semi-sealed	Kuboi	
		13.4		BCS	
		15		BELCA	
	Packaged air conditioning system (hot air heat pump)	15		BELCA	
Heating and cooling	Fan coil unit	20		Kobayashi	
		18		Kuboi	
		15.8		BCS	
		15	Exposed, floor mounted	BELCA	
	Fan convector	13.6		BCS	
		15	Exposed, floor mounted	BELCA	
	Cast-iron radiator	30		AIJ	
		20.8		BCS	
Total enthalpy heat exchanger	Total enthalpy heat exchanger	15	Rotating	BELCA	
	Heat exchanger unit	15	Embedded in ceiling	BELCA	
Air supply and venting equipment	Blower	20		AIJ	
		20		Kobayashi	
		18		Kuboi	
		18.6	Sirocco fan	BCS	
		20	Forward curved fan	BELCA	
	Smoke extractor	25	Forward curved fan	BELCA	
Pumps	Lifting pump	15	Turbine pump	AIJ	20 years for the motor
		15	Turbine pump	Kobayashi	20 years for the motor
		15		Kuboi	
		17	Sirocco fan	BCS	
		15	Multi-level	BELCA	
	Hot and cold water pump	17		BCS	
		15		BELCA	
	Hot water supply and recirculating pump	15		AIJ	20 years for the motor
		15		Kobayashi	20 years for the motor
		15	Line pump	BELCA	
	Cooling water pump	15	Volute	BELCA	
	Misc. waste water pump	15		AIJ	20 years for the motor
		15		Kobayashi	20 years for the motor
		15	Submerged	Kuboi	
		12.9	Submerged	BCS	
		10	Submerged	BELCA	
	Fire extinguishing pump	27	Turbine	AIJ	20 years for the motor, 25 for the engine
		27		Kobayashi	20 years for the motor, 25 for the engine
		27	Unit-type	BELCA	
Water tanks	Water intake tanks, elevated water tanks (Steel plate)	20		AIJ	
	Water intake tanks, elevated water tanks (FRP)	20		Kobayashi	
		20	Panel-type	BELCA	
	Water intake tanks, elevatec water tanks (Stainless steel	20	Panel-type	BELCA	
Tanks	Oil tanks (Underground)	25		BELCA	
	Hot water tank (Steel plate)	15		AIJ	
		15		Kobayashi	
		17.1		BCS	
		15		BELCA	
	Hot water tank (Stainless steel)	18.7		BCS	
		15		BELCA	
Pipes	Carbon steel pipes (White) (Water supply)	20		AIJ	
		20		Kobayashi	
		18.1		BCS	
	Carbon steel pipes (White) (Water supply)	18		AIJ	
		18		Kobayashi	
		14.9		BCS	
		12		BELCA	

Classification		By construction type	Service life	pecifications, etc.	Source	Notes
		Carbon steel pipes (White) (Water drainage and ventilation)	18		AIJ	
			18		Kobayashi	
			18.4		BCS	
			20		BELCA	
		Carbon steel pipes (White) (Firefighting)	20		AIJ	
			25		Kobayashi	
			25		BELCA	
		Carbon steel pipes (White) (Hot and cold water)	18		BCS	
			20		BELCA	
		Carbon steel pipes (Back) (Steam)	15		AIJ	
			17.8		BCS	
			20		BELCA	
		PVC-lined steel pipes (Water supply)	30		BELCA	
		Copper pipes (Hot water)	18.3		BCS	
			15	M	BELCA	
		Copper pipes(Coolant)	30	L	BELCA	
		Stainless steel pipes (Cold and hot water supply)	30		BELCA	
		Vinyl pipes (Water supply)	30	HIVP	BELCA	
		Vinyl pipes (Water drainage)	25	VP	BELCA	
		Cast iron pipes (Water drainage)	28		AIJ	
			28		Kobayashi	
			30		BELCA	
		Fume pipes (Water drainage)	28		AIJ	
			30		BELCA	
	Air ducts	Air conditioning ducts	20		AIJ	
			20		Kobayashi	
			30		BELCA	
		Pan-type air vent	20		BELCA	
		Universal-type air vents	20	VHS	BELCA	
	Water boilers	Gas water heaters	8.2		BCS	
			10		BELCA	
		Electric water heaters	10		BELCA	
	Fire extinguishers	Indoor fire hydrants	20		BELCA	
		Siamese connection	20		BELCA	
		Halogen fire extinguisher spray head	25		BELCA	
		Halogen fire extinguisher trigger system	25		BELCA	
	Hygienic equipment	Toilet bowl	25	Japanese-style	AIJ	
			25	Japanese-style	Kobayashi	
			25	Japanese-style	BELCA	
		Urinal	30		AIJ	
			30		Kobayashi	
			30		BELCA	
		Wash basins	25		AIJ	
			25		Kobayashi	
			25		BELCA	
		Faucets	20		BELCA	
	Auto control equipment	Sensors	10	Electronic, temperature	BELCA	
		Regulators	10	Electronic, temperature	BELCA	
		Controllers	10	Electronic	BELCA	
Elevators	Elevators	Elevators	20		AIJ	
			20		Kobayashi	
			25		Kuboi	
			25	Standard type	BELCA	

The Table was created with reference to values of the Architectural Institute of Japan, NTT, Kobayashi, Kuboi, BCS and BELCA, provided in the service life table of "Building's LC Assessment Database, 4th Revised Edition" (The 1st edition was published on March 1, 2008.) published by the Building and Equipment Long-life Cycle Association (BELCA), and values for sealing materials provided in "Technical Guidelines and Commentaries on Watertight Design and Construction of Outer Wall Joints (JASS8)" (The 2nd edition was published on February 25, 2008.) published by the Architectural Institute of Japan.

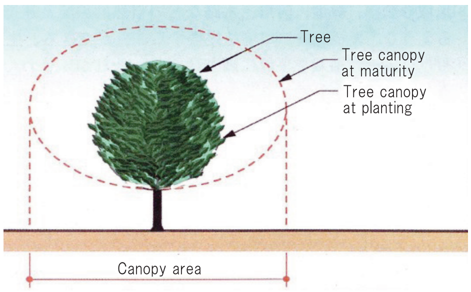
2. Calculation of Tree Canopy Size and Green Area

In principle, calculation of medium/tall tree canopy sizes and green spaces covered with plants such as lawns is based on the method referred to in the Urban Green Space Conservation Law. The law stipulates the following two methods to obtain tree canopy sizes and horizontal projected areas of ground-covering plants:
A. Method based on the Green Facility Planning Accreditation System (Article 60 of the Urban Green Space Conservation Law, Regulation 23)
- Horizontal projected area planned/expected at the time of plant maturity
B. Method based on the Green Zoning System (Article 34 of the Urban Green Space Conservation Law, Regulation 9)
- Actual horizontal projected area at the time of planting

In the CASBEE assessment, tree canopy sizes and green spaces are evaluated focusing on healthy, long-term growth of plants as aimed for by the planners and facility administrators. Thus, calculation in this assessment is largely based on Method A above, with some elements of Method B and other considerations.

In the CASBEE assessment, trees are categorized as follows:
- Medium/tall trees: trees with a height of 1.0 m or taller at the time of planting (apply Item (1) method below).
- Low trees: trees with a height of 1.0 m or lower at the time of planting (apply Item (2) method below).

<u>(1) Horizontal projected area of medium/tall trees (canopy area)</u>
- Apply the horizontal projected area of medium/tall tree canopies at the time of plant maturity. The method is not based on the area at the time of planting and requires calculation of the anticipated canopy areas at maturity (Regulation 23).
This method is recommended in cases where areas have many mature trees.



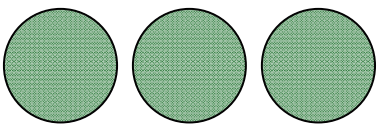
- The table below shows anticipated radii of tree canopies and corresponding canopy sizes based on tree heights at time of planting. The anticipated values can be applied in calculation of the horizontal projected area (Regulation 9).

Table II.1 Anticipated radius of tree crown

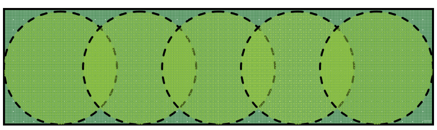
Tree height at time of planting	Anticipated radius of tree canopy	Anticipated area of tree canopy
4.0 m or taller	2.1m	13.8 ㎡
2.5 m or taller but lower than 4.0 m	1.6m	8.0 ㎡
1.0 m or taller but lower than 2.5 m	1.1m	3.8 ㎡

*This method can only be applied to trees with a height of 1 m or taller.

- Add all tree canopy areas except overlapping areas (Regulation 23).
In cases where canopies of multiple closely-placed trees overlap, obtain the total canopy area can be obtained as shown below (method based on the Planting Handbook published by Hiratsuka City; partially modified for CASBEE).



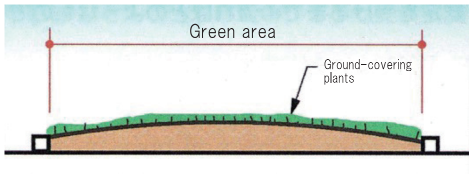
Canopies do not overlap:
Total area of all tree canopies



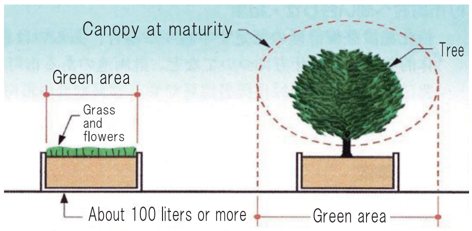
Canopies overlap: Area of within the canopy perimeter (bounded by straight lines)

(2) Calculation of green area with ground-covering plants or low trees

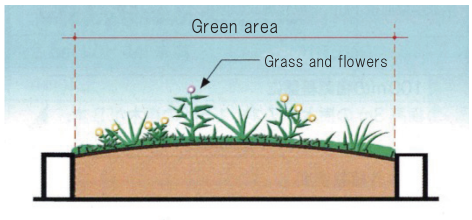
1) Green area with ground-covering plants (e.g. lawn) or low trees
- Apply the horizontal projected area that ground-covering plants (e.g. lawn and other plants) or low trees are expected to cover at the time of maturity (method based on Regulation 23; partially modified for CASBEE).



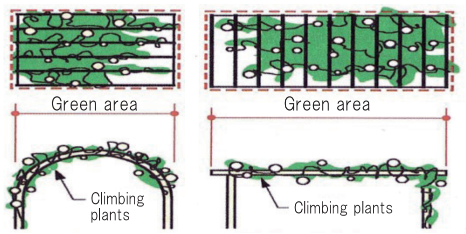
2) Green area with planters/containers
- In cases where planters or containers with a volume of 100 liters or more are used, calculate the area using the method described in (1) or (2)-1).
- In cases where a planter or container is used for a wall, apply the calculation method described in 5) (Regulation 23).



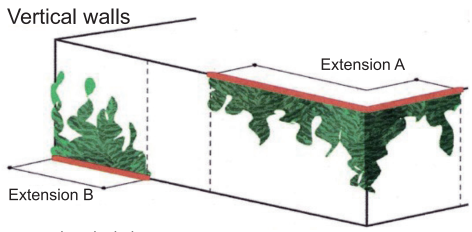
3) Green area of flower beds, etc.
- Apply the horizontal projected area of soil designated for flowers and other plants or of a green facility that is covered with other type of materials (Regulation 9).



4) Green area of plant trellises
- In cases where trellises are placed on the ground or on the rooftop, apply the horizontal projected area the plants are expected to cover at the time of maturity (Regulation 23).



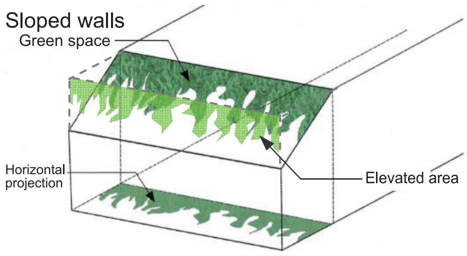
5) Green area of walls
i. Vertical walls
- In cases where plants grow upward from the ground or downward from the rooftop along the walls, calculate green area with the horizontal length of planned green area multiplied by 1.0 m (Regulation 23).
- However, when the said depth is clearly more than 1.0 m (such as with use of metal fences that support climbing plants) and can be verified, the actual values can be calculated (CASBEE's unique method).
- In cases where planting materials (e.g. plant bases) are placed on the wall, calculate the area covered by such materials (CASBEE's unique method).



Basic calculation:
Green area = (A + B) x 1.0 m
When extensions of more than 1.0 m can be verified, calculate using the actual values

ii. Sloped walls

- Apply the larger value of the two: horizontal projected area or elevated area of the expected green-covered wall (method based on Regulation 23; partially modified for CASBEE).



Reference: Building Greener Towns - System Guide to Urban Green Space Conservation Law - issued by Parks & Green Space Dept., MLIT, July 2006

3. Highly water-retentive materials

While a growing number of water-retentive materials are available on the market, the effectiveness of evaporative cooling varies depending on water content level in the materials. Assessment methods for the materials' capability in relation to heat island mitigation are not yet established and still under review at several research institutes. Therefore, determining standard performance levels still needs further study in many aspects.
Currently available water-retentive materials are categorized in Table II.2. The list includes some readily available materials; however, a variety of other materials (e.g. non-asphalt products with water-retentive components) have also been developed. Difference in the effectiveness of evaporative cooling is caused by water supply mechanisms (i.e. precipitation versus artificial supply), while solar reflectance levels account for surface temperature difference. Appropriateness of characteristics must be considered for each application. For example, the required strength of water-retentive building materials used for roofs, balconies and verandas require differs from that required for paving sidewalks, roadways, parkades and parks.
Table II.3 shows examples of standard values for water-retentive paving published by the Japan Interlocking Block Pavement Engineering Association. These values are currently used for assessment reference. Furthermore, the Society for Water-Retentive Paving Technology Studies has developed an indoor light exposure test method for water-retentive paving. The test analyzes surface temperature difference between regular paving and water-retentive paving under certain light exposure conditions.

Table II.2 Examples of Water-Retentive Materials Table II.2 Examples of Water-Retentive Materials

	Main materials	Main applications	Water retention capacity	Water content by volume when wet	Density
Tiles	Ceramic	Roof/verandah/balcony	5-15 L/m^2 (with 35 mm thickness)	15～40%	0.6～1.8g/cm^3
Blocks	Ceramic	Park/parkade/sidewalk/roadway	9-18 L/m^2 (with 60 mm thickness)	15～30%	1.6～1.9 g/cm^3
	Cement	Park/parkade/sidewalk/roadway	9-18 L/m^2 (with 60 mm thickness)	15～30%	―
Water-retentive agent	Asphalt+water-retentive agents	Parkade/sidewalk/roadway	3-6.5 L/m^2 (with 100 mm thickness)	6～13%	―
Soil	Soil	Park/sidewalk	-	―	―

Note: Items with [-] indicate that standard values are not available

Table II.3 Examples of Standard Values for Water-Retentive Paving1)

Assessed by	Water retention capacity	Water absorption	Slip-resistance*	Bend strength*	Size allowance*
Japan Interlocking Block Pavement Engineering Association	0.15 g/cm^3 or more	70% or more	Sidewalk: BPN 40 or more Roadway: BPN 60 or more	Sidewalk: 3.0 N/mm^2 or more Roadway: 5.0 N/mm^2 or more	Sidewalk: ±2.5 mm (width), +4 mm & -1.0 mm (thickness) Roadway: ±2.5 mm (width), ±2.5 mm (thickness)

* Performance standard not required in water-retentive building materials for roofs, verandas and balconies.

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1) Japan Interlocking Block Pavement Engineering Association, Quality Standard for Interlocking Blocks in Water-Retentive Paving, 2005
2) Jun Tanimoto, Toshiya Ogishima, et al., The Development of Highly Water-Retentive Passive Cooling Bricks, Architectural Institute of Japan Technical Reports, No.11, 2000
3) Yasunobu Ashie, et al., Planning Method Development for Urban Thermal Environment with Use of Water-Retentive Materials, Technical Papers Presented to The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, 1996

4. Materials with higher solar reflectance

Due to a growing interest in heat island mitigation, coating materials and waterproof sheets with high solar reflectance are now generally available. Local authorities such as the Tokyo municipal government have also supported and tested the use of various products in order to combat urban thermal issues. Under these circumstances, a calculation method for coating film, JIS K 5602, was established in 2008. As data based on standardized methods become available, further improvements in solar reflectance technology are expected.
The standard solar reflectance and long-wave radiation rates are established particularly with respect to urban heat island mitigation. The Tokyo prefectural government and other institutions have also taken a similar approach. This is thought to be in consideration of future comparisons with other technologies (e.g. green space materials, water-retentive materials). Some industry organizations have set their own standards. The table below shows the PMS27 standard by Japan Paint Manufacturers Association and the KRK S-001 standard for waterproof sheets with high solar reflectance established by the Synthetic Polymer Roofing Manufacturers Association. In addition to waterproof sheets and coating materials, a variety of other materials with the similar capacity are also being developed and applied in construction (e.g. roofing tiles, slates, metal/film materials, glass). As objective performance assessment methods are not yet established for these materials, use of the existing standard for coating materials and waterproof sheets is assumed.
Due care is required in building exterior walls or sidewalks with high solar reflectance to avoid negative impact on pedestrians. In particular, use of such materials for the exterior walls of an urban high-rise building is not recommended as it increases ground-level solar radiation heat of the surrounding areas. Furthermore, as solar reflectance rates of the materials have been indicated to decrease over time, shifts in performance levels must also be taken into account. It is recommended that the materials maintain solar reflectance of 80% or more of the initial rate after a two-year outdoor exposure test.

Table II.4 Standard performance values of solar reflectance and long-wavelength emittance

Assessed by	Solar reflectance	Long-wavelength emittance	Project/standard, etc.
Japan Paint Manufacturers Association	Solar reflectance in near-infrared region of 40.0% or higher at a luminosity L of 40.0 or less; or, a higher reflectance rate than L at a luminosity L higher than 40.0	-	JPMS27: Weather-Resistant Coating Materials for Roof (2009)
Synthetic Polymer Roofing Manufacturers Association	Near-infrared region solar reflectance of 50.0% or higher (wavelength: 780-2500 nm)	-	KRK S-001: Standard for Waterproof Sheets with High Solar Reflectance (2008)
Tokyo Prefecture	Solar reflectance of 50% or higher (gray) by third-party assessment	-	Cool Roof Promotional Project (2006)

Note: Long-wavelength emittance rates of all coating materials and waterproof sheets are approximately 0.9 and no standard value has been established. Note, however, the rates tend to decrease with metal roofs.

<Bibliography>
4) Yukio Ishikawa, Evaporative Cooling Study of Cool Roof Systems with Heat-Sensitive Hydrogel – Thermal Property Measurement, Joint Research Draft published by Solar Energy Society and Japan Wind Energy Association, 2004
5) Kazuhiro Mitsumoto, Heat Island Mitigation Effects of Highly Reflective Paints and Water-Retentive Building Materials, Tokyo Metropolitan Government Heat Island Symposium, July 2004
6) ASHRAE Guide, 1969
7) Pacific Gas and Electric Company, High Albedo Roofs (Codes and Standards Enhancement Study), 2000

PART III. Commentary

1. An Overview of CASBEE

1.1 Measures to Promote Sustainability

Buildings, which consume and discard resources and energy in enormous quantities, are one of architectural category which we must act urgently to develop and promote techniques and policies able to assist the drive towards sustainability. Possible methods for promoting sustainable construction include environmental construction education, dissemination of information and legal regulations. However, the introduction of the market mechanism based on an assessment system is considered most feasible. There has been a growing movement towards sustainable construction since the second half of the 1980s, leading to the development of various methods for evaluating the environmental performance of buildings. Methods developed overseas include BREEAM (Building Research Establishment Environmental Assessment Method[*1] and LEED™ (Leadership in Energy & Environmental Design[*2], as an international project. These methods have attracted interest around the world. This kind of assessment, with the publication of the results, is one of the best methods now available to provide an incentive for clients, owners, designers and users to develop and promote highly sustainable construction practices.

CASBEE was developed according to the following policies:

(1) The system should be structured to award high assessments to superior buildings, thereby enhancing incentives to designers and others.
(2) The assessment system should be as simple as possible.
(3) The system should be applicable to buildings in a wide range of building types.
(4) The system should take into consideration issues and problems peculiar to Japan and Asia.

Commentary

1. 2 Framework of CASBEE: CASBEE Family

1.2.1 Building Lifecycle and Four Assessment Tools

As shown in Figure III.1.1, CASBEE was developed in the suite of architectural design process*[3], starting from the pre-design stage and continuing through design and post design stages.

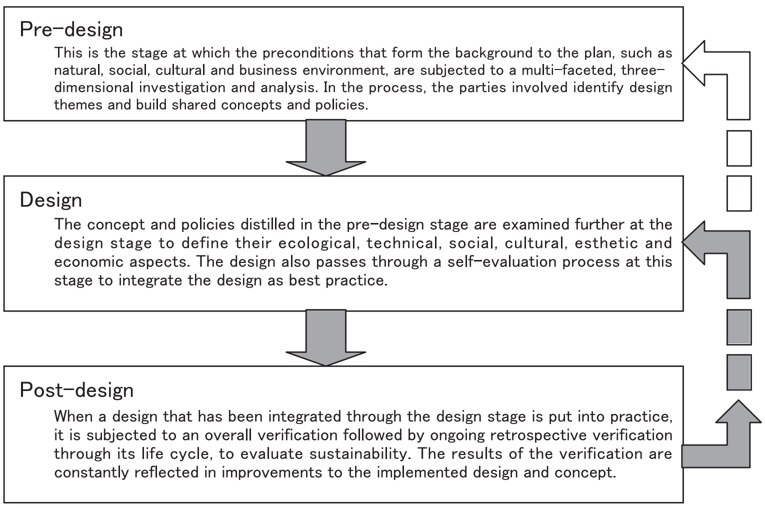


Figure III.1.1 The cyclical process of building design

*1 Building Research Establishment (UK), 1990
*2 US Green Building Council, 1997
*3 Architectural Institute of Japan, Sub Committee on National and International Trend Research and Proposal to Promote Sustainable Buildings, 2001

Corresponding to the building lifecycle, CASBEE is composed of four assessment tools, CASBEE for Pre-Design, CASBEE for Building (New Construction), CASBEE for Building (Existing Building) and CASBEE for Building (Renovation), and to serve at each stage of the design process (Figure III.1.2). "CASBEE Family" is the collective name for these four tools and the expanded tools for specific purposes, which are listed below. Each tool is intended for a separate purpose and target user, and is designed to accommodate a wide range of uses (offices, schools, apartments, etc.) in the evaluated buildings.

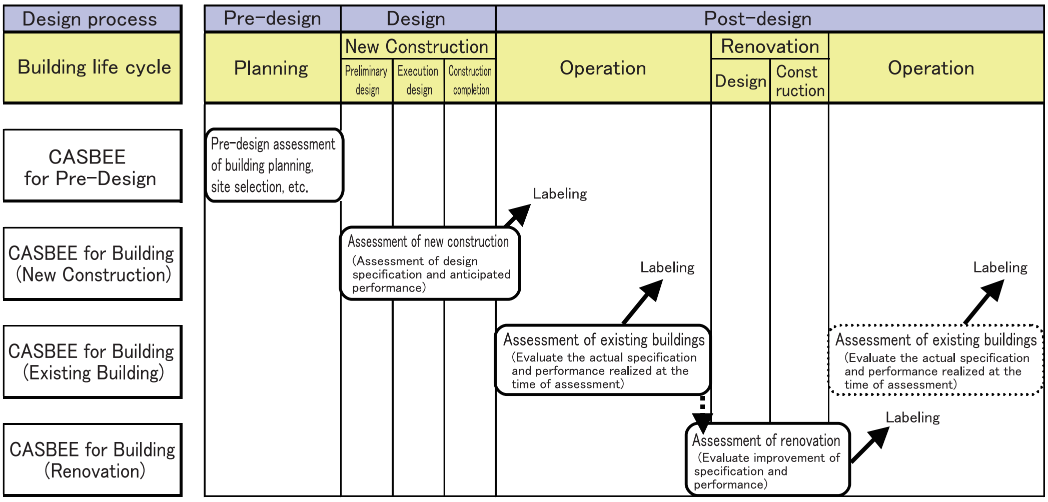


Figure III.1.2 Building Lifecycle and Four Assessment Tools

CASBEE for Pre-Design (under development)
This tool aims to assist the owner, planner and others involved at the planning (pre-design) stage of the project. It has two main roles:
1) To assist in grasping issues such as the basic environmental impact of the project and selecting a suitable site.
2) To evaluate the environmental performance of the project at the Pre-design stage.

CASBEE for Building (New Construction)
This is a self-assessment check system that allows architects and engineers to raise the BEE value of the building under consideration during its design process. It makes assessments based on the design specification and the anticipated performance. It can also serve as a labeling tool when the building is subjected to expert third-party assessment.

CASBEE for Building (Existing Building)
This assessment tool targets existing building stock, based on operation records for at least one year after completion. It was developed to be applicable to asset assessment as well.

CASBEE for Building (Renovation)
There is growing demand for building stock renovation, especially in Japanese market. In the same way as "CASBEE for Building (Existing Building)," this tool targets existing buildings. It can be used to generate proposals for building operation monitoring, commissioning and upgrade design with a view to ESCO (Energy Service Company) projects, which will be increasingly important in future, and for building stock renovation.

1.2.2 CASBEE for Specific Purposes

The basic CASBEE tool suite is applicable to a diverse range of individual applications.

(1) Applicability to detached houses
The CASBEE Basic Tools covered assessment of apartments, but not detached houses. As assessment tools for evaluating detached houses, CASBEE for Detached Houses (New Construction) and CASBEE for Detached Houses (Existing Building) were developed.

(2) Assessment of dwelling units of apartments
Regarding apartments, the overall building is evaluated based on CASBEE for Building (New Construction). However, the performance of the individual dwelling units cannot be evaluated utilizing CASBEE for Building (New Construction), since the performance is thought to be different depending on the position of each unit in the housing block. As a tool for evaluating the environmental performance of individual dwelling units, CASBEE for Dwelling Unit (New Construction) was developed.

(3) Application to buildings for short-term use
The tool "CASBEE for Temporary Construction," was developed as an extension to CASBEE for Building (New Construction) for evaluating temporary buildings constructed specifically for short-term use.

(4) Consideration for regional character
As noted above, CASBEE for Building (New Construction) can be used by local authorities in construction administration. Local authorities that use this tool can tailor it to local conditions, such as climate and prioritized policies. Changes are generally made by modifying the weighting coefficients. Such assessment can be made mandatory in the same way as an Energy Saving Plan, to be submitted to the authorities together with the building approval application, as a way to improve the environment efficiency of buildings in the region.
One example is "CASBEE-Nagoya," which began on April 2004 under building environmental consideration system of Nagoya city.
Flexible response to regional character is a common feature of all elements of the CASBEE family.

(5) Detailed assessment of heat island impact
The heat island effect is becoming a critical issue in major urban areas, such as Tokyo and Osaka. CASBEE for Heat Island was developed to evaluate efforts in buildings to alleviate the heat island effect. Its role is to make a more detailed and quantitative assessment of the heat island-related assessment items included in the basic tools.

(6) Applicability to the property market
In order to encourage broad use of eco-friendly buildings, a new framework is required, in which environmental measures taken in the building are connected to the increased added values of the property. Especially in existing buildings, intended users of the framework are stakeholders different from those involved in new construction, including building owners, investors, building users and managers. Therefore, an assessment framework that is easy to use for these stakeholders would be required. Consequently, CASBEE for Market Promotion, which is specialized in items relating to increased added values of properties in its scope of assessment, and in which the assessment standard has been significantly simplified, was developed. Buildings subject to the assessment are existing ones having operational experience of more than 1 year after the completion of construction.

(7) Expansion to the urban
The basic CASBEE tools evaluate individual buildings, but it is also important to evaluate environmental performance when buildings form groups. Many recent city-center redevelopment projects have been planned for integration with their surrounding districts, and in such cases they should deliver positive effects for the surrounding environment, such as promoting the use of dispersed energy over the entire area. In short, they should raise environment quality (Q). Even if each individual building has a different owner, the application of common restrictions on buildings within a district can raise environment quality and performance throughout the area. In order to

take into account the assessment of these measures taken through urban renewal and district-wide efforts involving multiple buildings, CASBEE for Urban Development was developed.

(8) Expansion to a city scale
CASBEE for Cities, a tool for evaluating environmental performance on a city scale that extends beyond the regional scale, was developed. The purpose of this tool is to support implementation of environmental policies by local governments, through which the public administration evaluates their own environmental policies and effects on a municipal basis.

Table III.1.1 Expansion of CASBEE for specific purposes (as of April 2014)

Application	Name	Summary
Assessment on detached houses	CASBEE for Detached Houses (New Construction) CASBEE for Detached Houses (Existing Building)	CASBEE assessment for detached houses
Assessment of dwelling units of apartments	CASBEE for Dwelling Unit (New Construction)	CASBEE Assessment of dwelling units of apartments
Short-term use	CASBEE for Temporary Construction	Currently covering all purposes
For individual areas	-	Modifying CASBEE for Building (New Construction) according to the locality
Assessment on the efforts in alleviating the heat island phenomenon	CASBEE for Heat Island	Detailed edition of CASBEE heat island assessment
Applicability to the property market	CASBEE for Market Promotion	Applicability of CASBEE assessment to the property market, focusing on existing buildings
Assessment on building groups (urban scale)	CASBEE for Urban Development	CASBEE assessment mainly about the external space on a district scale
Assessment on a city scale	CASBEE for Cities	The public administration evaluates their environmental policies and effects on a municipal basis.

1.3 The Background to CASBEE Development

1.3.1 Past development of environmental performance assessment

(1) Stage 1

The oldest form of environmental assessment of buildings in Japan is the performance assessment of building environments, mainly indoor environments, which is basically aimed at improving living amenities or enhancing convenience for occupants. This can be thought of as Stage 1 in the evolution of the environmental assessment of buildings. At this stage, since the local environment surrounding the building concerned and the global environment were generally considered as open systems, environmental assessments paid no attention to the fact that buildings simply discharged their environmental loadings into their surroundings. In this sense, the philosophy behind environmental assessments was very clear, but opposite to today's approach.

(2) Stage 2

The growth of public concern over air pollution problems or the effects of wind on pedestrians, etc. in urban areas such as Tokyo in the 1960s led to the establishment of environmental impact assessments. This was the time when the concept of environmental loadings was initiated and incorporated into building environmental assessments, and this is thought of as Stage 2. Here, only the negative effects that buildings have on their surrounding environments, such as urban air pollution, wind damage, and daylight obstruction, etc., are considered as environmental impacts, i.e. environmental loads. In Stage 1, the environment usually suggests a private space or property, whereas in Stage 2 it is a public (or non-private) space.

(3) Stage 3

Stage 3 in the evolution of the environmental assessment of buildings began after the increase in the consciousness of global environmental problems in the 1990's. A number of specific methods have already been proposed, based on extensive research experience, including BREEAM, LEED^{TM} and SB Tool.
In recent years, building environmental performance assessment methods such as these have spread rapidly in society, particularly in developed countries, and they have also come to be used for "Design for Environment (DfE)" and building environmental labeling (rating).
The main issue in assessment at this stage is the negative impacts; in other words, the environmental loads that the buildings have on the environment. That is to say, it considers Life Cycle Assessment (LCA), evaluating the environmental loads of a building throughout its life. In addition, building performance was also included as an object in some assessments, as in Stage 1. Notably, none of the above assessment tools clearly distinguish between these two basic assessment objects (in Stage 1 and Stage 2). Also, the scope (or boundary) of the assessment objects is not clearly stated. In this sense, the concept of environmental assessment in Stage 3 lacks the clear underlying philosophy found in Stage 1 and Stage 2, while the framework of assessment has expanded in Stage 3. The assessment framework, relative to the first and second stages, but conversely, the framework of assumptions on which the environmental performance evaluation is based has become unclear.

1.3.2 Stage 4: New Stage in the Environmental Assessment of Buildings

Development of CASBEE started from perception that the above situation required a reconstruction of the current environmental performance assessment framework into a new system clearly based on the perspective of sustainability. Stage 3 in environmental assessment began when it was recognized that the capacities of local environments, and the world as a whole, were reaching a limit. As a result, the concept of closed ecosystems became essential for determining environmental capacities when conducting environmental assessments. Therefore a virtual enclosed space bounded by the borders of the building site, as shown in Figure III.1.3 is proposed here in making environmental assessments of buildings. The on-site space bounded by these virtual boundaries can be controlled by the parties involved in the building, including the owner and planner, but the space beyond is public (non-private) space, which is largely beyond control.
The environmental loads can thus be defined as "negative aspects of environmental impact that go beyond the virtual enclosed space boundary to the outside (the public property)." The improvement of environmental performance within the virtual enclosed space boundary is defined as "improvement in everyday amenity for the building users." Dealing with both factors, the stage 4 environmental assessment clearly defines these two factors, and distinguishes one from the other. This makes the philosophy of assessment at stage 4 much clearer, and it has been based to form the framework for CASBEE.

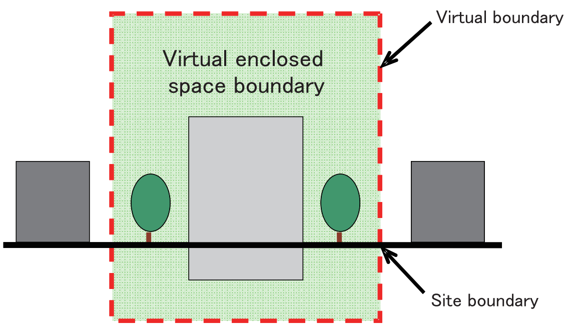


Figure III.1.3 Virtual enclosed space boundary divided by the site boundary

1.3.3 From Eco-efficiency to Built Environment Efficiency (BEE)

The concept of Eco-efficiency has been introduced for CASBEE to enable the integrated assessment of two factors, inside and outside the building site. Eco-efficiency is normally defined as "Value of products and services per unit environmental load."*4 Efficiency is commonly defined in terms of input and output quantities, so a new model can be proposed for an expanded definition of Eco-efficiency, as "(productive output)/(input + non-productive output)." As Figure III.1.4 shows, this new model of environment efficiency can be extended to define Built Environment Efficiency (BEE), which CASBEE uses as its assessment indicator.

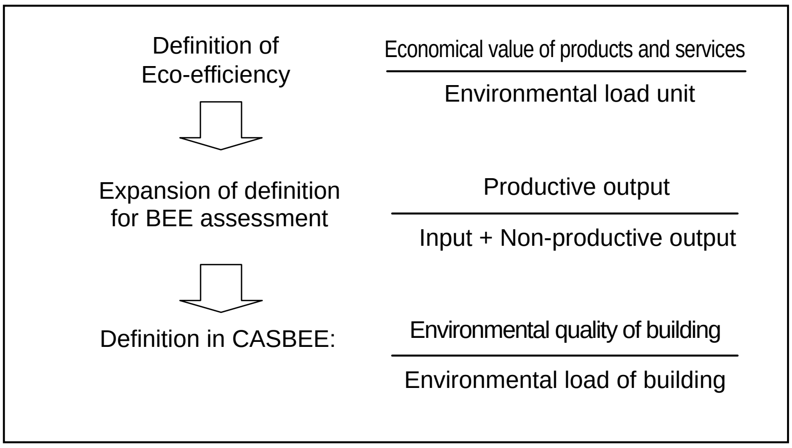


Figure III.1.4 Development from the Eco-efficiency concept to BEE

1.4 Assessment using CASBEE

1.4.1 Two Categories of Assessment: Q and L

Under CASBEE there are two spaces, internal and external, divided by the virtual boundary, which is defined by the site boundary and other elements, with two factors related to the two spaces. Thus we have put forward CASBEE in which the "negative aspects of environmental impact that go beyond the virtual enclosed space boundary to the outside (the public property)" and "improvement in everyday amenity for the building users, within the virtual enclosed space boundary" are considered side by side. Under CASBEE, these two factors are defined below as Q and L, the main assessment categories, and evaluated separately.

- Q (Quality): Environmental quality of building:
Evaluates "improvement in everyday amenity for the building users, within the virtual enclosed space boundary"

- L (Load): Environmental load of building:
Evaluates "negative aspects of environmental impact that go beyond the virtual enclosed space boundary to the outside (the public property)"

*4 From the World Business Council for Sustainable Development (WBCSD)

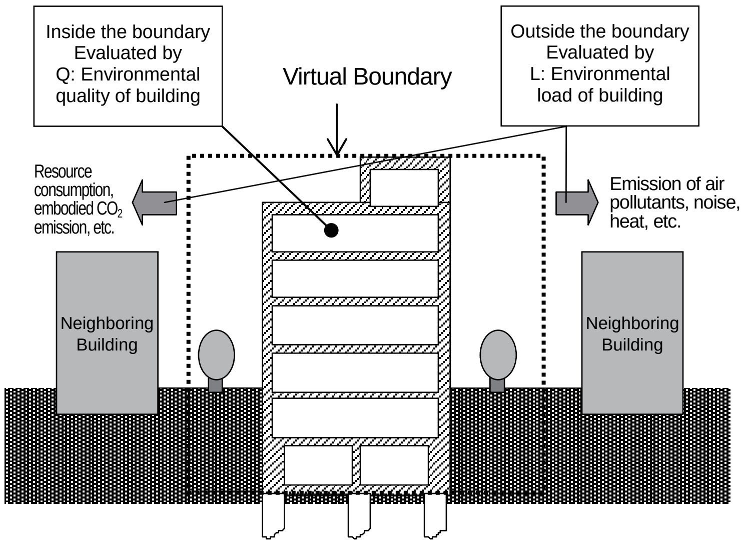


Figure III. 1.5 Division of the assessment categories for Q: Environmental quality of building and L: Environmental load of building based on the virtual boundary

1.4.2 Four Target Fields of CASBEE and the Rearrangement

CASBEE covers the following four assessment fields: (1) Energy efficiency (2) Resource efficiency (3) Local environment (4) Indoor environment. These four fields are largely the same as the target fields for the existing assessment tools described above in Japan and abroad, but they do not necessarily represent the same concepts, so it is difficult to deal with them on the same basis. Therefore the assessment categories contained within these four fields had to be examined and reorganized.

As a result, the assessment categories were classified as shown in Figure III. 1.6 into BEE numerator Q (Environmental quality of building) and BEE denominator L (Environmental load of building). Q is further divided into three items for assessment: Q1 Indoor environment, Q2 Quality of service and Q3 Outdoor Environment (On-site). Similarly, L is divided into L1 Energy, L2 Resources & Materials and L3 Off-site Environment.

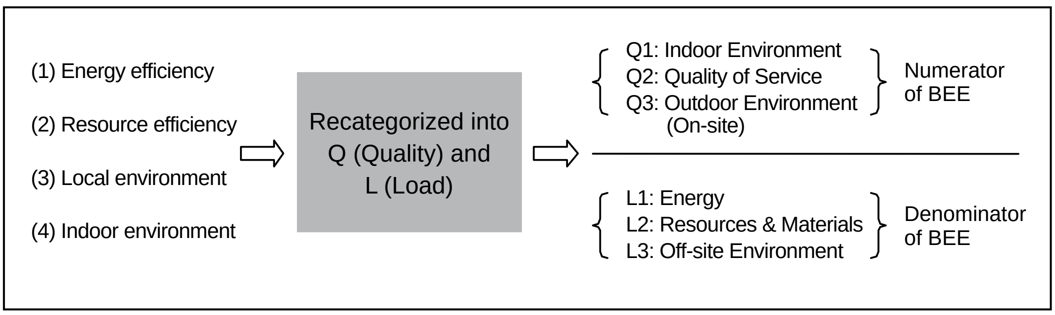


Figure III.1.6 Classification and rearrangement of assessment items into Q (Environmental quality of building) and L (Environmental load of building)

1.4.3 Environmental Labeling Using Built Environment Efficiency (BEE)

As explained above, BEE (Built Environment Efficiency), using Q and L as the two assessment categories, is the core concept of CASBEE. BEE, as used here, is an indicator calculated from Q (Environmental quality of building) as the numerator and L (Environmental load of building) as the denominator.

$$\text{Built Environment Efficiency (BEE)} = \frac{\text{Q (Environmental Quality of Building)}}{\text{L (Environmental Load of Building)}}$$

The use of BEE enabled simpler and clearer presentation of building environmental performance assessment results. BEE values are represented on the graph by plotting L on the x axis and Q on the y axis. The BEE value assessment result is expressed as the gradient of the straight line passing through the origin (0,0). The higher the Q value and the lower the L value, the steeper the gradient and the more sustainable the building is. Using this approach, it becomes possible to graphically present the results of built environment assessments using areas bounded by these gradients. The figure shows how the assessment results for buildings can be ranked on a diagram as class C (Poor), class B-, class B+, class A, and class S (Excellent), in order of increasing BEE value.

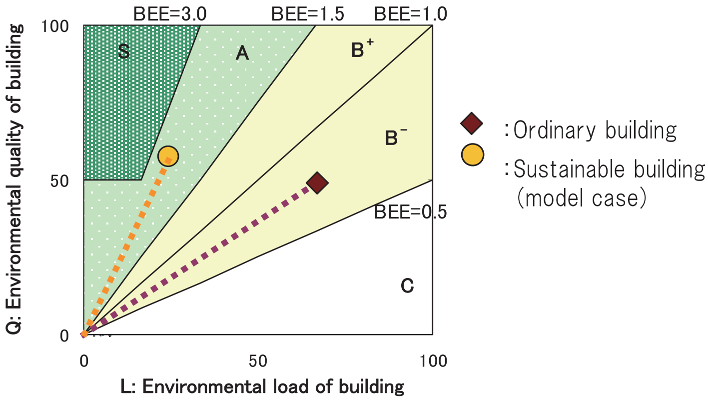


Figure III.1.7 Environmental labeling based on BEE

1.5 Basic Approach to Subjects for Assessment by CASBEE

CASBEE is a comprehensive tool focused on evaluating the environmental performance of buildings. Therefore it is not intended to evaluate all aspects of building performance and quality. In particular, specialized assessment systems already exist for fields such as aesthetic and economic performance, so they are excluded from consideration by CASBEE.

(1) Aesthetic assessment

CASBEE emphasizes everyday amenity and working convenience for building users as the key aspects of the environmental quality of buildings. Scenic consideration in matters such as building position, form and exterior materials, and efforts to adapt to regional character are considered here, but we have decided not to evaluate aesthetic design characteristics, such as building beauty, which are difficult to evaluate objectively.

(2) Assessment of Cost and Profitability

CASBEE is intended to be an assessment tool applicable to a wide range of building types in both the public and private sectors. As such we have decided that assessment of cost-effectiveness should be left for building owners to judge according to their individual business situations. The market value of the completed building, the profitability of business conducted in the building and other aspects less related to global environmental problems play a large part in the project client's judgment of how much to invest in improving a building's environmental performance.

CASBEE serves as an indicator for considering the "best balance of quality and the environment," based on the assumption of broadly economic buildings, and its assessment items include social perspectives such as consideration for regional character.

1.6 Application of CASBEE

CASBEE is currently utilized for various purposes described below.

1.6.1 Administrative Applications of CASBEE

The City of Nagoya has been operating its environmentally-responsible building program under the Environmental Conservation Ordinance since April 2004. The program mandates that, for new construction, extensions or renovation projects for buildings with a total floor space exceeding 2,000 m^2, owners must conduct assessment using CASBEE-Nagoya and report results to the City. Also, the City of Yokohama also started its own CASBEE reporting program in July 2005. As of April 2014, CASBEE programs have been implemented in 24 regional authorities and implementation is under consideration in more municipalities. Refer to the CASBEE website for further details.

1.6.2 Use in the Private Sector

(1) For designers to employ in Design for Environment (DfE)

CASBEE can serve as an assessment tool that designers can use to check the environmental performance of buildings at the design stage and provide their clients and others with objective information on environmental considerations. It can also be used as an indicator for the indirect setting of targets that clients, designers and others can use to evaluate their own environmental management activities under ISO14000 and other systems.

(2) Environmental labeling that can be used in the asset valuation of buildings

CASBEE can be used as an environmental labeling tool available at the time of property appraisal of buildings. Particularly, by obtaining a third-party certification, the labeling represents official reliability and can be easily taken into account upon realty appraisal.

(3) Environmental performance diagnosis and upgrade design with a view to ESCO projects and building stock refurbishment

CASBEE can be used as a tool to generate proposals for building operation monitoring, commissioning and upgrade design with a view to ESCO (Energy Service Company) projects and building stock refurbishment. Assessment under CASBEE for Building (Renovation) is a tool that can be applied to energy-saving remodeling, etc.

(4) Selection of contractors for design competitions, proposals and PFI projects

CASBEE is now being applied in the scoring process of design competitions and proposals, in evaluation of PFI project operators and in design-stage verification of environmental performances. CASBEE's comprehensive environmental performance indicators can be used to co-establish environmental targets between clients and designers, or between building owners and tenants. Further, not only municipal authorities but also building clients in the private sector could propose their target conditions of the comprehensive environmental performance to designers. Other possible applications include giving high points to designers who made design proposals achieving the optimum environmental performance on a limited budget.

(5) International building assessment tool

The International Organization for Standardization (ISO) has been developing an internationally-standardized assessment method for environmental performance in buildings under TC59/SC17 and in June 2010 published ISO 21931-1: Framework for methods of assessment of the environmental performance of construction works-Part I: Buildings, which offers a universal framework for various assessment tools including CASBEE. An assessment system in compliance with international standards can be applied globally for various purposes such as multilateral cross certification of environmental labeling. For example, such a system may be useful when a foreign company considers a lease or purchase of a building in Japan or when a Japanese company is building a factory abroad. In China, the environmental performance assessment system applied to design, construction and operations of the 2008 Beijing Olympics facilities (GOBAS: Green Olympic Building Assessment System), developed by a group led by Professor Jiang of Tsinghua University, was published in August 2003. In the near future, a comprehensive environmental performance assessment system is likely to be utilized at international design competitions held in China and other Asian countries, offering growing opportunities for Japanese companies to participate.

1.6.3 Application to Education

Use of CASBEE is also progressing in construction-related education in universities and elsewhere. At present, it is used for environmental planning training in most universities with faculties of architecture. We hope that construction-related professional bodies and academic bodies will use CASBEE in continuing professional development (CPD) for construction professionals who are already in practice.

1.7 CASBEE Assessment Certification System and Accredited Professional Registration System

The CASBEE Assessment Certification System and the Accredited Professional Registration System are implemented by the Institute for Building Environment and Energy Conservation (IBEC). The CASBEE Assessment Certification System also managed by accredited organizations designated by the institute.

1.7.1 Assessment Certification System

When the assessment results produced by CASBEE are provide to third parties, it becomes increasingly important to ensure their reliability and transparency. The assessment certification system is a system established to ensure reliability in information provided to third parties in order to confirm the accuracy of results generated by CASBEE, and thereby promote its proper and more widespread use. This is a system used to ensure the reliability of asset appraisal and labeling for evaluated buildings by designers, owners and builders. Buildings subject to the certification include not only those evaluated by CASBEE for Building (New Construction), but also a wide range of buildings including those evaluated by CASBEE for Building (Existing Building), CASBEE for Building (Renovation), CASBEE for Detached Houses, CASBEE for Market Promotion and CASBEE for Urban Development.

1.7.2 Accredited Professional Registration System

CASBEE is based on making assessment as quantitative as possible, but it includes assessment items that are qualitative in nature. As such, it requires a specialized engineer with expertise and knowledge in the comprehensive environmental performance evaluation of buildings. That is why the CASBEE Accredited Professional Registration System was established. Those aiming to become accredited professionals must attend the training course, pass the examination and complete registration. Currently, as specialist engineers who handle CASBEE for Building (New Construction), CASBEE for Building (Existing Building) and CASBEE for Building (Renovation), we have 3 types of experts: CASBEE Building Accredited Professionals, CASBEE Detached House Accredited Professionals who specialize in CASBEE for Detached Houses, and CASBEE Property Accredited Professionals who handle CASBEE for Market Promotion.

2. Lifecycle CO_2

2.1 What is $LCCO_2$

When evaluating impact on the global environment, it is important to evaluate the entire existence of the building from construction to demolition (called its "lifecycle"). Among impacts on the global environment, the one currently regarded as the most important is global warming, and the method generally used when gauging impact on global warming is to convert impact to an equivalent total emission of CO_2, as the representative GHG, for comparison. Lifecycle CO_2 ($LCCO_2$) is the total amount of CO_2 emission generated by the building in its entire lifespan.

The lifecycle of a building is divided into stages, including construction, operation, renewal, demolition and disposal, and the building impacts global warming at each stage, so it is necessary to evaluate the total impact. For example, at the construction stage, there is the manufacture of the materials used on the construction site, transportation of those materials to the site, and the use of materials and energy by heavy machinery on site. At the operation stage, there is energy consumption, such as for heating and cooling, hot water supply, lighting, and OA equipment, and refurbishment work performed once a decade or so uses energy for the manufacture of newly added materials, and for the disposal of removed materials. At the final demolition stage, energy is used for the demolition work, and for disposal of the demolished materials. The materials and energy used in these ways are converted to equivalent CO_2 emissions for the purpose of gauging impact on global warming, and the total of all such emissions is the lifecycle CO_2.

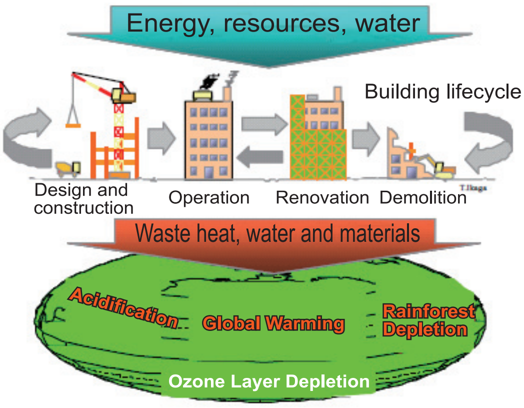


Figure III.2.1 Impact on the global environment generated from buildings (Ikaga)

2.2 Basic Approach to Lifecycle CO_2 Assessment Using CASBEE for Building (New Construction)

In general, the task of evaluating the lifecycle CO_2 of a building takes large amounts of time and effort. Taking the construction stage as an example, the first step is to investigate the types and amounts of energy resources used in each stage of the extraction, transportations and processing of the resources used to make every one of the materials and parts that make up the building, then multiply each by the CO_2 emission unit specific to the material (the CO_2 emission per unit weight of the material), and add together all the results. Next, calculate the CO_2 emissions corresponding to the energy consumed in the construction, and multiply each by the CO_2 emission coefficient* for each energy type (the CO_2 emission per unit energy consumption), and add the result to the previous result. This kind of process must also be performed for all stages to find the lifecycle CO_2.

* In this manual, the CO_2 emissions per unit material weight is referred to as CO_2 emissions unit, while the CO_2 emissions per unit energy consumption for each energy type is separately called the CO_2 emissions coefficient. The CO_2 emissions per 1 MJ primary energy consumption based on the primary energy consumption composition ratio by building purpose is referred to as the CO_2 conversion factor by use (See 2.3.3).

The collection of all these types of information, and the setting of assessment conditions, require expert knowledge. Also, buildings have different applications, component elements, locations, uses and other attributes, so each one must be evaluated individually. Performing this kind of task at the design and construction stages would be extremely difficult for most users of CASBEE for Building (New Construction), damaging the simplicity which was a key development concept for CASBEE.

Therefore, the following method is used for assessment.

(1) To minimize the burden of assessment work, there is no need to gather extra information or set conditions solely for the lifecycle CO_2 calculation. Instead, $LCCO_2$ is calculated automatically from the results of assessment items particularly related to CO_2 emissions, which have already been evaluated for CASBEE. This is called the "Standard Calculation."
(2) In the Standard Calculation, the assessment subjects are narrowed down to those which are important and can be evaluated, which means that not all of the efforts relevant to $LCCO_2$ are evaluated for calculation of $LCCO_2$. Nevertheless, it indicates $LCCO_2$ with the primary purpose of informing the user of an approximate figure for CO_2 emission, reduction effects, and other aspects related to CO_2 emissions.
(3) If the assessor personally gathers detailed data and calculates a more accurate $LCCO_2$ value, that value can be displayed in CASBEE for Building (New Construction) as "Individual Calculation" on the Evaluation Results Presentation Sheet under "2.2 Lifecycle CO_2 (Global Warming Impact Chart)." The results of individual calculations are not reflected in "LR3.1 Consideration of Global Warming" and BEE. (See 2.3.6)
(4) In order to simplify the process, calculation of CO_2 emissions at the operation stage is based on the conversion of primary energy consumption into CO_2 emissions.

2.3 Assessment Method

$LCCO_2$ in CASBEE for Building (New Construction) evaluates the following items within the building's lifecycle. The sum of these three classifications is the life cycle CO_2, which is used in the assessment of "LR3.1 Consideration of Global Warming," and is indicated with a breakdown on a bar chart in the Global Warming Impact Chart of the assessment software.

Construction: Manufacture, transportation and construction of materials and components used at the new construction stage.
Maintenance/Upgrade/Demolition: Manufacture and transportation of materials and components used at the maintenance and upgrade stage, and transportation to treatment facilities for demolition materials generated at the demolition stage.
Operation: Energy consumed during operation.

The following explains the method for assessment of Standard Calculation in CASBEE for Building (New Construction).

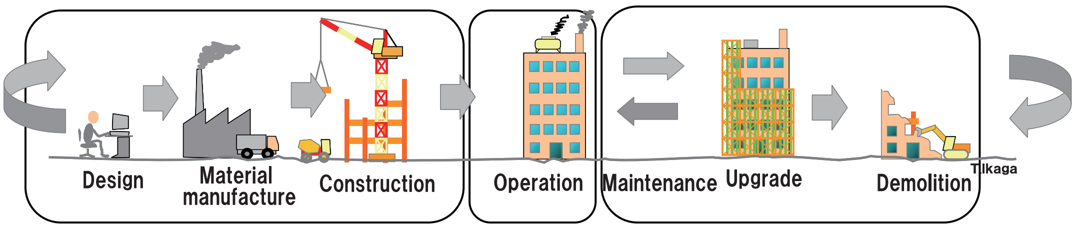
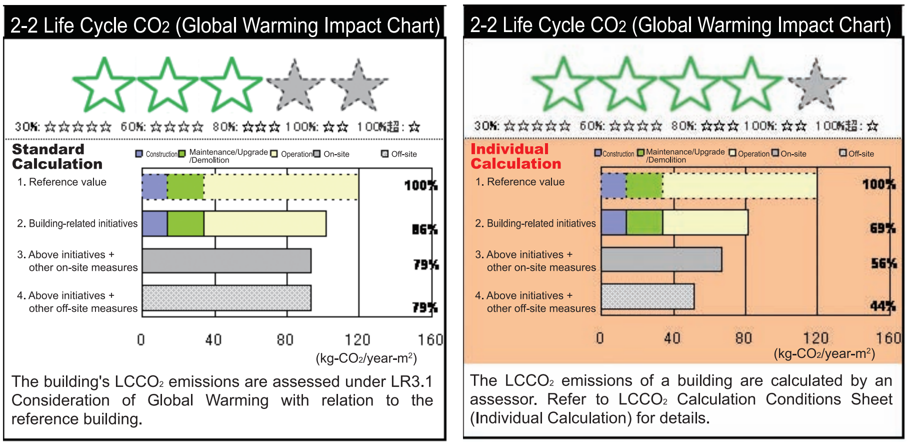


Figure III.2.2 Range of $LCCO_2$ assessment in CASBEE for Building (New Construction)

2.3.1 Basic components of $LCCO_2$ assessment

An example of $LCCO_2$ assessment results using CASBEE for Building (New Construction) is shown in Figure III.2.3. $LCCO_2$ is indicated in terms of the following items (1) to (4).
(1) Reference value ($LCCO_2$ emissions of a reference building that satisfies evaluation standards for building owners as referred to in the Energy Conservation Law) at each stage of a building's lifecycle (i.e. construction, maintenance/upgrade/demolition and operation).
(2) $LCCO_2$ emissions of subject building based on assessment of building-related initiatives (e.g. energy efficiency improvement, use of ecological materials and extended building lifespan) at each stage of a building's lifecycle (i.e. construction, maintenance/upgrade/demolition and operation).
(3) Assessment of above initiatives + other on-site measures (e.g. on-site solar power generation)
(4) Assessment of above initiatives + off-site measures (e.g. procurement of renewable energy certificates and carbon credits)

Regarding the CO_2 reduction due to the application of off-site measures in above (4), since there are various possible applications in the future, the assessment thereof is allowed only in the individual $LCCO_2$ calculation. With the standard calculation, the same value is presented in (3) and (4).
Furthermore, bar charts in (3) and (4) do not show the breakdown of each stage of a building lifecycle.



(a)Standard Calculation Results (b) Individual Calculation Results

Figure III. 2.3 Examples of $LCCO_2$ Assessment (Global Warming Impact Chart) for CASBEE for Building (New Construction)

2.3.2 CO_2 emissions at construction and maintenance/upgrade/demolition stages

As described above, it is difficult to calculate the emission volume for each block of an individual building. The figures used here are statistical values, for which the results of CO_2 emission calculations for typical examples of each building type and structure type have been prepared in advance as reference values and databased. The reference values are the CO_2 emissions for the reference building, which is a building scored with level 3 for every item. Quantitative effects relative to these reference values have also been calculated, corresponding to the various scoring levels for relevant CASBEE assessment items, and databased. This database preparation means that users of CASBEE for Building (New Construction) do not have to gather data for themselves. Instead, they can obtain rough calculated values for $LCCO_2$ just by inputting the building type and size, and performing the usually scoring for assessment items in CASBEE (some numerical input is required).

(1) Method of LCA calculation tools used

Calculations were performed using LCA guidelines for buildings "AIJ-LCA&LCW_ver.5.00" (Architectural Institute of Japan). Figure III.2.4 shows the method of totaling CO_2 emissions using the calculation tools concerned. At each stage, multiply the quantities of materials required for the construction and maintenance/upgrade/demolition of the building by the CO_2 emission unit for each material, then total the results. The following conditions were used in the CO_2 emission calculations (Standard Calculation).

- CO_2 emission units are analysis results produced by the Architectural Institute of Japan from the 2005 Industrial Input-Output Table (compliant with "AIJ-LCA&LCW_ver.5.00"), and boundaries used for CO_2 emission units up to the domestic consumption expenditure.
- Building service life settings: 60 years for offices, hospitals, hotels, schools and halls, 30 years for stores, restaurants, factories and apartments.
- Renewal intervals (years), repair rates, etc. are set for each material according to "AIJ-LCA &LCW_ver.5.00."
- Demolition material quantity was assumed to be 2,000 kg/m^2, and the road transport distance at 30 km for the purpose of the assessment.
- CFCs and halons were excluded from assessment because of the difficulty of finding the volume of leakage from each building.

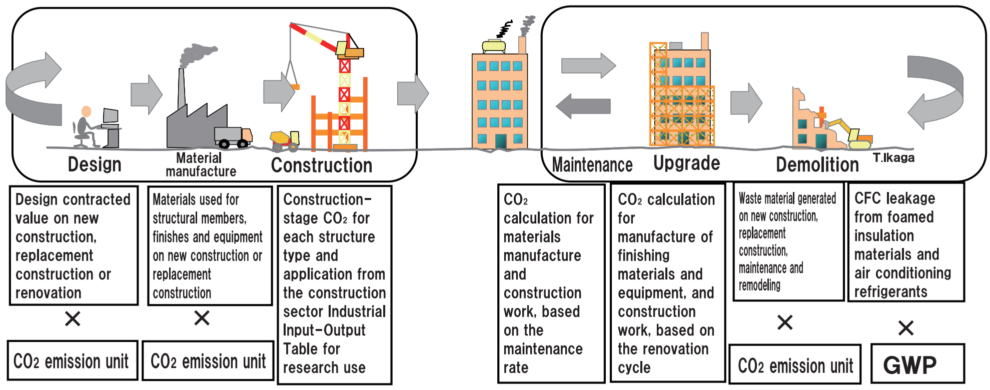


Figure III.2.4 Total of CO_2 missions in the building LCA Guidelines
("Construction" and "Maintenance/Upgrade/Demolition" stages)

Table III.2.1 CO_2 emission units for representative materials

Regular concrete	266.71 kg-CO_2/m^3
Blast furnace cement concrete	216.57 kg-CO_2/m^3
Steel frame*	1.28 kg-CO_2/kg
Steel reinforced	0.51 kg-CO_2/kg
Formwork	4.75 kg-CO_2/m^2

* Not distinguished between electric furnace steel and blast furnace steel.

(2) Statistical values used in calculations

A database has been prepared from statistical data produced by analysis of construction works of each size. For structural construction works, the weights of materials are set for each building type and structure type, on the basis of statistical data ("Analytical data on building construction unit prices," edited by the Construction and Industrial Management Research Group).

Table III.2.2 Quantities of Representative Materials in Structural Works

Building type	Structure	Concrete (m^3/m^2)	Formwork* (m^2/m^2)	Steel reinforced (t/m^2)	Steel frame (t/m^2)
[1] Apartments	SRC	0.75	1.0425	0.136	0.052
	RC	0.734	1.1075	0.1	0.012
	S	0.323	0.165	0.019	0.048
[2] Offices	SRC	0.696	0.6675	0.078	0.1
	RC	0.772	1.05	0.103	0.038
	S	0.567	0.4325	0.07	0.136
[3] Elementary, junior high and high schools	SRC	0.958	0.9725	0.11	0.078
	RC	0.865	1.225	0.112	0.005
	S	0.352	0.17	0.045	0.105
[4] Medical care and welfare facilities	SRC	0.812	0.8075	0.089	0.066
	RC	0.766	1.12	0.096	0.012
	S	0.317	0.17	0.034	0.074
[6] Restaurants, retailers and discount stores	SRC	0.307	0.4025	0.053	0.071
	RC	0.912	1.435	0.133	-
	S	0.342	0.155	0.024	0.072
[7] Hotels and inns	SRC	0.816	1.04	0.093	0.084
	RC	0.999	1.195	0.111	0.004
	S	0.436	0.3925	0.034	0.103
[8] Gymnasia, lecture halls and meeting facilities	SRC	0.862	1.0225	0.1	0.059
	RC	0.888	1.235	0.118	0.017
	S	0.345	0.3625	0.04	0.139
[9] Warehouses and logistics facilities	SRC	0.669	0.5575	0.08	0.077
	RC	0.77	0.7625	0.108	0.01
	S	0.354	0.175	0.031	0.088

* For formwork the figure is one quarter of the density of 12 kg/m^2, assuming it is reused four times.

(3) Calculation of effects of measures

Efforts related to reduction of CO_2 emissions are handled as described below in CASBEE assessment items.

1) Efforts for lifespan extension

Extension of service life is evaluated under "Q2 Quality of Service." However, it is difficult to estimate the actual extension of service life with sufficient precision to use as a calculation condition for $LCCO_2$. Therefore, take service life as a constant for all non-residential buildings for $LCCO_2$ estimation.

- Offices, hospitals, hotels, schools and halls: Fixed 60 years
- Retailers, restaurants and factories: Fixed 30 years
- Apartments: 30, 60 or 90 years, according to the deterioration countermeasure grades in the Japan Housing Performance Standard.

Table III.2.3 Scoring level and condition of CO_2 assessment of "Q2.2.2.1 Service Life of Structural Materials"

Level	Standard	Condition of CO_2 assessment
Level 1	(No corresponding level)	-
Level 2	(No corresponding level)	-
Level 3	Level equivalent to Grade 1 in the assessment standards for wood, steel frame and concrete structures (MLIT Directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)	Lifespan of structure and foundation: 30 years
Level 4	Level equivalent to Grade 2 in the assessment standards for wood, steel frame and concrete structures (MLIT Directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)	Lifespan of structure and foundation: 60 years
Level 5	Level equivalent to Grade 3 in the assessment standards for wood, steel frame and concrete structures (MLIT Directive 151 issued in 2014, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Act)	Lifespan of structure and foundation: 90 years

2) Resource-saving efforts

"Continuing Use of Existing Structural Frame, etc." and "Use of Recycled Materials" are evaluated under LR2 Resources & Materials, and the embodied CO_2 related to the manufacture of these materials, taking these measures into account, can be evaluated. For usage rates of existing structural skeletons and of blast furnace cement, relative to the entire new structure as 100%, the corresponding CO_2 emissions have been calculated in advance, as shown below for each usage rate at 100%, and the results databased. The effect magnitude is approximately calculated according to the percentage usage rate value input by the assessor for the evaluated building, based on the database.

- The CO_2 reduction amount for a structural member reuse rate of 100% is calculated with amounts of all representative materials (concrete, formwork, steel skeletons, steel rebar) set to zero.
- The CO_2 reduction amount for a blast furnace cement usage rate of 100% is calculated with the amount of concrete set entirely to blast furnace cement.

(4) CO_2 emissions at Construction and Maintenance/Upgrade/Demolition stages
CO_2 emission data as described in Items (1)-(3) are shown in Table III.2.4 and III.2.5.
Wooden buildings are evaluated as S (Steel) structures.

Table III.2.4 CO_2 emissions at the construction stage (kg-CO_2/year-m^2)

Building type			S/Wood	RC	SRC
Offices			14.01	13.23	14.00
	LR2.2.2 Existing structural frame	100%	6.45	6.60	6.52
	LR2.2.3 Recycled materials (blast furnace cement	100%	13.42	12.42	13.27
Schools			10.47	11.76	14.00
	LR2.2.2 Existing structural frame	100%	5.23	5.37	5.28
	LR2.2.3 Recycled materials (blast furnace cement)	100%	10.11	10.85	13.01
Retailers			16.57	22.39	16.96
	LR2.2.2 Existing structural frame	100%	8.40	8.60	8.49
	LR2.2.3 Recycled materials (blast furnace cement)	100%	15.87	20.51	16.32
Restaurants			16.57	22.39	16.96
	LR2.2.2 Existing structural frame	100%	8.40	8.60	8.49
	LR2.2.3 Recycled materials (blast furnace cement)	100%	15.87	20.51	16.32
Halls			11.54	12.47	13.08
	LR2.2.2 Existing structural frame	100%	5.45	5.58	5.50
	LR2.2.3 Recycled materials (blast furnace cement)	100%	11.18	11.53	12.18
Factories			19.56	22.50	23.65
	LR2.2.2 Existing structural frame	100%	9.99	10.30	9.97
	LR2.2.3 Recycled materials (blast furnace cement)	100%	18.81	20.81	22.23
Hospitals			10.41	12.26	13.70
	LR2.2.2 Existing structural frame	100%	6.30	6.45	6.36
	LR2.2.3 Recycled materials (blast furnace cement)	100%	10.08	11.45	12.86
Hotels			11.12	12.77	13.53
	LR2.2.2 Existing structural frame	100%	5.56	5.69	5.61
	LR2.2.3 Recycled materials (blast furnace cement)	100%	10.67	11.72	12.68

Apartments

			S/Wood	RC	SRC
Level 3			15.64	19.62	22.38
	LR2.2.2 Existing structural frame	100%	9.09	8.83	8.75
	LR2.2.3 Recycled materials (blast furnace cement)	100%	14.97	18.15	20.89
Level 4			7.82	9.81	11.19
	LR2.2.2 Existing structural frame	100%	4.55	4.42	4.37
	LR2.2.3 Recycled materials (blast furnace cement)	100%	7.49	9.07	10.44
Level 5			5.21	6.54	7.46
	LR2.2.2 Existing structural frame	100%	3.03	2.94	2.92
	LR2.2.3 Recycled materials (blast furnace cement)	100%	4.99	6.05	6.96

Table III.2.5 CO_2 emissions at Maintenance/Upgrade/Demolition stage (kg-CO_2/year-m^2)

Building type	S/Wood	RC	SRC
Offices	15.99	16.46	16.21
Schools	11.80	12.42	12.31
Retailers	6.88	7.74	6.91
Restaurants	6.88	7.74	6.91
Halls	12.81	13.43	13.25
Factories	8.65	9.42	9.06
Hospitals	15.43	16.05	15.89
Hotels	13.30	13.94	13.67

Apartments

	S/Wood	RC	SRC
Level 3	8.02	8.37	8.36
Level 4	9.72	9.74	9.68
Level 5	10.98	10.86	10.78

2.3.3 CO_2 emissios at operation stage

1. Basic guidelines and key points

The key points of the calculation method (standard calculation) for CO_2 emission at the operation stage are described below.

(1) Calculate CO_2 emissions volume based on assessment results of middle items evaluated under "LR1 Energy."

(2) Select the appropriate CO_2 emission coefficient for electricity use specific to the assessment objective. The assessment software for the 2014 edition allows use of the most recent actual emissions coefficient and alternative values (i.e. the actual 2012 values and the published values announced in December 2013). These values are based on Article 2-4 of the Ordinance on Calculation of Greenhouse Gas Emissions from Business Activities of Specified Emitters. The assessor may also apply other appropriate emission coefficients of choice (optional).

(3) To simplify the process, calculation of CO_2 emissions at the operation stage is based on the conversion of primary energy consumption into CO_2 emissions.

(4) When calculating CO_2 emissions in buildings (excluding apartments), establish reference values of primary energy consumption specific to building type. Convert the primary energy consumption to CO_2 using conversion coefficients based on energy composition ratio according to statistical data. This method offers a simplified CO_2 emission conversion from primary energy consumption at the operation stage obtained according to the Energy Conservation Law.

As indicated above in (3), the assessment of energy efficiency in CASBEE is based on the BEI (energy consumption ratio) and other related factors. Therefore, CASBEE utilizes a method in which the primary energy consumption of the reference building and the building subject to the assessment is calculated, which is converted into the CO_2 emissions. This approach enables a simplified calculation of CO_2 emissions using energy efficiency calculation results submitted to the government. At the same time, however, it means that the energy composition ratio of the subject building is no longer reflected in the assessment result. Furthermore, coefficients used for the conversion of primary energy consumption into CO_2 emissions are determined from the statistical data of the energy composition ratio, as described above in Item 4. As the same coefficients are applied to both reference and subject buildings, problems in effectiveness of comparative evaluation are also noted.

This revised edition follows the conventional method in the standard calculation, in order to take into account the consistency and sequentiality in the assessment of new construction and existing buildings, and calculation methods other than the Web program provided by the government (i.e., BEST, etc.), and to apply the same calculation rules to the Model Building Method and simplified calculations that cover small-scale buildings.

These issues relating to the standard calculation due to the simplified assessment of $LCCO_2$ in CASBEE, in which energy efficiency calculation results are utilized in accordance with the Energy

Conservation Law, were not fully resolved in the 2014 revised edition. Thus, further discussions thereon will continue.

2. Buildings excluding apartments

In addition to the key points indicated in Paragraph 1,

(1) The CO_2 emissions (per floor area) of the reference building are assumed equal to the CO_2 emissions estimated based on the statistical average of energy consumption.

(2)Similarly in the targeted building, the energy consumption ratio by building purpose for individual energy types is the same as the ratio obtained from the statistical data of (1).

(3) The CO_2 emissions of the targeted building are calculated by multiplying the primary energy consumption of the targeted building estimated by increasing or decreasing the primary energy consumption of the reference building depending on the assessment levels of middle items under LR1 by the CO_2 conversion factor.

A. CO_2 emission for the reference building

In terms of individual building purposes and scales, based on statistical data, the primary energy consumption intensity and composition ratios of energy types used, are determined (Table III.2.6). Based on the data, the consumption of individual energy types by building purposes is estimated, which is multiplied by the CO_2 emissions coefficient in order to obtain the CO_2 emissions.
The CO_2 emission coefficient used in the standard calculation are as shown in Table III.2.7.

CO_2 emission for the reference building (kg-CO_2/year)
= Σ (Primary energy consumption by the reference building (MJ/year)
x Ratio of primary energy consumption of energy source type i by building type
x CO_2 emission coefficient for energy source type i (kg-CO_2/MJ))

(1) Primary energy consumption by the reference building

The primary energy consumption of the reference building is obtained based on the primary energy consumption intensity (the average of sample values in the corresponding classification) by building purposes and scales (by regions in terms of elementary and junior high schools) indicated in Table III.2.6. As for multi-purpose buildings, a value for the entire building is obtained by weighting the primary energy consumption intensity by the floor space in each classification.

(2) Estimated CO_2 conversion factor by use

The CO_2 conversion factor (the CO_2 emissions per unit of primary energy consumption) is derived from the primary energy consumption and CO_2 emissions of the reference building. Energy consumption volumes are estimated from LR1 scoring levels for the evaluated building. When estimating CO_2 emissions in the evaluated building, the CO_2 conversion factor by use is utilized in order to convert the primary energy consumption into CO_2 emissions.

CO_2 conversion factor by use (kg-CO_2/MJ)
= CO_2 emission for the reference building (kg-CO_2/year)/Primary energy consumption by the reference building (MJ/year)

Table III.2.6 Statistical data of primary energy consumption

Building type			Number of reference buildings	Primary energy consumption by scale [MJ/year-m²] Total floor space classifications					Primary energy composition ratio per energy source			
				Less than 300 m²	More than 300 m² and less than 2,000 m²	More than 2,000 m² and less than 10,000 m²	More than 10,000 m² and less than 30,000 m²	More than 30,000 m²	Electricity	Gas	Other*	LPG
Offices	Offices		2,497		1,540		1,930	2,270	90%	6%	4%	–
	Government buildings		1,769		1,100		1,280		83%	9%	8%	–
Retailers	Department stores/Supermarkets		1,784	7,430		5,130	3,190		93%	3%	4%	–
	Other stores		447			2,450			92%	4%	4%	–
Restaurants			13			2,960			50%	38%	12%	–
Hotels/Inns			1,100		2,440		2,740		77%	10%	13%	–
Hospitals			2,209		2,210		2,450	2,920	65%	15%	20%	–
Schools	Nursery schools		522			490			71%	16%	13%	–
	Elementary/ Junior high schools	Hokkaido	461			520			62%	17%	21%	–
		Others	2,948			310			76%	14%	10%	
	High schools		2,391		390		360	240	74%	7%	19%	–
	Universities/Technical colleges		658		880		850	1,160	79%	12%	9%	–
Halls	Theatres/Halls		862		1,030		1,480		76%	16%	8%	–
	Exhibition facilities		1,055		1,120		1,540		81%	9%	10%	–
	Sports facilities		360		1,910		1,280		92%	6%	2%	–
Factories			–			500			100%	0%	0%	–
Apartments	Private areas		–	–	–	–	–	–	51%	21%	18%	10%
	Common areas		–	–	–	–	–	–	100%	0%	0%	–

* Kerosene is used in apartments.

Source: Summary of DECC data-base for Energy Consumption of Commercial Building (released in April 2013, Japan Sustainable Building Consortium)
The primary energy composition ratio of private areas of apartments is in reference to "Final energy consumption by energy type in residential sector (Energy demand and supply record in 2011, the Agency of Natural Resources and Energy)." Regarding factories, since there is no statistical data available, the energy consumption for lighting in office buildings under the Notification No. 7 of 2013 Energy Conservation Law is used. As for restaurants, data from buildings having a total floor space of more than 2,000 m^2 are compiled.

Table III. 2.7 CO_2 emission coefficient for each energy source type for use in assessment

Type	CO_2 emission coefficient		Notes
Electricity	※	kg-CO_2/MJ	* Value converted at 9.76 MJ/kWh (All Japan average for 2013 under the Law Concerning the Rational Use of Energy)
Town gas	0.0499	kg-CO_2/MJ	
Kerosene	0.0678	kg-CO_2/MJ	
Type A heavy oil	0.0693	kg-CO_2/MJ	
LPG	0.0590	kg-CO_2/MJ	Used for residential purposes in the standard calculation
Other	0.0686	kg-CO_2/MJ	(Average value for kerosene + type A heavy oil)

B. CO_2 emissions from the evaluated building

The CO_2 emissions of the target building are evaluated by assuming that the reference building is equivalent to the standard value for the primary energy consumption under the Energy Conservation Law, and by combining with CO_2 reduction effects achieved through the introduction of various energy saving measures in the target building. Thus, as Figure III.2.5 shows, start from energy consumption quantity A for the reference building, then estimate the CO_2 reduction quantities (effect magnitudes) for the energy-saving effects under each of the three items in LR1 assessment, and subtract those reduction quantities from A to derive energy consumption D for the evaluated building. Multiply D by the CO_2 conversion factor to obtain the CO_2 emissions volume. According to the new energy conservation standards, when the assessment is based on the BEI utilizing the Web program, the BEI assessment includes increased efficiency in building service systems as well as the reduced primary energy consumption due to the reduction in thermal load.

CO_2 emissions D' for the evaluated building (kg-CO_2/year)
= CO_2 emissions for the reference building A' (kg-CO_2/year)
- CO_2 reduction due to primary energy consumption ratio (BEI) (kg-CO_2/year)
- CO_2 reduction due to natural energy utilization (kg-CO_2/year)
- CO_2 reduction due to efficient operation (kg-CO_2/year)
= (Primary energy consumption by the reference building A (MJ/year)
- Primary energy consumption reduction due to primary energy consumption ratio (BEI) (a) (MJ/year)
- Annual natural energy usage (b) (MJ/year)
- Primary energy consumption reduction due to efficient operation (c) (MJ/year)
x CO_2 conversion factor by use (kg-CO_2/MJ)

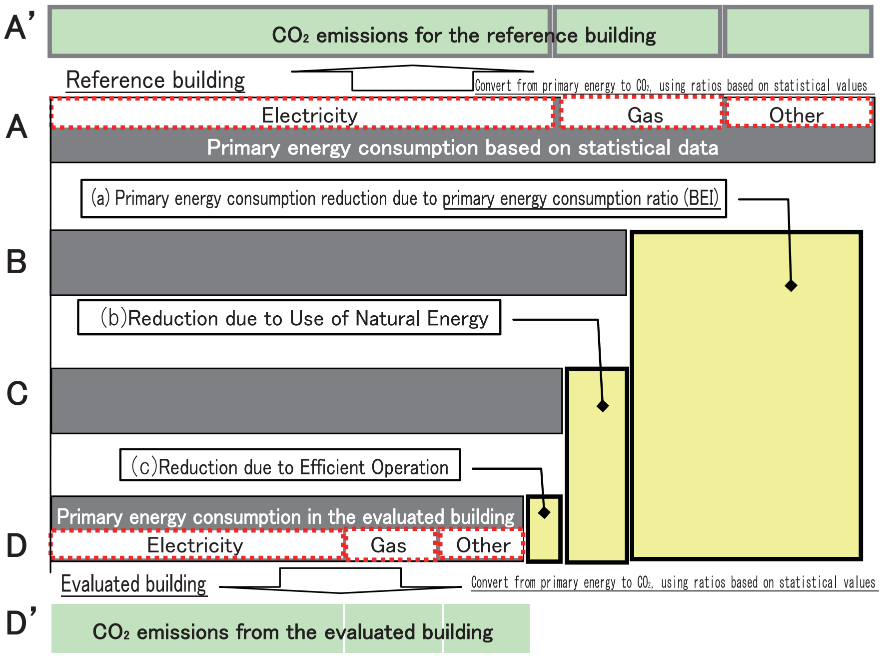


Figure III.2.5 Approach to calculating CO_2 emissions of the evaluated building

(1) Calculation method for effect magnitudes

a. Primary energy consumption ratio (BEI)

The assessment is conducted based on the primary energy consumption ratio (BEI) used for the rating in LR1.3 Efficiency in Building Service System. (When based on the Model Building Method, utilize BEIm.)

In this regard, assessments of the on-site technique should be excluded from the BEI assessment.

Primary energy consumption reduction due to primary energy consumption ratio (BEI) (a) (MJ/year) = (1 - BEI of the target building [-]) x (Primary energy consumption of the reference building (MJ/year))

b. Natural energy utilization

The calculation is conducted utilizing the direct use of the annual natural energy (based on the standard primary energy consumption per total floor space) evaluated in the rating of LR1.2 Natural Energy Utilization.

In cases of a qualitative assessment, the assessment result is converted into the annual usage in order to calculate the reduced primary energy consumption.

Table III.2.8 Method to convert qualitative assessment data into quantitative assessment data

Assessment Item		Assessment	Conversion to quantitative assessment data	Notes
2. Natural Energy Utilization	Direct use	Level 1	Estimated usage = 0 MJ/m^2	Level 1(-)
		Level 2	Estimated usage = 0 MJ/m^2	Level 2(-)
		Level 3	Estimated usage = 0 MJ/m^2	Level 3 (0- 1 MJ/m^2)
		Level 4	Estimated usage = 1 MJ/m^2	Level 4 (1- 15 MJ/m^2)
		Level 5	Estimated usage = annual usage Sch (Elementary/Junior High/High Schools) Estimated usage = 15 MJ/m^2	Level 5 (More than 15MJ/m^2, a qualitative assessment applies to Sch (Elementary/Junior High/High Schools))

c. Efficient operation

The assessment is conducted utilizing the scoring levels in LR1.4 Efficient Operation, as well as the energy consumption of the target building after taking into account the primary energy consumption ratio (BEI) and the use of natural energy as a parameter, based on the correction coefficient that corresponds to the level. Assume level 5 if it is possible for appropriate operation to avoid problems at the operation stage (i.e. the anticipated performance is realized), and evaluate according to wasteful energy consumption beyond the anticipated level corresponding to reduced levels.

Table III.2.9 Correction Coefficients for Each Level of "LR1.4 Efficient Operation" Scoring

Scoring level	Correction coefficient
Level 1	1.000
Level 2	1.000
Level 3	1.000
Level 4	0.975
Level 5	0.950

(2) Conversion of primary energy consumption into CO_2 emissions

The CO_2 emissions of the target building at the operation stage are estimated by multiplying the energy consumption of the target building calculated in the above (1) by the CO_2 conversion factor by use obtained in A.

3. For apartments

A. CO_2 emissions for the reference building

The primary energy consumption and the composition ratio by energy type used in the reference building are determined (Table III.2.6). Based thereon, the consumption of individual types of energy is estimated, by which the CO_2 emissions coefficient is multiplied in order to obtain the CO_2 emissions.

CO_2 emissions for the reference building (kg-CO_2/year)
= Σ (Primary energy consumption by the reference building (MJ/year)
x Ratio of primary energy consumption of energy source type i by building type
x CO_2 emission coefficient for energy source type i (kg-CO_2/MJ))

(1) Primary energy consumption by the reference building

(a) Private areas

For the primary energy consumption of the reference building, the sum of the standard primary energy consumption of individual dwelling units in the entire building calculated in a Web program and the like is used.

Primary energy consumption by the reference building (MJ/year)
= (Σ "Standard primary energy consumption (MJ/year)" of Dwelling unit n
- Σ "Energy consumption of other facilities (MJ/year)" of Dwelling unit n) x 110%
+Σ "Energy consumption of other facilities (MJ/year)" of Dwelling unit n)

Further, an approximate value of the sum of the "Energy consumption of other facilities [MJ/year]" in terms of the entire building is automatically calculated in assessment software, which can be used in the standard calculation.

The primary energy consumption of private areas of the reference building is equivalent to Level 3 in LR1.3 assessment for apartments. In this regard, the "Standard primary energy consumption" equivalent (x 100%) corresponds to Level 4 in LR1.3 assessment.

(b) Common areas

For the primary energy consumption of the reference building, values for the standard primary energy consumption of common areas calculated in a Web program and the like are used.

Primary energy consumption by the reference building (MJ/year)
= "Standard primary energy consumption (MJ/year)"

(2) Estimated CO_2 conversion factor by use

The CO_2 conversion factor by use in terms of private areas and common areas is obtained by multiplying the statistical data of the primary energy composition ratio for apartments (Table III.2.6) by CO_2 emissions coefficients by energy type (Table III.2.7).

CO_2 conversion factor by use (kg-CO_2/MJ)
= Σ (Primary energy composition ratio of Energy type i
x CO_2 emissions coefficient (kg-CO_2/MJ) of Energy type i)

B. CO_2 emissions of subject building

The CO_2 emissions of the target building at the operation stage is estimated by multiplying the energy consumption of the target building by CO_2 conversion factors by use listed in Table III.2.6.

CO_2 emissions of the target building (kg-CO_2/MJ)
= Σ (Primary energy consumption of the target building (MJ/year) x CO_2 conversion factor by use (kg-CO_2/MJ))

(1) Calculation of effect magnitude

The design primary energy consumption calculated in accordance with the energy efficiency calculation under the Energy Conservation Law by the government is used for the primary energy consumption of the target building. Effects of the HEMS and MEMS are left out of the consideration for the time being.
In this regard, assessments based on the on-site technique (i.e., solar power generation, etc.) should be excluded from the assessment of the design primary energy consumption.

(a) Private areas

Primary energy consumption by the target building (MJ/year)
= Σ"Design primary energy consumption (MJ/year)" of Dwelling unit n

In cases where the level assessment is conducted based on specifications without carrying out the energy calculation in LR1.3c. Assessment of primary energy consumption in apartments, the CO_2 emissions are calculated by utilizing the predetermined primary energy consumption indicated in Table III.2.10.
The primary energy consumption is converted according to the idea of consumption ratios in individual levels of LR1.3c. Assessment of primary energy consumption in apartments based on the standard primary energy consumption calculated in conformity with the conditions under the Guideline for Design, Construction and Maintenance regarding Rationalization of Energy Use for Residential Buildings (Notification No. 907) (hereinafter referred to as the Design and construction guideline) and "How to confirm 'buildings rated as equivalent or higher' " in Appendix 6 (2) of the Guideline. Therefore, the reference value of the primary energy consumption is equivalent to Level 3 in "LR1.3c. Assessment of primary energy consumption in apartments," converted into a primary energy consumption ratio of 110%.
Since the standard primary energy consumption differs depending on the types of facilities, various values corresponding to the individual facility types are used in the primary energy consumption required for the CO_2 emissions calculation.

Heating facility
- A: Heating the entire dwelling unit
- B: Heating living space only (Continuous heating)
- C: Heating living space only (Intermittent heating)

Cooling facility
- a: Cooling the entire dwelling unit
- b: Cooling living space only (Intermittent cooling)

Table III.2.10 Primary energy consumption used for calculating CO_2 emissions (MJ/m^2)

Facility type		Assessment level in LR1.3c.	Regional classification							
Heating	Cooling		1	2	3	4	5	6	7	8
A	a	Reference value	1484	1298	1189	1246	1163	1100	976	888
		Level 1	1721	1502	1373	1440	1343	1268	1121	1017
		Level 4	1365	1196	1097	1149	1074	1016	903	823
A	b	Reference value	1466	1282	1155	1179	1092	926	752	556
		Level 1	1700	1483	1333	1361	1258	1063	857	625
		Level 4	1348	1182	1066	1088	1009	858	700	521
B	a	Reference value	1374	1287	1223	1266	1190	1163	1012	888
		Level 1	1592	1489	1413	1464	1374	1343	1164	1017
		Level 4	1265	1186	1128	1167	1098	1074	936	823
B	b	Reference value	1356	1271	1189	1199	1119	990	789	556
		Level 1	1571	1470	1373	1385	1290	1137	900	625
		Level 4	1249	1172	1097	1106	1033	916	733	521
C	a	Reference value	1024	966	916	941	856	901	869	888
		Level 1	1178	1110	1050	1080	97	1033	995	1017
		Level 4	947	894	849	871	794	835	806	823
C	b	Reference value	1006	950	882	874	784	727	646	556
		Level 1	1157	1091	1010	1001	895	828	731	625
		Level 4	931	880	818	811	729	677	603	521

(b) Common areas
Primary energy consumption by the target building (MJ/year)
= "Design primary energy consumption (MJ/year)"

(2) Conversion from primary energy consumption into CO_2 emissions
The CO_2 emissions of the target building at the operation stage are estimated by multiplying the energy consumption of the target building calculated in above (1) by the CO_2 conversion factor by use obtained in A.

2.3.4 Calculation of CO_2 emissions with on-site measures

The 2010 edition now lists $LCCO_2$ emissions separately from use of on-site measures (e.g. renewable energy use within the property) and building-related initiatives (e.g. use of ecological materials, extended building lifespan, energy-saving measures within the building). In buildings with low energy consumption (e.g. detached houses), systems such as solar power generation alone can achieve a significant energy-saving effect and CO_2 reduction at the operation stage. However, use of other related measures should be regarded as equally important. Thus, separating the effectiveness of both types of energy-saving and CO_2 reduction measures was determined to be appropriate. While it is unlikely to apply to buildings assessed under CASBEE for Building (New Construction), the 2010 edition addresses the issue because use of renewable energy is expected to increase.
In order to promote solar power generation, excess electricity generated from solar systems which is not used in the building can be sold to the energy provider at a higher price than the provider's retail prices. With such energy sales, the environmental value (CO_2 reduction effect) of solar power generation is also passed on. From this perspective, environmental assessment of the building should not include the CO_2 reduction effect of solar-generated power that is sold.

On the other hand, as solar power generation plays an important role in building a low-carbon society, CASBEE assessment recognizes that the inclusion of physical measures on-site or of the building (i.e. use of solar panels) contributes to Japan's CO_2 reduction efforts. Thus, the CO_2 reduction effect of excess electricity sold to energy providers can be included in assessment of on-site measures. However, the amount sold to others through Feed-in-Tariffs is excluded from the assessment. Note that, as programs regarding the environmental value of solar-generated electricity are currently under review by the government and municipalities, assessment method may be revised accordingly in the future.

Further, in the Standard Calculation, when the Reduced Primary Energy Consumption Due to

Introduction of the On-Site Technique (MJ/year-m^2) is entered into the Planning Sheet in which figures for the energy efficiency calculation are entered, the effect thereof is automatically calculated utilizing the CO_2 conversion factor by use. While Individual Calculation requires the assessor to calculate such effects, the assessor can use reference data shown in the $LCCO_2$ Calculation Conditions Sheet (Individual Calculation) as shown in Figure III.2.7.

2.3.5 Calculation of CO_2 emissions with off-site measures

Carbon offsetting through earning renewable energy certificates or carbon credits is being promoted as a climate change countermeasure. These mechanisms do not necessarily indicate the environmental performance of buildings; however, they are nonetheless effective and valuable in realizing the climate change-related commitments of Japan. From the CASBEE 2010 edition, these efforts made off-site are organized as the off-site technique and are added to the $LCCO_2$ assessment.
The following off-site measures are evaluated in this category:

(1) Measures implemented by building owners or users
- Renewable energy certificates/heat certifications
- Kyoto credits
- J-Credit System, etc.

(2) Carbon offsetting measures implemented by energy providers

For the measures implemented by building owners or users, the purchase of applicable credits with the same validity period as the CASBEE for Building (New Construction) assessment (i.e. three years post-construction) must have already been completed or should be committed.
Effects of carbon offsetting measures implemented by energy providers can be evaluated, for example, by multiplying the difference between the most-recent actual emissions coefficient[*1] and the adjusted emission coefficients[*2] with electricity purchased from energy providers (refer to Figure III.2.7).

*1 Values are based on Article 2-4 of the Ordinance on Calculation of Greenhouse Gas Emissions from Business Activities of Specified Emitters (MOE et al).
*2 Values are based on Article 20-2 of the Ordinance on Reporting of Greenhouse Gas Emissions (MOE et al).
*3 The PPS-specific emission coefficients (real coefficient/adjusted coefficient) and the alternative coefficient values are revised and published annually by the government. Check if the values are current according to the CASBEE assessment manual or software. If revisions are not reflected in the manual or software, verify the latest coefficients available on MOE website and apply these in the calculation.

CO_2 reduction using off-site measures is not yet included in BEE. As the addition of further off-site measures is expected, the 2014 edition allows this assessment in individual $LCCO_2$ calculations. As applications of off-site measures are expected to increase, an ongoing review of CASBEE assessment methods is being conducted.

Table III.2.11 Actual/adjusted CO_2 emission coefficients per power provider (t-CO_2/kWh)

General PPS	Actual emissions coefficient (t-CO_2/kWh)	Adjusted emission coefficient (t-CO_2/kWh)
Hokkaido Electric Power Co., Inc.	0.000688	0.000680
Tohoku Electric Power Co., Inc.	0.000600	0.000560
Tokyo Electric Power Co., Inc.	0.000525	0.000406
Chubu Electric Power Co., Inc.	0.000516	0.000373
Hokuriku Electric Power Co., Inc.	0.000663	0.000494
Kansai Electric Power Co., Inc.	0.000514	0.000475
Chugoku Electric Power Co.,Inc.	0.000738	0.000672
Shikoku Electric Power Co., Inc.	0.000700	0.000656
Kyushu Electric Power Co., Inc.	0.000612	0.000599
Okinawa Electric Power Co., Inc.	0.000903	0.000692

Alternative value	0.000550 (t-CO_2/kWh)

Specified PPS	Actual emissions coefficient (t-CO_2/kWh)	Adjusted emission coefficient (t-CO_2/kWh)
eREX Co., Ltd.	0.000603	0.000428
Idemitsu Green Power Co., Ltd.	0.000086	0.000106
Itochu Enex Co., Ltd.	0.000676	0.000293
Eneserve Corp.	0.000616	0.000482
Ebara Environmental Plant Co., Ltd.	0.000456	0.000456
Oji Paper Co., Ltd.	0.000475	0.000471
ORIX Corp.	0.000762	0.000757
e-sell Co.,Ltd.	0.000000	0.000000
Ennet Corp.	0.000429	0.000427
F-Power Co., Ltd.	0.000525	0.000445
G-Power Co., Ltd.	0.000441	0.000000
Nihon Ceremony Corp.	0.000797	0.000789
Summit Energy Corp.	0.000438	0.000259
JX Nippon Oil & Energy Corp.	0.000367	0.000364
J JEN Holdings Co., Ltd.	0.000494	0.000490
Shigakogen Resort Kaihatsu Corp.	0.000312	0.000309

Specified PPS	Actual emissions coefficient (t-CO_2/kWh)	Adjusted emission coefficient (t-CO_2/kWh)
Showa Shell Sekiyu K.K.	0.000367	0.000364
Nippon Steel & Sumikin Engineering Co, Ltd.	0.000655	0.000654
Senboku Natural Gas Power Generation Co., Ltd.	0.000388	0.000385
Diamond Power Corp.	0.000431	0.000427
Tess Engineering Co.,Ltd.	0.000494	0.000490
Tokyo Eco Service Co., Ltd.	0.000092	0.000091
Nihon Techno Co., Ltd.	0.000508	0.000509
Japan Logistic Coop.	0.000486	0.000256
Panasonic Corp.	0.000498	0.000492
Premium Green Power Corp.	0.000018	0.000022
Marubeni Corp.	0.000378	0.000324
Mitsuuroko Green Energy Co., Ltd.	0.000366	0.000445
Les Power Co.,Ltd.	0.000420	0.000000

(2012 actual data published on December 19, 2013)

2.3.6 $LCCO_2$ assessment process (Individual Calculation)

In the individual calculation, when a detailed $LCCO_2$ calculation is conducted according to any published LCA method, the assessor can apply the calculation conditions and results to the individual calculation for CASBEE $LCCO_2$ assessment (Global Warming Impact Chart). In this case, the assessor must use $LCCO_2$ Calculation Conditions Sheet (Individual Calculation) as shown in Figure III.2.6 to enter the conditions and results specified below. Alternatively, a majority of results from the CASBEE standard calculation can also be applied in combination with other individually-calculated valid data. Specifically, the assessor can enter conditions and results for the standard calculation, while adding individually-calculated results of off-site measures.
Furthermore, refer to Figure III.2.7 for calculation results of CO_2 reduction with on-site measures (e.g. solar power generation) and with carbon offsetting measures implemented by energy providers.
The entry items include the following calculation conditions and results:

- Building overview (type/size/structure)
- Life cycle (estimated service life)
- CO_2 emissions at construction stage (calculation results)
- The above calculation method (e.g. Building LCA Tool Ver.5.00 developed by the Architectural Institute of Japan)
- Reference for CO_2 emission units (e.g. 2005 Industrial Input-Output Table published by the Architectural Institute of Japan)
- Boundary of CO_2 calculation (e.g. domestic consumption expenditure)
- Main materials: regular concrete (m^3/m^2), blast furnace cement concrete (m^3/m^2), steel frame (t/m^2), steel frame (electric furnace) (t/m^2), steel reinforced (t/m^2), etc.
- Environmental load of main materials: regular concrete ($kg\text{-}CO_2/m^3$), blast furnace cement concrete ($kg\text{-}CO_2/m^3$), steel frame ($kg\text{-}CO_2/t$), steel frame (electric furnace) ($kg\text{-}CO_2/t$), steel reinforced ($kg\text{-}CO_2/t$), etc.
- Main recycled materials and usage: blast furnace cement (structure use), existing frame materials (structural use), electric furnace steel (reinforcement), electric furnace steel (steel materials), etc.
- CO_2 emissions at maintenance/upgrade/demolition stage (calculation results)
- Maintenance period (year) (exterior/interior/service systems)
- Average repair rate (%/year) (exterior/interior/service systems)
- Calculation method for demolition-related CO_2 emissions (e.g. estimated with assumption of demolition material transport distance of XX km)
- CO_2 emissions at operation stage (calculation results)
1. Reference value
2. Building-related initiatives
3. Above + other on-site initiatives
4. Above + other off-site initiatives
- Calculation method for primary energy consumption
- CO_2 emission coefficients of energy (electricity, gas and other fuels)
- Other

■LCCO_2 Calculation Conditions Sheet (Individual Calculation) ■Building Name XX Building

CASBEE_BD-NC_2014(v.1.0)

Item		Reference Values (Reference Building)	Target	Note
Building Overview	Building type	Office	Office	
	Gross floor area	5,400m^2	5,400m^2	
	Structure	RC	RC	
Life Cycle	Estimated service life	Office area, 60 years	Office area, 60 years	
Construction Stage	CO_2 emissions	13.23	12.99	kg-CO_2/year-m^2
	Embodied CO_2 calculation method	Japan's average CO_2 emissions based on 2005 I-O table analysis by the Architectural Institute of Japan	Estimated by subtracting CO_2 reduction due to recycled material use from the reference value	
	Reference for CO_2 emissions unit	CO_2 emissions based on the analysis of the 2005 I-O Table by the Architectural Institute of Japan	See reference method	
	Boundary	Domestic consumption expenditures	See reference method	
	Representative Main Material Amounts			
	Regular concrete	0.772	〃	m^3/m^2
	Blast furnace cement concrete	0	〃	m^3/m^2
	Steel frame	0.038	〃	t/m^2
	Steel frame (electric furnace)	0	〃	t/m^2
	Steel reinforced	0.103	〃	t/m^2
	□ □	0.013	〃	t/m^2
	□ □	○○	〃	kg/m^2
	Representative Material Environmental Load			
	Regular concrete	266.71	〃	kg-CO_2/m^3
	Blast furnace cement concrete	216.57	〃	kg-CO_2/m^3
	Steel frame	1.28	〃	kg-CO^2/kg
	Steel frame (electric furnace)	1.28	〃	kg-CO^2/kg
	Steel reinforced	0.51	〃	kg-CO^2/kg
	Lumber	4.75	〃	kg-CO^2/m^2
	□ □	○○	〃	kg-CO^2/kg
	Main Recycled Materials and Usage			
	Blast furnace cement (structural use)	0%	5%	
	Existing frame materials (structural use)	0%	0%	
	Electric furnace steel (steel reinforced)	0%	0%	
	Electric furnace steel (steel materials)	0%	0%	
Maintenance/ Upgrade/ Demolition Stage	CO_2 emissions	16.46	16.46	kg-CO_2/year-m^2
	Upgrade period (year)			
	Exterior	25 years	25 years	
	Interior	18 years	18 years	
	Service system	15 years	15 years	
	Average maintenance rate (%/year)			
	Exterior	1%	1%	
	Interior	1%	1%	
	Service system	2%	2%	
	Calculation method for demolition-related CO_2 emissions	Estimated assuming demolition materials of 2,000 kg/m^2 and road transport distance of 30 km	See reference method	
Operation Stage	CO_2 emissions			
	1. Reference value/ 2. Building-related initiatives	83.39	59.40	kg-CO_2/year-m^2
	3. Above + other on-site initiatives	–	48.57	kg-CO_2/year-m^2
	Reference	Solar power-related reduction	○○	
		incl. In-house consumption	○○	
		incl. Excess power sold	○○	
		Other renewable energy		
	4. Above + other off-site measures	–	33.57	kg-CO_2/year-m^2
	Reference	(a) Carbon offsetting with renewable energy certificates	○○	
		(b) Carbon offsetting with green heat certificate		
		(c) Other carbon credit		
		(d) Difference between actual and adjusted emissions (obtained from the adjusted emissions coefficient)		
	Calculation method for energy consumption	Based on ○○	Based on ○○	
	Primary energy consumption	○○	○○	MJ/year-m^2
	CO_2 emissions coefficient for energy			
	Primary energy Non-residential buildings	○○	As reference value	kg-CO_2/MJ
	Primary energy Residential buildings (Private areas)	○○	As reference value	kg-CO^2/MJ
	Electricity	○○	As reference value	kg-CO_2/kWh
	Gas	○○	As reference value	kg-CO^2/MJ
	Other energy ( )	○○	As reference value	kg-CO^2/MJ
	Potable water			
Other				

Figure III.2.6 LCCO_2 Calculation Conditions Sheet (Individual Calculation)

<Reference> Values available for individual calculation

Operation Stage	Reduction in CO_2 emissions with use of solar power (Apply only when the amount of power generated is equivalent to 3. On-site efforts, and when the emission coefficient for electricity is used for the reduced amount.)			
	Solar-generated power	Total	110,656	kWh/year
		In-house consumption	110,656	kWh/year
		Excess power sold	0	kWh/year
	Reduction in CO_2 emission	Total (1)	10.76	kg-CO_2/year-m^2
		In-house consumption	10.76	kg-CO_2/year-m^2
		Excess power sold	0.00	kg-CO_2/year-m^2
	Difference over emission value (using adjusted coefficient)			
	Electricity consumption of the subject building 3.		4,359	kWh/year
	Emission coefficient	Actual emissions coefficient	0.525	kg-CO_2/kWh
		Adjusted emission coefficient	0.406	kg-CO_2/kWh
	Difference over real emission	Entire building	519	kg-CO_2/year
		Per gross floor area (2)	0.10	kg-CO_2/year-m^2

Figure III.2.7 Examples of reference values used in LCCO$_2$ Calculation Conditions Sheet (Individual Calculation)

Afterword

This publication is developed by the Research Committee for CASBEE established as part of a joint industrial/government/academic project with the support of the Housing Bureau of the MLIT and led by the Japan Sustainable Building Consortium (chaired by Shuzo Murakami, President of the Institute for Building Environment and Energy Conservation), requesting the participation of City Bureau, the MLIT. We hope this achievement will be used in a wide-range of fields and make an important contribution in building a sustainable society.

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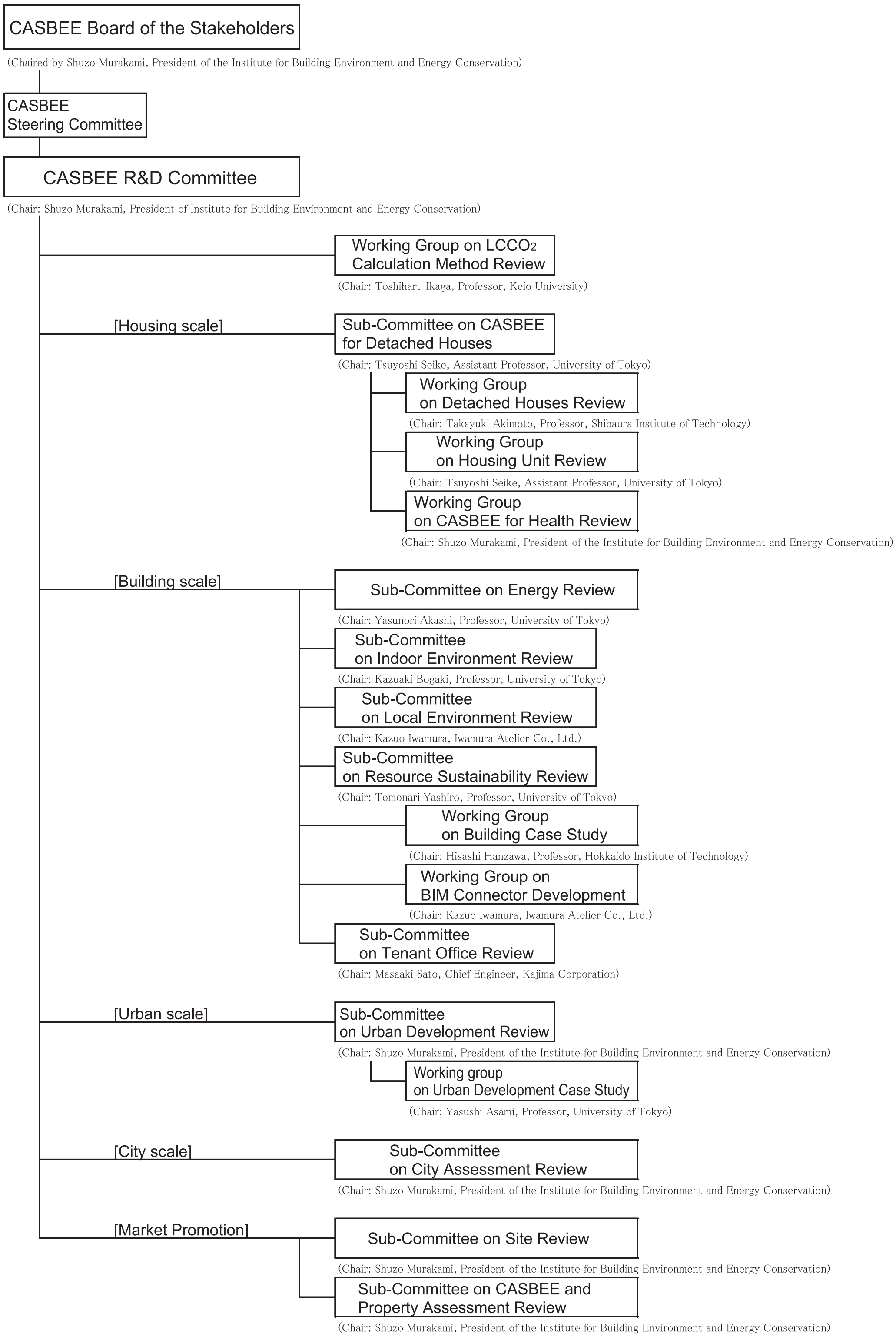

CASBEE for Building (New Construction) Assessment Manual (2014 Edition)

Not for Sale

First Edition	Published May 27, 2014
Editorial Assistance	Japan Sustainable Building Consortium (JSBC)
Published by	Institute for Building Environment and Energy Conservation (IBEC)
	Zenkyouren Building Kojimachi-kan, 3-5-1 Kojimachi, Chiyoda-ku, Tokyo 102-0083 Japan
	TEL: +81-3-3222-6723 FAX: +81-3-3222-6696
	e-mail casbee-info@ibec.or.jp URL http://www.ibec.or.jp/CASBEE
Printed by	Rengo Printing Center Co., Ltd.

CASBEE® for Building (New Construction) ●Technical Manual (2014 Edition)

Editorial Assistance: Japan Sustainable Building Consortium (JSBC)
Published by: Institute for Building Environment and Energy Conservation (IBEC)