CASBEE® for New Construction

Comprehensive Assessment System for Built Environment Efficiency

●Technical Manual (2010 Edition)

Tool-1

Japan Sustainable Building Consortium (JSBC)

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Introduction

In recent years, climate change has become a global issue of extraordinary importance. In 2008, the commitment period of the Kyoto Protocol, based on the Framework Convention on Climate Change began. As international negotiations on a post-Kyoto Protocol framework are already in progress, Japan has committed to reductions in greenhouse gas emissions of 25% by 2020 and 80% by 2050 based on 1990 levels. To achieve such targets, the Basic Law for Prevention of Global Warming, which clarifies the stance and direction of Japan's environmental policies, is currently being established.

On the other hand, controlling growing energy consumption within the private sector continues to be a major challenge. In the construction field, 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 such as BREEAM (Building Research Establishment Environmental Assessment Method) in the UK, LEED™ (Leadership in Energy and Environment Design) in the U.S. and the international GBTool model (Green Building Tool). These methods have attracted interest around the world.

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 Building Environmental Efficiency (CASBEE).

In 2008, in order to facilitate active participation in CO_2 reduction initiatives, improvements were made to include life cycle CO_2 ($LCCO_2$) assessment tools used to evaluate efforts to reduce operating energy, a causal factor in climate change, as well as efforts that contribute to reducing embodied CO_2 associated with the manufacturing of construction materials. New versions of CASBEE with assessments which explicitly include such climate-change reduction measures were published as CASBEE for New Construction (2008 Edition), CASBEE for Existing Building (2008 Edition) and CASBEE for Renovation (2008 Edition).

In order to further promote and improve a low carbon society, we have now developed the 2010 edition of CASBEE for New Construction. The new edition promotes CO_2 reduction initiatives that include energy efficiency improvement, use of ecological materials and extended building lifespan. It is also intended for use in labeling buildings with superior low-carbon performance such as zero energy buildings (ZEBs), zero energy houses (ZEHs) and life cycle carbon minus (LCCM) houses. It is our hope that CASBEE will continue to gain importance in Japan, thus greatly contributing to the advancement of sustainable building development.

Shuzo Murakami, Chair
The Research Committee for CASBEE
Japan Sustainable Building Consortium (JSBC)

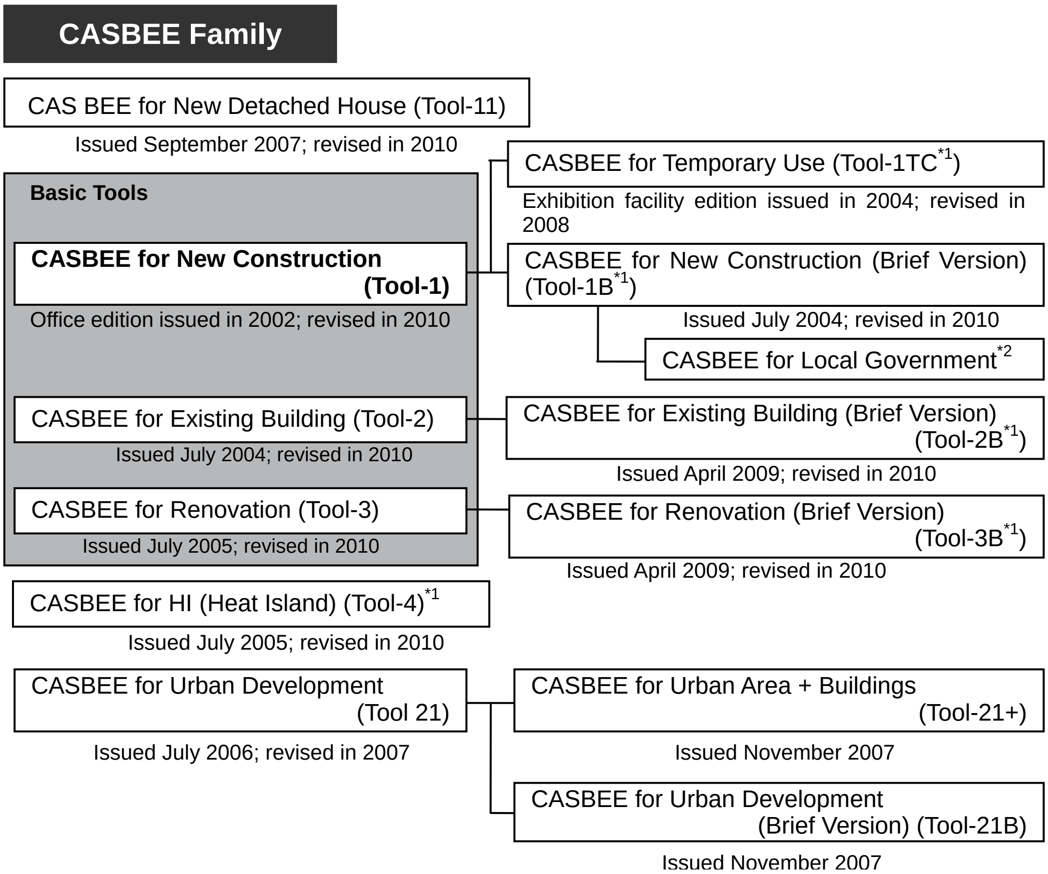
PART I. Outline of CASBEE for New Construction

1. CASBEE: Framework for New Construction

1.1 What is CASBEE?

CASBEE (Comprehensive Assessment System for Building Environmental 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: Superior (S), Very Good (A), Good (B^+), Slightly Poor (B^-) and Poor (C).

As shown in Figure I.1.1, CASBEE is comprised of assessment tools tailored to different scales: construction (residential and non-residential buildings) and urban (town and city development). These tools are collectively known as the CASBEE Family.



*1 HI: Heat Island, TC: Temporary Construction, B: Brief version
*2 CASBEE tools are adapted in municipalities nationwide, including CASBEE-Nagoya (April 2004), CASBEE-Osaka (October 2004) and CASBEE-Yokohama (July 2005).

Figure I.1.1 Structure of the 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 the Ministry of Land, Infrastructure, Transport and Tourism. 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 "Building Environmental Quality (Q)" and "Building Environmental Load (L)" and [3] Assessment based on the newly-developed Building Environmental Efficiency (BEE) indicator.

1.2 The Position of CASBEE for 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 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.
As CASBEE for 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 Existing Building.

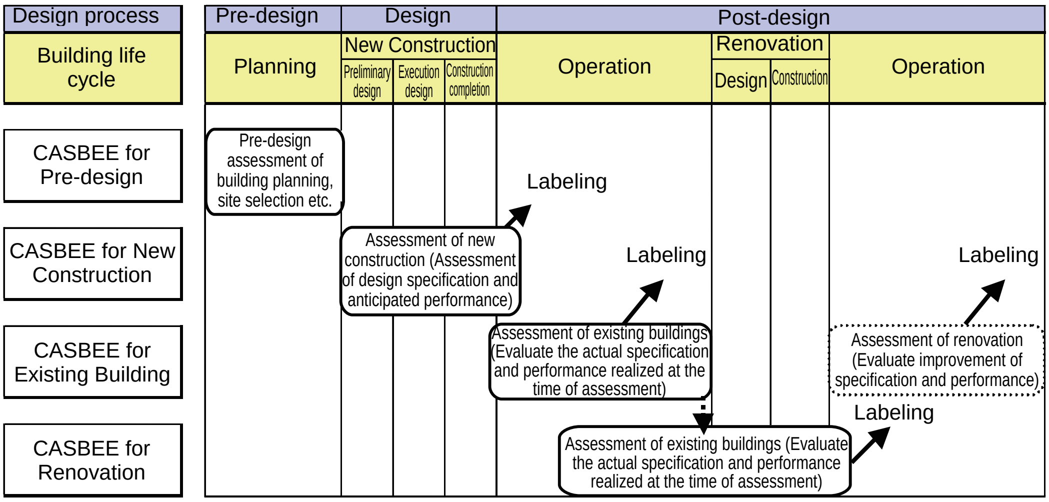


Figure I.1.2 Building Life Cycle and the Four Basic Tools of CASBEE

1.3 Assessment Targets of CASBEE for New Construction

CASBEE for New Construction evaluates Q (environmental Quality) and LR (environmental Load Reduction) based on design specifications of newly-constructed buildings.
It also covers assessment of remodeling (i.e. new construction that partially reuses existing buildings) and reconstruction.

1.4 How to Use CASBEE for New Construction

The following are the four main uses of CASBEE for New Construction.

[1] Design for Environment (DfE) tool for building designers

Building designers can use CASBEE for New Construction at the design stage to check environmental performance, set various goals, establish consensus with parties involved in design (e.g. architecture, structure and facility service system) and demonstrate design performance to the client.

[2] Environmental labeling tool
Third-party verification (labeling) by experts based on the CASBEE assessment results can also be used for property value assessment from an environmental perspective.
Regarding the verification system, please refer to the separate detailed rules.

[3] Construction administration tool
Used as a PR tool for construction and environmental administration, the construction administration tool can publicize a building's environmental attributes.

[4] Selection of contractors for design competitions, proposals and PFI projects
Clients in the public or private sectors can use the tool to indicate overall environmental performance targets to designers, assigning high grades to designs which deliver optimal environmental efficiency within a budget. It can also be used for both domestic and overseas projects.

1.5 Points to Note on CASBEE for New Construction

(1) Assessment at Preliminary Design, Execution Design and Construction Completion Stages

Efforts beginning at the Preliminary Design stage are important for efficient Design for Environment.
Detailed specifications are determined at the Execution Design and construction stages, when design details are finalized, so changes may be made to specifications in certain cases.
Therefore, CASBEE for New Construction can be used for assessment in three phases:

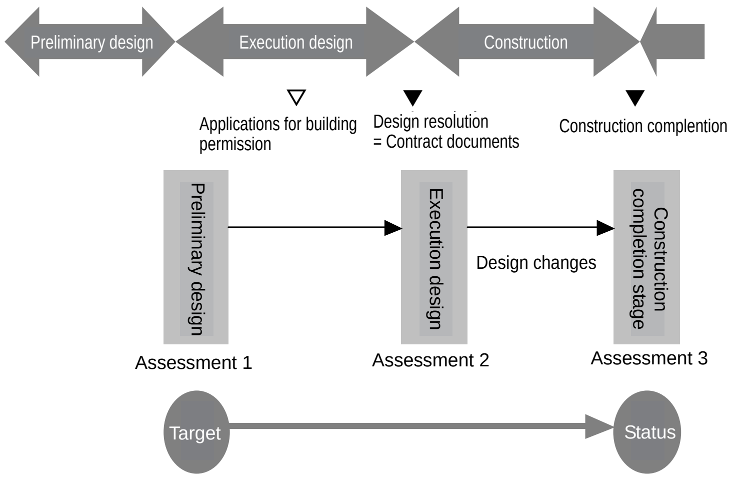


Figure I.1.3 Assessment Stages of CASBEE for New Construction

(2) Use of existing assessment systems

The evaluation criteria make maximum use of existing, established evaluation methods, such as energy-saving standards (PAL/CEC) and the Housing Performance Indication System, and aim for conformity with those methods, in order to save time and work in the evaluation process.

(3) Provision of a simplified edition

We have produced a simplified edition that can be used to make assessments in a short period. It can be used for purposes such as the following:
- Simplified setting of the Building Environmental Efficiency level (as a tool for consensus forming between owners, designers and builders, etc.).
- Setting environmental design targets and evaluating attainment (as a proposal management tool etc. under ISO14001).
- Preparing documents for submission to government agencies etc. (building environmental plans etc.).

(4) Provision of an assessment system for buildings intended for short-term use

In some cases, buildings are constructed to be used for a short period of time, such as exhibition facilities, theaters and commercial facilities. Environmental considerations in such buildings differ from those intended for permanent use. Therefore, different assessment criteria are necessary. We have developed CASBEE for New Construction (for short-term use) to cover such buildings.

1.6 Summary of Revisions in the 2010 Edition

1.6.1 Further promotion of low-carbon initiatives

(1) Introduction

The 2008 revision of CASBEE introduced the $LCCO_2$ assessment, which evaluates CO_2 emissions during the entire building life cycle from construction and operation to demolition and disposal. Performed in conjunction with the existing BEE assessment, the $LCCO_2$ assessment enables further promotion of comprehensive sustainable buildings. Additionally, a quantitative indication of environmental impact from the building's CO_2 emissions helps various stakeholders (such as building owners, designers and builders) recognize the critical importance of measures to counteract climate change.

In 2009, the government set a new CO_2 emission reduction target of 25% by 2020 based on 1990 levels, underscoring an increasing awareness of climate change. In the construction field, high energy efficiency and sophisticated anti-global warming measures have become essential. The 2010 edition of CASBEE for New Construction promotes CO_2 reduction initiatives that include energy efficiency improvement, use of ecological materials and extended building lifespan. It is also intended for the use in labeling buildings with superior low-carbon performance such as zero energy buildings (ZEBs), zero energy houses (ZEHs) and life cycle carbon minus (LCCM) houses.

(2) Introduction of green star ranking based on $LCCO_2$ performance

Since 2008, CASBEE has included $LCCO_2$ assessment, which evaluates CO_2 emissions during the entire building life cycle from construction and operation to demolition and disposal. A new "Standard Calculation" method automatically provides a simplified estimation of $LCCO_2$ based on data already entered in a CASBEE spreadsheet. The feature is especially beneficial to assessors who are not familiar with the $LCCO_2$ evaluation. Additionally, the "Individual Calculation" method can be selected for buildings with more extensive CO_2 reduction measures.

In the 2010 edition, $LCCO_2$ performance is indicated more precisely by awarding 1 to 5 green stars based on $LCCO_2$ emissions together with the existing BEE assessment (e.g. S: 5 red stars). Specifically, the emissions rate (%) for the assessment target is evaluated relative to the $LCCO_2$ emission level of a reference building (one that satisfies evaluation standards for building owners according to the Energy Conservation Law). Green stars are awarded based on the criteria below:

$LCCO_2$ over 100% (non-energy efficient building): 1 green star
$LCCO_2$ below 100% (current energy efficiency standards are satisfied): 2 green stars
$LCCO_2$ below 80% (30% energy saving achieved during building operation): 3 green stars
$LCCO_2$ below 60% (50% energy saving achieved during building operation): 4 green stars
$LCCO_2$ below 30% (zero energy consumption achieved during building operation): 5 green stars

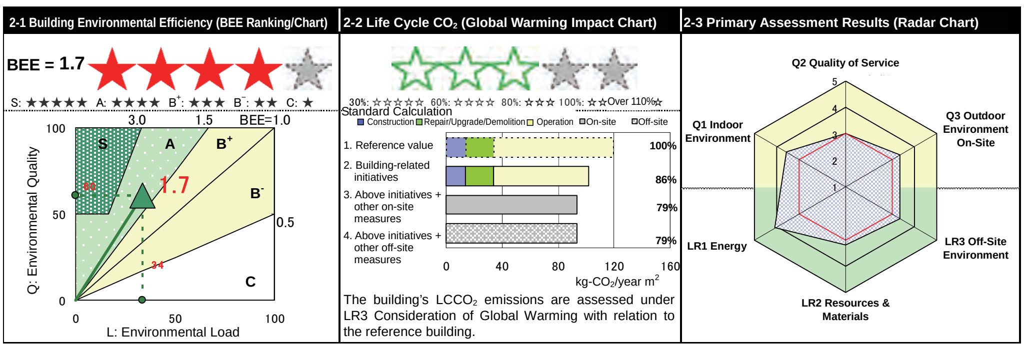


Figure I.1.4 BEE (Red Stars) and $LCCO_2$ (Green Stars), Rankings in CASBEE for New Construction (2010 Edition)

(3) On-site assessment

In the 2010 edition, assessment of on-site renewable energy usage (e.g. solar power generation) separate from other initiatives for the building itself such as energy efficiency improvement, use of ecological materials, and extended building lifespan, is possible.

(4) Off-site assessment

Carbon offsetting through earning green power certificates or carbon credits is promoted as a climate change countermeasure. These mechanisms do not necessarily indicate the environmental performance of buildings; but are nonetheless effective and valuable in achieving Japan's climate change-related commitments. As such, these efforts are categorized as off-site initiatives and are included in the $LCCO_2$ assessment in the 2010 edition of CASBEE. Specifically, the off-site assessment includes carbon offset schemes* such as green power certificates and carbon credits acquired by building owners and users, as well as carbon credits earned by energy supply companies.

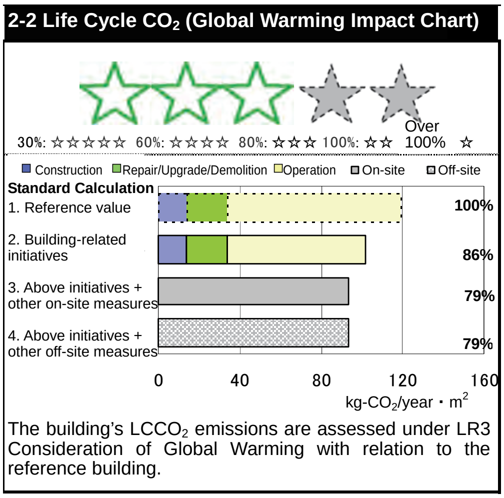
*Note: In an $LCCO_2$ "individual calculation," carbon offset achieved by a power supplier can be recognized as off-site CO_2 reduction for a building that utilizes power from the said company. In such a case, the difference between actual and adjusted emission coefficients of each power company is used for assessment. The coefficients are available under the Basic Law for Prevention of Global Warming.

(5) Breakdown of $LCCO_2$ assessment

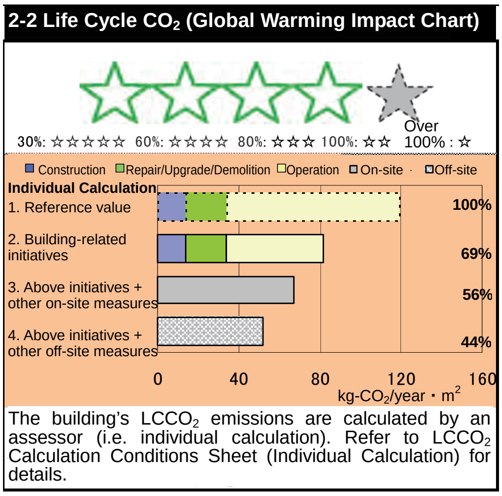
$LCCO_2$ emissions are evaluated based on the nature of CO_2 reduction initiatives: measures for buildings (e.g. energy efficiency improvement, use of ecological materials and extended building lifespan) and the aforementioned on- and off-site measures. The results are shown individually as below:

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)
2. $LCCO_2$ emissions of a targeted building: assessment of building-related initiatives (e.g. energy efficiency improvement, use of ecological materials and extended building lifespan)
3. Assessment with above initiatives + other on-site measures (e.g. on-site solar power generation)
4. Assessment with above initiatives + off-site measures (e.g. procurement of green power certificates and carbon credits)

CO_2 reduction using off-site measures (No.4) are currently not included in BEE. As the addition of off-site measures is expected in the future, the 2010 edition allows this assessment in individual $LCCO_2$ calculation.



(a) Standard Calculation Results



(b) Individual Calculation Results

Figure I.1.5 Examples of $LCCO_2$ Assessment (Global Warming Impact Chart) for CASBEE for New Construction (2010 Edition)

(6) BEE ranking/chart analysis based on $LCCO_2$ assessment

The $LCCO_2$ results determine the performance levels (1 to 5) under LR3.1 Consideration of Global Warming, which are reflected in BEE and CASBEE rankings. In order to maintain uniformity in assessment, LR3.1 Consideration of Global Warming has been evaluated using only standard calculations. In the 2010 edition, with the understanding that the off-site measures in No. 4 do not necessarily indicate the environmental performance of buildings, a corresponding assessment is evaluated using the standard calculation results from the above assessment No. 3 (i.e. No.2 + other on-site measures) and excludes off-site measures from this evaluation, as with the 2008 edition.

1.6.2 Summary of Revisions to Assessment Criteria

Criteria for the CASBEE assessment are, by definition, subject to revision based on changes in social trends. The following items have undergone significant review:

(1) Compatibility with the revised Energy Conservation Law (inclusion of small-scale buildings)

The 2009 revision of the Energy Conservation Law promoted environmental considerations, such as energy saving measures, to be implemented in relatively small buildings. As such, the new edition of CASBEE now includes assessment criteria for such buildings. In evaluating LR1 Energy, items were added so that the simplified point scoring system can be applied to buildings with a floor area of less than 2,000 square meters.
Also, as a multi-split air conditioning system (e.g. multiple A/C system for office buildings) is often used in small-scale buildings, some items were adjusted in order to assess performance more accurately. Assessment for "1.1.2 Equipment Noise" under Q1 Indoor Environment now includes measures to prevent noise not only from equipment rooms and ducts but also from multiple A/C systems. It also covers the positioning of external units. For "2.4 Reliability" under Q2 Quality of Service, A/C and ventilation system assessment employs specific criteria for small buildings with a multi-split A/C system. Furthermore, system efficiency assessment for "4.1 Monitoring" under LR1 Energy considers energy measurement and COP evaluation of A/C units based on a simplified measuring method for a multi A/C system to satisfy level 5 objectives.
For "1.3 Maintenance Management" under Q2 Quality of Service, the assessment previously included only certain types of buildings specified in the Law for Maintenance of Sanitation in Buildings (i.e. buildings for specific purposes such as office or retail use and with a floor space of more than 3,000 square meters). Revisions were made to add small buildings into the assessment. The same addition was made to "1.2.2 Barrier-free Planning".
Furthermore, some criteria were added for the assessment of small buildings with wooden structures.

(2) Further promotion of low-carbon initiatives

Assessment standards have been revised to be more stringent in conjunction with the aforementioned revisions specified in Section 1.6.1.
Criteria for "1 Building Thermal Load" under LR1 Energy became stricter overall to further promote low-carbon initiatives. Level 3 in the earlier editions, equivalent to the evaluation standard for building owners as referred to in the Energy Conservation Law, is now considered level 2. Level 5 requires load reduction of more than 35% over the evaluation standard. Furthermore, assessment must be performed using the performance standard (PAL values). Assessment using the specification standard now includes additional items in order to facilitate evaluation using the simplified point scoring system. In keeping with the aforementioned criteria changes, revisions to the specification standard were made in correspondence with the performance standard.
Furthermore, in evaluation of "3 Efficiency in Building Service System", assessment was based mainly on the ERR calculated from the thermal expansion coefficient (CEC) values. For a specification standard assessment via the standard/simplified point scoring systems, weighted average calculations using weighting coefficients have been discontinued. Instead, awarded points are converted to the CEC reduction rate (relative to the CEC standard value), which is then used to calculate the energy reduction ratio (ERR) value. As shown in Figure I.1.6, standards in the 2010 edition are higher than those of the previous version. ERR for level 5 in the performance standard is now stipulated as "35% or more" as compared with the previous "25% or more". Until the latest edition, levels were determined according to the ERR values in integer format. However, a more detailed assessment which includes multiple items (i.e. A/C, ventilation, lighting, hot water supply and elevators) is appropriate for this category. Thus, assessment is now based on values with up to one decimal place using linear interpolation (PAL values also use linear interpolation).

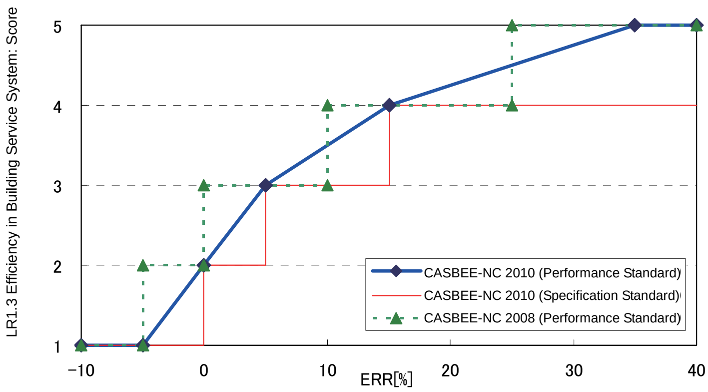


Figure I.1.6 Comparison of Evaluation Standards under LR1.3 Efficiency in Building Service System (2008 vs. 2010)

In "1 Consideration of Global Warming" under LR3 Off-Site Environment, the emissions rate (%) for the assessment target is evaluated relative to the $LCCO_2$ emission level of a reference building (one that satisfies evaluation standards for building owners as referred to in the Energy Conservation Law). In the 2008 edition, level 5 (the highest level) was awarded when an estimated value of $LCCO_2$ of the target building was less than 75% of the reference level. In the new edition, however, in order to promote low-carbon initiatives, level 5 must satisfy an estimate value of less than 50%.

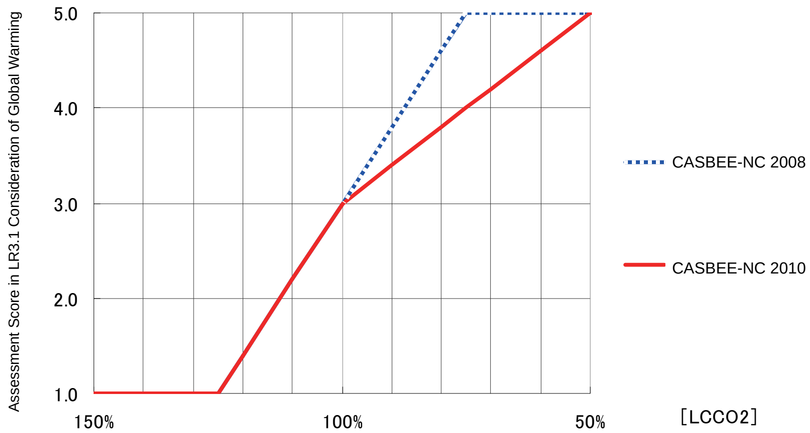


Figure I.1.7 Comparison of Evaluation Standards under LR3.1 Consideration of Global Warming (2008 vs. 2010)

(3) Measures for other social trends

Some items and standards were added as deemed appropriate due to new developments in technology and environmental issues. Also, in order to eliminate inconsistency between assessors, simpler standards and examples were added for clarification of assessment targets and corresponding standards. In Q1 Indoor Environment, revisions were made so as to properly evaluate popular new initiatives, such as Cool Biz/Warm Biz, and energy-saving lighting systems (e.g. a task/ambient system). In "2.1.1 Earthquake Resistance" under Q2 Quality of Service, level-4 now requires a 25% increase in earthquake resistance. In "3.2.1 Fire Retardant" under LR2 Resources and Materials in the 2008 edition, the use of halon fire retardants was evaluated according to the ozone depleting potential (ODP) of the substance. In the new edition, however, assessment is more stringent as global warming potential (GWP) values are also considered in order to reflect current environmental issues and the purported objective of this assessment category. Furthermore, in conjunction with revisions made to CASBEE-HI, corresponding items in

CASBEE for New Construction were also adjusted.
Additionally, for buildings under the category 'School,' new criteria specific to primary and secondary schools were added to some items, allowing a more precise assessment using standards which differ from those applied to post-secondary schools. In “3.2 Wind Damage & Daylight Obstruction” under LR3 Off-Site Environment, assessment of sand and dust control measures is now included under the 'School' category.

2. Assessment method

2.1 Buildings for Assessment under CASBEE for New Construction

CASBEE for New Construction is applicable to all building types except for detached houses. Buildings are divided into categories consisting of apartments and eight other building types as defined in the Energy Conservation Law (including factories). For factories, assessments under Q1 Indoor Environment and Q2.1 Service Ability mainly address occupied areas (e.g. office space), and exclude production areas. Also, assessment of LR1 Energy does not include energy consumption related to production processes.
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 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: built environment quality) and L (Load: built environment load) 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 (built environment load reduction). 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 Standards 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 (built environment quality) and L (built environment load) should be according to the scoring criteria set for each (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.

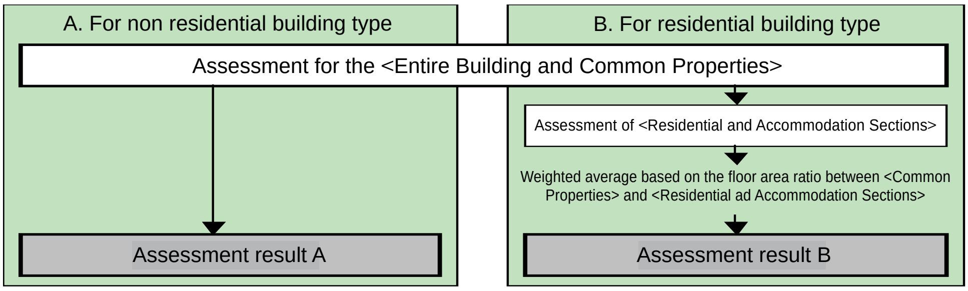


Figure I.2.1 Building assessment system including buildings for “residential” and “non-residential”

(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 volume 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 and demolition).

1) Construction stage

Under LR2 Resources and Materials, the continued use of existing building structural frames and the 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 during a building's operation stage are calculated simply by using the following values evaluated under LR1 Energy: a) the PAL value of perimeter performance, or points awarded under the standard and the simplified scoring systems, b) the reduction rate of primary energy consumption (e.g. ERR) for the entire building calculated using the denominator and numerator of the equipment CEC values, and c) the reduction rate as a result of efficient building operations.

3) Maintenance and demolition stages

Extension of building service life achieved through longevity improvement is evaluated under Q2 Quality of Service. However, estimating the degree of extension with sufficient precision for use in the $LCCO_2$ calculation is difficult. Therefore, $LCCO_2$ is estimated based on fixed service life assumptions for all non-residential buildings.

- Offices, hospitals, hotels, schools and meeting halls: 60 years (fixed)
- Retailers, restaurants and factories: 30 years (fixed)
- 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. Examples of applicable LCA methods include the LCA Guidelines for Buildings compiled by the Architectural Institute of Japan (published by Maruzen in 2006). 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.

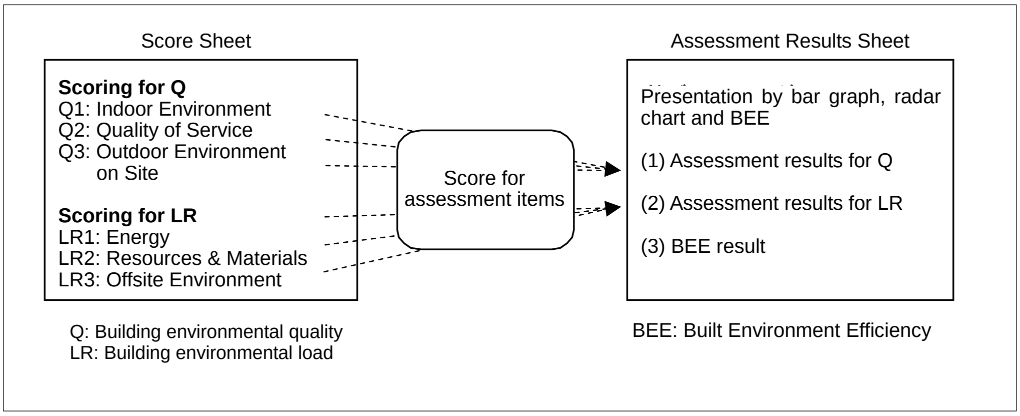


Figure I.2.2 Basic configuration of CASBEE

The Assessment Results Sheet presents assessment results for each category as radar charts, bar graphs and numerical data for Q (environmental quality of the building) and LR (environmental load reduction of the 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.

$$BEE = \frac{\text{Q: Built environment quality}}{\text{L: Built environment load}} = \frac{25 \times (SQ - 1)}{25 \times (5 - SLR)} \quad (1)$$

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.

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 =
Σ(score for each building type x corresponding floor area ratio) (2)

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

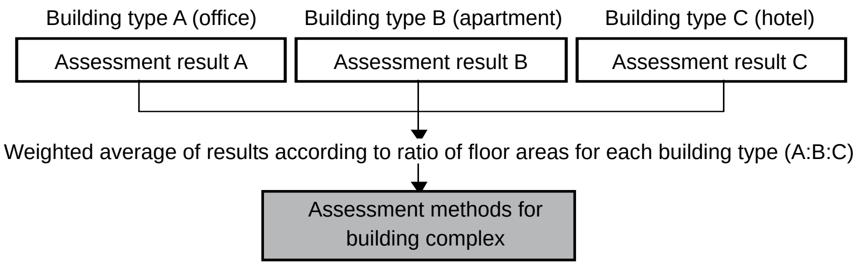


Figure I.2.3 Assessment methods for building complex (for a building combining three types)

In the assessment of LR1 Energy, for all building types, all of the primary energy consumption for each building type are added together, so that the ERR for the whole building can be calculated and used for the assessment.

2.5 Assessment items of CASBEE for New Construction

Q: Built environment quality

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

Table I.2.3 Assessment items included in Q: Environmental quality of the 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 Management
	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 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. Many assessment items concerning materials that pollute indoor area were incorporated, reflecting the level of related concern and social need in recent years.

1. Sonic Environment

Evaluate the background noise level in connection with comfort and ease of working, but the assessment extends to equipment noise countermeasures for air conditioning and other services, sound insulation to prevent noise from reaching interiors, and sound absorption to stop reverberation of sound that penetrates the room.

2. Thermal Comfort

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

3. Lighting & Illumination

Evaluate the use of daylight (efficient use of natural light), anti-glare measures (systems to prevent glare caused by light fixtures and direct daylight), illuminance (the degree and balance of brightness) and lighting control (systems managing brightness and lighting positions).

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 management. 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 hypothetical 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 applies to CASBEE for Existing Buildings). 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 Q3-1 Preservation & Creation of Biotope, Q3-2 Townscape and Landscape and Q3-3 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. Conservation & 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: Built environment load

The aspects of reduction of building environmental load that are considered by CASBEE for 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 the building (LR)

LR1 Energy	1. Building Thermal Load	
	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 Rainwater & Greywater
	2. Reducing Usage of Non-renewable Resources	2.1 Reducing Usage of Materials
		2.2 Continuing Use of Existing Structural Frames etc.
		2.3 Use of Recycled Materials as Structural Frame 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. Building Thermal Load”, “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 saving standards for buildings in Japan have been established based on the Energy Conservation Law since 1980. In addition to two numerical indicators already used in the performance standard, PAL and CEC, a standard point scoring system and a simplified version specifically for small buildings have recently been added for use in the specification standard assessment. Energy-saving measures with new perspectives, such as the active use of natural energy and untapped energy, the introduction of the building energy management system (BEMS) and the operational efficiency optimization of a building, have also become necessary in recent years. As such, CASBEE has developed a framework for a comprehensive assessment that includes evaluation of these new measures.
For assessment of apartments, on the other hand, we have constructed an assessment framework for private portions which is consistent with the scoring criteria used in the Housing Performance Indication System under the Housing Quality Assurance Law, and assessment criteria based on the Energy Conservation Law for public areas. However, for apartments, “4. Efficient Operation” is excluded from consideration because, in comparison with commercial and business facilities, there are fewer aspects where the management of the building can contribute.

1. Building Thermal Load

Apply the PAL value, or points awarded under standard/simplified scoring systems, in evaluation of investment performance improvement made to the building design. These are closely related to reductions in the energy consumption of A/C systems. For apartments, evaluate the thermal load in accordance with the Housing Performance Indicator system under the Housing Quality Assurance Law.

2. Natural Energy Utilization

Evaluates the efforts for direct use of natural energy (light and ventilation etc.) and the converted use of renewable energy (solar generation, heat use etc.).

3. Efficiency in Building Service System

Use the ERR values, calculated using the CEC value or points awarded under standard/simplified scoring systems, to evaluate the level of efficiency improvement of various equipment types (i.e. A/C, ventilation, lighting, hot water supply and elevators). For apartments, evaluate the CEC value or points awarded under standard/simplified scoring systems for each piece of equipment, or specifications and plans of the installed devices.

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.

LR2 Resources & Materials

In this section, “1. Water Resources,” “2. Reducing the 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 mains water as an environmental problem beyond the hypothetical closed space and evaluate reduction of main water usage, referring to whether or not there are efforts for saving water, using rainwater, and reusing greywater.

2. Reducing the Use of Non-renewable Resources

Regard depletion of non-renewable resources as an environmental problem beyond the hypothetical closed space, and evaluate efforts to reduce consumption of such resources. Specifically, evaluate reduction in the resource usage volume itself under “2.1 Reducing Usage of Materials,” and the state of usage of reused and reusable materials and products under “2.2 Continuing Use of Existing Structural Skeletons etc.,” “2.3 Use of Recycled Materials in Structural Frame 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
Assessment is performed based on the emissions rate (%) relative to $LCCO_2$ (kg CO_2/year-m^2) of a reference building with level 3 performance in all assessment categories except this item (excluding LR1 Energy) and equivalent to the evaluation standard for building owners as referred to in the Energy Conservation Law.

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 On Site Thermal Environment”. 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 rainwater 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 are vulnerable to damage from wind hazards (e.g. large structure buildings) should be carefully considered during the design stage. Under “3.2.1 Wind 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.

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.2.5. These values remain unchanged in the 2010 edition.

Table I.2.5 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 New Construction has been developed to allow simple data entry from general-purpose spreadsheet software for various usage of assessment result. Furthermore, scoring can be carried out using the same software, regardless of differences in building type. At this stage, there are the Main Sheet and Score Entry Sheet for data entry and the Score Sheet and Assessment Results Sheet for output. The basic information on the building (building type, floor area etc.), necessary for assessment, is entered on the Main Sheet. The scoring criteria for the building under assessment are presented on the Score Entry Sheet, and the scoring results for each assessment item are input with reference to criteria. The Energy Calculation Sheet for data input for the LR1 Energy assessment, and the Consideration Record Sheet for detailed statements and the Emission Coefficient Sheet for $LCCO_2$ assessment are also available.

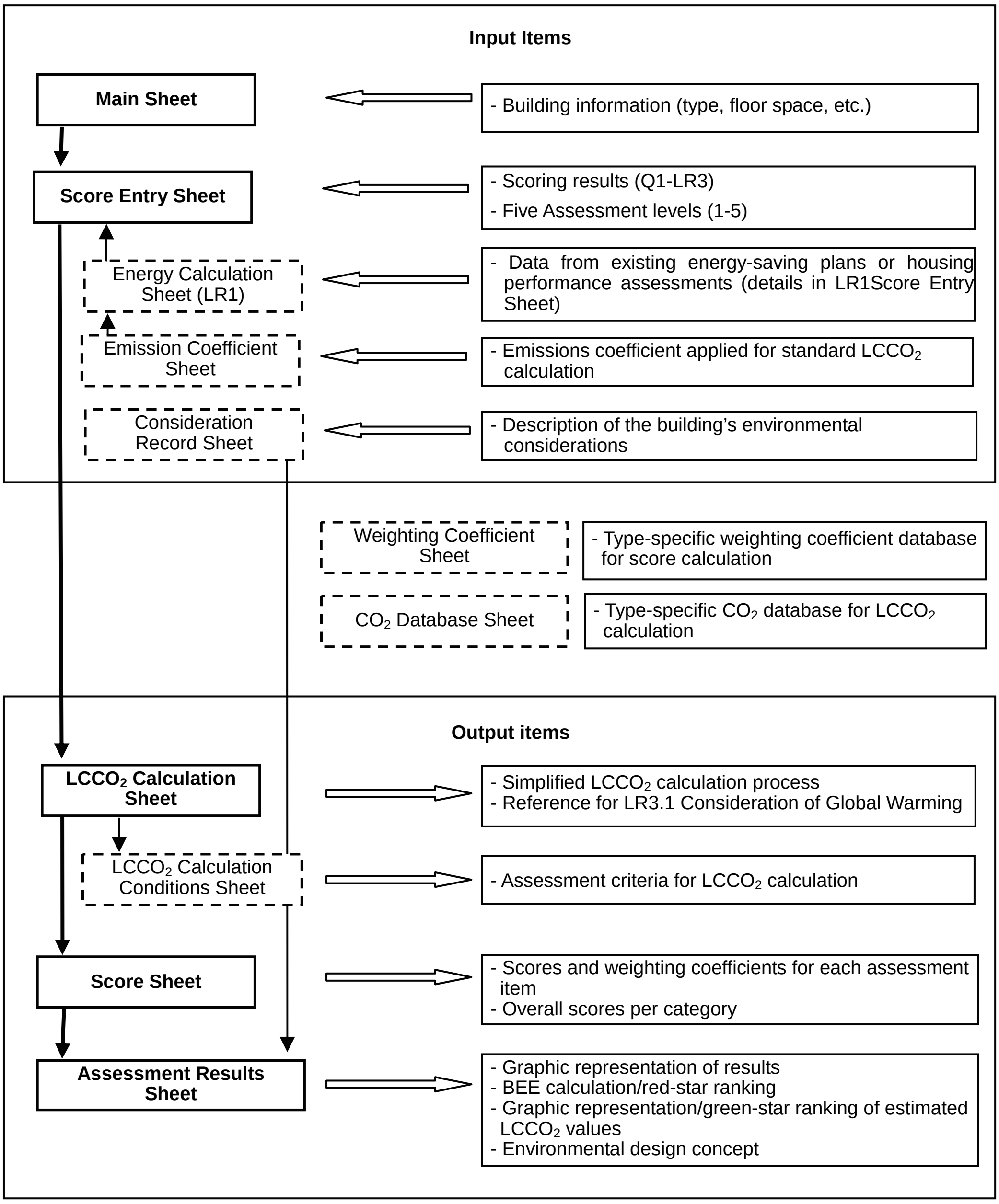


Figure I.3.1 Assessment Sheet Overview

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>.

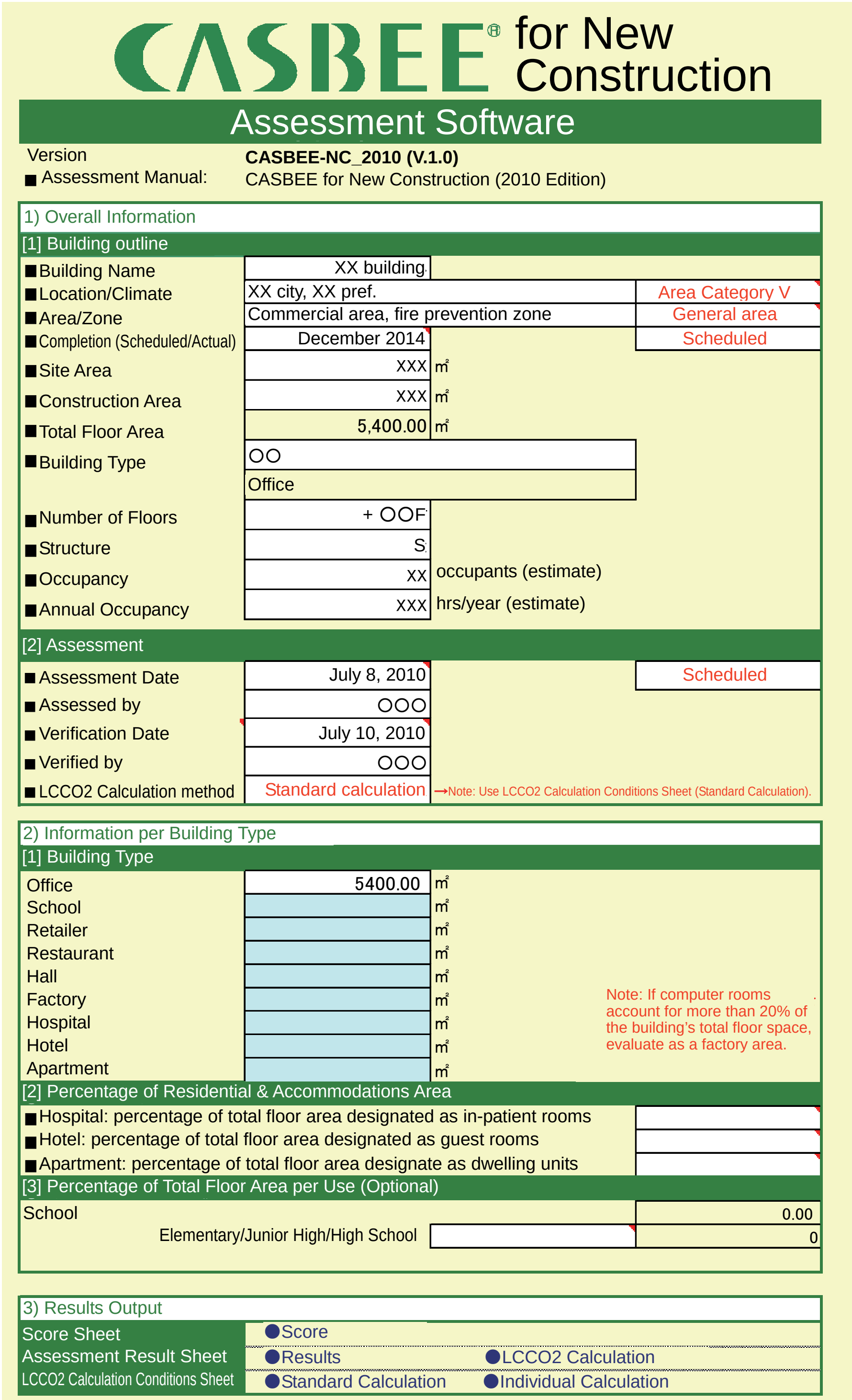


Figure I.3.2 Main Sheet screen (date entry example)

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	Total 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	Area category V*1	Number of floor	+XXF
Completion	2011.12	Structure	S
Site area	(squre meter)	Average occupancy	(number of people)
Construction area	(squre meter)	Annual occupancy time (in hours)	(hours)

*1 Select the regional category from among six regions (I to VI) in the Appendix Table I Evaluation Standards for Clients and Owners of Specified Buildings Concerning Rational Use of Energy in Housing (Ministry of Economy, Trade and Industry/Ministry of Land, Infrastructure, Transport and Tourism, 2009 Directive No.1). This is only applicable to apartments.

*2 Total 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 total floor area for each building type. Use 1) Summary input to enter more specific type for the building concerned.

(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. Building type and classification

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 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) Floor area ratio for specific building types (optional)
For elementary schools, junior high schools and high schools enter the value 1.0.

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 is where the assessor records the actual scores, evaluating grades of level 1-5 for each assessment item on the sheet, according to the stated assessment criteria. There are individual Score Entry Sheets for each assessment category, Q1 to 3 and LR1 to 3.

Q1 Indoor Environment Select from the pull-down list or enter values and additional comment **Execution design stage**

1 Acoustic Environment
1.1 Noise
1.1.1 Indoor Background Noise Level **dB (A)**

Entire Building/Common Properties	Weighting Coefficient (Default) = 0.50				Residential/Accommodation Sections Weighting Coefficient (Default) = 0.00	
Level 3.0	Sch (Elementary/Junior High/High Schools) ▪ Hsp (Waiting Room) ▪ Htl	Sch (Universities, etc.) ▪ Hsp (Examining Room)	Rtl ▪ Rst	Hal	**Level 3.0**	Hsp ▪ Htl ▪ Apt
Level 1	50 < [Background noise level]	45 < [Background noise level]	55 < [Background noise level]	40 < [Background noise level]	**Level 1**	45 < [Background noise level]
Level 2	(No corresponding level)	(No corresponding level)	(No corresponding level)	(No corresponding level)	**Level 2**	(No corresponding level)
■**Level 3**	45 < [Background noise level] ≦ 50	40 < [Background noise level] ≦ 45	50 < [Background noise level] ≦ 55	35 < [Background noise level] ≦ 40	■**Level 3**	40 < [Background noise level] ≦ 45
Level 4	40 < [Background noise level] ≦ 45	35 < [Background noise level] ≦ 40	45 < [Background noise level] ≦ 50	30 < [Background noise level] ≦ 35	**Level 4**	35 < [Background noise level] ≦ 40
Level 5	[Background noise level] ≦ 40	[Background noise level] ≦ 35	[Background noise level] ≦ 45	[Background noise level] ≦ 30	**Level 5**	[Background noise level] ≦ 35

Figure I.3.3 Score Entry Sheet Display

Table I.3.3 Main elements in Score Entry Sheet

Element	Description
Scoring	Choose level 1-5 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, “Exclude” can be selected for some assessment items (Items which can be excluded are listed in the commentary in the manual). If “Exclude” 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.

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 process, 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).

Q3 Outdoor Environment On-Site

Select from the pull-down list or enter values and additional comments

Execution design stage

1. Conservation of Biological Resources

	Weighting Coefficient (Default) = 0.30
Level 4.0	Off ▪ Sch ▪ Rtl ▪ Rst ▪ Hal ▪ Hsp ▪ Htl ▪ Fct ▪ Apt
Level 1	Insufficient consideration has been given and few measures have been established (0-3 pts)
Level 2	Sufficient consideration has been given but few measures have been established (4-5 pts)
Level 3	Sufficient consideration has been given and standard measures have been established (7-9 pts)
■Level 4	Sufficient consideration has been given and relatively many measures have been established (10-12 pts)
Level 5	Thorough consideration has been given and extensive measures have been established (13 pts+)

Efforts to be evaluated

Score	Item	Description	Point
2 pts	I. Identification of Local Biological Characteristics and Plan Objectives	1) Biological characteristics of the site and surrounding areas have been identified and appropriate plan objectives have been established	2
2 pts	II. Conservation of Biological Resources	1) Biological resources on site are protected or restored (e.g. flora and fauna, topsoil, wetland area)	2
2 pts	III. Use of Green Space	1) Green area accounts for 10% or more and less than 20% of total outside property area AND mid/high trees are planted (1 pt) Green space accounts for 20% or more and less than 50% of total outside property area (2 pts) Green space accounts for 50% or more of total outside property area (3 pts)	1-3
2 pts		2) Building greenery index is measured 0.05 or higher and less than 0.2 (1 pt) Building greenery index is measured 0.2 or higher (2 pts)	1-2
1 pts	IV. Quality of Green Space	1) Greenery planning is appropriate for site and building characteristics	1
0 pts		2) Greenery planning facilitates conservation of natural habitats for small animals	1
1 pts		3) Greenery planning facilitates conservation of native/local species	1
1 pts	V. Use of Biological Resources	1) Appropriate management policy has been established AND green space management/maintenance facility is in operation	1
1 pts		2) Space where members of the community and users of the building can interact with nature is available	1
0 pts	VI. Other	1) Initiatives other than those listed above have been established in order to protect or create natural resources	1
Total:	**12 pts**		

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

3) Scoring method for LR1 Energy

Building energy-saving standards based on the Energy Saving Law are incorporated in some assessment items under LR1 Energy. Use the PAL value (performance standard), or points awarded under standard/simplified scoring systems (specification standard), in the evaluation under “1 Building Thermal Load” (for houses, use the energy efficiency grade under the Housing Quality Assurance Law). For automatic calculation of the average floor space per above ground floor, enter the number of floors for each usage (above- and underground floors separately).

Under “3 Efficiency in Building Service System”, evaluate the overall ERR based on the CEC value or points awarded under standard/simplified scoring systems. Use the Energy Calculation Sheet shown in Figure I.3.5 to enter data for these two categories. Specifically, for each item of perimeter performance and service equipment under the energy efficiency standard, select the PAL value, the standard points, simplified points, or other assessment indicators in the “Data by criteria” column, then enter the corresponding values. 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 Building Thermal Load” and “3 Efficiency in Building Service System”.

■Data from energy-saving plan or housing performance assessment

Select from the pull-down list or enter values and additional comments

	Building type		Entire building	Offices	Schools	Retailers	Restaurants	Halls
	Floor area per type	m^2	5,400	5,400				
	Number of floors Above ground			8				
	Underground			0				
Building plan	Data by criteria			**PAL value**	**PAL value**	**PAL value**	**PAL value**	**PAL value**
	PAL value	MJ/yr-m^2		270.0				
	Evaluation standard for building owners	MJ/yr-m^2		300	320	380	550	550
	Point value, thermal insulation grade	pt		**290**	**100**	**100**	**100**	**120**
	Evaluation standard for building owners	pt		100	–	–	–	–
	ΔPAL			10.0%	100%	100%	100%	100%
	LR1.1 Building Thermal Load			Level 3.5	No PAL value entered	No PAL value entered	No PAL value entered	No PAL value entered
Entire building	**LR1.1 Building Thermal Load**		**Level 3.5**	3.50				
Natural energy usage	Natural energy use MJ/year	MJ/year		1,080,000	0	0	0	0
	incl. solar power	kWh/yr	110,000	**110,000**				
	in-building consumption	kWh/yr	110,000	**110,000**				
	incl. volume duplicated in ERR assessment (excl. solar power)	MJ/yr	3	**3**				
Air conditioning system	Data by criteria			**CEC/AC value**	**CEC/AC value**	**CEC/AC value**	**CEC/AC value**	**CEC/AC value**
	CEC/AC value	(–)		**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
	Evaluation standard for building owners	(–)		1.5	1.5	1.7	2.2	2.2
	Annual A/C energy consumption	MJ/yr		1,312,000	1,312,000	1,312,000	1,312,000	1,312,000
	Annual virtual A/C load	MJ/yr		**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
	Point value	pt		100	100	100	100	100
	Adjustment	pt						
	Evaluation standard for building owners	pt		–	–	–	–	–
	ΔCEC			33.3%	-66.7%	41.2%	54.5%	54.5%
	LR1.3.1 Air Conditioning System			–	–	–	–	–
	Weighting Coefficient			0.45	0.65	0.40	0.40	0.40
Mechanical ventilation system	Data by criteria			**CEC/V value**	**CEC/V value**	**CEC/V value**	**CEC/V value**	**CEC/V value**
	CEC/V value	(–)		**0.80**	**1.00**	**1.00**	**1.00**	**1.00**
	Evaluation standard for building owners	(–)		1.0	0.8	0.9	1.5	1.0
	Annual ventilation energy consumption	MJ/yr		542,640	678,300	678,300	678,300	678,300
	Annual virtual ventilation energy consumption	MJ/yr		**678,300**	**678,300**	**678,300**	**678,300**	**678,300**
	Point value	pt		**100**	**100**	**100**	**100**	**100**
	Evaluation standard for building owners	pt		–	–	–	–	–
	ΔCEC			20.0%	-25.0%	-11.1%	33.3%	0.0%
	LR1.3.2 Ventilation System			–	–	–	–	–
	Weighting Coefficient			0.15	0.10	0.10	0.10	0.10
Lighting system	Data by criteria			**CEC/L value**	**CEC/L value**	**CEC/L value**	**CEC/L value**	**CEC/L value**
	CEC/L value	(–)		**0.80**	**1.00**	**1.00**	**1.00**	**1.00**
	Evaluation standard for building owners	(–)		1.0	1.0	1.0	1.0	1.0
	Annual lighting energy consumption	MJ/yr		3,238,400	4,048.000	4,048.000	4,048.000	4,048.000
	Annual virtual lighting energy consumption	MJ/yr		**4,048,000**	**4,048,000**	**4,048,000**	**4,048,000**	**4,048,000**
	Point value	pt		**100**	**100**			
	Evaluation standard for building owners	pt		–	–			
	ΔCEC			20.0%	0.0%	0.0%	0.0%	0.0%
	LR1.3.3 Lighting System			–	–	–	–	–
	Weighting Coefficient			0.30	0.20	0.35	0.35	0.35
Hot water system	Data by criteria			**CEC/HW value**	**CEC/HW value**	**CEC/HW value**	**CEC/HW value**	**CEC/HW value**
	CEC/HW value	(–)		**1.60**	**1.00**	**1.00**	**1.00**	**1.00**
	Ix value			**8**				**9**
	Evaluation standard for building owners	(–)		1.6	Ix value not entered	Ix value not entered	Ix value not entered	1.6
	Annual hot water load	MJ/yr		312,000	195,000	195,000	195,000	195,000
	Annual virtual hot water energy consumption	MJ/yr		**195,000**	**195,000**	**195,000**	**195,000**	**195,000**
	Point value	pt		**100**	**100**	**100**	**100**	**100**
	Evaluation standard for building owners	pt		–	–	–	–	–
	ΔCEC			0.0%	33.3%	33.3%	33.3%	37.5%
	LR1.3.4 Hot Water System			–	–	–	–	–
	Weighting Coefficient			0.05	0.05	0.15	0.15	0.15
Elevator system	Data by criteria			**CEC/EV value**	**CEC/EV value**	**CEC/EV value**	**CEC/EV value**	**CEC/EV value**
	CEC/EV value	(–)		**0.70**	**1.00**	**1.00**	**1.00**	**1.00**
	Evaluation standard for building owners	(–)		1.0	–	–	–	–
	Annual elevator energy consumption	MJ/yr		94,430	0	0	0	0
	Annual virtual elevator energy consumption	MJ/yr		**134,900**	**134,900**	**134,900**	**134,900**	**134,900**
	Point value	pt		**100**	**100**	**100**	**100**	**100**
	Evaluation standard for building owners	pt		–	–	–	–	–
	ΔCEC			30.0%	100.0%	100.0%	100.0%	100.0%
	LR1.3.5 Elevator System			–	–	–	–	–
	Weighting Coefficient			0.05	–	–	–	–
Efficient energy use*	Annual energy conservation via solar power use	MJ/yr	1,073,600	1,073600	0	0	0	0
	Annual energy conservation via other systems	MJ/yr		**40,000**	0	0	0	0
	Annual energy conservation via all systems	MJ/yr		1,113,600	0	0	0	0
	Annual energy consumption of entire building	MJ/yr		**11,869,000**	0	0	0	0
	Energy conservation rate (k-value) A/B			9.4%	0.0%	0.0%	0.0%	0.0%
ERR	Evaluation method			Performance standard				
	Specification standard: Primary energy consumption rate of subject building			0.87	1.96	1.03	0.91	0.94
	Primary energy consumption of reference building			1.22	1.51	1.23	1.21	1.21
	ERR			28.4%	-29.2%	16.5%	24.9%	22.6%
	LR1.3 Efficient Energy Use			Level 0.0	Level 0.0	Level 0.0	Level 0.0	Level 0.0
	Primary energy consumption of subject building	MJ/yr		6,632,871	0	0	0	0
	Primary energy consumption of reference building	MJ/yr		8,961,360	0	0	0	0

*Note: e.g. solar power system, co-generation system

LR1.3 High-Efficient System

ERR for entire building (excl. apartments)	Primary energy consumption of subject building	MJ/yr	6,632,871
	Primary energy consumption of reference building	MJ/yr	8,961,360
	ERR (reduction of primary energy consumption)		26.0%

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. Obtain the area-weighted average for each assessment item, and select the corresponding values from the pull-down list in the Score Entry Sheet. The averaged results are rounded to the nearest whole integer. For a more detailed assessment, the weighted averages in decimal form can be manually entered in the corresponding columns.

In evaluating LR1 Energy, the Energy Calculation Sheet for multi-use buildings has spaces for transferring values from the Energy Saving Plan and the Housing Performance Assessment for each of the nine building types, so the figures for each application can be input. For "1. Building Thermal Load," use an area-weighted average of the scoring levels for all building types. For "3. Efficiency in Building Service System," total the reference primary energy consumption values and the corresponding values for the evaluated building, use them to calculate ERR for the building as a whole (an automatic calculation), and evaluate according to the result.

3.4 Consideration record sheet

State points are considered in the Design for Environment, 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 consideration" 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

Considerations in design	
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-NC, 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 2010 edition allows use of the most recent actual emissions coefficient and alternative values (i.e. actual 2008 values and published values announced in December 2009). 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 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)

Name of PPS	Coefficient	
		t-CO2/kWh

(1) Using a designated emissions coefficient:

	PPS/Reasons, etc.	Coefficient	
○			(t-CO2/kWh)

(2) Using a coefficient based on the calculation method for greenhouse gas 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-CO2/kWh)

B: Other:

	PPS/Reasons, etc.	Coefficient	
○			(t-CO2/kWh)

C: Alternative coefficient value

	Reasons, etc.	Coefficient	
○	Alternative value		(t-CO2/kWh)

(3) Other:

	PPS/Reasons, etc.	Coefficient	
○			(t-CO2/kWh)

CO2 Emission Coefficient per PPS published in 2008

Coefficient per PPS and alternative value based on Ordinance on Calculations of Greenhouse Gas Emissions

[1] Actual emissions coefficient

Hokkaido Electric Power Co., Inc.	0.000588	
Tohoku Electric Power Co., Inc.	0.000469	
Tokyo Electric Power Co., Inc.	0.000418	
Chubu Electric Power Co., Inc.	0.000455	
Hokuriku Electric Power Co., Inc.	0.000550	
Kansai Electric Power Co., Inc.	0.000355	
Chugoku Electric Power Co., Inc.	0.000674	
Shikoku Electric Power Co., Inc.	0.000378	
Kyushu Electric Power Co., Inc.	0.000374	
Okinawa Electric Power Co., Inc.	0.000946	
eREX Co., Ltd.	0.000462	
Eneserve Corp.	0.000422	
Ennet Corp.	0.000436	
F-Power Co., Ltd.	0.000352	
Oji Paper Co., Ltd.	0.000444	
Summit Energy Corp.	0.000505	
GTF Green Power Co., Ltd.	0.000767	
Showa Shell Sekiyu K.K.	0.000809	
Nippon Steel Engineering Co., Ltd.	0.000759	
Nippon Oil Corporation	0.000433	
Diamond Power Corp.	0.000482	
Japan Wind Development Co., Ltd.	0.000000	
Panasonic Corp.	0.000679	
Marubeni Corp.	0.000501	(t-CO2/kWh)

[2] Alternative value

Alternative value	0.000561	(t-CO2/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 Local Government (designated by the municipality), etc.

(2) Using a coefficient based on the calculation method for greenhouse gas 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 greenhouse gas 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-CO2/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.

②

		Coefficient	
○			(t-CO2/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 the Ministry of Environment and the Ministry of Economy, Trade and Industry.
→ 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 the Ministry of Environment 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 $LCCO_2$ (the 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 (for a building rated as level 3 in all assessment categories except Energy and equivalent to the evaluation standard for building owners as specified in the Energy Conservation Law) and the CO_2 emissions for the subject building are displayed in kg-CO_2/year-m^2.

CASBEE for New Construction (2010 Edition)
xx Building

■Manual: CASBEE for New Construction (2010 Edition)
■Software: CASBEE-nc_2010(v.1.5)

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

Q2 2.2.1 Service Life of Structural Materials	Area/Total Floor Area	Level 3 (kg-CO2/year m²)	Level 4	Level 5	Score Results	Target: CO₂ Emissions (kg-CO2/year m²)	Reference: Score Results	Reference: CO₂ Emissions (kg-CO2/year m²)
Office	1.00	13.57	13.57	13.57	3.0	13.57	3.0	13.61
School	0.00	10.21	10.21	10.21	3.0	10.21	3.0	10.24
Retailer	0.00	16.07	16.07	16.07	3.0	16.07	3.0	16.13
Restaurant	0.00	16.07	16.07	16.07	3.0	16.07	3.0	16.13
Hall	0.00	10.93	10.93	10.93	3.0	10.93	3.0	10.96
Factory	0.00	18.12	18.12	18.12	3.0	18.12	3.0	18.18
Hospital	0.00	10.36	10.36	10.36	3.0	10.36	3.0	10.39
Hotel	0.00	10.88	10.88	10.88	3.0	10.88	3.0	10.92
Apartment	0.00	15.88	8.04	5.45	3.0	15.88	3.0	15.93

	Target	Reference
Structure	S	
LR2 2.2 Use of Existing Structural Frame	0%	0%
LR2 2.3 Recycled Materials for Structural Components (Blast Furnace Cement)	5%	0%
1-2. Total	13.57	13.61

2. CO_2 Emissions Related to Maintenance & Demolition
2-1. Conversion of Assessment Results to CO_2 Emissions

Q2 2.2.1 Service Life of Structural Materials	Area/Total Floor Area	Level 3 (kg-CO2/year m²)	Level 4	Level 5	Score Results	Target: CO₂ Emissions (kg-CO2/year m²)	Reference: Score Results	Reference: CO₂ Emissions (kg-CO2/year m²)
Office	1.00	20.23	20.23	20.23	3.0	20.23	3.0	20.23
School	0.00	16.68	16.68	16.68	3.0	16.68	3.0	16.68
Retailer	0.00	12.20	12.20	12.20	3.0	12.20	3.0	12.20
Restaurant	0.00	12.20	12.20	12.20	3.0	12.20	3.0	12.20
Hall	0.00	17.39	17.39	17.39	3.0	17.39	3.0	17.39
Factory	0.00	13.62	13.62	13.62	3.0	13.62	3.0	13.62
Hospital	0.00	20.24	20.24	20.24	3.0	20.24	3.0	20.24
Hotel	0.00	18.11	18.11	18.11	3.0	18.11	3.0	18.11
Apartment	0.00	13.58	14.94	16.22	3.0	13.58	3.0	13.58
2-2 Total						20.23		20.23

3. CO_2 Emissions Related to Operation Energy

	KWh/year	Emission Coefficient	Reduction	Target (kg-CO2/year m²)		Reference (kg-CO2/year m²)
3-1 Building-related Initiatives (2)				68.21	Reference Value (1)	85.09
3-2 Above initiatives + other on-site measures (3)				59.70		
Solar Power Generation	110,000	0.418	45,980.00	8.51		

4. $LCCO_2$ Calculation (Standard Calculation)

	Target: CO₂ Emissions (kg-CO2/year m²)	Reference: CO₂ Emissions (kg-CO2/year m²)
Construction	13.57	13.61
Maintenance & Demolition	20.23	20.23
Operation	59.70	85.09
Total	**93.49**	**118.93**

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.

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 Value (Standard Building)	Subject	Note
Construction	Blast Furnace Cement (Percentage of Structural Use)	0%	0%	
	Use of Existing Structural Frame (Percentage of Structural Use)	0%	0%	

Figure I.3.10 $LCCO_2$ Calculation Conditions Sheet (standard calculation): Utilization of Blast Furnace Cement and Existing Structural Frame (%)

■LCCO2 Calculation Conditions Sheet (Standard Calculation) ■Building Name XX Building

CASBEE-NC_2010 (V.10)

Item		Reference Values (Standard Building)	Target	Note
Building Overview	Building type	Office,	Office,	
	Total floor area	5,400m^2	5,400m^2	
	Structure	S structure	S structure	
Life Cycle	Estimated service life	Office area, 60 yrs	Office area, 60 yrs	
Construction Stage	CO_2 emissions	13.61	13.57	kg-CO_2 / yr-m^2
	Embodied CO_2 calculation method	Japan's average CO_2 emissions based on 1995 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 1995 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	0.57	0.54	m^3 / m^2
	Blast furnace cement concrete	0.00	0.03	m^3 / m^2
	Steel frame	0.14	0.14	t / m^2
	Steel frame (electric furnace)	0.00	0.00	t / m^2
	Steel reinforced	0.07	0.07	t / m^2
	Lumber	0.01	0.01	t / m^2
	XX	XX	〃	kg / m^2
	Representative Material Environmental Load			
	Regular cement	282.00	〃	kg-CO_2 / yr-m^3
	Blast furnace cement	206.00	〃	kg-CO_2 / yr-m^3
	Steel frame	0.90	〃	kg-CO^2 / kg
	Steel frame (electric furnace)	0.90	〃	kg-CO^2 / kg
	Steel reinforced	0.70	〃	kg-CO^2 / kg
	Cement formwork	7.20	〃	kg-CO_2 / yr-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 (other use)	0%	0%	
Maintenance & Demolition Stage	CO_2 emissions	20.23	20.23	kg-CO_2 / yr-m^2
	Maintenance period (yr)			
	Exterior	25 yrs	25 yrs	
	Interior	18 yrs	18 yrs	
	Service system	15 yrs	15 yrs	
	Average repair rate (%/yr)			
	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	85.09	68.21	kg-CO_2 / yr-m^2
	3. Above + other on-site initiatives	–	59.70	kg-CO_2 / yr-m^2
	Reference	Solar power-related reduction	8.51	kg-CO_2 / yr-m^2
		incl. in-house consumption	8.51	kg-CO_2 / yr-m^2
		incl. surplus trade	0.00	kg-CO_2 / yr-m^2
		Other renewable energy	–	
	4. Above + other off-site measures	–	59.70	kg-CO_2 / yr-m^2
	Reference	(a) Carbon offsetting with green power certificate	–	
		(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	10,454,400	8,380,998	MJ / yr
	CO_2 emissions unit per energy type			
	Primary energy	0.0439	As reference value	kg-CO_2 / MJ
	Electricity	0.555	As reference value	kg-CO_2 / kWh
	Gas	0.0506	As reference value	kg-CO^2 / MJ
	Other energy ( )	○○	As reference value	kg-CO^2 / MJ
	Treated water			
Other				

Figure I.3.11 LCCO$_2$ Calculation Conditions Sheet (standard calculation)

3.7 Score Sheet

The Score Sheet is shown in Figures I.3.12 and I.3.13. The Score Sheet tabulates the results entered in the Score Entry Sheet. The corresponding weighting coefficients are applied to the score for each item, and the weighted values are combined. All scores, total of each category from Q1 to Q3 (SQ1 to SQ3) and from LR1 to LR3 (SLR1 to SLR3), the combined total of all categories under Q (SQ) and the combined total of all categories under LR (SLR) are displayed automatically. If the building under assessment is a residential type building, the Score Sheet presents score results for <Entire Building and Common Properties> and for <Residential and Accommodation Sections> in parallel. The results are calculated as a weighted average according to the ratio of floor areas for each section to produce a score for the building as a whole. The scores weighted on a pro-rata basis entered in ratio of <Residential and Accommodation Sections> under 2) building outline entry on the Main Sheet are displayed in the “Total” column as the final score for the evaluated building.
In the “Summary of Environmental Conscious Efforts in Design” column, state the specific details of the efforts on which the score is based, particularly of over 3 points (level 3) is awarded.

CASBEE for New Construction (2010 Edition)	Enter values or additional comments	Assessment Manual: CASBEE for New Construction (2010 Edition)
XX Building		Assessment Software: CASBEE-NC_2010 (V.1.0)

Score Sheet Execution design stage

Concerned items	Summary of environmentally conscious efforts in design	Entire Building and Common Properties		Residential and Accommodation sections		Total
		Score	Weighting coefficients	Score	Weighting coefficients	
Q: Environmental Quality of the Building						**3.4**
Q1 Indoor Environment			0.40			**3.6**
1. Sonic Environment		**3.0**	0.15		–	**3.0**
1.1 Noise		**3.0**	0.40		–	
1 Background noise level		3.0	0.50		–	
2 Equipment Noise		3.0	0.50		–	
1.2 Sound Insulation		**3.0**	0.40		–	
1 Sound Insulation of Openings		3.0	0.60		–	
2 Sound Insulation of Partition Walls		3.0	0.40		–	
3 Sound Insulation Performance of Floor Slabs (light-weight impact source)			–		–	
4 Sound Insulation Performance of Floor Slabs (heavy-weight impact source)			–		–	
1.3 Sound Absorption		3.0	0.20		–	
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		–	
2 Variable Loads and Following-up Control			–		–	
3 Perimeter Performance	Double skin	5.0	0.20		–	
4 Zoned Control		3.0	0.30		–	
5 Temperature and Humidity Control		3.0	0.10		–	
6 Individual Control			–		–	
7 Allowance for After-hours Air Conditioning		3.0	0.10		–	
8 Monitoring Systems			–		–	
2.2 Humidity Control		**3.0**	0.20		–	
2.3 Type of Air Conditioning System	Floor vented system	**5.0**	0.30		–	
3. Lighting & Illumination		**3.6**	0.25		–	**3.6**
3.1 Daylighting		**5.0**	0.30		–	
1 Daylight Factor	25%	5.0	0.60		–	
2 Openings by Orientation			–		–	
3 Daylight Devices	Light shelf	5.0	0.40		–	
3.2 Anti-glare Measures		**3.0**	0.30		–	
1 Glare from Light Fixtures		3.0	0.40		–	
2 Daylight Control		3.0	0.60		–	
3 Reflection Control			–		–	
3.3 Illuminance Level		**3.0**	0.15		–	
3.4 Lighting Controllability		**3.0**	0.25		–	
4. Air Quality		**3.4**	0.25		–	**3.4**
4.1 Source Control		**3.0**	0.50		–	
1 Chemical Pollutants		3.0	0.33		–	
2 Asbestos			–		–	
3 Mites, Mold etc.		3.0	0.33		–	
4 Legionella		3.0	0.33		–	
4.2 Ventilation		**3.0**	0.30		–	
1 Ventilation Rate		3.0	0.25		–	
2 Natural Ventilation Performance		3.0	0.25		–	
3 Consideration for Outside Air Intake		3.0	0.25		–	
4 Air Supply Planning		3.0	0.25		–	
4.3 Operation Plan		**5.0**	0.20		–	
1 CO_2 Monitoring	CO2 monitoring system	5.0	0.50		–	
2 Control of Smoking	Smoking prohibited in the building	5.0	0.50		–	
Q2 Quality of Service		–	0.30	–	–	**3.0**
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		–	
2 Use of Advanced Information System	Power supply 40 VA/m^2 or higher	4.0	0.33		–	
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		–	
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 Management		**3.0**	0.30		–	
1 Design Which Considers Maintenance Management		3.0	0.50		–	
2 Securing Maintenance Management Functions		3.0	0.50		–	
2. Durability & Reliability		**2.9**	0.31		–	**2.9**
2.1 Earthquake Resistance		**3.2**	0.48		–	
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**	0.33		–	
1 Service Life of Structural Materials		3.0	0.23		–	
2 Necessary Refurbishment Interval for Exterior Finishes		3.0	0.23		–	
3 Necessary Renewal Interval for Main Interior Finishes		3.0	0.09		–	
4 Necessary Replacement Interval for Air Conditioning and Ventilation Ducts		3.0	0.08		–	
5 Necessary Renewal Interval for HVAC and Water Supply and Drainage Pipes		3.0	0.15		–	
6 Necessary Renewal Interval for Major Equipment and Services		3.0	0.23		–	

Figure I. 3.12 Score Sheet (output example 1/2)

2.4 Reliability		2.2	0.19		–	
1 HVAC System		1.0	0.20		–	
2 Water Supply & Drainage		1.0	0.20		–	
3 Electrical Equipment		3.0	0.20		–	
4 Support Method of Machines & Ducts		3.0	0.20		–	
5 ommunications & IT Equipment		3.0	0.20		–	
3. Flexibility & Adaptability		**2.6**	0.29		–	**2.6**
3.1 Spatial Margin		**3.0**	0.31		–	
1 Allowance for Floor-to-floor Height		3.0	0.60		–	
2 Adaptability of Floor Layout		3.0	0.40		–	
3.2 Floor Load Margin		**3.0**	0.31		–	
3.3 System Renewability		**2.0**	0.38		–	
1 Ease of Air Conditioning Duct Renewal		2.0	0.17		–	
2 Ease of Water Supply and Drain Pipe Renewal		2.0	0.17		–	
3 Ease of Electrical Wiring Renewal		1.0	0.11		–	
4 Ease of Communications Cable Renewal		3.0	0.11		–	
5 Ease of Equipment Renewal		1.0	0.22		–	
6 Provision of Backup Space		3.0	0.22		–	
Q3: Outdoor Environment On-Site		–	**0.30**	–	–	**3.4**
1. Conservation & 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 the Building		–	–	–	–	**3.6**
LR1: Energy		–	**0.40**	–	–	**4.1**
1. Building Thermal Load	PAL = 270 MJ/yr-m[2]	**3.5**	0.30		–	**3.5**
2. Natural Energy Utilization		**5.0**	0.20		–	**5.0**
Execution design/Completion of construction		**5.0**	1.00		–	
Primary design			–		–	
2.1 Direct Use of Natural Energy			–		–	
2.2 Converted Use of Renewable Energy			–		–	
3. Efficiency in Building Service System	ERR = 17.1	**4.5**	0.30		–	**4.5**
4. Efficient Operation		**3.5**	0.20		–	**3.5**
4.1 Monitoring	Introduction of BEMS	**4.0**	0.50		–	
4.2 Operation & Management System		**3.0**	0.50		–	
LR2: Resources & Materials		–	**0.30**	–	–	**3.2**
1. Water Resources		**3.4**	0.15		–	**3.4**
1.1 Water Saving		**3.0**	0.40		–	
1.2 Rainwater & Greywater		**3.6**	0.60		–	
1 Rainwater Use System	Rainwater Use System	4.0	0.67		–	
2 Grey Water Use System		3.0	0.33		–	
2. Reducing Usage of Non-renewable Resources		**3.4**	0.63		–	**3.4**
2.1 Reducing Usage of Materials		3.0	0.07		–	
2.2 Continuing Use of Existing Structural Frame etc.		3.0	0.24		–	
2.3 Use of Recycled Materials as Structural Frame Materials	Blast furnace cement (concrete)	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	0.05		–	
2.6 Efforts to Enhance the Reusability of Components and Materials		3.0	0.24		–	
3. Avoiding the Use of Materials with Pollutant Content		**2.7**	0.22		–	**2.7**
3.1 Use of Materials without Harmful Substances		3.0	0.32		–	
3.2 Elimination of CFCs and Halons		**2.6**	0.68		–	
1 Fire Retardant		2.0	0.33		–	
2 Foaming Agents (Insulation Materials, etc.)		3.0	0.33		–	
3 Refrigerants		3.0	0.33		–	
LR3: Off-site Environment		–	**0.30**	–	–	**3.4**
1. Consideration of Global Warming	Energy Saving efforts	**3.8**	0.33		–	**3.8**
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 Rainwater Discharge Loads		–	–		–	
2 Sewage Load Suppression		3.0	0.33		–	
3 Traffic Load Control		3.0	0.33		–	
4 Waste Treatment Loads		3.0	0.33		–	
3. Consideration of Surrounding Environment		**3.0**			–	**3.0**
3.1 Noise, Vibration & Odor		**3.0**	0.40		–	
1 Noise		3.0	1.00		–	
2 Vibration		–	–		–	
3 Odor		–	–		–	
3.2 Wind Damage & Daylight Obstruction		**3.0**	0.40		–	
1 Restriction of Wind Damage		3.0	0.70		–	
2 Sand and Dust		3.0	0.30		–	
3 Restriction of Daylight Obstruction			–		–	
3.3 Light Pollution		**3.0**	0.20		–	
1 Outdoor Illumination and Light that Spills from Interiors		3.0	0.70		–	
2 Measures for Reflected Solar Glare from Building Walls		3.0	0.30		–	

Figure I. 3.13 Score Sheet (output example 2/2)

3.8 Assessment Results Sheet

The Assessment Results Sheet is shown in Figure I.3.14.The assessment results of Q (Environmental Quality of the building), LR (Environmental Load Reduction of the building), BEE (Building Environmental 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 Charts

Assessment results of Q

Assessment results of LR

3. Design Consideration

CASBEE® for New Construction — Assessment Results

Assessment Manual: CASBEE for New Construction (2010 Edition) Assessment Software: CASBEE-NC 2010 (V.1.0)

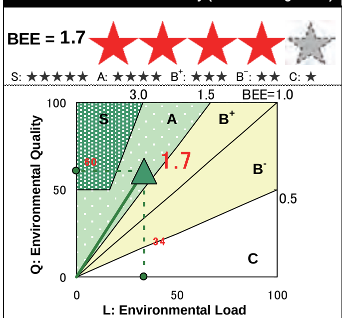
1-1 Building Outline / **1-2 Building image**

Building Name	XX building	Number of Floors	+XX F
Location	XX city, XX pref.	Structure	S
Area Zone	Commercial area, fire prevention zone	Average Occupancy	XX occupants
Climate Zone	Area Category V	Annual Occupancy Hours	XX hrs/year
Building Type	Office,	Assessment State	Execution design
Completion	December 2014 Scheduled	Assessment Date	July 8, 2010
Site Area	XX m²	Assessed by	XX
Construction Area	XX m²	Verification Date	July 10, 2010
Total Floor Area	5,400.00 m²	Verified by	XX

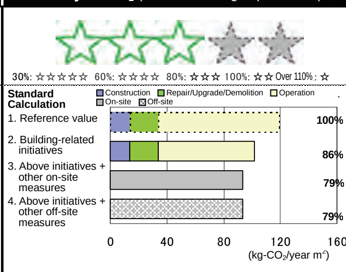
(e.g. exterior view)

Disable sheet protection when inserting image

2-1 Built Environment Efficiency (BEE Ranking/Chart)

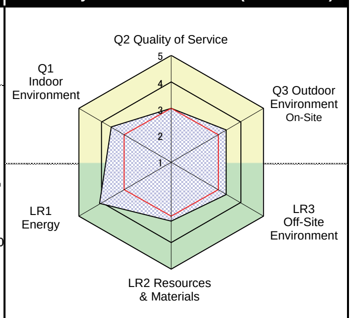


2-2 Life Cycle CO_2 (Global Warming Impact Chart)



The building's LCCO2 emissions are assessed under LR3 Consideration of Global Warming with relation to the reference building.

2-3 Primary Assessment Results (Radar Chart)



2-4 Secondary Assessment Results (Bar Chart)

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-NC, 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.3.14 Assessment Results Sheet for CASBEE for New Construction (2010 edition) (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: Building Environmental 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 the Building	
		Results under LR: Environmental Load Reduction of the Building	
3. Design considerations			

1. Building outline

Shows the project summary information from the (I) building outline entry of the Main Sheet, 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: Building Environmental Efficiency (BEE)

Building Environmental Efficiency (BEE), which is calculated from the assessment results of Q (Building Environmental Quality) and L (Building Environmental Load), 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 building environmental quality 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 through B^-, B^+, A and S, corresponding to regions divided according to the line gradient. The ranks correspond to the assessment expressions shown in Figure I.3.15, using a number of 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 graph. 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 green power certificates and carbon credits)

For the standard calculation, Item 3 and 4 show the same value.

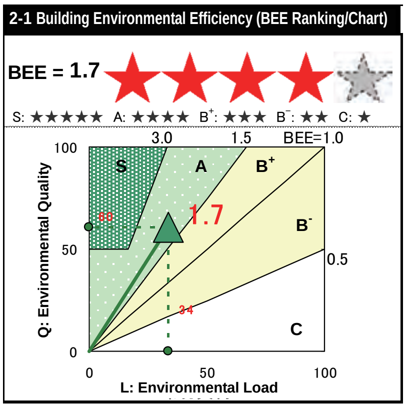


Figure I.3.15 Enlarged Image of Section 2-1 (BEE Value and Red Star Ranking)

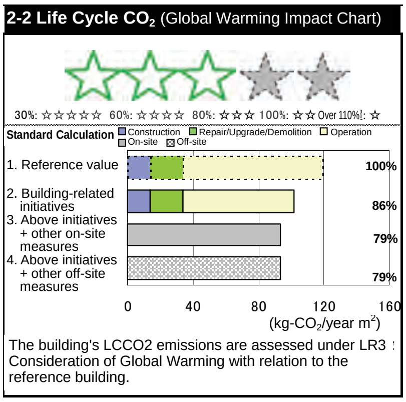


Figure I.3.16 Enlarged Image of Section 2-2 ($LCCO_2$ and Green Star Ranking)

2-3 Radar chart

The points for the six major categories from Q1 to LR3 are shown together in a radar chart (Figure I.3.17) on the upper right of the second column, to give an immediate clear presentation of the characteristics of environmental considerations in the target building.

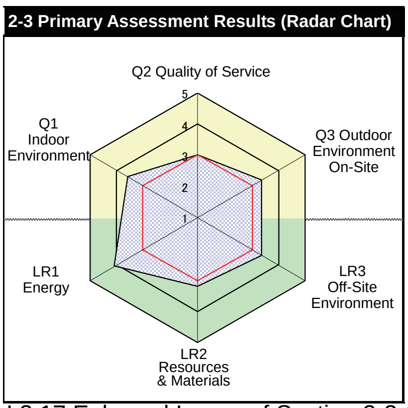


Figure I.3.17 Enlarged Image of Section 2-3 (Rader Chart)

2-4 Bar chart

Assessment results for Q (Environmental quality of the building) is presented as a bar graph per medium-level categories 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 the building) are presented likewise, for LR1 Energy, LR2 Resources & Materials and LR3 Off-site Environment.

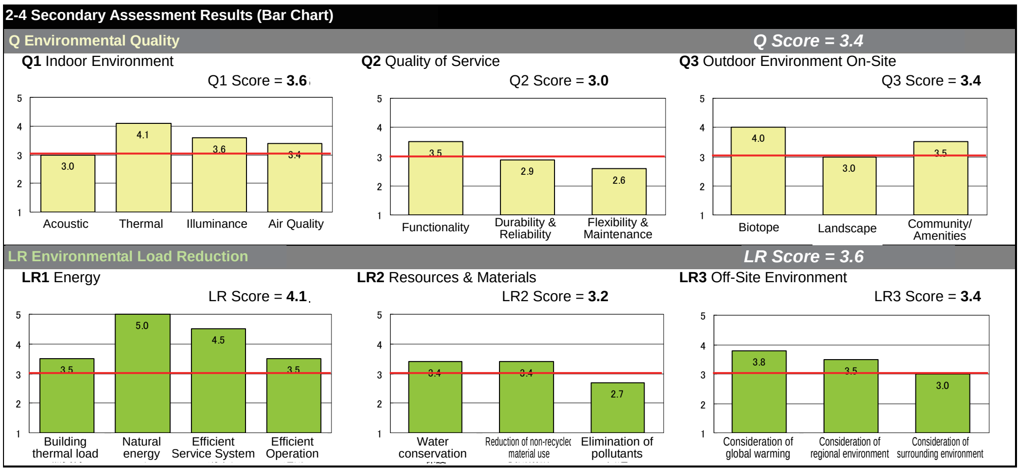


Figure I.3.18 Enlarged Image of Section 2-4 (Bar Chart)

3. Design consideration

Indicate items considered in the environmentally conscious design, 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-NC, 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.

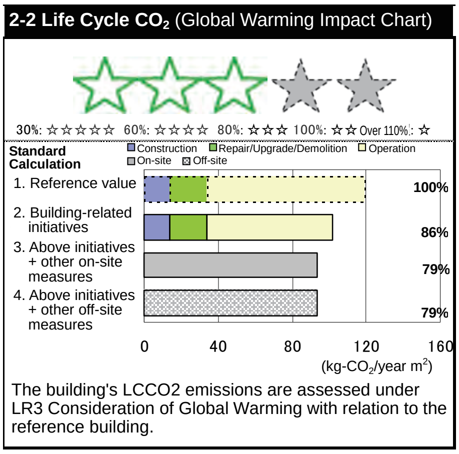
Figure I.3.19 Design consideration

3.9 Points to Note Concerning the CASBEE for New Construction (2010 edition) Assessment Software

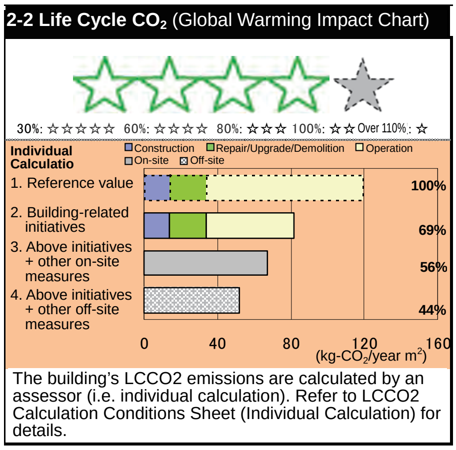
In addition to the standard calculation, when assessors have gathered more detailed data and performed more accurate $LCCO_2$ calculations as individual calculations, CASBEE for New Construction can be included as part of the assessment results.
Specifically, the calculated values, along with the green 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 2010 edition 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 in 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 (for a building rated as level 3 in all assessment categories except Energy, and equivalent to the evaluation standard for building owners as referred to in the Energy Conservation Law) and CO_2 emissions for the targeted building are entered 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

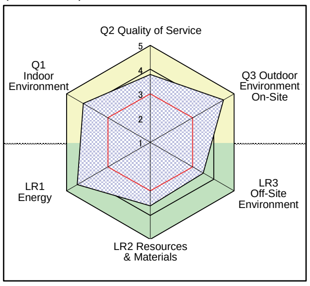
Figure I.3.20 Examples of $LCCO_2$ (Global Warming Impact Chart) Display Based on Individual Calculation

Note: Many of the buildings evaluated here as examples embody highly active environmental consideration. Therefore the reader should note that this is a concentration of relatively high rankings. Also, the buildings presented here are all anonymous. The owners and other relevant parties should be contacted before visiting any of these buildings.

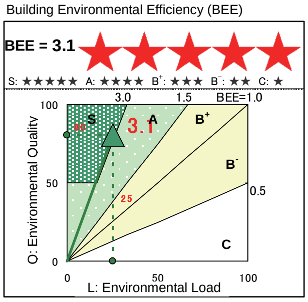
4. Case Studies

Case A — Assessment Result:Rank S (BEE：3.1)

Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment Summary

This building was designed to create an innovative office space that offers a comfortable working environment equipped with an intelligent energy-efficient sensor network.

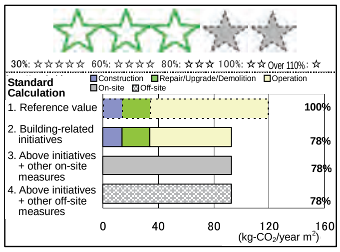
The walls below the windows were raised to a height of 450 mm in consideration of the surrounding residential areas, allowing maximum open area for the windows. Double-glazing units with Low-E coating and gray heat-absorbing glass reduce daytime sun exposure, contributing to air conditioning load reduction and improvement of the environment around the windows.

In order to create a comfortable working environment with an intelligent energy-saving system, the building plan included a hybrid sensor system which achieves an optimal lighting and thermal environment for the occupied space. Additionally, task/ambient air conditioning and adjustable air flow diffusers contribute to achieving the plan objective.

Building outline

Building type(s): Office, Apartments
Location: Minato-ku, Tokyo
Site area: 5,066.92 m2
Total floor area: 22,694.88 m2
Floors: 15 (above ground)
Completion: July 2007

LCCO2 (Global Warming Impact Chart)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

Design Consideration

Items considered in planning		Key environmental measures
General	Creation of an innovative office space that offers a comfortable working environment equipped with an intelligent energy-efficient sensor network	
Q1 Indoor Environment	With the concept of creating a comfortable environment wherever there are people, an optimal lighting and thermal environment for the occupied space is created by a hybrid sensor system for occupancy, illuminance and room temperature.	- Solar radiation and daylight control is carried out by an out frame exterior, eaves and automatic blinds -Heat-absorbing glass + Low-E glass - Multi-purpose sensor system (i.e. free address hybrid sensor) that detects occupancy and transmits data to the lighting sensor or wireless thermostat
Q2 Quality of Service	Seismic damping structure was used for Grade A earthquake resistance	- OA floor 100 mm high, power supply capacity 60 VA/m^2. - Installation of seismic damping system
Q3 Outdoor Environment On-Site	The building plan was developed with consideration of the surrounding residential areas	- Attention to streetscape aesthetics - Provision of green space and attention to air flow and louver layout for waste heat
LR1 Energy	In order to achieve both user comfort and energy efficiency, ambient air conditioning provides overall air control, while zoned task air conditioning processes internal heat generated from occupants and equipment such as computers. Air diffusers with adjustable air flows are used to accommodate the Cool Biz practice.	- Out frame exterior, heat-absorbent glass + Low-E glass (PAL value: 216.9) -Task/ambient A/C system - Adjustable air flow diffusers - Natural ventilation, night purging, daylight control and blind control
LR2 Resources & Materials	Water resource protection through water conservation measures and rainwater recycling	-Use of water-saving devices -Rainwater recycling system
LR3 Off-site Environment	Attention to the prevention of atmospheric pollution, vibration, wind hazards, light pollution, etc.	- All-electrical building system for prevention of atmospheric pollution

Case B

Assessment Result:Rank S (BEE: 1.6)

Assessment Summary

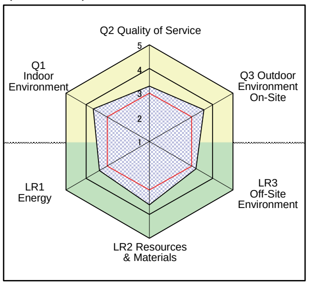
After 35 years of use, this building was to be rebuilt in 2005 due to a range of issues including office space, aging service systems, seismic risks and asbestos concerns.

The building plan reflected the environmental commitments of the owner company (i.e. effective use of resources and energy, promotion of environmental protection awareness and load reduction). With the theme of effective use of natural energy and energy conservation, the building was designed to realize an environmentally conscious, small-scale office building in an urban setting.

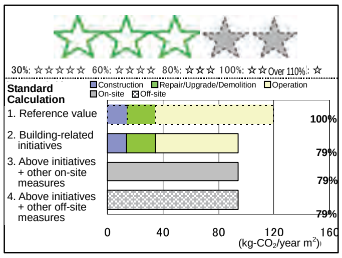
Building outline

Building type(s): Office
Location: Toshima-ku, Tokyo
Site area: 214.37 m2
Total floor area: 931.35 m2
Floors: 6 (above ground)
Completion: January 2007

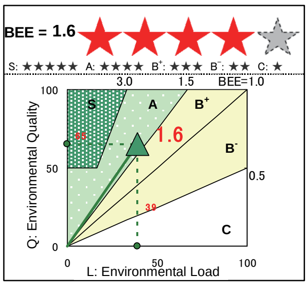
Evaluation Results of Environmental Functions (Radar chart)

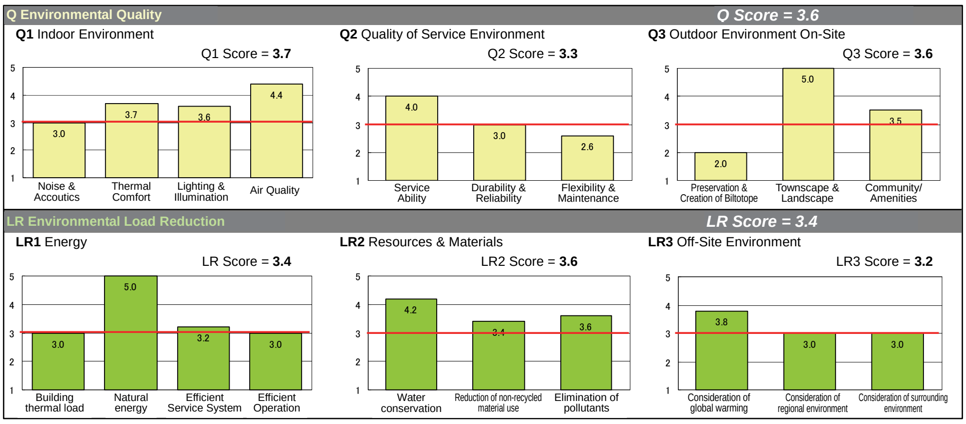


LCCO2 (Global Warming Impact Chart)



Building Environmental Efficiency (BEE)





Assessment results for CASBEE-NC_2010 (Ver.1.0)

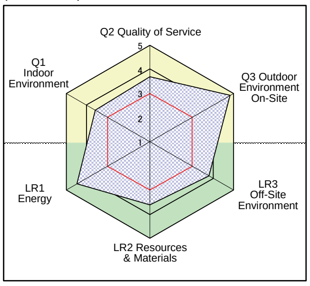
Design Consideration

Items considered in planning		Key environmental measures
General	Focusing on integration of structure and functionality, and architectural features, as well as the effective environmental load reduction technologies for small offices, the building was designed to contribute to the rejuvenation of the surrounding streetscape. The design was also to provide a bright, functional workspace that optimizes the limited 214-m^2 lot, a less-than-sufficient floor height of 3.05 meters due to right-of-light restrictions, and a building depth of approx. 8-13 meters.	
Q1 Indoor Environment	Natural lighting was provided through a façade on the northeast side consisting of large layered glasses. Combined use of overhead and floor diffuser A/C systems for each floor minimizes the temperature difference in the air-conditioned rooms. Package A/C system with AHU for each floor ensures humidification control.	Daylight utilization Large double-layered glass Overhead A/C + A/C with floor diffusers Package A/C system with AHU
Q2 Quality of Service	Floor height of 3.05 m ensures 2.55 m ceiling height under joists and 2.80 m under slab. PCa flooring slabs that also function as reflectors for lighting devices are used. Design includes use of water-saving devices and rainwater/groundwater utilization.	PCa flooring slabs Exposed ceiling design
Q3 Outdoor Environment On Site	Graceful and modern façade with clear and well-chiseled edges give the building a landmark presence in an area of mixed office, retail and residential buildings in front of the Shin-Otsuka Station. Building planning was based on Toshima Ward Amenity Development Guidelines.	Landmark presence in the local cityscape Compliance with Toshima Ward Amenity Development Guidelines
LR1 Energy	Use of outdoor air cooling system with package A/C unit and natural ventilation system with smoke ventilation windows Lighting fixtures with occupancy/lighting intensity sensors	Natural ventilation system with package A/C system Lighting control system
LR2 Resources & Materials	Design includes use of water-saving devices and rainwater/groundwater utilization. Non-chemical adhesive and coating materials are used.	Rainwater/groundwater recycling Use of ecological materials
LR3 Off-site Environment	All-electric building with no combustion machinery	Designed with no combustion machinery

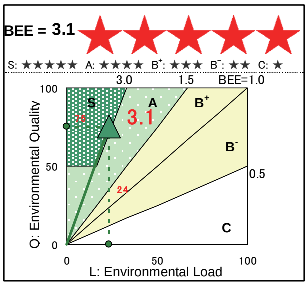
Case C

Assessment Result:Rank S (BEE：3.1)

Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment Summary

This building was designed as an environmentally conscious facility which encourages amenity improvement in the surrounding areas.

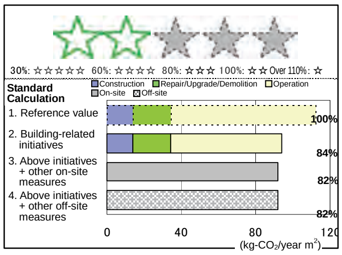
Special attention is given to extensive greening initiatives. With the goal of turning the entire building site into a green space, greenery that flows from the ground areas to the roof minimizes the building's artificial presence.

Furthermore, natural lighting and ventilation, as well as solar power generation, are implemented in order to gain optimal benefit from the use of Kagoshima's rich natural environment.

Building outline

- Building type(s): Office
- Location: Kagoshima City, Kagoshima Prefecture
- Site area: 10,162.44 m2
- Total floor area: 2,992.52 m2
- Floors: 2 (above ground)
- Completion: May 2008

LCCO2 (Global Warming Impact Chart)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

Design Consideration

Items considered in planning		Key environmental measures
General		
Q1 Indoor Environment	Natural materials such as locally-produced lumber and traditional lime plaster create a warm space. Ceiling height and air space per person are adjusted depending on use of each room. An underfloor heating/cooling system which uses groundwater source heat is installed in the high-ceiling exhibition area (phase2).	Rooftop greenery, underfloor heating/cooling system, etc.
Q2 Quality of Service	Visitors can enjoy a stroll around the property including the rooftop. The building requires no entry fee, and the layout is designed to accommodate diverse community activities (e.g. seminars). Open design of the staff room is designed to have an open atmosphere, facing the entrance, promoting detailed consideration of visitors.	
Q3 Outdoor Environment On-Site	Expansive green space is created by a lawn covering the entire property (including rooftop and parking space). Various shaded indoor areas are created (e.g. corridors with tall trees and wisteria vines).	User-friendly building, expansive green space, etc.
LR1 Energy	The building's energy plan was designed to benefit from site characteristics. Situated by the Kotsuki River, the building uses abundant subsurface water for air conditioning and service water. The layout of the building was decided so as to use the prevailing east-west wind. Earth pits below the building are used for precooling/preheating of outdoor air. Photovoltaic panels with a rated output of 40 kW are installed. Energy consumption and the effects of natural energy utilization are visually presented with BEMS.	Multi-packaged air conditioning system using groundwater source heat, natural air flows, daylight utilization, solar power generation system, rooftop greenery, etc.
LR2 Resources & Materials	The building maximizes the use of local natural materials (e.g. lumber). Shirasu, siliceous volcanic sand unique to this area, is mixed in materials for flat boards for rooftop greenery and interlocking blocks. Waste lumber from a stage renovation at the Kagoshima Civic Center, such as cedar and Japanese cypress, were reclaimed as floorboards for exhibition rooms and polished with beeswax. Classroom interior items, including desks and other materials from a closed elementary school in the city, are reused in one of the exhibition rooms. Ecological materials were actively used (e.g. eco-cable for wiring, and recycled three-layer PVC foamed pipes for water drainage).	Waste water recycling, use of ecological materials, etc.
LR3 Off-site Environment	In consideration of the surrounding residential areas, the building profile was kept low in order to maintain a human scale environment. Situated near the Kotsuki River, the building has an open space on the river side of the building to facilitate easy access. Plants are added regularly around the building, providing pedestrian-friendly space.	Landscaping, rooftop greenery, etc.

Case D

Assessment Result:Rank S (BEE：3.1)

Assessment Summary

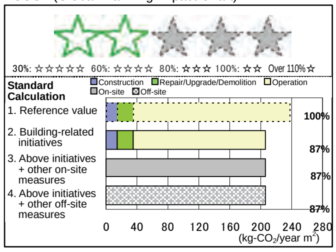
Seeking to become a model as an environmentally-conscious hospital that reflects Okinawa's unique characteristics, thorough consideration was given specifically to the indoor environment, functionality/reliability, and environmental impact survey of the surrounding areas (Q: Environmental Quality).

Furthermore, the building and equipment were designed to achieve optimal energy efficiency and water conservation by maximizing Okinawa’s climate conditions. As a result, the building received exceptionally high marks (i.e. SQ: 4.3, Ranking: S and BEE: 3.1).

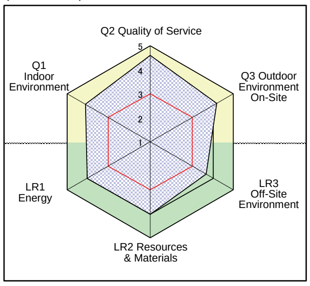
Building outline

Building type(s): Hospital
Location: Okinawa Prefecture
Site area: 12,503.46 m2
Total floor area: 42,733.90 m2
Floors: 6 (above ground)
Completion: April 2006

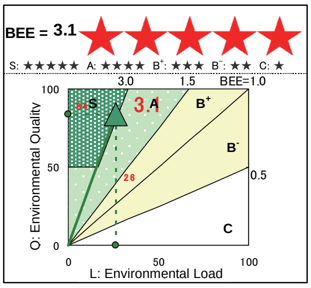
LCCO2 (Global Warming Impact Chart)



Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

Design Consideration

Items considered in planning		Key environmental measures
General	Okinawa has a severe climate and geographical characteristics such as strong and prolonged solar radiation, high temperatures and humidity throughout the year, and droughts and typhoons, resulting in infrastructure degradation. Thorough consideration was given to these elements, key factors affecting sustainability in Okinawa, and the architectural and system designs for the hospital, while creating a facility that meets the growing needs of advanced medical services.	
Q1 Indoor Environment	As an advanced medical facility, special attention was given to temperature/humidity control and air purification. Both indoor environment and energy efficiency were achieved with the use of a desiccant A/C system for humidity control and a task/ambient A/C system in 4-bed inpatient rooms (cool air is circulated from the ceiling).	Task/ambient A/C system Desiccant A/C system for humidity control
Q2 Quality of Service	Maintenance and upgrading, and restoration of the A/C system during a disaster are improved by adding ISS in the ceilings in the 1st and 3rd floors (where key A/C units are located). Energy-supply reliability is enhanced through a dual system for power and cold-water supply and a multi-energy heat source system.	ISS: interstitial space used for service equipment
Q3 Outdoor Environment On Site	As a community-based medical facility, the building is equipped with a meeting space for adults/children and a rooftop garden. Amahaji, a structure typically seen in traditional Okinawan houses, surrounds the building, sheltering pedestrians from the rain and intense sun.	Space for community use, rooftop garden, Okinawa's traditional sun shading system
LR1 Energy	Desiccant A/C system with water-conveyance cold-source system using mid-large temperature difference, suitable in Okinawa's high humidity, reduces energy consumption by 41%.	Desiccant A/C system, water-conveyance cold-source system using mid-large temperature difference
LR2 Resources & Materials	Okinawa has poor water resources and high-humidity conditions. As a water-saving measure, in addition to rainwater, the large amount of water generated from A/C condensation is used as greywater, accounting for 48% of general service water usage.	Use of rainwater and A/C condensation water
LR3 Off-site Environment	Sterilization of wastewater prior to discharge is carried out to remove the threat of infection from advanced medical care. Sufficient distance from adjacent sites and vertical louvers provide relief from daytime sun exposure and nighttime light pollution.	Vertical louvers for light control

Case E

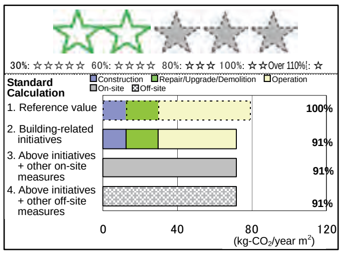
Assessment Result:Rank S (BEE：3.1)

Assessment Summary

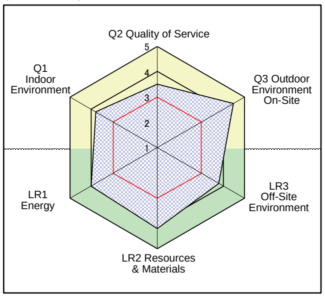
This elementary school was built on a waterfront property in Fukuoka, next to junior high and high school buildings.
The building was designed to blend in with the school buildings, with bricks covering the main exterior walls and the three-story atrium lobby in the center of the building. General classrooms are placed on the north side of the building to make effective use of daylight.
The building concept was to create a comfortable school environment in harmony with nature. Based on the long-term performance of the environmental measures in place with the existing schools, the elementary school adapted various environmental features (i.e. natural ventilation for classrooms, use of daylight in north-facing rooms via the atrium lobby, cooling/heating tubes placed in underground pipe space, use of rainwater, etc.). Furthermore, a new rooftop sprinkler system was designed for the gymnasium.

Building outline
Building type(s): Elementary school
Location: Fukushima Prefecture
Site area: 49,330 m2
Total floor area: 8,305 m2
Floors: 3 (above ground)
Completion: January 2010

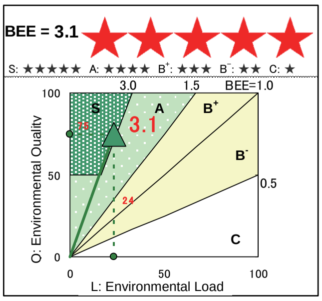
LCCO2 (Global Warming Impact Chart)



Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

Design Consideration

Items considered in planning		Key environmental measures
General	A comfortable school environment was created in harmony with nature.	
Q1 Indoor Environment	Spaces which are environmentally-conscious and comfortable were created with active use of natural light and air flows.	- Use of daylight in north-facing classrooms - Active use of natural air flow in the atrium and classrooms - Floor-vented air conditioning.
Q2 Quality of Service	Improvement of building reliability was achieved through use of rainwater and recycled water.	- Ceiling height: 3,000 mm - Brick exterior for extended building lifespan - Rainwater and greywater utilization
Q3 Outdoor Environment On-Site	Attention was given to air flow when designing the building layout.	- Specific layout plan and building shape - Rooftop sprinkler system - On-site greening program
LR1 Energy	Optimal use of natural energy was achieved by effectively using air flow, light and geothermal heat.	- Natural ventilation for classrooms via atrium - Use of daylight for north-facing classrooms - Cooling/heating tubes placed in underground pipe space
LR2 Resources & Materials	Water resources are protected by implementation of water conservation measures and rainwater recycling.	- Use of rainwater and water-saving equipment - Use of recycled water supplied via the local infrastructure system
LR3 Off-site Environment	The building was designed in consideration of the prevention of atmospheric pollution, wind hazards, light pollution, etc.	- Layout in consideration of air flow - Attention given to rooftop waste heat and air flow - Night lighting in consideration of impact on surrounding areas - Use of rainwater

Case F | Assessment Result:Rank A (BEE: 2.7)

Assessment Summary

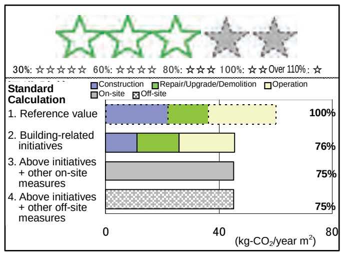
This building was part of a renovation project for a rental apartment complex built in 1958. The redevelopment plan aims to create an environmentally conscious community that reflects local values. To realize this goal, various meetings with the existing residents and environmental workshops have been held.

Regarding environmental initiatives, five themes were established: creation of a green network, biodiversity conservation, a clear passage for air movement, heat island reduction, and promotion of an environmentally friendly lifestyle. Specifically, the initiatives included existing technologies such as outdoor space improvement (e.g. conservation of natural vegetation, rooftop greenery, biotope creation) and environmental improvement of the building (e.g. optimal layout for wind conditions, thermal insulation improvement) and use of high-efficiency equipment (e.g. solar power generation, water heater unit with latent heat recovery system, CO_2 heat pump). Additionally, newer technologies were also implemented including double-glazed glass for all units, high reflective coating for eaves over balconies and open-corridors, and LED lighting in common areas.

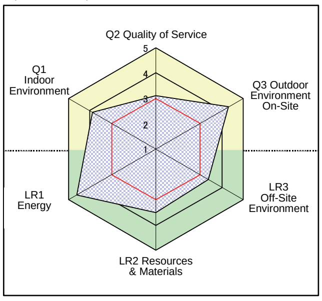
Building outline

Building type(s): Apartments
Location: Suginami-ku, Tokyo
Site area: 28,075.36 m2
Total floor area: 29,560.50 m2
Floors: 4 (above ground)
Completion: March 2011 (scheduled)

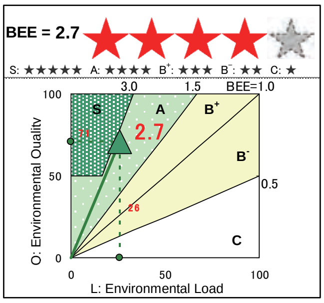
LCCO2 (Global Warming Impact Chart)



Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

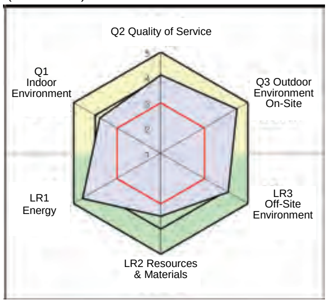
Design Consideration

Items considered in planning		Key environmental measures
General	Environmental initiatives were implemented under the themes of creation of a green network, biodiversity conservation, clear passage for air movement, heat island reduction, and promotion of an environmentally friendly lifestyle.	
Q1 Indoor Environment	Comfortable living space was achieved with high thermal insulation and effective daylight control.	Energy-saving Grade 4 under the Housing Quality Assurance Act with use of double-layered glass and interior thermal insulation; use of four-star rated products
Q2 Quality of Service	Functionality, durability and reliability were enhanced in order to achieve extended building lifespan.	Deterioration countermeasure Grade 2 (structural frame etc.), on-site network with 100 Mbps LAN
Q3 Outdoor Environment On Site	Environmental initiatives include conservation of natural vegetation, biotope creation, a clear passage for air movement (by creating a layout in harmony with the wind conditions of the surrounding areas) and rooftop/wall greenery.	Conservation of natural vegetation, green bank program (full use of existing trees), rooftop/wall greenery, biotope creation and appropriate layout for wind conditions
LR1 Energy	The building design includes reduction of thermal load and improvement in equipment efficiency by using double-glazed glass, a water heater unit with latent heat recovery system and CO_2 heat pump.	Solar power generation, water heater unit with latent heat recovery system, CO_2 heat pump and LED lighting (common areas)
LR2 Resources & Materials	The design includes reduction in resource consumption and measures to reduce environmental load such as use of advanced water-saving toilets and recycled materials.	Rainwater utilization, recycled three-layer PVC foamed pipes and advanced water-saving toilets
LR3 Off-site Environment	The outdoor parking lot was partially incorporated into the apartment building to minimize outdoor asphalt areas, thus contributing to heat island reduction.	Underground rainwater permeation, water-retentive/permeable paving and leaf composting

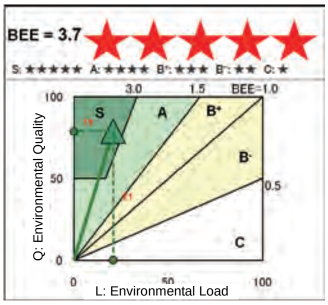
Case G

Assessment Result:Rank S (BEE：3.7)

Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)

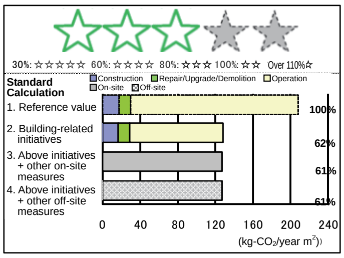


Assessment Summary

This building is situated on an exceptional location on the Kusatsu side of Omi Ohashi Bridge, across from Otsu on Lake Biwa. It was designed as an "eco shopping mall" that coexists with the local communities and blends in with the surrounding nature.
The exterior of the building was designed to fit the landscape of Lake Biwa and rustic scenery of the surrounding area, and energy efficiency was incorporated in the interior design features such as an environmentally friendly lighting system.
Furthermore, a variety of environmental technologies, including an ice thermal storage system, natural energy, and greenery utilization, were introduced. The mall also promotes the importance of environmental efforts among visitors by offering information on its initiatives through eco-info terminals and panel displays.
Also, BEMS-based optimal operation of the building and life cycle planning was included in the building design.

Building outline
Building type(s): Retailers (restaurants/movie theaters)
Location: Kusatsu City, Shiga Prefecture
Site area: 41,915.96 m2
Total floor area: 165,238.10 m2
Floors: 6 floors (above ground) & 1 floor (basement)

LCCO2 (Global Warming Impact Chart)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

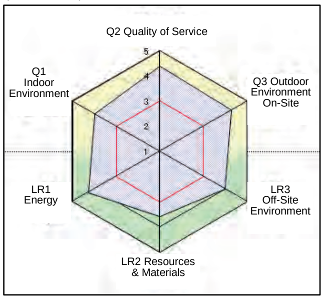
Design Consideration

Items considered in planning		Key environmental measures
General	The building, designed as an "eco shopping mall" which fits the landscape of Lake Biwa, contributes to global environment protection through CO_2 emissions reduction.	- Landscape consideration
Q1 Indoor Environment	Measures for energy conservation and improvement of the thermal environment include the combined use of central and individual A/C systems. Light wells are used for daylight utilization. Smoking sections are completely closed off.	- Light wells, occupancy sensors for stairs and washrooms - Use of materials with low chemical content. - Interior design for enhanced ease of cleaning and maintenance
Q2 Quality of Service	Ample floor and ceiling heights were provided. For improvement in reliability, multiple devices were installed as backup for equipment failure. Also, the high level of maintenance management, as well as ease of equipment upgrade, was achieved.	- Universal design - Electricity and communication systems placed on the 2nd floor or above.
Q3 Outdoor Environment On Site	The site has an extensive green area with native trees. The low-rise building design, locally-available materials and reduced light level for signs and illumination systems were incorporated in order to enhance integration with the surrounding landscape. Also, biotopes were created in order to contribute to biological resources.	- Restoration of the on-site rice field using natural resources such as flora and topsoil harvested prior to construction. - Local forest thinning from Shiga Prefecture area, art objects using subsoil from Lake Biwa - Eco-stations
LR1 Energy	Reduction of solar radiation load was achieved by establishment of a non-air-conditioned area around the building and installation of smaller windows with the exception of the north side of the building. A large temperature difference A/C system with ice thermal storage and a high-efficiency lighting system were used as energy efficiency measures. Furthermore, 200 kW solar panels were installed.	- Large temperature difference A/C system with ice thermal storage - High-efficiency lighting, LED - Solar power generation - Energy data collection and commissioning using BEMS
LR2 Resources & Materials	Recycled materials, forest thinning and laminated lumber were used extensively. The water resource management system uses groundwater and rainwater.	- Louvers with recycled lumber, recycled interlocking blocks - Use of groundwater and rainwater
LR3 Off-site Environment	Segregated garbage collection is established. Ample parking space and multiple entrance/exit points are provided in order to reduce traffic congestion. Also, the water processing capacity at the facility exceeds the level set under the sewage discharge standards.	- On-site bus depots for public transportation - Rooftop and wall greenery (moss tiles) - Kitchen water processing system

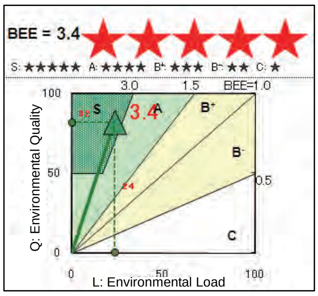
Case H

Assessment Result:Rank S (BEE : 3.4)

Evaluation Results of Environmental Functions (Radar chart)



Building Environmental Efficiency (BEE)



Assessment Summary

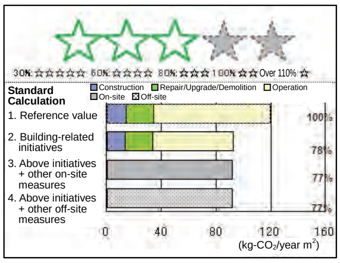
This building was designed as a R&D hub for advanced technologies surrounded by nature. An innovative step-structured office space, together with a seven-story atrium and large toplights, offers pleasant stimulation from the sky and surrounding nature to encourage creative R&D activities. The theater-like space also significantly enhances communication between different work floors, thus fostering a sense of community.

The unique building design was complemented with a wide-range of environment control technologies, such as natural ventilation, exterior blinds and glass roof sprinklers. Rooftop greenery, green cubes and green mounds using concrete debris were designed in harmony with the surrounding environment.

Building outline

Building type: Office, Parking lot
Location: Atsugi City, Kanagawa Prefecture
Site area: 37,597.00 m2
Total floor area: 69,471.00 m2
Floors: 7 (above ground)/1 (basement)
Completion: May 2007

LCCO2 (Global Warming Impact Chart)



Assessment results for CASBEE-NC_2010 (Ver.1.0)

Design Consideration

Items considered in planning		Key environmental measures
General	The creative step-structured workplace is equipped with various energy-efficient and environmentally friendly measures.	
Q1 Indoor Environment	The north-facing toplights are equipped with exterior louvers and Low-E glass in order to reduce thermal load while optimizing natural lighting and views.	- Natural lighting through north-facing toplights - Floor-vented air conditioning
Q2 Quality of Service	The expansive office space has an exposed ceiling with walls more than 3.0 m high, maintaining spatial continuity with the use of a see-through elevator and an open utility room for the air conditioning system situated in the central area.	- Office area with high, exposed ceiling - Seismic isolation structure - See-through core plan (e.g. open utility room for air conditioning system)
Q3 Outdoor Environment On Site	Rooftop greenery and green mounds were designed in harmony with the surrounding environment. Green cubes bring nature into the workplace.	- Roof planting (green cubes, etc.) - Plant design in harmony with natural vegetation - Relocation of existing trees with wide bases
LR1 Energy	The building's extensive use of glass enhances peripheral thermal performance while inviting in the natural environment. Furthermore, the building efficiently combines a variety of features such as an air conditioning system with floor diffusers in occupied areas and natural energy utilization measures such as outdoor air cooling.	- Outside air cooling, cool/heat trench, solar chimney - Daylight control, illuminance level adjustment - BEMS
LR2 Resources & Materials	Effective use of resources was achieved through various measures such as kitchen wastewater and rainwater used for toilet flushing and concrete debris from an existing building recycled as green mound fillers for the outdoor landscaping.	- Concrete debris recycling - Kitchen wastewater recycling and rainwater utilization
LR3 Off-site Environment	Energy for the building is supplied by a power plant in order to minimize impacts on the surrounding areas. Off-site load reduction measures include rainwater and wastewater quality management, organic waste composting and garbage compression.	- Energy supply from a power plant - Rainwater percolation facility, wastewater quality management facility - Organic waste processing

Part II. 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.

When the symbols listed below appear on the scoring items in the table, they indicate the building type and whether or not they are applicable. The details are presented below.

● 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

Assessment stage	Symbols
Preliminary Design	PD
Execution Design	ED
Construction Completion	CC

1. Q: Built Environment Quality

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 outpatient waiting 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 schools 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. Sonic Environment

1.1 Noise

1.1.1 Background noise level

Assessment stage	Building type
PD	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 · Hsp (Waiting Room) · Htl · Fct · 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 schools (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).

*Note: Background levels in earlier editions are now referred to as the indoor background levels in the 2010 edition.

■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 5m away		Possible from 10m apart Telephone use (normal)		Possible from 3m apart Telephone use (bearable)		Loud conversation (3m) Telephone use (unbearable)
Studios	Silent room	Studio for newsreading etc.	Radio studio	Television studios	Mixing room	General offices			
Venues and halls		Music hall	Theater (medium)	Stage theaters	Movie theater, planetarium		Hotel lobbies		
Hospitals		Hearing test room	Special sickrooms	Sickrooms	Examining room	Laboratories	Waiting rooms		
Hotel and residential				Reading rooms	Bedrooms	Banquet halls	Lobbies		
General offices				Large meeting rooms	Reception rooms	Meeting rooms			Typing and accounting rooms
Public buildings				Auditorium	Museums	Library	Auditorium/ gymnasium	Indoor sports facilities	
Schools and churches				Music classroom	Chapels	Research rooms and classrooms		Corridors	
Commercial buildings				Jewelers and art shops	Music cafes	Bookshops	Banks and restaurants	Canteens	

■Bibliography 2), 3), 4), 11)

1.1.2 Equipment Noise

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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).

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct (building with a total floor space of 2,000 m^2 or more)
Level 1	No noise countermeasures. (No countermeasures at all among the efforts to be evaluated)
Level 2	Some measures taken. (Two or more noise countermeasures used from among the efforts to be evaluated).
Level 3	Noise countermeasures used. (Four or more noise countermeasures used from among the efforts to be evaluated).
Level 4	Countermeasures at a moderately high level. (Six or more noise countermeasures used from among the efforts to be evaluated).
Level 5	Countermeasures at an advanced level. (All noise countermeasures used from among the efforts to be evaluated).
Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct (building with a total floor space of less than 2,000 m^2)
Level 1	No noise countermeasures (No countermeasures at all among the efforts to be evaluated).
Level 2	Some measures taken (One or more noise countermeasures used from among the efforts to be evaluated).
Level 3	Noise countermeasures used (Two or more noise countermeasures used from among the efforts to be evaluated).
Level 4	Countermeasures at a moderately high level (Three or more noise countermeasures used from amont the efforts to be evaluated).
Level 5	Countermeasures at an advanced level (All noise countermeasures used from among the efforts to be evaluated)

<Residential and Accommodation Sections>	
Building type	Hsp · Htl (building with a total floor space of more than 2,000 m^2)
Level 1	No noise countermeasures. (No countermeasures at all among the efforts to be evaluated)
Level 2	Some measures taken. (Two or more noise countermeasures used from among the efforts to be evaluated).
Level 3	Noise countermeasures used. (Four or more noise countermeasures used from among the efforts to be evaluated).
Level 4	Countermeasures at a moderately high level. (Six or more noise countermeasures used from among the efforts to be evaluated).
Level 5	Countermeasures at an advanced level. (All noise countermeasures used from among the efforts to be evaluated).
Building type	Hsp · Htl (building with a total floor space of less than 2,000 m^2)
Level 1	No noise countermeasures. (No countermeasures at all among the efforts to be evaluated)
Level 2	Some measures taken. (One or more noise countermeasures used from among the efforts to be evaluated).
Level 3	Noise countermeasures used. (Two or more noise countermeasures used from among the efforts to be evaluated).
Level 4	Countermeasures at a moderately high level. (Three or more noise countermeasures used from among the efforts to be evaluated).
Level 5	Countermeasures at an advanced level. (All noise countermeasures used from among the efforts to be evaluated).
Building type	Apt
Level 1	No noise countermeasures. (No countermeasures at all among the efforts to be evaluated)
Level 2	
Level 3	Noise countermeasures used. (Two or more noise countermeasures used from among the efforts to be evaluated).
Level 4	
Level 5	Countermeasures at an advanced level. (All noise countermeasures used from among the efforts to be evaluated).

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

Efforts to be evaluated (Types of equipment noise and the countermeasures)

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct (building with a total floor space of 2,000 m^2 or more)	
No.	Type of equipment noise	Examples of noise countermeasures
1	Vents and intakes	Low-noise vents and intakes, optimal positioning, flow speed/volume adjustment, etc.
2	Indoor A/C units	Sound-proof covers, optimal positioning, etc.
3	Machine room: penetrating noise	Sound-proof covers, noise absorption and acoustic insulation of machine room, optimal positioning, etc.
4	As above: solid-borne noise	Vibration-proof racks and supports, etc.
5	Ducts and pipes: penetrating noise	Sound-absorbing products (e.g. ducts, elbows, boxes and pipe claddings), optimal positioning, etc.
6	as above: solid-borne noise	Vibration-proof suspensions and supports, flexible joints, vibration proofing of penetrating areas, etc.
7	Outside: cooling towers and external units	Sound barrier fences, sound buffers, vibration-proof supports, optimal positioning, etc.
8	Outside: intakes and vents	Optimal positioning, flow speed/volume adjustment, etc.
Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct (building with a total floor space of less than 2,000 m^2)	
No.	Type of equipment noise	Examples of noise countermeasures
1	Ducts and pipes: penetrating noise	Sound-proof pipe claddings, optimal positioning, etc.
2	as above: solid-borne noise	Vibration-proof suspensions and supports, flexible joints, vibration proofing of penetrating areas, etc.
3	Indoor units of multiple A/C system	Low-noise units, etc.
4	External units of multiple A/C system	Sound barrier fences, sound buffers, vibration-proof supports, optimal positioning, etc.
Building type	Apt	
No.	Type of equipment noise	Examples of noise reduction measures
1	Water use in washrooms/bathrooms (supply/drainage)	Appropriate water pressure, sound-proof pipe claddings, vibration-proof pipe hardware, vibration-proofing of toilets and bathroom units, optimal positioning, etc.
2	Water hammer	Appropriate water pressure, water hammer preventers, etc.
3	Indoor A/C units	Low-noise units, etc.
4	External A/C units	Vibration-proof rubber supports and mats, low-noise units, etc.
5	Fans	Low-noise units, etc.

☐Commentary

For equipment noise countermeasures, evaluate measures against noise generated by building equipment and services, such as air conditioning equipment and drainage equipment. For

example, air conditioning equipment generates noise in its compressors, motors and fans, and that noise is carried to building interiors through ducts, walls and structural elements to occupied areas inside the building. Once noise has been generated and emitted into the building interior, it is often very difficult to control. Therefore, it is important to start planning for noise source countermeasures and anti-noise design from the design phase.
Evaluate whether adequate countermeasures were taken against each type of noise. There is no need to use all the measures offered as examples of countermeasures. If the equipment does not generate noise, noise countermeasures should be deemed to have been taken.

■Bibliography 4)

1.2 Sound Insulation

1.2.1 Sound Insulation of Openings

☐**Assessment stage**	Building type
PD, ED and CC	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・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>		
	PD	ED and CC
Building type	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・Apt	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・Apt
Level 1	Noise causes annoyance	Less than T-1
Level 2		(No corresponding level)
Level 3	Noise causes almost no annoyance	T-1
Level 4		(No corresponding level)
Level 5	Noise causes no annoyance	T-2 or above

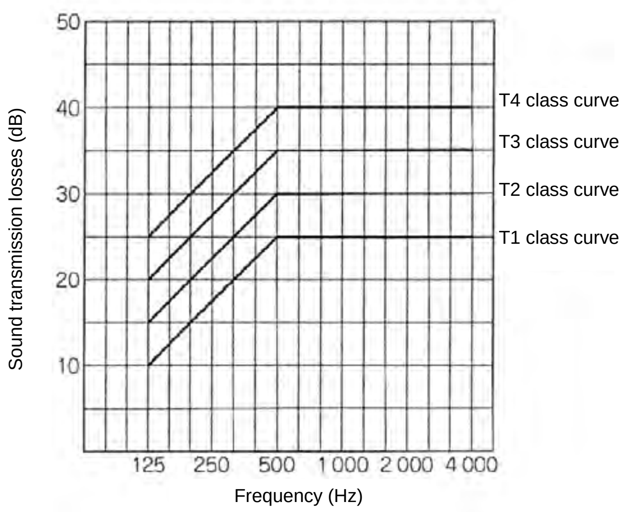
<Residential and Accommodation Sections>		
	PD	ED and CC
Building type	Hsp・Htl・Apt	Hsp・Htl・Apt
Level 1	Noise causes annoyance	Lower than T-1
Level 2		(No corresponding level)
Level 3	Noise causes almost no annoyance	T-1
Level 4		(No corresponding level)
Level 5	Noise causes no annoyance	T-2 or higher

☐**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.

For assessment at the preliminary design stage, perform a qualitative assessment. At the execution design stage and after completion of construction, apply the T classification as the performance indicator. 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.

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



■Bibliography 3)

1.2.2 Sound Insulation of Partition Walls

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Application condition

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

<Entire Building and Common Properties>		
	PD	ED and CC
Building type	Off·Sch·Rst·Fct	Off·Sch·Rst·Fct
Level 1	People's ordinary voices cause annoyance.	Less than Dr-30
Level 2		Dr-30
Level 3	People's ordinary voices do not cause annoyance.	Dr-35
Level 4		Dr-40
Level 5	People's ordinary voices are almost inaudible.	Dr-45 or more
Building type	Hsp (Examining Room)	Hsp (Examining Room)
Level 1	The content of conversation etc. can be understood.	Less than Dr-35
Level 2		Dr-35
Level 3	The sounds of conversation and general sounds can be heard at low volume.	Dr-40
Level 4		Dr-45
Level 5	The sounds of conversation and general sounds can barely be heard.	Dr-50 or higher

<Residential and Accommodation Sections>			
	PD		ED and CC
Building type	Hsp·Htl	Apt	Hsp·Htl·Apt
Level 1	Ordinary sounds such as TV, radio and conversation can be clearly heard.	Activities in the next home can be clearly heard.	Less than Dr-40
Level 2			Dr-40
Level 3	Ordinary sounds such as TV, radio and conversation can barely be heard faintly.	Activities in the next home can be heard but are not intrusive.	Dr-45
Level 4			Dr-50
Level 5	Ordinary sounds such as TV, radio and conversation cannot normally be heard.	No sounds from the next home.	Dr-55 or more

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

☐**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.

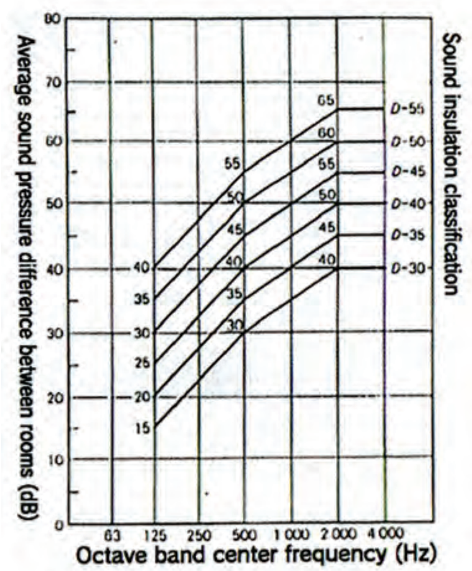
For assessment at the preliminary design stage, qualitatively evaluate the level of sound insulation performance between rooms.

At the execution design stage and after completion of construction, apply the Dr-value classification as the performance indicator. Dr-values are used in the assessment of sound insulation peformance 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 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.

■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)

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>		
	PD	ED and CC
Building type	Sch	Sch
Level 1	Noise of chair movement and falling objects is intrusive.	Worse than Lr-65
Level 2		Lr-65
Level 3	Noise of chair movement and falling objects causes considerable annoyance.	Lr-60
Level 4		Lr-55
Level 5	Noise of chair movement and falling objects is audible but quiet.	Lr-50 or better

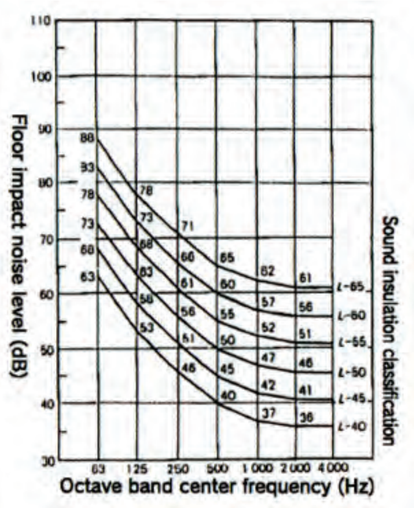
<Residential and Accommodation Sections>		
	PD	ED and CC
Building type	Hsp·Htl·Apt	Hsp·Htl·Apt
Level 1	Noise of chair movement and falling objects causes considerable annoyance.	Worse than Lr-55
Level 2		Lr-55
Level 3	Noise of chair movement and falling objects is audible but quiet.	Lr-50
Level 4		Lr-45
Level 5	Noise of chair movement and falling objects is almost inaudible.	Lr-40 or better

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

☐**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.
For assessment at the preliminary design stage, evaluate the target values of sound insulation performance qualitatively.
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 1418-2: Field Measurement of Floor Impact Sound Insulation in Buildings (Part

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



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.

■Bibliography 3)

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

□**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>		
	PD	ED and CC
Building type	Sch	Sch
Level 1	Noise of people jumping and running causes considerable annoyance	Worse than Lr-65
Level 2		Lr-65
Level 3	Noise of people jumping and running is highly audible	Lr-60
Level 4		Lr-55
Level 5	Noise of people jumping and running is slightly audible	Lr-50 or better

<Residential and Accommodation Sections>		
	PD	ED and CC
Building type	Hsp·Htl·Apt	Hsp·Htl·Apt
Level 1	Noise of people jumping and running is highly noticeable	Worse than Lr-60
Level 2		Lr-60
Level 3	Noise of people jumping and running is audible	Lr-55
Level 4		Lr-50
Level 5	Noise of people jumping and running is audible but hardly noticed	Lr-45 or better

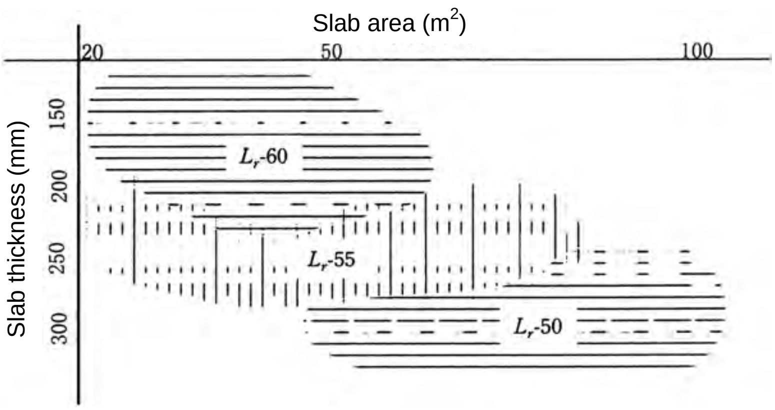
In cases where it is difficult to determine between the above levels, select an intermediate level (e.g. level 2 or 4).

□Commentary

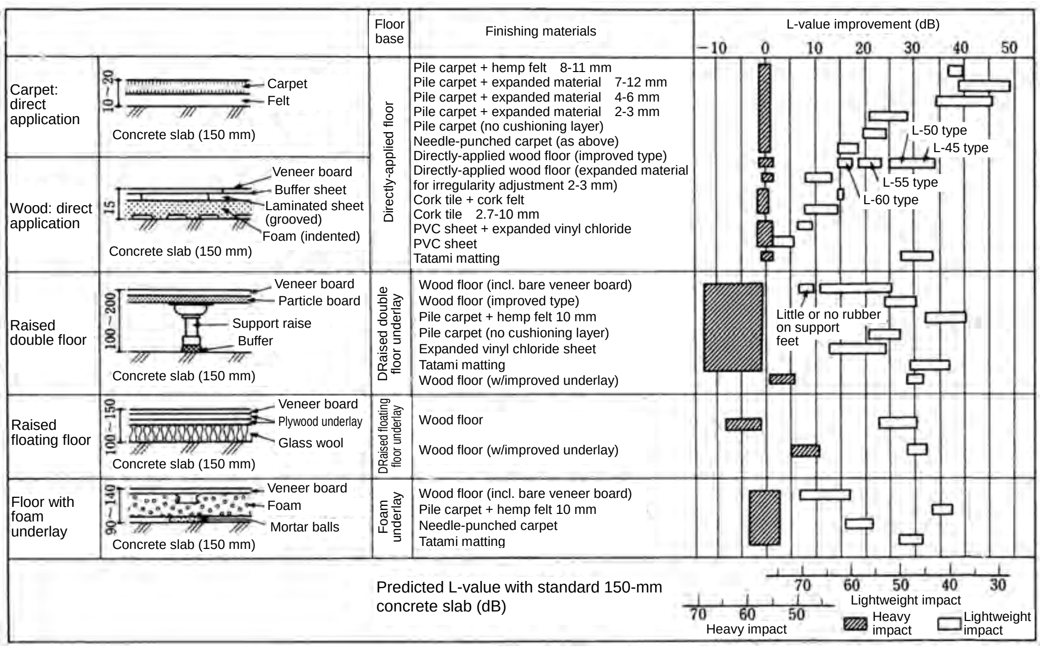
Examples of heavy impact sounds include noise generated in the room(s) by vibration from the floor above, due to a heavy but soft impact (e.g. child jumping). Basic characteristics of heavy impact sound insulation depend on the floor structure. Therefore, performance improvement using flooring materials is often difficult to achieve.
For assessment at the preliminary design stage, evaluate the target values of heavy impact sound insulation performance qualitatively.
At the execution design stage and after completion of construction, apply the Lr-value classification as the performance indicator. For this evaluation, apply either predictive Lr-values or the actual measurement values.

When obtaining measurement data, follow the methods described in JIS A 1418-2: 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.

■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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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·Hsp·Htl·Fct
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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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>		
	PD	ED and CC
Building type	Off	Off
Level 1	Not adequate for Level 3	Not adequate for Level 3
Level 2	Room temperatures of 20°C in winter and 28°C in summer with some occupant discomfort	Minimum equipment capacity to achieve temperatures of 20°C in winter and 28°C in summer with some occupant discomfort
Level 3	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	Room temperatures of 22°C to 24°C in winter and 24°C to 26°C in summer as referred to in the ASHRAE[†1] comfort standard or POEM-O[†2]	Sufficient equipment capacity to achieve room temperatures of 24°C in both winter and summer
Building type	Hsp (Waiting Room)·Htl·Fct·Apt	Hsp (Waiting Room)·Htl·Fct·Apt
Level 1	Room temperatures of 20°C in winter and 28°C in summer with some occupant discomfort	Minimum equipment capacity to achieve room temperatures of 20°C in winter and 28°C in summer with some occupant discomfort
Level 2		
Level 3	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	Room temperatures of 22°C to 24°C in winter and 24°C to 26°C in summer as referred to in the ASHRAE comfort standard or POEM-O	Sufficient equipment capacity to achieve room temperatures of 24°C in winter and 24°C in summer

[†1] The American Society of Heating, Refrigerating and Air-Conditioning Engineers

[†2] POEM-O, acronym for Post-Occupancy Assessment Method - Office, is an indoor environment assessment method developed for offices by the Indoor Environment Forum (a joint research group with the private sector, academia and the former Architecture Research Institute). See Bibliography 1).

Building type	$\boxed{\text{Hsp}}$ (Examining Room)	$\boxed{\text{Hsp}}$ (Examining Room)
Level 1	Room temperatures of 21˚C in winter and 28˚C in summer with some occupant discomfort	Minimum equipment capacity to achieve room temperatures of 21˚C in winter and 28˚C in summer with some occupant discomfort
Level 2		
Level 3	General room temperatures of 23˚C in winter and 26˚C in summer	Sufficient equipment capacity to achieve a general room temperature of 23˚C in winter and 26˚C in summer
Level 4		
Level 5	By referring the ASHRAE1) Comfortable Room Temperature Range and the POEM-O2), it is set ranges of 22-24˚C in winter and 24-26˚C in summer.	Equipment capacity is provided to achieve temperatures of 24˚C in winter and 24˚C in summer.
Building type	$\boxed{\text{Sch}}$ (Universities, etc)	$\boxed{\text{Sch}}$ (Universities, etc)
Level 1	Room temperatures of 10˚C or higher in winter and 30˚C or lower 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	Commonly-applied room temperatures of 18 to 20˚C in winter and 25 to 28˚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	By referring the ASHRAE Comfortable Room Temperature Range and the POEM-O, it is set ranges of 22-24˚C in winter and 24-26˚C in summer.	Equipment capacity is provided to achieve temperatures of 24˚C in winter and 24˚C in summer.
Building type	$\boxed{\text{Sch}}$ (Elementary/Junior High/High Schools)	$\boxed{\text{Sch}}$ (Elementary/Junior High/High Schools)
Level 1	(No corresponding level)	(No corresponding level)
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Room temperatures of 18˚C or higher in winter and 28˚C or lower in summer	Minimum equipment capacity to achieve room temperatures of 18˚C or higher in winter and 28˚C or lower in summer
Level 4	Room temperatures of 20˚C or higher in winter and 25˚C or lower in summer	Sufficient equipment capacity to achieve room temperatures of 20˚C or higher in winter and 25˚C or lower in summer
Level 5	Room temperatures of 22˚C or higher in winter and 24˚C or lower in summer	Sufficient equipment capacity to achieveg room temperatures of 22˚C or higher in winter and 24˚C or lower in summer

Building type	Rtl·Rst·Hal	Rtl·Rst·Hal
Level 1	Room temperatures of 18˚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	Commonly-applied room temperatures of 20˚C in winter and 26˚C in summer	Sufficient equipment capacity to achieve general room temperatures of 20˚C in winter and 26˚C in summer
Level 4		
Level 5	Room temperatures of 20˚C to 22˚C in winter and 24˚C to 26˚C in summer as referred to in the ASHRAE comfort standard or POEM-O	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>		
	PD	ED and CC
Building type	Hsp·Htl	Hsp·Htl
Level 1	Room temperatures of 20˚C in winter and 28˚C in summer with some occupant discomfort	Minimum equipment capacity to achieve room temperatures of 20˚C in winter and 28˚C in summer with some occupant discomfort
Level 2		
Level 3	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	Room temperatures of 22˚C to 24˚C in winter and 24˚C to 26˚C in summer as referred to in the ASHRAE comfort standard or POEM-O	Sufficient equipment capacity to achieve room temperature of 24˚C in both winter and in summer
Building type	Apt	Apt
Level 1	Room temperatures of 18˚C in winter and 28˚C in summer for all rooms	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	General room temperatures of 22˚C in winter and 26˚C in summer for all rooms	Sufficient equipment capacity to achieve general room temperatures of 22˚C in winter and 26˚C in summer
Level 4		
Level 5	Room temperatures of 22 to 24˚C in winter and 24 to 26˚C in summer for all rooms	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 assessment at the preliminary design stage, evaluate the target values for room temperature.
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).
At the execution design stage and after completion of construction, evaluate the capacity of equipment provided to achieve the set room temperatures.

Assessment levels are set as below:
Level 1: Mandatory level under the MEXT School Sanitation Standards (applicable to 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 universities, etc.) and the MEXT School Sanitation Standards (applicable to 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 retailers, restaurants and halls, 20 to 22˚C in winter)

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

2.1.2 Variable Loads and Following-up Control

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

<Entire Building and Common Properties>	
Building type	Sch · Rtl · Rst · Hal
Level 1	No notable consideration has been given to sudden changes in loads.
Level 2	
Level 3	General load variations are considered, and the system affords some degree of control.
Level 4	
Level 5	The control system allows advanced following-up control of load variations.

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

<Residential and Accommodation Sections> Inapplicable

☐**Commentary**
Evaluate variable load following-up control used to realize room temperature setting values.

Even if the applicable system is not adequate, a high level can be evaluated if operation is managed manually, and the internal environment is maintained with an adequate degree of success.
Sch, Rtl and similar buildings have large occupied room spaces, and experience wide variations of internal loads, such as occupants and lighting. Therefore, even if the equipment capacity is adequate, there is the risk of excessively long lags in the air conditioning system. If room

temperature control cannot keep up with variable loads, the room temperature will fluctuate. For example,

Level 1: On/Off control.
Level 3: PID control (PI control, PD control etc.)
Level 5: Occupancy (load) prediction, scheduled changes in temperature setting, and scheduled switching of the heat source off and on.

Even if the applicable system is not adequate, a high level can be evaluated if operation is managed manually, and the internal environment is maintained with an adequate degree of success.

2.1.3 Perimeter Performance

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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>		
	PD	ED and CC
Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt
Level 1	Insufficient 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 insulation blocking and insulation performance are poor.	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])
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 insulation blocking and insulation performance.	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])
Level 4		
Level 5	Close 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 the building has the highest level of insulation blocking and insulation performance.	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])

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

<Residential and Accommodation Sections>

	PD	ED and CC
Building type	Hsp·Htl	Hsp·Htl
Level 1	Insufficient 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 insulation blocking and insulation performance are poor.	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 insulation blocking and insulation performance.	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, outside walls, roof and floor (particularly where piloti are used), and the building has the highest level of insulation blocking and insulation performance.	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]

	PD
Building type	Apt
Level 1	Grade one-equivalent combinations of roof and exterior wall materials and opening specifications, as defined in the Japan Housing Performance Standards “5-1 Energy-saving countermeasure grades,” have been set.
Level 2	Grade two-equivalent combinations of roof and exterior wall materials and opening specifications, as defined in the Japan Housing Performance Standards “5-1 Energy-saving countermeasure grades,” have been set.
Level 3	Grade three-equivalent combinations of roof and exterior wall materials and opening specifications, as defined in the Japan Housing Performance Standards “5-1 Energy-saving countermeasure grades,” have been set.
Level 4	(No corresponding level)
Level 5	Grade four-equivalent combinations of roof and exterior wall materials and opening specifications, as defined in the Japan Housing Performance Standards “5-1 Energy-saving countermeasure grades,” have been set.

	ED and CC					
Building type	Apt (With annual heating and cooling load)					
	Annual heating and cooling load H (units: MJ/m^2 year)					
	Zone I*[2]	Zone II	Zone III	Zone IV	Zone V	Zone VI
Level 1	840 < [H]	840 < [H]	840 < [H]	840 < [H]	840 < [H]	840 < [H]
Level 2	470 < [H] ≦ 840	470 < [H] ≦ 840	470 < [H] ≦ 840	470 < [H] ≦ 840	470 < [H] ≦ 840	470 < [H] ≦ 840
Level 3	390 < [H] ≦ 470	390 < [H] ≦ 470	390 < [H] ≦ 470	390 < [H] ≦ 470	390 < [H] ≦ 470	390 < [H] ≦ 470
Level 4	―	―	―	―	―	―
Level 5	[H] ≦ 390	[H] ≦ 390	[H] ≦ 390	[H] ≦ 390	[H] ≦ 390	[H] ≦ 390

Building type	Apt (with thermal transmission loss coefficient and summer insolation acquisition coefficient)					
	Thermal transmission loss coefficient Q (units W/m²-K)					
	Zone I*2	Zone II	Zone III	Zone IV	Zone V	Zone VI
Level 1	2.8 < [Q]	4.0 < [Q]	4.4 < [Q]	4.9 < [Q]	7.1 < [Q]	7.1 < [Q]
Level 2	1.8 < [Q] ≦ 2.8	2.7 < [Q] ≦ 4.0	3.1 < [Q] ≦ 4.4	3.6 < [Q] ≦ 4.9	3.9 < [Q] ≦ 7.1	6.2 < [Q] ≦ 7.1
Level 3	1.6 < [Q] ≦ 1.8	1.9 < [Q] ≦ 2.7	2.4 < [Q] ≦ 3.1	2.7 < [Q] ≦ 3.6	2.7 < [Q] ≦ 3.9	3.7 < [Q] ≦ 6.2
Level 4	–	–	–	–	–	–
Level 5	[Q] ≦ 1.6	[Q] ≦ 1.9	[Q] ≦ 2.4	[Q] ≦ 2.7	[Q] ≦ 2.7	[Q] ≦ 3.7
	Summer insolation acquisition coefficient μ					
	Zone I*2	Zone II	Zone III	Zone IV	Zone V	Zone VI
Level 1	Level 1	–	–	–	–	–
Level 2	Level 2	–	–	0.10 < [μ]	0.10 < [μ]	0.10 < [μ]
Level 3	Level 3	0.08 < [μ]	0.08 < [μ]	0.07 < [μ] ≦ 0.10	0.07 < [μ] ≦ 0.10	0.07 < [μ] ≦ 0.10
Level 4	Level 4	–	–	–	–	–
Level 5	Level 5	[μ] ≦ 0.08	[μ] ≦ 0.08	[μ] ≦ 0.07	[μ] ≦ 0.07	[μ] ≦ 0.07

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

*1 SC: (Insolation) Shading Coefficient, U: Thermal conductivity, H: Annual heating and cooling load (units: MJ/m²-year), Q: Thermal transmission loss coefficient (units: W/m²-K), summer insolation acquisition coefficient μ

*2 Zone I to IV represent area categories. The area categories here correspond to those used in the "Standard for Judgment by Owner Regarding the Rational Use of Energy for Housing Operation".

☐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.

At the preliminary design stage it is likely that specific values for building envelope performance will not have been set, so the above content should be judged according to the designers' design intentions and policies.

At the Execution Design Stage and Construction Completion Stage, assessments of level 3 or below may be based on the set specification. Higher levels require confirmation of verified performance values by measurement and experiment.

For Apt, take the 1999 standards (next-generation energy saving standard).

At the Preliminary Design Stage, base assessment on the strength of measures, with reference to the energy-saving countermeasure grades of the Housing Quality Assurance Act.

Assessment criteria at the Execution Design Stage and Construction Completion Stage should be either the "annual heating and cooling load standard" or the "thermal transmission loss coefficient and summer insolation acquisition coefficient standards." When basing the assessment on the thermal transmission loss coefficient and summer insolation acquisition coefficient standards, evaluate according to the one which is at the lower level.

■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 (Δt<=3˚C), level 3 (Δt<=6˚C) and level 1 (Δt>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/αi) x (Tr−To) αi: interior heat transfer coefficient (around 9W/m^{2}K).
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 design has been checked by experiments etc. before completion of construction, it is possible to base assessment at the operation stage on measurement to confirm that air flow volume is appropriate and as designed.
[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

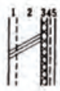
Heat penetration from the outside must be minimized in order to maintain a comfortable internal environment. The overall heat transfer coefficient U , which represents the level of heat flow for a given temperature difference, and shading coefficient SC, which represents the entry of daylight to the 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

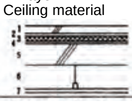
Example values of overall heat transfer coefficient for exterior walls, roofs, floors and other elements are presented below.

(Quoted from "Standards and Procedures for Building Equipment Design" (partially modified), Japanese Ministry of Land, Infrastructure, Transport and Tourism.)

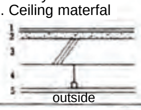
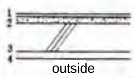
Examples of heat transfer coefficient U for walls

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	0.57

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	0.8
		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

t = thlckness

(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/m^2K)

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/m^2K)

High-performance multi-pane glass

: Shading coefficient SC = 0.5, heat transfer coefficient around 3.0(W/m^2K).

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

2.1.4 Zoned Control

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct
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).

2.1.5 Temperature and Humidity Control

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・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・Hsp・Htl・Fct・Apt
Level 1	On/Off control of temperature and humidity.
Level 2	Proportional or multiposition control of temperature and humidity.
Level 3	PID control of temperature and humidity.
Level 4	
Level 5	Comfort sensors etc. can be used to control temperature and humidity (temperature control within the comfort range).

NOTE) When it is difficult to decide, choose an intermediate level (level 4).

<Residential and Accommodation Sections>	
Building type	Hsp・Htl
Level 1	On/Off control of temperature and humidity.
Level 2	Proportional or multiposition control of temperature and humidity.
Level 3	PID control of temperature and humidity.
Level 4	
Level 5	Comfort sensors etc. can be used to control temperature and humidity (temperature control within the comfort range).

NOTE) When it is difficult to decide, choose an intermediate level (level 4).

☐**Commentary**
Evaluate the grade of temperature and humidity control.Evaluate whether consideration has been given to a control system able to create an environment with little fluctuation in temperature and humidity and no discomfort.

The following are examples of control systems corresponding to the levels.
Level 1: Systems which create a variable temperature range (differential) relative to a set value, such as by On/Off control.
Level 2: Proportional or multiposition control etc., which result in smaller ranges of variation in temperature and humidity than level 1 (if some deviation remains after stabilization).
Level 3: PI or PID control etc., which stabilize the variation of temperature and humidity.
Level 5: Comfort control (rather than just controlling the physical quantities of temperature and humidity, physiological parameters are incorporated with the aim of controlling human comfort).

2.1.6 Individual Control

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition

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

<Entire Building and Common Properties: Inapplicable>

<Residential and Accommodation Sections>		
Building type	Hsp · Htl	Apt
Level 1	Occupants can manually switch air volume between low, middle and high.	Not adequate for level 3.
Level 2		
Level 3	Occupants can manually change the direct temperature setting and adjust air volume between low, middle and high.However, the heat source is switched between heating and cooling on a seasonal basis.	Temperature can be set for each individual room.
Level 4		
Level 5	Occupants can directly adjust temperature settings and airflow volumes with local controls.(Heat sources are for heating and cooling simultaneously.)	The temperature for the whole dwelling can be set, and further settings can be made for each individual room.

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

☐**Commentary**

Evaluate whether the occupants of each room can set room temperature and wind volume to their preference.

Buildings with large numbers of occupants, such as office buildings, should not be evaluated by representative temperature and humidity settings. Instead, evaluate whether detailed, personal-level settings can be made for each occupant, or for small numbers of occupants.

2.1.7 Allowance for After-hours Air Conditioning

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct
Level 1	Air conditioning does not operate after hours, or on holidays.
Level 2	
Level 3	The air conditioning system can operate for any whole floor that is occupied after hours and on holidays.
Level 4	
Level 5	The air conditioning system can operate for any zone that is occupied after hours and on holidays.

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

<Residential and Accommodation Sections> Inapplicable

☐**Commentary**
Evaluate how air conditioning after hours is handled.Even if the start time for air conditioning is the same for a whole building, it must be rare for all air conditioning needs to stop simultaneously.Air conditioning should be able to provide a comfortable environment for those in the building after hours.
Evaluate according to whether the design is reasonable, on the assumption that air conditioning will be used after hours.

2.1.8 Monitoring Systems

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

<Entire Building and Common Properties>	
Building type	Rtl · Rst
Level 1	There is no multiple zoning for separate loads on the same floor, but sensors or other monitoring systems are installed for monitoring a representative zone.
Level 2	
Level 3	There is multiple zoning for area-specific loads on the same floor and a comprehensive monitoring system that includes a multiple zone control sensor and several separate monitoring/measuring sensors are installed
Level 4	
Level 5	There is detailed multiple zoning for usage-specific thermal preferences (i.e. sales areas, other tenant use) on the same floor and a comprehensive monitoring system that includes a detailed multi-zone control sensor and several separate monitoring/measuring sensors are installed

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

<Residential and Accommodation Sections> Inapplicable

☐Commentary

Evaluate whether there are detailed monitoring systems for maintenance and management purposes.

There are many zones with different load characteristics and building types, such as Rtl and Rst, in a mix of sales areas on each floor. Monitoring systems are needed that can tell the temperature in each zone and control it closely.

In cases where the monitoring system itself is not sufficient, level 4 can be awarded, provided a detailed manual temperature control is installed instead.

It is recommended that each zone be equipped with a control sensor and several separate monitoring and measuring sensors in order to allow monitoring of uniform temperature distribution.

2.2 Humidity Control

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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).

<Entire Building and Common Properties>		
	PD	ED and CC
Building type	Off·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt	Off·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
Level 2		
Level 3	Humidification equipment is available, and planned to keep humidity to 50% in summer and 40% in winter.*[1]	Humidification equipment is available, and equipment capacity is generally sufficient to keep humidity to 50% in summer and 40% in winter.
Level 4		
Level 5	Humidification and dehumidification functions equipment is available, and to be set for a range of 45-55% with reference to the ASHRAE comfort zone and POEM-O.*[2]	Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.
	Sch (Universities, etc)	Sch (Universities, etc)
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
Level 2		
Level 3	Humidification equipment is available, and planned to keep humidity to 50-65% in summer and 40-70% in winter.	Humidification equipment is also available, and equipment capacity is generally sufficient to keep humidity to 40-70% in winter and 50-65% in summer.
Level 4		
Level 5	The system is planned to have humidification and dehumidification functions, and to be set for a range of 45-55% with reference to the ASHRAE comfort zone and POEM-O. 2)	Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.
	Sch (Elementary/Junior High/High Schools)	Sch (Elementary/Junior High/High Schools)
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
Level 2		
Level 3	General indoor humidity of 30 to 45% in winter and 55 to 80% in summer	Sufficient equipment capacity to achieve general indoor humidity of 30 to 45% in winter and 55 to 80% in summer
Level 4		
Level 5	Humidity control system with humidifier/dehumidifier; indoor humidity of 45 to 55% as referred to in the ASHRAE comfort standard or POEM-O	Sufficient equipment capacity with humidifier/dehumidifier to achieve humidity of 45 to 55%

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>		
	PD	ED and CC
Building type	Hsp · Htl	Hsp · Htl
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
Level 2		
Level 3	Humidification equipment is available, and planned to keep humidity to 50% in summer and 40% in winter.*1	Sufficient equipment capacity with humidifier to achieve general humidity of 50% in summer and 40% in winter.
Level 4		
Level 5	Humidification and dehumidification functions equipment is available, and to be set for a range of 45-55% with reference to the ASHRAE comfort zone and POEM-O.*2	Humidification and dehumidification equipment is available, and equipment capacity is sufficient to keep humidity in the range 45-55%.
Building type	Apt	Apt
Level 1	No consideration given.	No consideration given.
Level 2	(No corresponding level)	(No corresponding level)
Level 3	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.	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.	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	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.	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.

NOTE) 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.

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 the Ministry of Education, Culture, Sports, Science and Technology of Japan.

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 universities, etc.) and the MEXT School Sanitation Standards (applicable to

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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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>		
	PD	ED and CC
Building type	Off · Sch · Rtl · Rst · Hal · Hsp(Waiting Room) · Htl · Fct · Apt	Off · Sch · Rtl · Rst · Hal · Hsp(Waiting Room) · Htl · Fct · Apt
Level 1	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.
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 the room. Targets for vertical temperature distribution and airflow speed are set to within 5˚C and 0.35 m/s, respectively.
Level 4		
Level 5	The air conditioning system* was chosen to mitigate the vertical temperature distribution and airflow speed in the room.	The air conditioning system* is appropriate to reduce vertical variation and air flow in occupied areas; OR any air conditioning system which can maintain vertical temperature variation of 2˚C or less and air flow rate of 0.15 m/s
Building type	Hsp (Examining Room)	Hsp (Examining Room)
Level 1	Air conditioning system designed without specific consideration of vertical temperature variation and air flow in occupied areas	Air conditioning system 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, and the partitions in the medical examing rooms.	Standard air conditioning system with air intake/outlet system designed in consideration of vertical temperature distribution and air flow in occupied areas as well as partitions in examination rooms. Performance targets set at a vertical temperature variation of 5˚C or less and an air flow rate of 0.35 m/s
Level 4		
Level 5	The air conditioning system* was chosen to mitigate the vertical temperature distribution and airflow speed in occupancy zone, and to consider the partitions of the medical examining rooms.	Air conditioning system designed in consideration of vertical temperature distribution and air flow in occupied areas as well as partitions in examination rooms*; OR any air conditioning system which can maintain a vertical temperature variation of 2˚C or less and air flow rate of 0.15 m/s

<Residential and Accommodation Sections>		
	PD	ED and CC
Building type	Hsp·Htl	Hsp·Htl
Level 1	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.	The air conditioning system was planned with no particular consideration for the vertical temperature distribution and airflow speed in occupancy zone.
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 the room. Targets for vertical temperature distribution and airflow speed are set to within 5˚C and 0.35 m/s, respectively.
Level 4		
Level 5	The air conditioning system* was chosen to mitigate the vertical temperature distribution and airflow speed in occupancy zone.	The air conditioning system* was chosen to mitigate the vertical temperature distribution and airflow speed in the room. Targets for vertical temperature distribution and airflow speed are set to within 2˚C and 0.15 m/s, respectively.
Building type	Apt	Apt
Level 1	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	Air conditioning system 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	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	Targets for vertical temperature distribution and airflow speed within rooms are set to within 4˚C and 0.4 m/s, respectively. Spot air conditioning is available even in non-air-conditioned areas such as toilets and bathrooms, mitigating temperature differences between rooms.
Level 4		
Level 5	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	Targets for vertical temperature distribution and airflow speed within rooms are set to within 2˚C and 0.2 m/s, respectively. Air conditioning is available in all rooms, including rooms such as toilets and bathrooms, making it possible to eliminate temperature differences between rooms.

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

<Examples of air conditioning systems>

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 Daylighting

3.1.1 Daylight Factor

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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·Hsp·Htl·Fct·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]

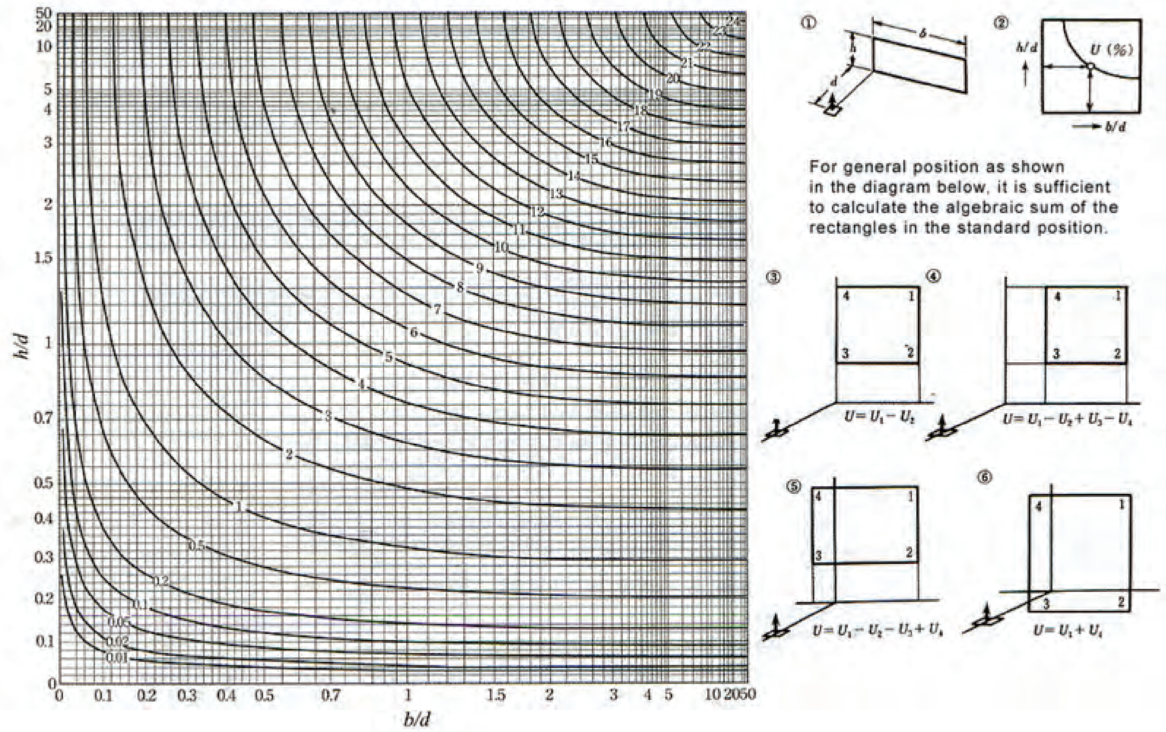
☐**Commentary**

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.

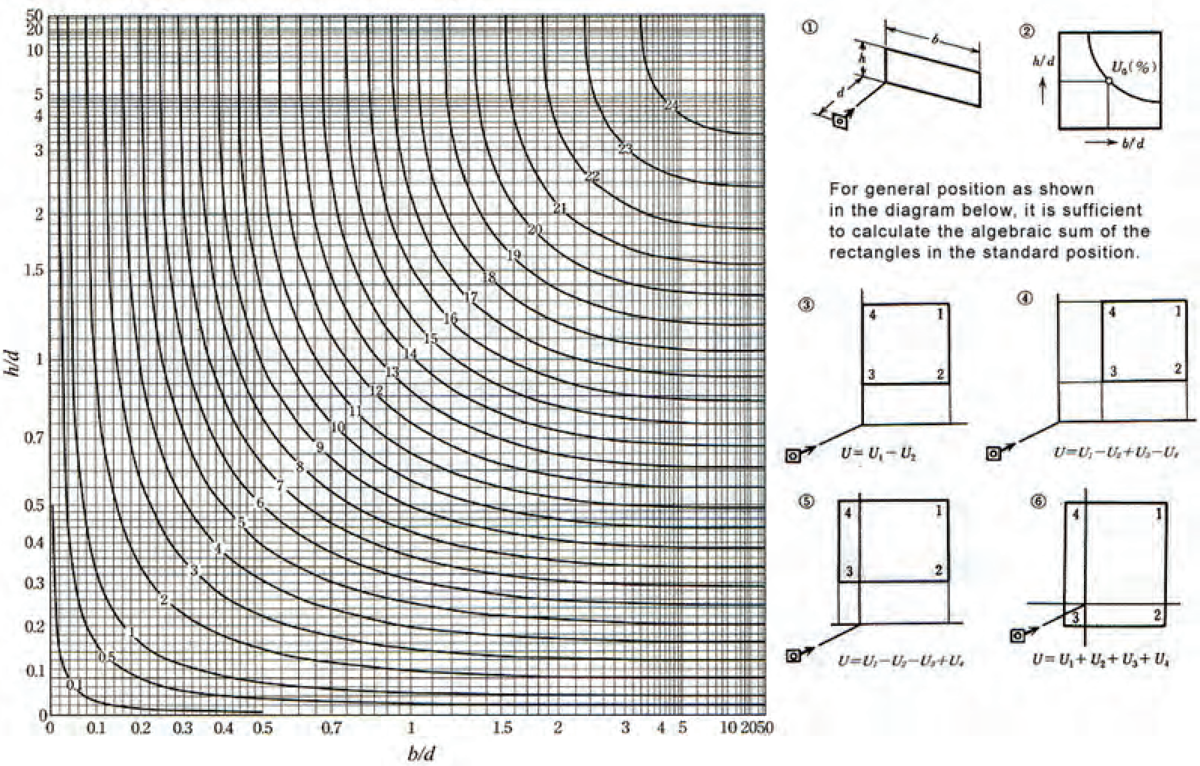
The calculation point is taken as the center of the floor surface in the room concerned, and the value is derived using two calculation charts. Reference 1 is the chart for a window in a wall, and Reference 2 is for toplights and other forms. The types of rooms for evaluation are expected to be standard administrative Off, classrooms in Sch, and lobbies and other common areas in Apt, Hsp and Htl.

The calculation of the daylight factors here uses direct daylight factors, to make the forecast as simple as possible. Also, the three-dimensional angular projection factor is assumed to be equal to the daylight factor. Window glass transmission rate and ceiling reflection rate are not considered. 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)

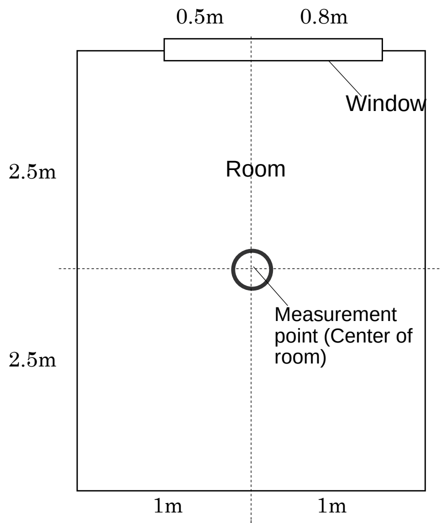
■Reference 3) Calculation method for the daylight factor used in reference 1 and 2.

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.

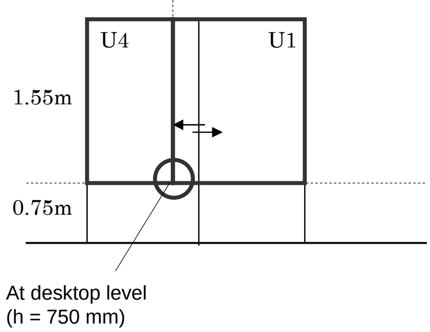
$$U = \frac{S''}{\pi \cdot r^2} \times 100 \quad (\%)$$

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)

Q-1

3.1.2 Openings by Orientation

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
Not applicable to portions of Apt other than dwellings.

<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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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.

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 Glare from Light Fixtures

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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).

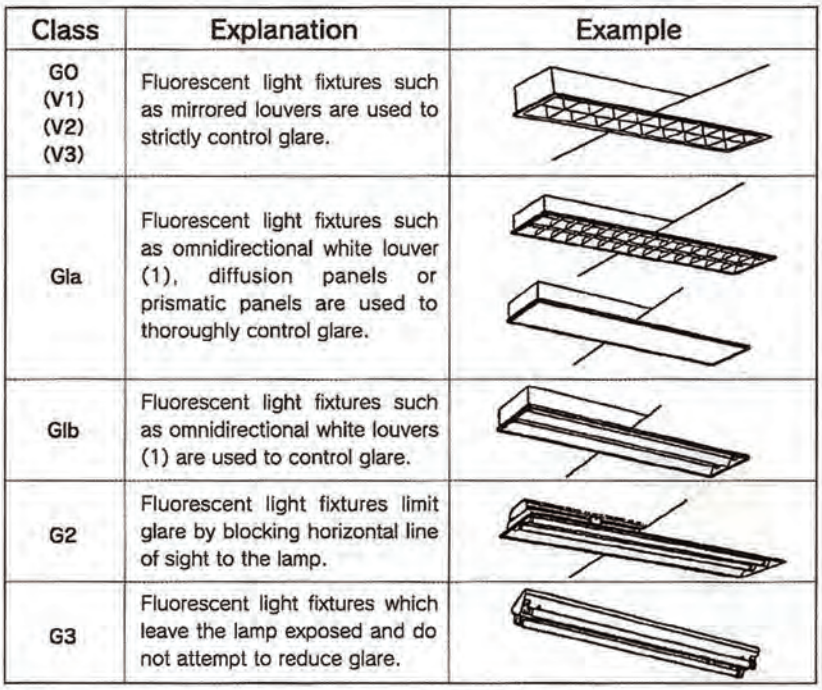
<Entire Building and Common Properties>	
Building type	Off · Hsp · Htl · Apt · Sch · Fct
Level 1	The light source is exposed when viewed horizontally, and the light fixture does not restrict glare. G3 category fixtures.
Level 2	(No corresponding level)
Level 3	The light source is not exposed when viewed horizontally, and the light fixture restricts glare. G2 category fixtures.
Level 4	(No corresponding level)
Level 5	Use of reflective panel forms, louvers, transparent covers and other elements in light fixtures restrict glare. G1, G0 and V category fixtures.

<Residential and Accommodation Sections>	
Building type	Hsp·Htl·Apt
Level 1	The light source is exposed when viewed horizontally, and the light fixture does not restrict glare.G3 category fixtures.
Level 2	(No corresponding level)
Level 3	The light source is not exposed when viewed horizontally, and the light fixture restricts glare.G2 category fixtures.
Level 4	(No corresponding level)
Level 5	Use of reflective panel forms, louvers, transparent covers and other elements in light fixtures restrict glare.G1, G0 and V category fixtures.

☐Commentary

The more control is applied to glare, by preventing exposure of the light source and through measures such as reflective panels, louvers and transparent covers, the higher the assessment should be. Evaluate typical fluorescent light fixtures with reference to the fluorescent lamp glare classifications (G and V categories) contained in the Technical Guideline for Office Illumination JIEC-001 (Illumination Engineering Institute of Japan, 1992).
The glare classifications of typical fluorescent light fixtures are presented below for reference.

■Reference) Glare classifications (Fluorescent light fixtures)



Class	Explanation	Example
G0 (V1) (V2) (V3)	Fluorescent light fixtures such as mirrored louvers are used to strictly control glare.	
G1a	Fluorescent light fixtures such as omnidirectional white louver (1), diffusion panels or prismatic panels are used to thoroughly control glare.	
G1b	Fluorescent light fixtures such as omnidirectional white louvers (1) are used to control glare.	
G2	Fluorescent light fixtures limit glare by blocking horizontal line of sight to the lamp.	
G3	Fluorescent light fixtures which leave the lamp exposed and do not attempt to reduce glare.	

(1) Fluorescent light fixture shaded with white louvers in the A-A and B-B cross sectional directions.
(2) Fluorescent light fixture shaded with white louvers in the A-A cross sectional direction only.

■Bibliography 21), 22)

3.2.2 Daylight Control

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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.)·Rst·Hsp·Htl·Fct·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	No measure is in place
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**
Evaluate measures against glare produced by direct daylight by whether or not there are eaves, awnings (tends or shades against sunshine), screens, curtains, blinds, shades and similar elements around openings. The more the control of direct insolation adjusts to changes in the sun's position (daylight adjustment potential), the higher the evaluated level. Automatically-controlled blinds that automatically control the angles of blind slates to match the changing position of the sun.

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.

3.2.3 Reflection Control

! Application conditions

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

3.3 Illuminance Level

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition

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	[Illuminance] < 300 lx	[Illuminance] < 300 lx	[Illuminance] < 150 lx
Level 2	300 lx ≦ [Illuminance] < 500 lx, or 1,000 lx ≦ [Illuminance]	(No corresponding level)	(No corresponding level)
Level 3	500 lx ≦ [Illuminance] < 750 lx	300 lx ≦ [Illuminance] < 500 lx, or 750 lx ≦ [Illuminance]	150 lx ≦ [Illuminance]
Level 4	Overall lighting system: 750 lx ≦ [Illuminance] < 1,000 lx; Task/ambient lighting system (or equivalent): 750 lx ≦ [Illuminance] < 1,000 lx for task zones AND 1/3 to 2/3 of task-zone illuminance level for ambient zone	500 lx ≦ [Illuminance] < 750 lx	Equivalent to level 3 AND 100 lx ≦ [vertical illuminance] for walls
Level 5	Task/ambient lighting system (or equivalent): 750 lx ≦ [Illuminance] < 1,000 lx for task zones AND 1/3 to 2/3 of task-zone illuminance level for ambient zone, with 100 lx ≦ [vertical illuminance] of walls or [horizontal illuminance] of a ceiling	(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 illuminace 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

For levels 1 to 3, evaluate horizontal illuminance (lux) on desk surfaces (approximately 80 cm above the floor) in a room.
In cases where facility use is limited to daytime hours, such as schools, apply lux values based on a minimum daylight levels.
For offices, hospitals (examination rooms) and factories, level 4 is awarded where an overall lighting system is used to provide the appropriate horizontal illuminance on the desk surface in a room. Level 4 is also awarded where a task/ambient lighting system that provides a clear visual environment (the appropriate illuminance in visual task zones and reduced illuminance in non-visual task zones) or other similar system (optimal task illuminance specific to characteristics of tasks and occupant preferences) is used to provide appropriate illuminance levels. Level 5 is awarded where a task/ambient lighting system or an equivalent system provides appropriate illuminance levels and also enables sufficient vertical/horizontal illuminance in 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 hospitals (waiting rooms) and apartments and <Residential and Accommodation Sections> of hospitals, 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 apartments, evaluate based on the most principal room of the unit.
Furthermore, when using an overall lighting system, illuminance exceeding 1,000 lx for offices and 750 lx for schools 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. Several mapping software programs are available on the market.
*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 21), 22), 23), 24), 25), 26)

3.4 Lighting Controllability

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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>		
	PD	ED and CC
Building type	Off · Sch (Universities, etc.) · Rtl · Hsp · Htl · Fct · Apt	Off · Sch (Universities, etc.) · Rtl · Hsp · Htl · Fct · Apt
Level 1	No lighting control is available	Lighting control is not zoned AND no control panel/devices are available for adjustment
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Broad lighting control per multi-area unit (task/sales areas) is available	Lighting control per four-task unit is available OR control panel/devices are available for adjustment
Level 4	(No corresponding level)	(No corresponding level)
Level 5	Detailed lighting control is available for each task/sales area OR automatic lighting control is available	Lighting control per task unit is available AND adjustment via computer terminal/remote contol or automatic control is available
	Sch (Elementary/Junior High/High Schools)	Sch (Elementary/Junior High/High Schools)
Level 1	Lighting control is not zoned in accordance with illuminance levels and learning methods	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 is zoned in accordance with illuminance levels and learning methods AND on/off control is available to occupants	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	Level 3 is satisfied AND automatic lighting adjustment is partially available	Level 3 is satisfied AND automatic lighting adjustment is partially available

<Residential and Accommodation Sections>		
	PD	ED and CC
Building type	Hsp	Hsp
Level 1	No lighting control is available	No lighting control is available
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Broad lighting control per multi-bed unit is available	Lighting control per multi-bed unit is available OR control panel/devices for adjustment are available
Level 4	(No corresponding level)	(No corresponding level)
Level 5	Detailed lighting control per bed is available	Detailed lighting control per bed is available
Building type	Htl·Apt	Htl·Apt
Level 1	No lighting control is available	No lighting control is available
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Broad lighting control is available in a room	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 multi-zone unit is available OR automatic lighting control 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 offices, 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 apartments, a multi-zone unit is used for an area where partial lighting is available in accordance with the location and movements of occupants. For hospitals, 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 universities, etc., assessment criteria equivalent to offices are applied, assuming large-capacity classrooms. Elementary/junior high/high schools have smaller classrooms. As such, evaluate lighting control systems based mainly on daylight control.

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.

Among the potential pollutants, chemical pollutants have attracted the most attention in recent years, but for the purpose of maintaining healthy indoor air, the same level of consideration must be given to measures against mineral fiber, mites, mold, legionella bacterium, cigarette smoke and other pollutants.

4.1.1 Chemical Pollutants

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct · Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	Satisfies the Building Standards Law.
Level 4	The Building Standard Law is satisfied AND building materials not regulated under the Building Standards 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 Standards 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 Standards Law.
Level 4	The Building Standard Law is satisfied AND building materials not regulated under the Building Standards 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 Standards 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 of Japan has responded by publishing concentration guideline values for chemical pollutants and pursuing various avenues of research, leading to the revision of the Building Standards 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 Standards 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 Standards 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

! Application condition

This is excluded from assessment in CASBEE for New Construction.

4.1.3 Mites, Mold etc.

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The décor on at least 50%, but less than 65% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.
Level 4	The décor on at least 65%, but less than 80% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.
Level 5	The décor on at least 80% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	The décor on at least 50%, but less than 65% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.
Level 4	The décor on at least 65%, but less than 80% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.
Level 5	The décor on at least 80% of the area of floors and external walls has been designed to restrict the growth of mites and mold, or to facilitate cleaning and maintenance.

☐**Commentary**

Mites and mold are allergens (substances that provoke allergies). Also, chemical agents are used to remove mites and mold when they grow, which could indirectly harm indoor air quality.

Evaluate the degree to which interior materials have been selected to restrict the growth of mold and mites, and to facilitate cleaning and maintenance. For the sake of hygiene it is desirable to use wood or plastic floor coverings or tiles wherever possible, as they allow complete removal of dust and waste through cleaning. If carpets are used, they should be short pile, allowing appropriate cleaning and maintenance to remove dead mites and dust. Tiles that can be removed for cleaning are better than wall-to-wall carpets. Materials that resist mites and mold are preferable to materials that rely on chemical treatment. Of course, thorough measures must also be taken against condensation, which is the root cause of mold.

■Bibliography 29), 30), 32), 33)

4.1.4 Legionella

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	There is a minimum level of water processing in water cooling towers, and measures against dispersion, and a minimum level of measures for water heaters.
Level 4	There is no water cooling tower, or there is thorough water processing in water cooling towers, thorough measures against dispersion, and a minimum level of measures for water heaters.
Level 5	There is no water cooling tower, or water processing in water cooling towers, measures against dispersion, and measures for water heaters are all thorough. There is also a good design for the maintenance of this equipment.

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	There is a minimum level of water processing in water cooling towers, and measures against dispersion, and a minimum level of measures for water heaters.
Level 4	There is no water cooling tower, or there is thorough water processing in water cooling towers, thorough measures against dispersion, and a minimum level of measures for water heaters.
Level 5	There is no water cooling tower, or water processing in water cooling towers, measures against dispersion, and measures for water heaters are all thorough. There is also a good design for the maintenance of this equipment.

☐**Commentary**
Evaluate measures for water cooling towers and hot water tanks.
Infection with legionella bacteria causes symptoms resembling pneumonia. Death can result in cases of incorrect treatment. Water cooling towers and hot water tanks can easily become breeding grounds for legionella bacteria. From cooling towers, the bacteria could move to the building interior through outside air intakes. Water heater tanks can become breeding grounds if they stay at a low temperature.
The minimum level of countermeasures for water cooling towers is chemical injection and automatic blowing to maintain water quality, with measures to prevent dispersion to the building's outside air intakes. Water heaters must maintain temperature of at least 55˚C, even at peak times, to prevent legionella bacteria from reproducing. Level 5 requires special measures, such as building a highly reliable system capable of central monitoring of cooling tower water quality and hot water storage tank water temperature, and with a two-stage hot water storage tank, and thorough planning based on consideration of maintenance space, equipment storage etc. If there

is no water cooling tower, thorough consideration given to water heaters is sufficient for level 5.

■Bibliography 29), 30)

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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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	(No corresponding level)	(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 Standards Law (including measures for sick house syndrome) and the Law for Maintenance of Sanitation in Buildings	Ventilation rate required in the Building Standards 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 Standards 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 Standards 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 Standards 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 Standards Law (including measures for sick house syndrome) and the School Sanitation Standards

<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	(No corresponding level)
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 Standards 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 Standards 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 Standards 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 Standards 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application conditions

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·Fct
Level 1	Not adequate for level 3 standard
Level 2	(No corresponding level)
Level 3	Fixed windows and no valid opening for natural ventilation for an occupied room; OR openable windows and 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 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
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 equivalent to level 4 and 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.

<Residential and Accommodation Sections>		
Building type	Hsp·Htl	Apt
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Fixed windows and no valid opening for natural ventilation for occupied room; 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 equivalent to level 4, and 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 1/6 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 apartment 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct
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)

4.2.4 Air Supply Planning

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Outside air is mixed with return air in the air conditioning equipment and supplied to each room in a volume determined by the thermal load in that room, so the system does not guarantee delivery of an adequate volume of outside air to all rooms in all load conditions.
Level 4	(No corresponding level)
Level 5	Outside air is not mixed with return air, and is supplied directly to each room in the volume required for ventilation. Therefore, the system guarantees the necessary outside air, delivered to the places where it is needed, regardless of the load conditions in each room.
<Residential and Accommodation Sections>	
Building type	Hsp · Htl · Apt
Level 1	Not adequate for level 3.
Level 2	(No corresponding level)
Level 3	Outside air is mixed with return air in the air conditioning equipment and supplied to each room in a volume determined by the thermal load in that room, so the system does not guarantee delivery of an adequate volume of outside air to all rooms in all load conditions.
Level 4	(No corresponding level)
Level 5	Outside air is not mixed with return air, and is supplied directly to each room in the volume required for ventilation. Therefore, the system guarantees the necessary outside air, delivered to the places where it is needed, regardless of the load conditions in each room.

☐**Commentary**

In a central air conditioning system, outside air is usually mixed with return air in the air conditioning equipment and supplied to each room in a volume determined by the thermal load in that room. Therefore, the total volume of outside air required in all rooms connected to the air conditioning equipment may be provided, but there is still no guarantee that enough outside air will reach everywhere that it is actually needed. A system that treats outside air in a separate system and supplies it direct to the rooms, guarantees an adequate volume where needed.

■Bibliography 29), 37)

4.3 Operation Plan

4.3.1 CO_2 Monitoring

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Fct
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 hospitals, hotels and apartments under Q2.1 Service Ability, evaluation is based on common properties of each building (e.g. examination rooms in hospitals, public areas in hotels, common-use areas for apartments, 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 management.

1.1 Functionality & Usability

1.1.1 Provision of Space & Storage

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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.

*Note: 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>	
Building type	Off·Fct
Level 1	Not adequate for level 2.
Level 2	Measures such as OA floors[†3)] 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.

☐**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.

[†3] OA floors refer to raised-access system floors. Structures with equivalent functions can be included in this category.

■Bibliography 1), 39), 41), 42)

1.1.3 Barrier-free Planning

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

<Entire Building and Common Properties>		
Building type	Off · Fct	Rtl · Rst
Level 1	Not adequate for level 3 standard	Not adequate for level 3 standard
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 standard	Not adequate for level 3 standard
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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>		
Building type	Off·Fct	Rtl
Level 1	Not adequate for level 3	Not adequate for level 3
Level 2	(No corresponding level)	(No corresponding level)
Level 3	Smoking areas are provided.	Rest space is at least 2% of the sales floor area.
Level 4	Level 3 equivalent AND rest space is at least 1% of the office space	Rest space is at least 3% of the sales floor area
Level 5	Level 4 + installation of vending machines etc.	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.
Level 3 can be awarded even if smoking areas are not provided, if building-wide prohibition of smoking is assumed for offices
In assessing a multi-tenant building, evaluate planned smoking areas, rest space and spaces for vending machines, etc., that are included in the building design.

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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct · 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.	Content
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 interior design to integrate the lighting design (e.g. effective use of indirect lighting specific to activity type, interior design 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 Management

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 management 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 Which Considers Maintenance Management

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

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

<Residential and Accommodation Sections> Inapplicable

Efforts to be evaluated

Content
[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 management 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 rainwater by using rain flashing	
[9] Facade design: Measures have been applied to prevent damage from the droppings of pest 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 management.	

☐Commentary

For this assessment, evaluate the maintenance management considerations in the building design with respect to structure and building materials. Verify that measures in place correspond to the assessment criteria. Assessment levels are determined by the total number of applicable measures taken.

[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.
Water-washable designs and structures are those with joint treatment to prevent gaps in the floor surface in which water can remain.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.
The typical example of floor types of very different maintenance management methods is carpet, which requires hours to dry if it gets wet, and wood flooring, which can warp and split when wet. Different flooring materials have their own maintenance management systems, and designs which mix multiple floor types closely together can easily cause trouble at the operation stage.

[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).

[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.

[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 bird pests 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.
In designs which avoid level changes as far as possible, the JIS T9251 standard for guide blocks for the blind sets the height of the bumps at 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 Management Functions

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Apt · Fct
Level 1	(No corresponding level)
Level 2	Insufficient level of measures have been taken to ensure functionality of maintenance management system (0-8 applicable measures in place)
Level 3	Standard level of measures have been taken to ensure functionality of maintenance management system (4-6 applicable measures)
Level 4	Higher than standard level of measures have been taken to ensure functionality of maintenance management system (7-9 applicable measures)
Level 5	Extensive level of measures have been taken to ensure functionality of maintenance management system (10 or more applicable measures)

Q-2

<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)

Descriptions
[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 management 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 management.
[13] Other than the above, points related to securing maintenance management functions have been identified and implemented.

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

Descriptions
[1] Storage space for cleaning materials is included in the design
[2] Sink for cleaning materials with safe drainage is installed
[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/management 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 management.
[12] Other than the above, points related to securing maintenance management functions have been identified and implemented.

☐Commentary

For this assessment, evaluate the basic measures for achieving a high level of maintenance management.
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. Commentary on assessment criteria for specified buildings (as referred to 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,” 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 management 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,” 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.
Space for washing cleaning equipment after use is secured, and drainage system connects to sewage line or septic tanks where cleaning liquid and waste water can be properly treated.

[4] Judge from design documents whether space has been provided for washing machines.

[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. Taking the example of an office building based on the guideline standards for Tokyo, the proportion of total floor area for storage areas in a building of 50,000 m^2 or more is 0.29%.

[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 also important to provide cleaning receptacles on a separate dedicated circuit, to avoid impeding the activities of other building users. It is assumed here that motorized cleaning equipment powered by AC electricity will be used, for which power cables are generally 8-15 m long. Judge an effort to have been made if dedicated cleaning receptacles on a separate circuit are installed at a rate of at least one within each 30 m radius in corridors in common areas.

[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. According to JIS Z9110-1979, which sets recommended lighting values, a lighting level of at least 75 lux is desirable. The figure is the same for buildings in all industry types, and is equal to the minimum value in the standard range for corridors in normal use.

[10] Judge from design documents.
For efficient maintenance management, 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 management, 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,” 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 management aspects, to assist effective maintenance management and energy saving after completion of the building.

II. Commentary on assessment criteria for non-specified buildings (as referred to 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 management 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.

[3] Evaluate based on design documents if a gradient of approximately 2% is provided for the described areas.
In the Manual for Sanitation Management Manual for Large-Scale Food Preparation Facilities (as referred to in the Food Sanitation Law No.85 Supplement dated March 24 1997 published by the Ministry of Health, Labour and Welfare; revised in the Food Safety Law No. 0618005 issued June 18, 2008), it is stipulated that the floor where water is used is to have an appropriate gradient (approximately 2%) and drain channels (with a 2-4% gradient) in order to facilitate smooth drainage.

[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 management.

[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 management 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, 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 management and energy-efficient systems for proper building operation.

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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · 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 Standards Law.
Level 4	The building's earthquake resistance exceeds the requirements of the Building Standards Law by a 25% margin.
Level 5	The building's earthquake resistance exceeds the requirements of the Building Standards 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.

Level 3 is equivalent to the seismic capacity that satisfies requirements under the Building Standards 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.
<u>In cases where design includes damage control systems, level 5 is awarded on the basis that a high seismic capacity level is assumed.</u>
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
Evaluate the increase in required horizontal load-bearing capacity based on factors of importance and story shear coefficient (Ci).

[2] Limit load-bearing calculation
Evaluate based on the increase in external force.

[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 Standards Law by 25%, and level 5 when values exceed 50%.
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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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

□**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)
Level 4	Level equivalent to Grade 2 in the assessment standards for wood, steel frame and concrete structures (MLIT directive 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)
Level 5	Level equivalent to Grade 3 in the assessment standards for wood, steel frame and concrete structures (MLIT directive 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)

□**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 Law. 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 management.
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 management.
Grade 1	Measures stipulated under the Building Standards Law have been applied.

For more details, refer to the assessment standards under the Japan Housing Performance Standard (MLIT directive No. 354 issued in 2009).

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2.2.2 Necessary Refurbishment Interval for Exterior Finishes

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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. The first part of Appendix 1 includes values published by BELCA and the Government Buildings Department. In cases where corresponding values are not available in the first list, apply values in the reference table in the second part of Appendix 1, published by the Architectural Institute of Japan and other sources. 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 repair interval.

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2.2.3 Necessary Renewal Interval for Main Interior Finishes

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct	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 20 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. The first part of Appendix 1 includes values published by BELCA and the Government Buildings Department. In cases where corresponding values are not available in the first list, apply values in the reference table in the second part of Appendix 1, published by the Architectural Institute of Japan and other sources. 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 hospitals, hotels and apartments, 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Apt · Fct
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	Cold/warm water	Warm 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 (black)	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	C	C		B	C	C		C							C	B			C	C			
Copper pipe	CUP	C	D	C	C	B		C	C			A				A				B	C	C	C			
Lead pipe for drainage	LP			A	A											A					A					
Rigid PVC pipe	VP	B		B	B	A	B										B							C	C	
Heat-resistant PVC pipe	HT		B					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

Source: Service Life Improvement Technology for Building Equipment, published by Building Maintenance & Management Center in 1986

2.2.6 Necessary Renewal Interval for Major Equipment and Services

□**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

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

□**Commentary**

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.

The first part of Appendix 1 includes values published by BELCA and the Government Buildings Department. In cases where corresponding values are not available in the first list, apply values in the reference table in second part of Appendix 1, published by the Architectural Institute of Japan and other sources. 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.

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2.3 Appropriate Renewal

(Inapplicable under CASBEE for 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.

The reliability levels are set according to the basic principles below, with reference to the characteristics of the evaluated items.

Level 1: No efforts to maintain functions.
Level 3: The effects of measures taken will maintain a minimum level of equipment function in the event of a disaster.
Level 4: The effects of measures taken will maintain a partial level of equipment function in the event of a disaster.
Level 5: The effects of measures taken will maintain a largely normal level of equipment function in the event of a disaster.

2.4.1 HVAC System

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Hal · Hsp · Htl · Fct (building with a total floor space of more than 200 m^2)	Sch · Rtl · Rst · Apt (building with a total floor space of more than 200 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 · Hsp · Htl · Fct · 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 total 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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	(No corresponding level)	(No corresponding level)
Level 3	Applicable to one of the efforts to be evaluated.	Applicable to one of the efforts to be evaluated.
Level 4	Applicable to tow 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.

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 and etc.
6	The building is equipped with a simple filtration system allowing conversion of rainwater to potable water in the event of a disaster. (Not applied to Rtl and Rst.)

☐**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 treated 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

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

Efforts to be evaluated

No.	Descriptions
1	Emergency generator is installed (Not applicable to Sch, Rtl, Rst or Apt regardless of building size)
2	Uninterruptible power supply system is installed
3	Redundant power receiving system for key service equipment is installed (Not applicable to Sch, Rtl, Rst or Apt regardless of building size)
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 Sch, Rtl, Rst, or Apt with total floor space of less than 2,000 m^2)

☐**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 (not applicable to small-sized Sch, Rtl, Rst, or Apt as the level 4 standard is generally satisfied in those buildings).

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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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[†4] B (Human safety is assured and secondary damage prevented after a major earthquake.)
Level 4	Earthquake resistance class A (In addition to Class B, important functions can be secured without major repairs)
Level 5	Earthquake resistance class S (In addition to Class A, all functions can be secured without major repairs)

☐**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, is awarded when machinery and duct support measures ensure prevention of injury to occupants in the event of an earthquake. Level 4, equivalent to Class-A seismic performance, 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, 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 48), 49)

[†4] 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct	Apt
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.	Applicable to one of the efforts to be evaluated.
Level 4	Applicable to tow of the efforts to be evaluated.	Applicable to tow of the efforts to be evaluated.
Level 5	Applicable to three of the efforts to be evaluated.	Applicable to three 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 (i) and (ii) have been taken or (iii) applies, in order to avoid damage to data networks due to water percolation into precision machinery. (i) Installation of precision machinery below ground is avoided. (ii) Devices to prevent the groundwater percolation (waterproof doors, waterproof panels, embankments, dry ditches) and drainage equipment (pumps etc.) are installed. (iii) No danger of water percolation.

☐**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.

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 hospitals, 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<Entire Building and Common Properties>	
Building type	Off·Sch·Rtl·Rst·Hsp·Fct (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·Hsp·Fct (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

☐**Assessment stage**	Building type
PD, ED and CC	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.

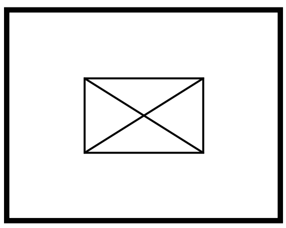
■Points to consider concerning calculation subjects

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

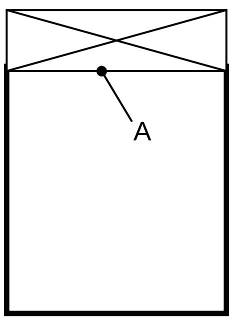
[1] Equipment spaces (PS, EPS, EV shafts) should be considered to be “areas for which room configuration cannot be altered to accommodate future usage,” and excluded from the exclusive area.
[2] The walls of equipment spaces (PS, EPS, EV shafts) could become constraints on “areas for which room configuration 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 x3 (a x 3).

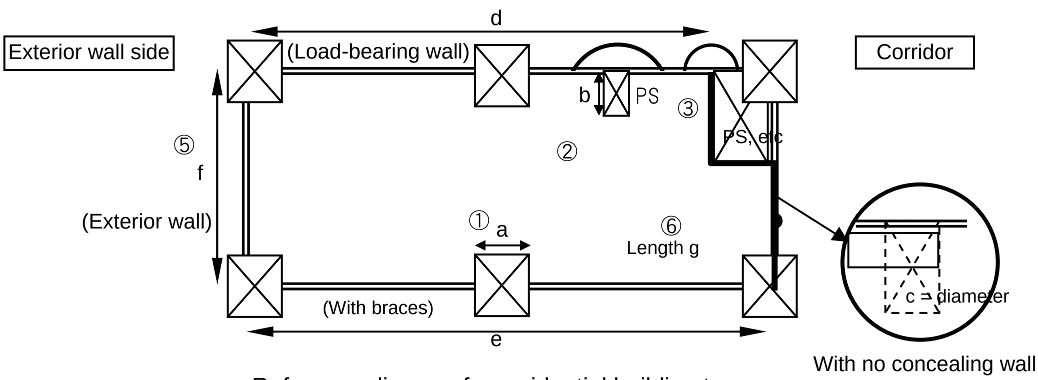
[2] For "Apartments," include water supply and drainage pipes in exclusive areas. The calculation method for PS with attached walls or free-standing interior PS is to add the long side x3 (b x 3) for walls to conceal pipes, or the diameter x3 (c x 3) of the fattest pipe if there is no concealing wall, 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 verandah, add the length of contact between the PS (MB) and the exclusive area, and the lengths of walls of other areas on the verandah 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

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).

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

<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	3,500 N/m^2 or more	2,300 N/m^2 or more
Level 4	3,500 N/m^2 or more	4,200 N/m^2 or more	2,900 N/m^2 or more
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 1800 N/m^2
Level 3	1,800 N/m^2 or more
Level 4	2,100 N/m^2 or more
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 Standards 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 Standards 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Fct · 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[†5], 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.

[†5] ISS: Interstitial Space System. System that architecture and facilities are integrated.

3.3.2 Ease of Water Supply and Drain Pipe Renewal

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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	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*	High	High	High
2	In pipe shaft	Embedded in walls (LGS, etc.)	Embedded in cinder concrete	Sleeved	(N/A)	Low*	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

*Note: 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).

3.3.3 Ease of Electrical Wiring Renewal

□**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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

□**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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

☐Assessment stage	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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	(No corresponding level)
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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 of Environmental Design Concerns” 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 of environmentally conscious efforts in planning” column of the software.

1. Conservation & Creation of Biotope

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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	Points
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 pt) Green areas account for 20% or more but less than 50% of the total outside property area (2 pts) Green areas account for 50% or more of the total outside property area (3 pts)	1 to 3
	[2] Building greenery index is measured at 0.05 or higher but less than 0.2 (1 pt) Building greenery index is measured at 0.2 or higher (2 pts)	1 to 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 management 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:

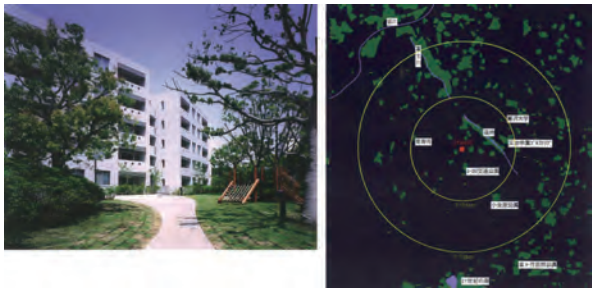
Supporting documents
- Aerial photograph of the site and surrounding area
- Topographic or land usage map covering the photographed area
- Baseline information on existing biotopes and source information (if independent research is

carried out, include details of research methods, etc.)
- Plan policy statement that reflects the identified characteristics

<Examples of Biotope Planning>
○Eco Village Matsudo

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.



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

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 measurements> 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 measurements> 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.

II. 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.

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

*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.

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

*3 Building planting index = Ratio between the total of roof planting area and wall planting area and the total area of the building.
*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 Green Space Conservation>

[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 management of conserved or created habitat.
Award one point if facilities necessary for the maintenance management 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 management 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

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

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.

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. Note that the level of aesthetics is not assessed in CASBEE. As such, visual superiority of buildings and the surrounding environment are not included in the scope of this assessment.

<Approach to assessment>

[1] 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.
[2] 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.
[3] State the specific content of the efforts to be evaluated, and append documents that will be comprehensible to a third party.

The following are examples of matters that should generally be considered and specific measures which could be used for forming good scenery.

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

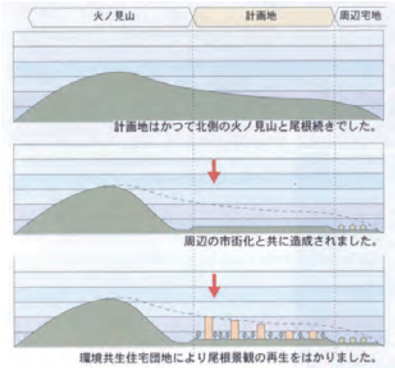
Arranging blocks with visual depth when seen from the main road reduces the oppressive atmosphere created on the road.

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

Q-3

○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.

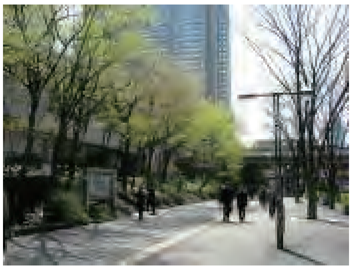
[1] Trees are planted along the streets to provide continuity of the green landscape
[2] Tree selection is based on symbolic significance and integration with existing trees on adjacent properties and streets
[3] Large-sized parking space facing the public roads is landscaped with trees, water features,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

<Examples of efforts>

Case Study of Use of Green Space to Form Good Scenery

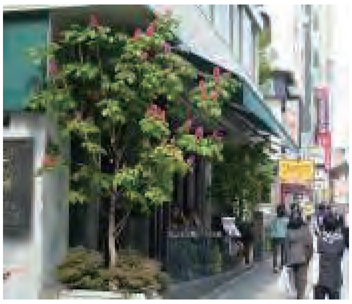
○Green space along roads in a commercial district (Shinjuku)

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. (The Keio Plaza Hotel)

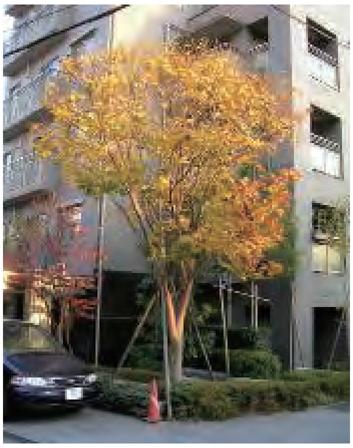


○ Green space along roads in a commercial district (Shirogane)

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, Nagoya)

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.

*Note: 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

□**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

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

Q-3

Efforts to be evaluated

Assessment Item	Descriptions	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 management of the building.	1
VI. Other	8) 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. Here we evaluate amenities for activity and vitality. Scenic amenity, in the form of visually pleasing places, are handled under Q3 “2.Townscape & Landscape.”

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.

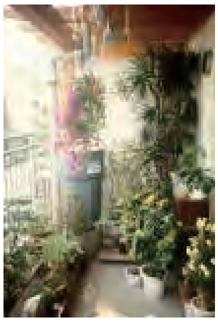
III. Formation of rich intermediate zones linking the building interior and exterior

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

☐**Assessment stage**	Building type
PD, ED and CC	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・Apt

Building type	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・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	Descriptions	Assessment 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 to 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. as 10% or more, less than 20% (1 pt) 20% or more, less than 30% (2 pts) 30% or more (3 pts)	1 to 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 pt) 20% or more, less than 30% (2 pts) 30% or more (3 pts)	1 to 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 to 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 pts) The building has an accessible rooftop area that is extensively covered with plants (3 pts)	2 to 3
	2. Appropriate exterior wall materials for thermal control are used Percentage of exterior walls with appropriate materials is: Less than 10% (1 pt) 10% or more, less than 20% (2 pts) 20% or more (3 pts)	1 to 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 pt) Most cooling towers or outdoor units generating waste heat are installed 10 meters or higher above ground level OR no units are installed (2 pts)	1 to 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 pt) Most high-temperature heat venting units are installed 10 meters or higher above ground level OR no units are installed (2 pts)	1 to 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 Wind Corridor Plans>
- 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

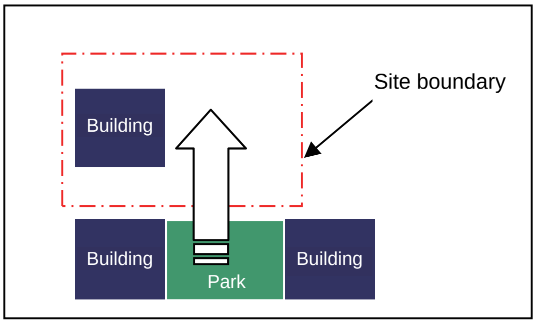


Figure 1 Layout of a wind corridor including the adjacent space

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.
- Percentage of open space = 100 (%) – <percentage of Building Coverage Area> (%)
  Piloti and eaves more than 1 m deep are generally included in a building coverage area. 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 (%)
- 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> =

$$\frac{[(\text{Horizontal projection areas of medium/tall trees}) + (\text{Horizontal projection areas of piloti, eaves, pergolas, etc.})]}{\text{Total area of site}} \times 100\ (\%)$$

- 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 3.
- 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.

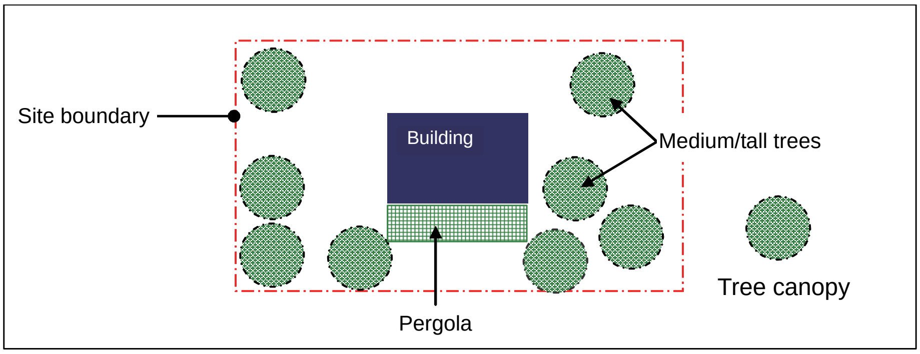


Figure 2 Horizontal projection areas of medium/tall trees and pergola

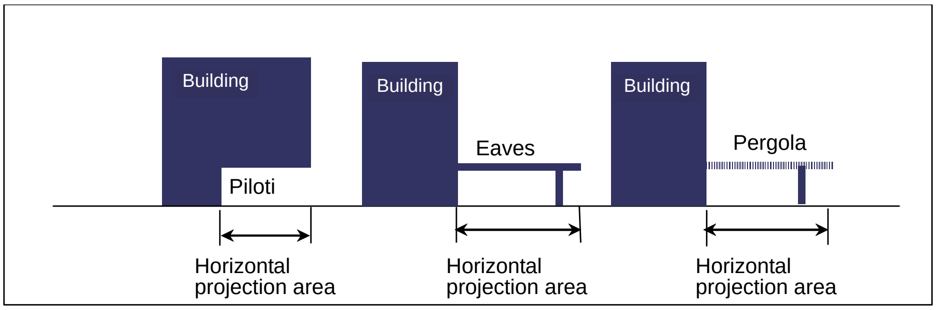


Figure 3 Horizontal projection areas of medium/tall trees, piloti, eaves, pergolas, etc.

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.

- Evaluate based on the total percentage of green-covered areas (e.g. lawn, meadows, shrubs), water-covered area and horizontal projection area of medium/tall trees
- Obtain each percentage using the following formula*:

<Percentage of green-covered area> = <Green area>/<Site Area> x 100 (%)
<Percentage of water-covered area> = 2.0 x <Water surface area>/<Site area> x 100 (%)
<Percentage of horizontal projection area of medium/tall tree> = 1.5 x <Horizontal projection area of medium/tall tree>/<Site area> x 100 (%)

*Note: Coefficient values for 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.

- 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 thermal control using water mister>
○2005 Aichi Expo Site

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> =

$$\frac{\langle\text{Green-covered exterior wall area}\rangle + \langle\text{Exterior wall area with water-retentive materials}\rangle}{\langle\text{Total exterior wall area}\rangle} \times 100\ (\%)$$

Q - 3

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: Built Environment Load Reduction

LR1 Energy

Assessment of energy is based on methods which apply current laws and regulations, such as the Energy Saving Law, and the “5-1 Energy Saving Countermeasure Grade,” which is based on the Japan Housing Performance Standard under the Housing Quality Assurance Law.

1. Building Thermal Load

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition

For assessment of all building types except apartments, evaluate based on the performance standard (PAL value) and the specification standard (standard/simplified point values) as referred to in the Energy Conservation Law. For assessment of apartments, use the energy efficiency grade under the Housing Quality Assurance Law.

For assessment during the preliminary design stage of any type of new building with a total floor area more than 5,000 m^2, except apartments, the specification standard (point value) can be applied (simplified point calculation does not apply in this case).

	Off·Sch·Rtl·Rst·Hal·Hsp·Htl		
Building type	Assessment based on the performance standard [PAL value]	Assessment based on the specification standard [point value] (building with a total floor space of 5,000 m^2 or less)	Assessment based on the specification standard [simplified point value] (building with a total floor space of less than 2,000 m^2)
Level 1	Level 1: [PAL reduction rate] ≦ -5% Level 2: [PAL reduction rate] = 0% Level 3: [PAL reduction rate] = 5% Level 4: [PAL reduction rate] = 15% Level 5: {PAL reduction rate] ≧ 35% Note: assessment for each level is based on the PAL value with up to one decimal place using linear interpolation	[Point value] < 100 pts	[Point value] < 100 pts
Level 2		100 pts ≦ [Point value] < 115 pts	100 pts ≦ [Point value] < 115 pts
Level 3		115 pts ≦ [Point value] < 140 pts	115 pts ≦ [Point value]
Level 4		140 pts ≦ [Point value]	(No corresponding level)
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 Grade.”		
Level 3	Corresponding to grade 3 of the Japan Housing Performance Standard “5-1 Energy-saving Countermeasure Grade.”		
Level 4	(No corresponding level)		
Level 5	Corresponding to grade 4 of the Japan Housing Performance Standard “5-1 Energy-saving Countermeasure Grade.”		

☐**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.

For assessment of offices, schools, retailers, restaurants, halls, hospitals and hotels, evaluate based on the performance standard (PAL value) and the specification standard (standard/simplified point values) according to the evaluation standard for building owners.
When applying the performance standard [PAL value], determine the level based on the PAL reduction rate (relative to the reference value) as shown in the line graph in Figure 4.

PAL reduction rate = (Reference PAL value – Calculated PAL value)/
Reference PAL value x 100[%] (Formula 1)

In this case,
Reference PAL value: evaluation standard value for building owners specific to building type [MJ/year-m^2]
Calculated PAL value: PAL value of the subject building [MJ/year-m^2]

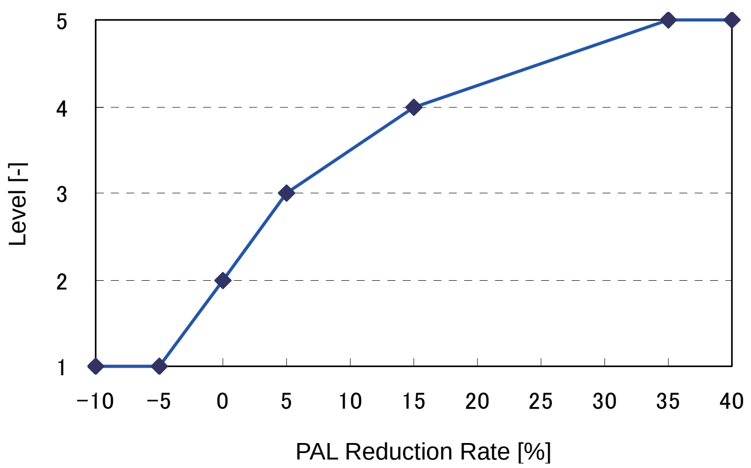


Figure 4 Levels based on performance standard [PAL value]

For “Apartments,” evaluate insulation performance and shading performance as before, according to the current Energy Saving Law and the Japan Housing Performance Standard under the Housing Quality Assurance Law which is based on it, and also the passive systems applied, such as outside air loads and direct gains, under the Building Thermal Load items.
Under the energy conservation standard for residential buildings, assessment applies to each individual dwelling, not to the entire residential block, so if the standard differs between individual dwellings, evaluate according to proportions of the total number of dwellings. Under the April 2006 amendment to the Energy Saving Law, grade 4 of the residential “Standard for Judgment by Owner Regarding the Rational Use of Energy Relating to Buildings” is equivalent to level 3 (standard) under CASBEE, but for the time being we will continue to take grade 3 as level 3.

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

Building type	Hotels	Hospitals	Retailers	Offices	Schools	Restaurants	Halls	Factories
Performance standard MJ/m^2-yr	420or less (470 or less in cold regions)	340 or less (370 or less in cold regions)	380 or less	300 or less	320 or less	550 or less	550 or less	—
Specification standard	100 or more							

■Reference 2) Energy Saving Countermeasure Grade under the Housing Quality Assurance Law

Regional categories / Housing Quality Assurance Law	Annual heating and cooling load MJ/m^2-yr					
	I	II	III	IV	V	VI
Grade 1	—（Buildings that fall short of grade 2）					
Grade 2	840 or less	980 or less	980 or less	980 or less	980 or less	980 or less
Grade 3	470 or less	610 or less	640 or less	660 or less	510 or less	420 or less
Grade 4	390 or less	390 or less	460 or less	460 or less	350 or less	290 or less

※ Other than the items above, the judgment standard contain corrected value standards for equivalent clearance area, summer solar gain coefficient and passive solar housing. (Refer to the bibliography for details)

■Reference 3) Details of assessment items

Middle item	Specific items	Details	
Building thermal load control	Insulation performance	Annual heating and cooling load	Heat loss coefficient
	Solar-gain shading performance		Summer solar gain coefficient
	Outside air loads		Total enthalpy heat exchanger, etc.
	Direct gains		Load reduction by solar gain

■Bibliography 50)

2. Natural Energy Utilization

As a general rule, during the preliminary design stage, make an individual assessment for direct and converted natural energy use based on the implemented method and scale. During the execution design and construction completion stages, evaluate both direct and converted natural energy use based on the annual energy usage per unit floor area equivalent to primary energy with the exception of apartments, for which only the converted natural energy use is evaluated.
Natural energy utilization is broadly divided into direct and converted use, as defined below.

Form of use	Definition
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.
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.

*Photovoltaic generation is also evaluated under 6 Equipment for Improving Energy Efficiency in Efficiency in Building Service System, but multiple assessments are permissible.
*For the $LCCO_2$ assessment, energy use included in the ERR evaluation must be entered as duplicate data in order to avoid redundancy with the evaluation under Category 3: Efficiency in Building Service System.

☐**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off · Sch (Universities, etc.) · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition

Apply to all building types during the design execution and construction completion stage except schools (elementary/junior high/high schools) and apartments.

Building type	Off · Sch (Universities, etc.) · Rtl · Rst · Hal · Hsp · Htl · Fct
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	0 MJ/m^2-yr ≦ [Natural energy usage] < 1 MJ/m^2-yr Include planned use for monumental purposes, as well as no natural energy usage.
Level 4	1 MJ/m^2-yr ≦ [Natural energy usage] < 20 MJ/m^2-yr
Level 5	20 MJ/m^2-yr ≦ [Natural energy usage]

☐**Commentary**

Evaluate the content of natural energy use, as appropriate for the scale and purpose of the building and its surrounding conditions. The main element is quantitative assessment for the entire building, using results of a forecast of annual usage, combining direct and converted use. Measures that have been partially applied, or use for monumental purposes, should be evaluated as level 3, because they do not lead to practical energy-saving effects. Higher levels of effort should receive level 4 or 5, depending on the quantity of natural energy usage.

$$\text{Natural energy usage (MJ/m}^2\text{-yr)} = \frac{\text{Annual direct usage(MJ/yr) + Annual converted usage(MJ/yr)}}{\text{Total floor area (m}^2\text{)}} \quad \text{(Formula 2)}$$

2.1 Direct Use of Natural Energy

☐**Assessment stage**	Building type
PD	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
ED and CC	Off·Sch (Elementary/Junior High/High Schools)·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition

Apply to all building types except schools (elementary/junior high/high schools) and apartments during the preliminary design stage, and to apartments and schools (elementary/junior high/high schools) during all stages.

	PD	PD, ED and CC
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 standards
Level 3	No measures of the assessment criteria are implemented	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	Some measures of the assessment criteria are implemented (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[†6], 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, 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 “2.2 Converted Use of Renewable Energy”.

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

Evaluate measures for direct use of natural energy within the building appropriate to its scale, type and surrounding area. For assessment during the preliminary design stage, evaluate measures for effective use of natural energy and at what scale, as well as the methods of implementation included in the building design.
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 apartments and schools (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. The same criteria apply to all stages.

2.2 Converted Use of Renewable Energy

☐**Assessment stage**	Building type
PD	Off･Sch･Rtl･Rst･Hal･Hsp･Htl･Fct･Apt
ED and CC	Off･Sch (Elementary/Junior High/High Schools)･Rtl･Rst･Hal･Hsp･Htl･Fct･Apt

! Application condition

Apply to all types of building during the preliminary design stage and to apartments and schools (elementary/junior high/high schools) during the execution design stage and the construction completion stage.

	PD	ED and CC
Building type	Off･Sch･Rtl･Rst･Hal･Hsp･Htl･Fct･Apt	Sch (Elementary/Junior High/High Schools)･Apt
Level 1	(No corresponding level)	(No corresponding level)
Level 2	(No corresponding level)	(No corresponding level)
Level 3	No measures of assessment criteria are implemented	0 MJ/m^2･yr ≦ [Renewable energy usage] < 1 MJ/m^2･yr ∗Include planned use for monumental purposes, as well as use as energy.
Level 4	Some measures of assessment criteria are implemented (excluding monument design)	1 MJ/m^2･yr ≦ [Renewable energy usage] < 15 MJ/m^2･yr
Level 5	Same as level 4 AND converted energy usage of 15 MJ/m^2-yr or more	15 MJ/m^2･yr ≦ [Renewable energy usage]

Efforts to be evaluated

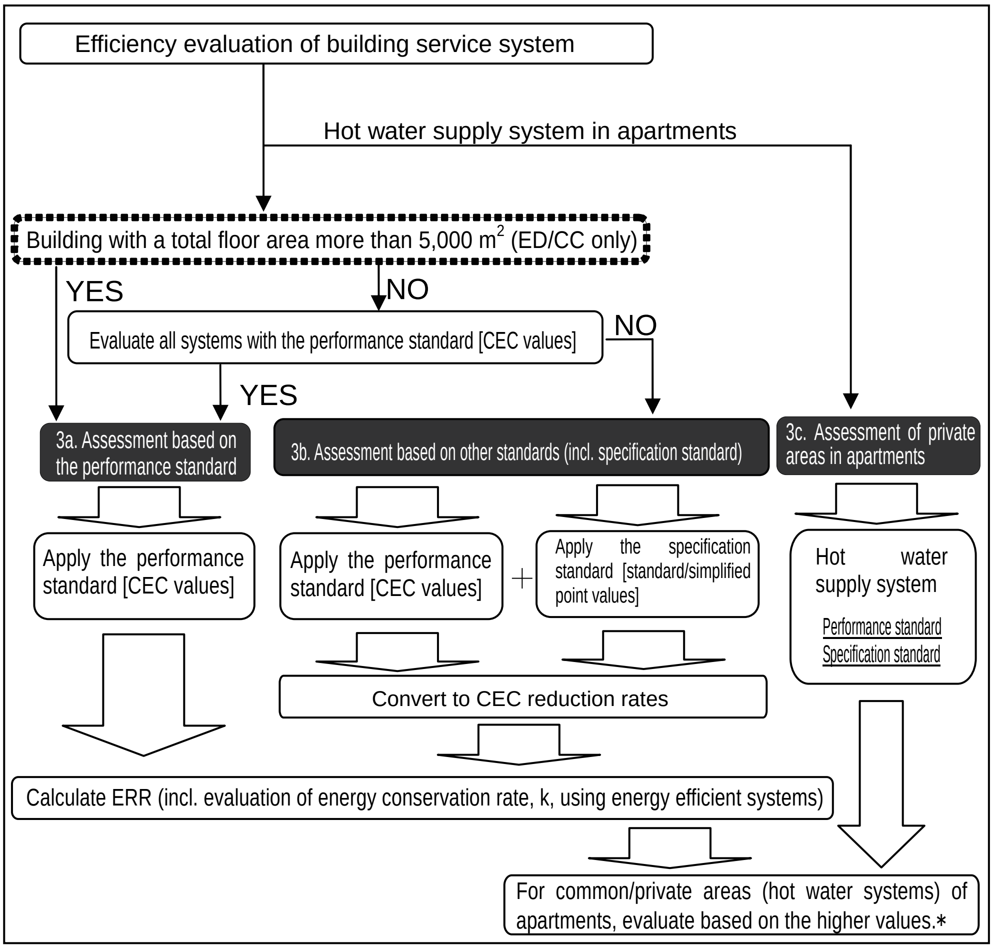
NO.	Description
1	Use of daylight: Planning for solar generation systems used in place of electrical power equipment. (e.g. Solar panels etc.)
2	Use of solar heat: Planning for effective use of solar heat systems in heating equipment to reduce heating loads. (e.g. Solar panels, vacuum-type water heaters.)
3	Use of unused heat: Planning for effective use of unused-heat systems to improve heat source efficiency in heating equipment. (e.g. Heat pumps using well water or river water etc.)
4	Other: Planning for the effective use of nature in other systems.

☐**Commentary**

Solar cells, solar panels and other methods for converting natural energy into electricity or heat should be evaluated as converted use of renewable energy.
Evaluate measures for convert use of natural energy in the building appropriate to its scale, type and surrounding areas. For assessment during the preliminary design stage, evaluate measures for the effective use of natural energy and the appropriate scale, as well as methods of implementation included in the building design.
Localized energy use measures (such as for a monument) do not contribute to an effective energy management, and thus are considered to be level 3. Level 4 or 5 is awarded to measures that are expected to achieve a substantial reduction in energy use.
For apartments in particular, assessment of the converted use of natural energy is based on the entire building, while evaluation of direct use of natural energy is based on private areas. Therefore, apply the same standard as for all other building types during the preliminary design stage (solar photovoltaic and solar thermal panels are most likely installed in a common rooftop area due to building layout, thus individual solar systems for private areas are considered rare).
Furthermore, for assessment of schools (elementary/junior high/high schools) and apartments at the execution design and construction completion stages, evaluate the converted natural energy use based on annual energy usage per unit floor area equivalent to primary energy.

3. Efficiency in Building Service System

For assessment of the efficiency in the service system of all building types except apartments, evaluate the reduction rate of primary energy consumption (ERR) for the entire building based on the performance standard (CEC values) or the specification standard (standard/simplified point values) for each system as referred to in the Energy Conservation Law.
For apartments, evaluate both the service system in common areas as required under the Energy Conservation Law since 2006 and hot water supply system in private areas based on the corresponding CASBEE criteria.
Select one of the assessment methods stated below (3a, 3b or 3c).
For assessment during the preliminary design stage of any new building with a total floor area of more than 5,000 m^2, the specification standard (point value) can be applied (simplified point calculation is not applicable in this case).



*Apartments require two assessments: 3a or 3b for common areas and 3c for private areas. Divide the resulting values proportionately between respective floor areas of the common and private sections.

3a. Assessment based on performance standard: apply when all evaluations are based on the performance standard (incl. common areas in apartments)
3b. Assessment based on other standards: apply when some evaluations are based on the specification standard (incl. common areas in apartments)
3c. Private area assessment (apartments): apply when an apartment's hot water supply system is evaluated

3a. ERR assessment based on the performance standard

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)

! Application condition

Apply when all evaluations are based on the performance standard (CEC values). In cases where some of the systems are evaluated based on the specification standard, apply the condition under 3b.

For apartments, assess the common areas only (hot water systems in private areas are evaluated under 3c).

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)
Level 1	Level 1: [ERR Value] ≦ -5%
Level 2	Level 2: [ERR Value] = 0%
Level 3	Level 3: [ERR Value] = 5%
Level 4	Level 4: [ERR Value] = 15%
Level 5	Level 5: [ERR Value] ≧ 35% Note: assessment for each level is based on ERR values to one decimal place using linear interpolation

ERR is a comprehensive indicator using the CEC calculation results under the Energy Saving Law. It expresses the rate of reduction in primary energy consumption for equipment systems and is calculated by the formula below.

$$\mathrm{ERR} = \frac{\text{Total amount of energy saved in the evaluated building}}{\text{Standard primary energy consumption for the evaluated building}}$$

$$= \frac{(E^0_{TL} - E^C_{TL} + \triangle E^C_{EE})}{E^0_{TL}} = 1-(1-k)\times\frac{E^C_{TL}}{E^0_{TL}} \quad \text{(Formula 3)}$$

Where

$$E^C_{TL} = E^C_{AC} + E^C_V + E^C_L + E^C_{HW} + E^C_{EV} + E^C_{OT}$$

$$E^0_{TL} = E^0_{AC} + E^0_V + E^0_L + E^0_{HW} + E^0_{EV} + E^0_{OT}$$

In this case,

E^C_{TL}= Energy consumption in the whole building
E^C_{AC}= Energy consumption for air conditioning
E^C_V= Energy consumption for ventilation
E^C_L= Energy consumption for lighting
E^C_{HW}= Energy consumption for hot water supply
E^C_{EV}= Energy consumption for elevators
E^C_{OT}= Other energy consumption (everything other than air conditioning, ventilation, lighting, hot water supply and elevators) $=0.4\times(E^C_{AC}+E^C_L)$
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.
$\triangle E^C_{EE}$= Actual amount of energy saved by the installation of equipment for improving energy efficiency.
k= Energy saving rate by equipment for improving energy efficiency = $\triangle E^C_{EE} / E^C_{TL}$
Note: Refer to commentary on the k value.

LR-1

E^0_{TL}= The standard energy consumption for whole building
E^0_{AC}= The standard energy consumption for air conditioning $=L^C_{AC}\times CEC^0_{AC}$
E^0_{V}= The standard energy consumption for air ventilation $=L^C_{V}\times CEC^0_{V}$
E^0_{L}= The standard energy consumption for lighting $=L^C_{L}\times CEC^0_{L}$
E^0_{HW}= The standard energy consumption for hot water supply $=L^C_{HW}\times CEC^0_{HW}$
E^0_{EV}= The standard energy consumption for elevators $=L^C_{EV}\times CEC^0_{EV}$
E^0_{OT}= Standard energy consumption for other systems (all systems except air conditioning, ventilation, lighting, hot water supply and elevators) $=0.4\times(E^C_{AC}+E^C_{L})$
Note) E^0_{OT} is assumed to equal $E^0_{OT} = E^C_{OT}$ as no standard has been set for it.

CEC^0= The CEC judgment criterion value specified in the Energy Saving Standard (notification) for the building.
L^C_{AC}= Hypothetical air conditioning load
L^C_{V}= Energy consumption for the standard ventilation equipment
L^C_{L}= Energy consumption for the standard lighting equipment
L^C_{HW}= Hypothetical hot water supply load
L^C_{EV}= Energy consumption for the standard elevator equipment

Note) Symbol key
E= Primary energy consumption (MJ/m^2-yr)
L= Annual load, or primary energy consumption from each of the standard equipment systems (MJ/m^2-yr)
【*superscripts*】 0=Standard (reference) value, C=Calculated values for the evaluated building
【*subscripts*】 Indicate energy applications;
AC = Air conditioning application, V = Ventilation application, L = Lighting application, HW = Hot water supply application, EV = Elevator application, EE = Equipment for improving energy efficiency, OT = 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.), TL = Total of all applications (= AC + V + L + HW + EV + OT)

□Commentary
When all systems are evaluated solely on the performance standard (CEC values), evaluate the reduction rate of primary energy consumption (ERR) by consolidating all CEC values to determine the assessment level, as shown in the line graph in Figure 5.

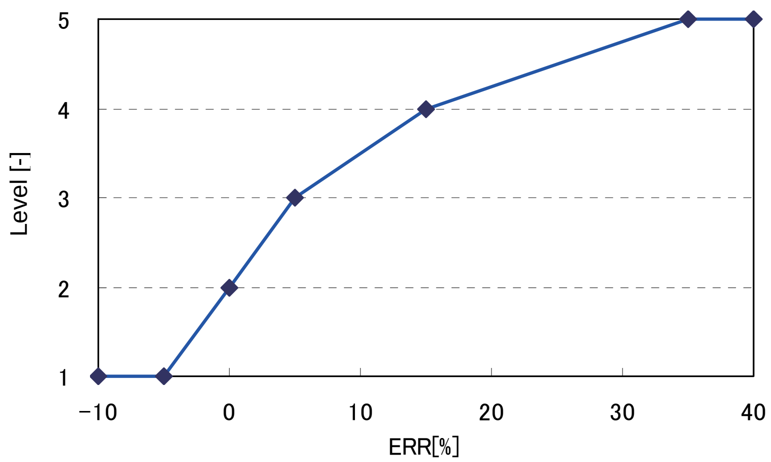


Figure 5 Levels for system evaluation based on the performance standard [CEC] only

1) Other energy consumption assessment
The current Energy Conservation Law (the Energy Conservation Standard for Buildings) includes assessment of five systems (air conditioning, ventilation, lighting, hot water supply and elevator),

while CASBEE, in principle, includes all energy-consuming systems. Outside of those 5 systems, assessment criteria has not been established, therefore no evaluation is performed. For the ERR calculation of E_{OT} (other types of energy consumption such as power outlets, etc.), the denominator and the numerator are equal ($E^0_{OT} = E^C_{OT}$). In cases where energy-saving measures such as a DC distribution system are implemented and a corresponding reduction in energy consumption results, the reductions can be used as the numerator E^C_{OT} (specify the basis for energy reduction calculations).

2) Assessment of energy efficiency improvement systems
Obtain the Energy Saving Rate (k value) as below and apply to ERR calculation.
Energy efficiency improvement systems include solar power and cogeneration systems. Installation of such systems improves the building's overall energy efficiency.
To obtain the energy saving rate (k value), calculate the reduction in primary energy consumption attained by the use of such systems, divide by the overall annual primary energy consumption for the entire building and finally, reflect the rate in the score for each system.
In cases where other types of building-wide measures to reduce energy consumption are implemented, evaluation can reflect the energy saving rate k, based on the primary energy standard. In this case, specify the basis for calculation of the k value.

$$\text{Energy Saving Rate } k = \frac{\text{Reductions in energy consumption attained by the use of an energy efficiency improvement system (MJ/yr)}}{\text{Annual primary energy consumption for entire building (MJ/yr)}} \quad \text{(Formula 4)}$$

The ERR calculation uses the energy saving rate k, thus reflecting energy efficiency in the assessment (refer to P. 183).

Some assessment criteria for solar power are the same as for items under LR1 “2.2 Converted Use of Natural Energy”. However, as the scope of the two evaluations differs, such overlaps are therefore permitted.
Furthermore, reductions in energy consumption are, calculated based on the formula for energy efficiency improvement systems as referred to in the Energy Conservation Law in principle.

3) Common areas in apartments
For common areas in apartments, evaluate each system as specified under the Energy Conservation Law (i.e. ventilation, lighting and elevator systems) based on the same criteria as other building types. Hot water supply systems are also assessed (refer to 3c). Combine the higher assessment results of the ventilation, lighting and elevator systems in common areas, and the results of the hot water system in private areas. Then, divide proportionally the combined values in accordance with respective total floor areas in common/private sections to obtain the final assessment values for apartments.

The service system evaluation standards for building owners as referred to in the Energy Conservation Law are shown below.

■ CEC^0 (energy consumption coefficiencies for service systems) assessment values as specified in the Energy Conservation Law directives

		Hotels	Hospitals	Retailers	Offices	Schools	Restaurants	Halls	Factories
Performance standard	CEC/AC	2.5	2.5	1.7	1.5	1.5	2.2	2.2	―
	CEC/V	1.0	1.0	0.9	1.0	0.8	1.5	1.0	―
	CEC/L	1.0							
	CEC/HW	1.5-1.9 (a value set according to pipe length/hot water volume							
	CEC/EV	1.0	―	―	1.0	―	―	―	―
Specification standard		100 pts or more (Same for all equipment items)							

■Bibliography 50)

■ CEC^0 (energy consumption coefficiencies for service systems) assessment values for apartments as specified in the Energy Conservation Law directives

	A/C	Ventilation	Lighting	Hot water supply*	Elevator	Notes
Performance standard	No standard value	CEC/V≦ 1.0	CEC/L≦ 1.0	No standard value	CEC/EV≦ 1.0	
Specification standard		100 or more	None		100 or more	

*Note: Use CASBEE standards for assessment of the hot water supply system in private areas of apartments (refer to 3c).

■Bibliography 51)

3b. ERR assessment based on other standards

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)

! Application condition

This category is applicable when some of the service systems of the building are evaluated based on the specification standard (standard/simplified point values). When evaluating a building with a total floor area of more than 5,000 m^2 during the execution design or construction completion stages, evaluate under 3a.

For apartments, evaluate common areas only (the hot water system in private areas is evaluated under 3c).

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Common Areas)
Level 1	[ERR value] < 0%
Level 2	0% ≦ [ERR value] < 5%
Level 3	5% ≦ [ERR value] < 15%
Level 4	15% ≦ [ERR value]
Level 5	(No corresponding level)

☐**Commentary**

When some of the service systems of a building are evaluated based on the specification standard (standard/simplified points), convert each result to a CEC reduction rate and calculate ERR using a standard energy consumption unit for each system.

Follow the steps below.

1. Using energy consumption rates (Table 1) specific to building/system types as CEC standard values, calculate the primary energy consumptions from CEC reduction rates of the systems.
2. Include other energy types in the above calculation.

Evaluation is based on the level descriptions above instead of line approximation (up to level 4 for this category).

1) ERR calculation based on other standards

<u>i. Conversion of point value to CEC reduction rate</u>

Using Figure 6, convert each point value (standard/simplified point value) to the CEC reduction rate (△CEC). Note Formula 5 is applied to obtain △CEC for assessments based on the performance standard (CEC).

CEC reduction [%] = (CEC standard value-CEC calculated value)/CEC standard value (Formula 5)

In this case,

CEC standard value: evaluation standard value for building owners specific to building type [-]

CEC calculated value: CEC value of the subject building [-]

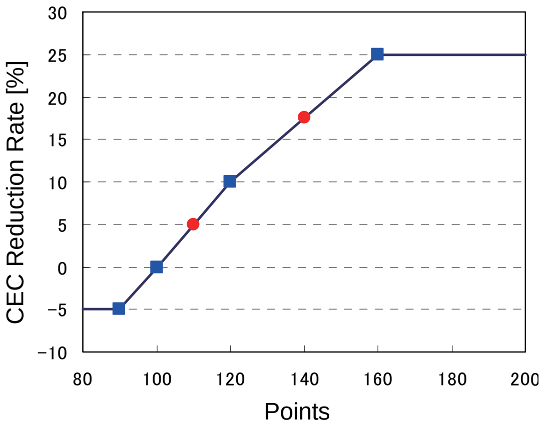


Figure 6 Conversion of the specification standard results to CEC reduction rate

ii. ERR calculation

Calculate ERR using CEC reduction values (converted from point values) and standard energy consumption ratios specific to building and system types.

Table 1 Energy ratios for building/system types R

	Off	Sch	Rtl	Rst	Hsp	Htl	Apt	Hal	Fct
A/C R_{AC}	0.45	0.65	0.40	0.40	0.55	0.40	—	0.40	—
Ventilation R_v	0.15	0.10	0.10	0.10	0.10	0.15	0.40	0.10	—
Lighting R_L	0.30	0.20	0.35	0.35	0.20	0.20	0.50	0.35	0.85
Hot water supply R_{HW}	0.05	0.05	0.15	0.15	0.15	0.20	—	0.15	0.15
Elevators R_{EV}	0.05	—	—	—	—	0.05	0.10	—	—

Apply the formula below to calculate ERR based on the specification standard.

$$ERR = \frac{\text{Total energy reduction in the subject building}}{\text{Standard primary energy consumption for the subject building}} = 1-(1-k)\times\frac{E^C_{TL}}{E^0_{TL}} \quad \text{(Formula 6)}$$

In this case,

$E^C_{TL} = E^C_{AC} + E^C_V + E^C_L + E^C_{HW} + E^C_{EV} + E^C_{OT}$

The standard primary energy reduction E^0_{TL}, the denominator, is determined by Formula 7 and can be divided into energy consumption specific to each system using the corresponding energy consumption ratio R in Table 1.

$$E^0_{TL} = E^0_{AC} + E^0_V + E^0_L + E^0_{HW} + E^0_{EV} + E^0_{OT} = E^0_{TL}\times(R_{AC}+R_V+R_L+R_{HW}+R_{EV}+R_{OT}) \quad \text{(Formula 7)}$$

The energy consumption of the subject building E^C_{TL} is determined by Formula 8, using both Formula 7 and CEC reduction rates (ΔCEC) in Table 1.

$$\begin{aligned} E^C_{TL} &= E^C_{AC} + E^C_V + E^C_L + E^C_{HW} + E^C_{EV} + E^C_{OT} \\ &= E^0_{TL}\times(R_{AC}\times(1-\Delta CEC_{AC}) + R_V\times(1-\Delta CEC_V) + R_L\times(1-\Delta CEC_L) \\ &\quad + R_{HW}\times(1-\Delta CEC_{HW}) + R_{EV}\times(1-\Delta CEC_{EV}) + R_{OT}) \quad \text{(Formula 8)} \end{aligned}$$

R_{OT}, set as 40% of AC and lighting, is obtained with Formula 9, using energy consumption ratios for the subject building.

$$R_{OT} = 0.4\times(R_{AC}\times(1-\Delta CEC_{AC}) + R_L\times(1-\Delta CEC_L)) \quad \text{(Formula 9)}$$

Using the above formula, ERR calculation using the point method represents in Formula 10.

$$ERR=1-(1-k)\times\frac{1.4\times R_{AC}\times(1-\Delta CEC_{AC})+R_V\times(1-\Delta CEC_V)+1.4\times R_L\times(1-\Delta CEC_L)+R_{HW}\times(1-\Delta CEC_{HW})+R_{EV}\times(1-\Delta CEC_{EV})}{R_{AC}+R_V+R_L+R_{HW}+R_{EV}+0.4\times(R_{AC}\times(1-\Delta CEC_{AC})+R_L\times(1-\Delta CEC_L))}$$

(Formula 10)

2) For other energy consumption
Evaluate under 3a.

3) Assessment of energy efficiency improvement systems
Evaluate under 3a. In cases where it is difficult to estimate annual primary energy consumption for the entire building, obtain energy saving rate k using an estimated consumption based on standard energy units specific to building types shown in Reference 1.

■Reference 1 Standard primary energy consumption units for buildings (per total floor area)

	Htl	Hsp	Rtl	Off	Sch	Elementary/Junior High/High Schools*1	Rst	Hal	Fct*2	Apt (Common Areas)*3
Unit (MJ/m2-yr)	2,918	2,399	3,225	1,936	1,209	367	2,923	2,212	330	100

(Source: 2004 Building Energy Consumption Survey Report, The Building-Energy Manager's Association of Japan, March 2005)

*1 Primary energy consumption is based on the DECC data-based ranking of application-specific energy consumption in existing buildings, 2009 Architectural Institute of Japan Lecture Digest (D1 Environmental Engineering). Electricity and gas ratios are uniformly set at 50% due to large regional fluctuations.
*2 Only lighting is included. Actual values in office areas are applied.
*3 The value is based on data for high/mid-rise apartments listed in the Planning Guidebook for Housing Cogeneration Systems (Institute of Building Environment and Energy Conservation, 1997). The standard value, set at 820 kWh/yr/unit (80 m^2/unit), and the primary energy unit for electricity are used for calculation.

4) Common areas in apartments
As with 3) on p. 185, evaluate common areas based on the specification standard and combine with results for the hot water supply system (refer to 3c). Then, divide proportionally the combined values in accordance with respective total floor areas in order to obtain the final assessment values for apartments.

■Bibliography 52), 53), 54)

3c. Assessment of private areas in apartments

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Private Areas)

! Application condition

Evaluate the service system in private areas in apartments. In the 2010 edition, assessment in this category was limited to the hot water supply system.

3c-1. Hot water supply system

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt (Private Areas)

	Apt (Private Areas)
	Individual supply systems
Level 1	Systems other those specified below
Level 2	Electric water heaters (with electric control)
Level 3	Fuel-based on demand water heaters
Level 4	(No corresponding level)
Level 5	Fuel-based on demand water heaters with latent heat recovery; electric heat pump water heaters

	Apt (Private Areas)		
	Centralized supply systems		
	Evaluate based on performance standard (CEC-HW values)	Assessment based on the specification standard [point value] (building with a total floor space of 5,000 m^2 or less)	Assessment based on the specification standard [simplified point value] (building with a total floor space of less than 2,000 m^2)
Level 1	[CEC reduction rate] < 0%	[Point value] < 100 pts	[Point value] < 100 pts
Level 2	0% ≦ [CEC reduction rate] < 5%	100 pts ≦ [point value] < 115 pts	100 pts ≦ [point value] < 115 pts
Level 3	5% ≦ [CEC reduction rate] < 15%	115 pts ≦ [point value] < 140 pts	115 pts ≦ [point value]
Level 4	15% ≦ [CEC reduction rate] < 35%	140 pts ≦ [point value]	(No corresponding level)
Level 5	35% ≦ [CEC reduction rate]	(No corresponding level)	(No corresponding level)

CEC reduction rate [%] = (CEC standard value - CEC calculate value) / CEC standard value (Formula 11)

In this case,

CEC standard value: evaluation standard value for building owners specific to building type [-]

CEC calculated value: CEC value of the subject building [-]

Table 2 Primary energy consumption levels and individual supply system types

Score	Standard	Corresponding systems*
Level 2	Primary energy consumption: 2.0KJ or more but less than 3.0 kJ	Electric water heaters (with electric control)
Level 3	Primary energy consumption: 1.2KJ or more but less than 2.0 kJ	Fuel-based instantaneous water heaters
Level 4	(No corresponding level)	—
Level 5	Primary energy consumption: less than 1.2KJ	Fuel-based instantaneous water heaters with latent heat recovery; electric heat pump water heaters

*Note: Evaluate other systems not listed in the table by calculating primary energy consumption based on the rated capacity of the system used.

☐Commentary

Efficiency improvement of a hot water supply system is achieved mainly by the following two measures.

[1] Improved insulation of the water pipes and hot water tanks
[2] Use of optimal control methods for hot water supply systems and of high-efficiency equipment

For assessment criteria of private areas in apartments using individual heat sources, determine the appropriate level according to system type (level 1 to 5; level 4 is not applicable). Higher levels are awarded when energy-efficient devices are used to achieve better energy-saving effects. If centralized systems are adopted in apartments, as with hotels, evaluate the assessment criteria set for buildings other than apartments: the performance standard (CEC-HW) and the specification standard (standard/simplified points).

4. Efficient Operation

4.1 Monitoring

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition

Exclude “Apartments” from assessment.

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.

*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 three of the types listed in table 3. 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 three 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 3).
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 3 Efficiency Assessment Examples

Equipment items		Assessment Items	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)	
		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	Other	CGS assessment	Electricity generation efficiency, overall efficiency, energy saving rate	
		Coordinated controls	Lighting/ventilation on/off control linked with security sensors	
		Other		

4.2 Operation & Management System

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition

Exclude “Apartments” from assessment.

	PD	ED and CC
Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct
Level 1	(No corresponding level)	No operation and management has been planned.
Level 2	(No corresponding level)	Organizations, systems or management policies have been planned for operation and management.
Level 3	No significant moves (proposals) have been made towards an operation and management system.	In addition to level 2, there must be an organized operation and management system, designated manager.
Level 4	Basic guidelines for operation, maintenance and preservation have been planned.	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 the above, target values have been planned for annual energy consumption.	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)

☐**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.

LR2 Resources & Materials

1. Water Resources

1.1 Water Saving

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 Rainwater & Greywater

1.2.1 Rainwater Use System

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No systems for using rainwater.
Level 4	Rainwater is used.
Level 5	Rainwater usage brings the rainwater usage rate to at least 20%.

☐**Commentary**
Evaluate the level of rainwater use based on the system and usage rates.

The rainwater usage rate specified in level 5 is calculated by the formula below.

$$\text{Rainwater usage rate} = \frac{\text{Rainwater use (m}^3\text{)}}{\text{Main water use (m}^3\text{)} + \text{Rainwater use (m}^3\text{)} + \text{Wastewater use (m}^3\text{)}}$$

In this case,
Wastewater use (m^3) = greywater 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 rainwater 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition

Small buildings with a total floor area of less than 2,000 m^2 are excluded from this assessment.

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No systems for reusing greywater.
Level 4	Greywater is reused.
Level 5	More than two types of wastewater are used

☐**Commentary**

In CASBEE for New Construction, evaluate utilization of greywater, sewage water and industrial water (collectively referred to as wastewater) based on how many types of wastewater are being used. Level 5 is awarded where more than two types of wastewater 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 Usage of Non-renewable Resources

2.1 Reducing Usage of Materials

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
Buildings with wood as the main structural component are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	(No corresponding level)
Level 2	Major structural elements are made of non-wood materials (RC/SRC/S), and earned 0 points or more 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	Descriptions
Concrete strength F_C and main rebar strength F of main structure (unit: N/mm^2)	
1 pt	Fc = 36 or more but less than 60 AND F = 390 or more
3 pts	Fc = 60 or more but less than 100 AND F = 490 or more
4 pts	Fc = 100 or more AND F = 590 or more
Steel frame strength F in main structure frame (unit: N/mm^2)	
1 pt	F = 325 or more but less than 355
3 pts	F = 355 or more but less than 440
4 pts	F = 440 or more
Other measures related to major structural elements	
1 pt	Use of pre-stressed concrete (which reduces material cross section, thereby reducing materials used.
1pt	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 reinforcement 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.

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition
Recycled use of existing building frames in temporary buildings is excluded from this assessment.

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	The existing building frame is not reused, or there is no existing building on the site to use.
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.

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.
Parts of the reused existing building frames as temporary use are excluded from this assessment.

2.3 Use of Recycled Materials as Structural Frame Materials

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt
Level 1	(No corresponding level)
Level 2	(No corresponding level)
Level 3	No recycled materials are used in main structure
Level 4	(No corresponding level)
Level 5	Recycled materials are used in main structure

☐**Commentary**

Evaluate whether recycled materials are used in the building's main structure.
This category covers structural materials listed as Eco Mark Products by the Japan Environment Association or as 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.
Unless the quantity is extremely limited, include all materials used.
Recycled materials used in the foundation of wooden structures are evaluated as use in the building's main structure.

Examples of recycled materials
i. Green procurement items (public works)
  Blast furnace slag aggregate
  Ferronickel slag aggregate
  Copper slag aggregate
  Electric furnace oxidized slag aggregate
  Blast furnace cement (concrete)
  FA cement (concrete)
  Eco cement (concrete)
  Lumber
  Recycled wood board
ii. Wood board with Eco Mark (Product Category 111)
iii. Products using thinned lumber, reused and unused wood materials, etc., with Eco Mark (Product Category 115)
iv. Construction products with Eco Mark for interior finish (Product Category 123)

The list of recognized green recycled materials is constantly updated; check the following websites prior to assessment.
- Green Procurement Law: designated item information
  (http://www.env.go.jp/policy/hozen/green/g-law/gpl-db/material.html)
- General information site for Eco Mark products (the Japan Environment Association)
  (http://www.greenstation.net/)

2.4 Use of Recycled Materials as Non-structural Materials

□**Assessment stage**	Building type
PD	Inapplicable
ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 for non-structural applications, listed as “Eco Mark Products” by the Japan Environment Association or as “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

- Evaluate the number of recycled material types used (refer to the examples below). When multiple materials belonging to the same category are used, count them all as one item.
- 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.

・Verify applicable materials from the following websites:
Green Procurement Law: designated item information
(http://www.env.go.jp/policy/hozen/green/g-law/gpl-db/material.html)
General information site for Eco Mark products (the Japan Environment Association)
(http://www.greenstation.net/)

Examples of applicable targeted recycled materials and calculation methods are shown below as reference.

Examples of recycled materials

Assessment subjects	Material name
Green procurement items	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 (recycled by the user) Recycled heated asphalt mixtures (other) Asphalt mixtures with added ferrous slag (recycled by the user) Asphalt mixtures with added ferrous slag (other) Use of recycled structural skeletons as roadbed material Use of recycled structural skeletons as embankment material Roadbed material with added ferrous slag Thinned lumber Blast furnace cement (soil cement) FA cement (soil cement) Eco cement (soil cement)

Assessment subjects	Material name
	Sprayed concrete using FA Paving blocks (fired) using recycled materials Paving blocks (precast, non-reinforced concrete) using recycled materials Dust shield sheets using recycled materials Ceramic tile Lumber Laminated wood Particle board Wooden-type cement panels
Tiles and blocks that have been awarded the Eco Mark (Product Category 109)	Tile Block Brick
Boards using wood materials that have been awarded the Eco Mark (Product Category 111)	Fiber board Particle board
Products using thinned lumber, reused and unused materials, etc. that have been awarded the Eco Mark (Product Category 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) Outdoor materials (Columns) Outdoor materials (Beams) Outdoor materials (Foundations) Activated carbon (for moisture regulation) Activated carbon (for water purification) Soil improvement materials
Construction products (for interior decorating finishes) that have been awarded the Eco Mark (Product Category 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 Accordion doors
Construction products (cladding and exterior parts and materials) that have been awarded the Eco Mark (Product Category 137)	Roofing Roof materials Cladding materials Plastic decking materials Composite materials of recycled wood and plastic Rainwater storage tanks
Construction products (material-type parts and materials) that have been awarded the Eco Mark (Product Category 138)	Construction stone Hard PVC pipes for drainage and ventilation Sumps for residential land

Assessment subjects	Material name
Construction products (equipment) that have been awarded the Eco Mark (Product Category 139)	Residential bathroom units Waterproof pans

Calculation example: Brick products A and B (Eco Mark Product Category 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

☐**Assessment stage**	Building type
PD, ED and CC	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・Apt

! Application condition
Inapplicable if no timber is used.

Building type	Off・Sch・Rtl・Rst・Hal・Hsp・Htl・Fct・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.

$$\text{Proportion of timber used} = \frac{\text{Total quantity of timber used from sustainably managed forests (volume)m}^3}{\text{Total quantity of timber used in the building (volume)m}^3}$$

☐**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 range of timber produced in sustainably managed forests is as stated below. (Formwork is not included in this assessment).

1. From thinned trees.
2. Timber from a verified source where sustainable logging is practiced.
3. Coniferous timber produced in Japan.

Japan has a system, as seen in other countries, that verifies that timber comes from forests where sustainable logging is practiced, but it is still in the early stages of expansion, and very little timber clearly identified with stamps etc. is distributed in Japan.
Therefore, as a practical measure, coniferous woods such as cedar, which can be inferred to have been produced from thinning and, usually, from sustainable forests, can be treated as timber from sustainable forests. The coniferous wood listed in the Ministry of Construction's Notification 1452 (2000) on “determination of the standard strength of timber” can largely be regarded as being logged from sustainably managed forests. In addition, various foreign-produced conifers can also be regarded as logged from sustainable forests.

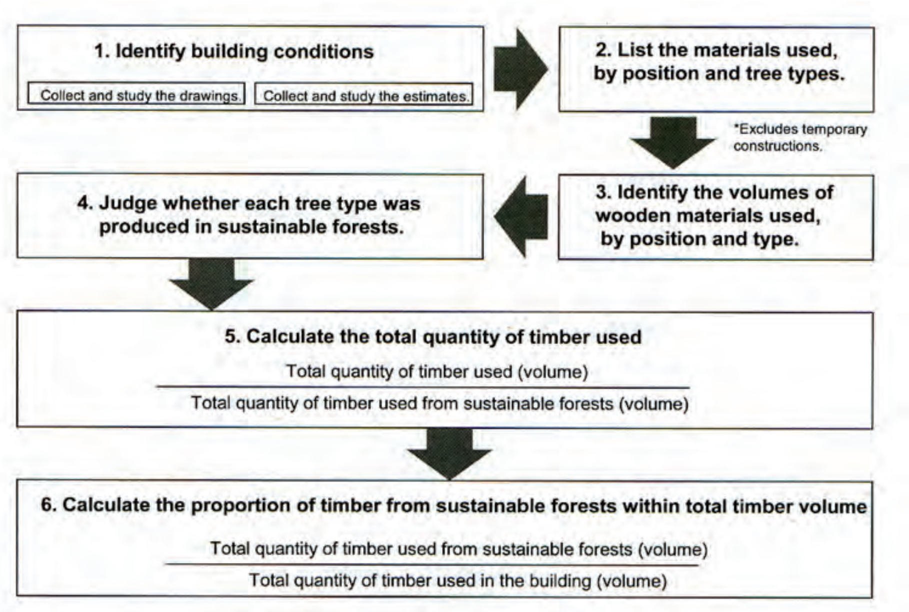
＜Examples of conifers produced in Japan＞
Red pine, Japanese Larch, white cedar, hinoki (Japanese cypress), spruce, todo fir, cedar

LR-2

The usage ratio for timber produced from sustainable forests can be calculated by the procedure below.

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.

$$\frac{\text{Total quantity of timber used from sustainably managed forests (volume)}}{\text{Total quantity of timber used in the building (volume)}}$$



2.6 Efforts to Enhance the Reusability of Components and Materials

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 or more of measures, as the efforts to be evaluated, to encourage recycling of materials on demolition has been used.
Level 5	Two points or more of measures, as the efforts to be evaluated, to encourage recycling of materials 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.

☐**Commentary**

"2.3 Use of Recycled Materials as Structural Frame 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 this examples, the items of “easy separation”, “relatively easy separation” and the eqhivalent are evaluated as 1 point.

＜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.

3. Avoiding the Use of Materials with Pollutant Content

3.1 Use of Materials without Harmful Substances

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 is are 1-3 building materials to be evaluated without substances specified in the Pollutant Release and Transfer Register Law.
Level 5	There is 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 Type 1 and 2 chemicals referred to in the law governing improved reporting and management of specific chemicals released into the environment. Type 1 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 “type one designated chemical substances” and “type two 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 June 2003, (Japanese) government ordinances have designated 354 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.

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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
Exclude from assessment if there is absolutely no fire-extinguishing equipment, or only sprinklers.

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
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.)

□**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Insulation foaming materials with OPD = 0.2 or above are used.
Level 2	Insulation foaming materials with OPD = 0.01-0.2 are used.
Level 3	Insulation foaming materials with OPD = 0.0-0.01 are used.
Level 4	(No corresponding level)
Level 5	Insulation foaming materials with zero-ODP and low GWP (less than 50, 100 year values) 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.

■Reference1) 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.
・Ministry of the Environment 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
Exclude from assessment if no refrigerant gases are used.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 of environmentally conscious efforts in planning" 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 "Excluded," 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 "Exclude" 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 of environmentally conscious efforts in planning" column of the software.

1. Consideration of Global Warming

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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 greenhouse gas. Lifecycle CO_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 volume for each building application is set based on the $LCCO_2$ emission volume 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 and demolition).

1) Construction stage
LR2 Resources and Materials evaluates "Continuing Use of Existing Building Skeleton, 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 ERR, the primary energy consumption reduction rate, which is evaluated under LR1 Energy, to make a simple estimate of the CO_2 emission at the operation stage.
3) Maintenance and 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, 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 emission volume, 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 emission volumes, their values and reduction effects, so we have decided to present approximate figures.
If the assessor personally makes more detailed calculations ("individual calculations"), they are not to be reflected in the scores for this item.

2. Consideration of Local Environment

2.1 Air Pollution

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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·Apt·Fct
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 NOx emission guidelines for small combustion equipment (Ministry of the Environment) 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 NOx emission guidelines for small combustion equipment (Ministry of the Environment) 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 NOx emission guidelines for small combustion equipment (Ministry of the Environment) or local ordinances.
Level 5	No incineration equipment is used, and absolutely no atmospheric pollutants leave the hypothetical closed space of the building to the outside.

Note) The criterion for concentration level is the Air Pollution Control Law, the NOx emission guidelines for small combustion equipment (Ministry of the Environment) 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 NOx Emission Guidelines for Small Capacity Combustors (Ministry of the Environment) 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 hypothetical enclosed space to space outside). Therefore, fully elected residents, and building with multi-HVAC systems or belonging to district heating and cooling systems, which do not use combustion equipment, should be graded level 5.
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	Gas generator, heating furnace	- 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	1. 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: 60-400ppm Existing facilities: 130-600ppm 2. Overall emission standard Regional/facility-specific standard set based on overall emission reduction plan

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■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 the Ministry of the Environment; 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 (Ministry of the Environment, 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 12A/13A city gas and LPG. Other types of city 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Total score for assessment criteria: 0 pt
Level 2	Total score for assessment criteria: 1-5 pts
Level 3	Total score for assessment criteria: 6-12 pts
Level 4	Total score for assessment criteria: 13-19 pts
Level 5	Total score for assessment criteria: 20 pts or higher

Efforts to be evaluated

Assessment Item		Descriptions	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 to 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 pt The building does not obstruct the flow of air downwind:2 pts	1 to 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 pt 40% or more but less than 60%: 2 pts Less than 40%: 3 pts	1 to 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 pt 0.4 or more but less than 0.5: 2 pts 0.5 or more: 3 pts	1 to 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 pt 30% or more but less than 45%: 2 pts 45% or more: 3 pts	1 to 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 pt 20% or more but less than 40%: 2 pts 40% or more: 3 pts	1 to 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 pt 10% or more but less than 20%: 2 pts 20% or more: 3 pts	1 to 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 pt 4.0 or more but less than 4.5: 2 pts 4.5 or more: 3 pts	1 to 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 pt at intermediate level: 2 pts at advanced level: 3 pts	1 to 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)	1 to 2
		[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)	

☐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 On-Site Thermal Environment".

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 7, 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 7 and 8). Refer to CASBEE-HI (Heat Island) for details regarding the wind characteristics database.

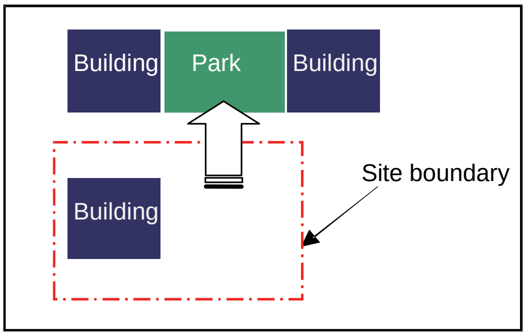


Figure 7 Example of building position for unobstructed air flow

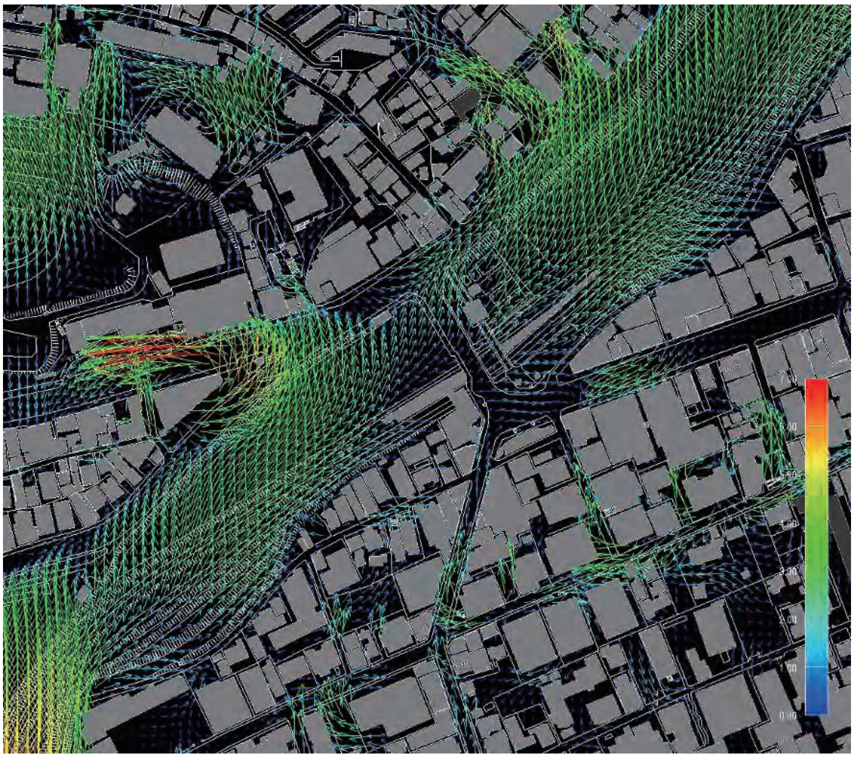


Figure 8-1 Wind characteristics database for Tokyo: pedestrian-level wind velocity distribution

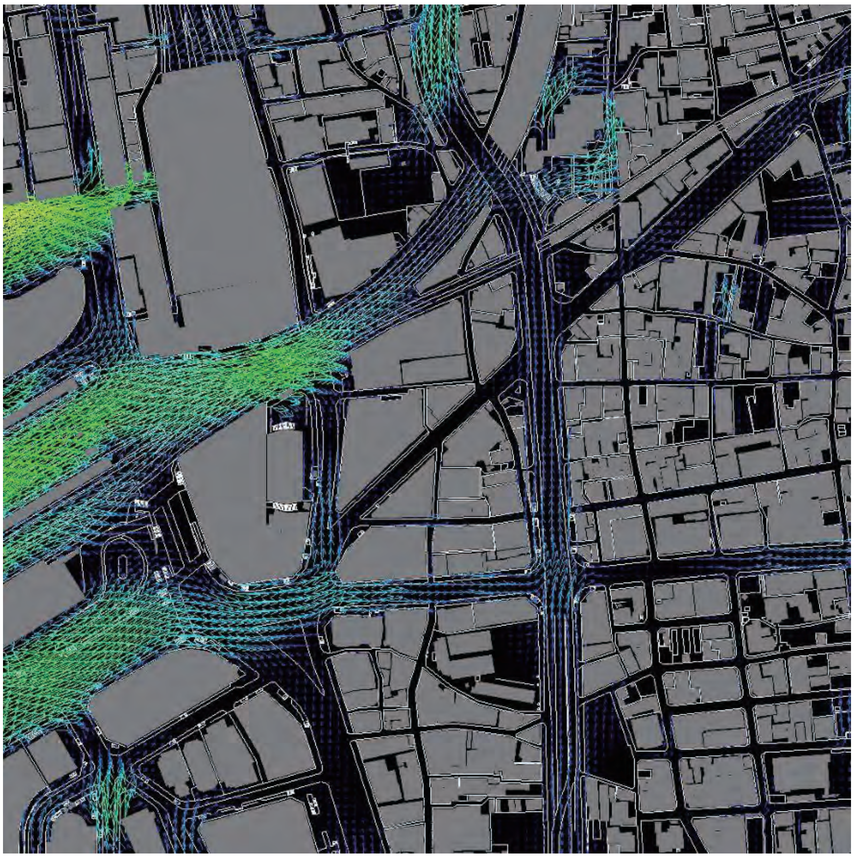


Figure 8-2 Wind characteristics database for Osaka: pedestrian-level wind velocity distribution

For Items [2] and [3], evaluate the building's effectiveness in promoting airflow to downwind areas from a broader perspective.

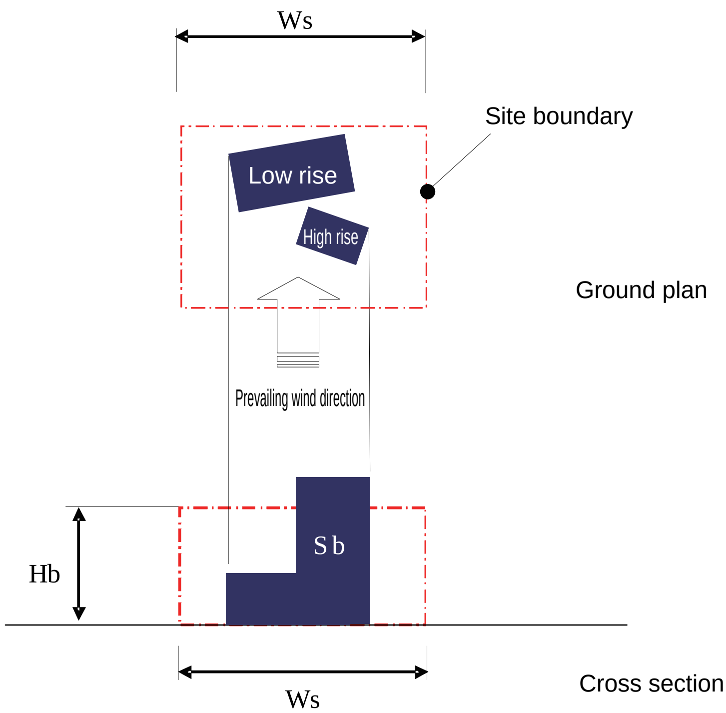
- A decrease in wind velocity occurs in downwind areas due to building wind resistance. Impact can thus be greatly reduced by ensuring that the smallest possible exposed area faces the prevailing wind. For Item 2, evaluate exposed area of the building facing the prevailing wind.
- At the same time, decreased 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.

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 9):

<Percentage of exposed area> = Sb/(Ws x Hb) x 100(%)

- Standard height Hb: (standard floor-space ratio/standard building-to-land ratio) x floor height
- Floor height: Building height/number of stories
- 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 10.

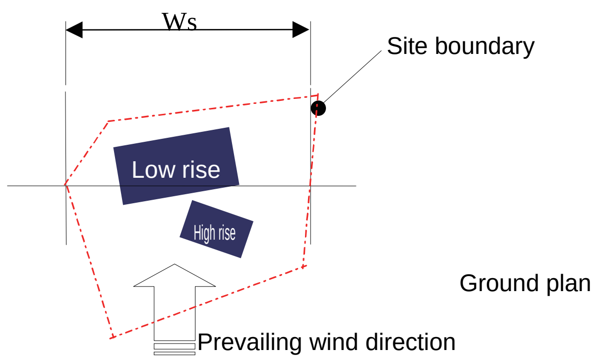


Sb : Exposed area perpendicular to the prevailing wind direction

Hb: Standard height = [(standard floor-space ratio/standard building-to-land ratio) x floor height]

Ws: Maximum width of the site perpendicular to the prevailing wind direction

Figure 9 Percentage of exposed area of the building that faces the prevailing wind



Ws: Maximum width of the site perpendicular to the prevailing wind direction

Figure 10 Ws of an irregularly-shaped site

For Item [3], evaluate the effectiveness of wind recovery in the area downwind from the building, based on the building spacing index (Rw) which is the ratio of the distance set back from site boundary in the direction of the prevailing wind in summer months relative to the building height.
- Evaluate the effectiveness of wind velocity recovery for buildings with a height 50% or more than the standard height Hb based on building spacing in the direction of prevailing wind
- Standard height Hb: [(standard floor-space ratio/standard building-to-land ratio) x floor height] (same as Item [2])
- Evaluate setback distance (W_1, W_2) in the direction of prevailing wind
- Determine the site boundary (i.e. maximum site width W_d) in the direction of prevailing wind and evaluate the setback distance.
- Obtain the building spacing index Rw using the formula below:

$$Rw = (W_1 + W_2) / H = \underset{\text{Value of upwind side}}{W_1 / H} + \underset{\text{value of downwind side}}{W_2 / H}$$

- 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 12.
- In cases where the higher portion of the building has a setback, calculate the setback distance according to the method shown in Figures 13 and 14.
- In cases where the site consists of several units, calculate according to the method shown in Figure 15. Apply the method in Figure 16 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 17.

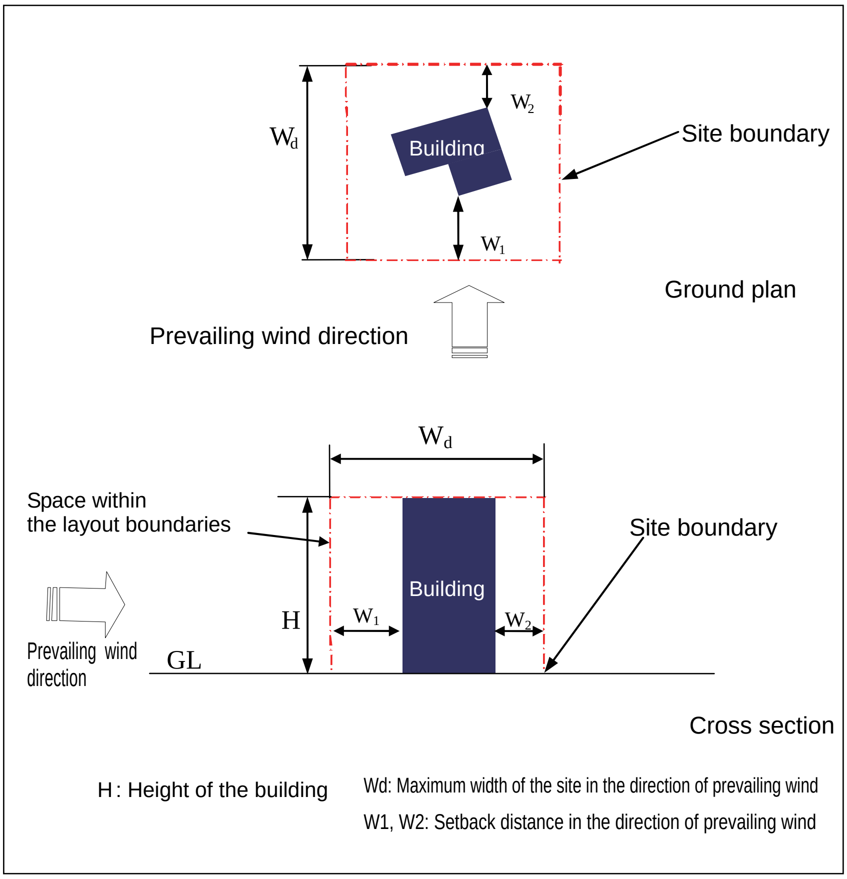


Figure 11 Setback distance from site boundary W_1/W_2 and building height H

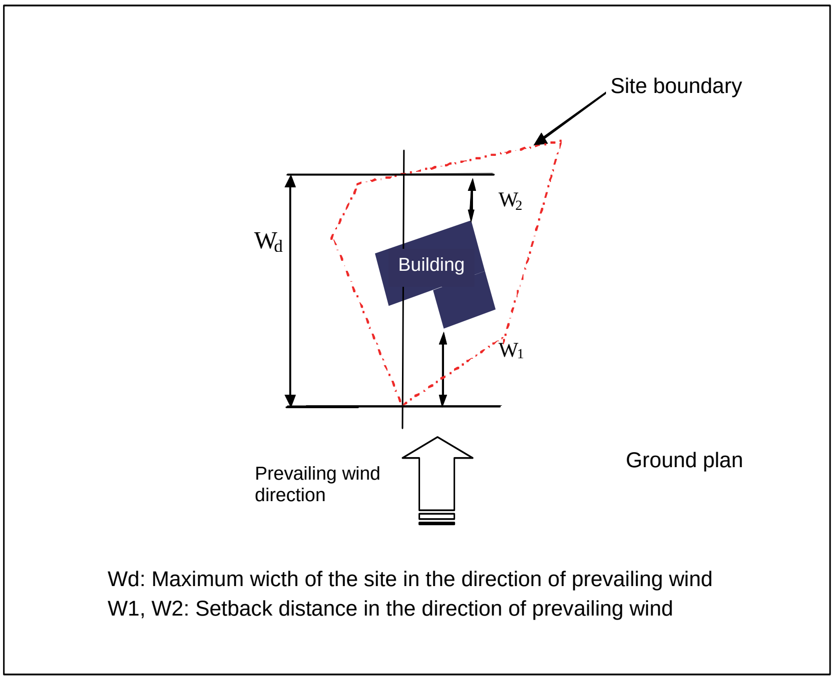
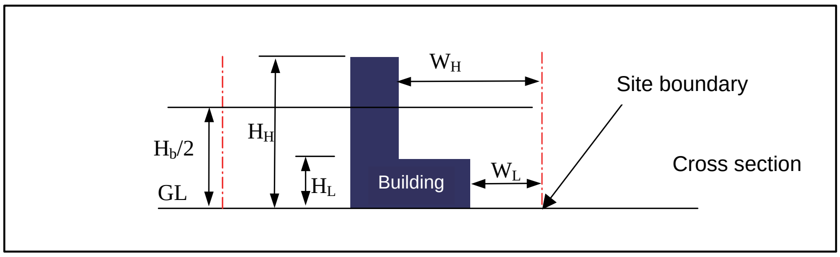
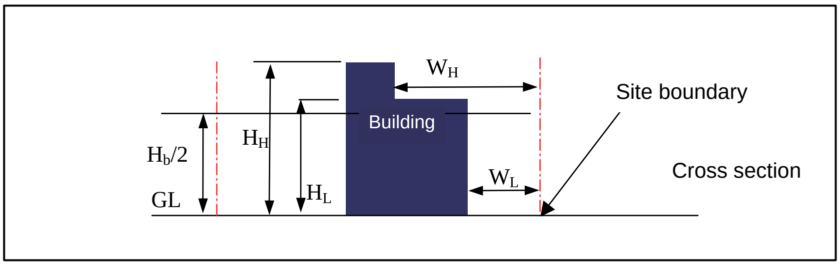


Figure 12 Maximum site width W_d and setback distance W_1 and W_2 on an irregularly-shaped site



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 13 W/H calculation method in cases where the higher portion of the building has a setback: 1



If the setback of the higher portion of the building is located at $H_b/2$ or higher, apply the setback distance of the portion $(W_H + W_L)/2/H_H$ regardless of whether it is downwind or upwind.

Figure 14 W/H calculation method in cases where the higher portion of the building has a setback: 2

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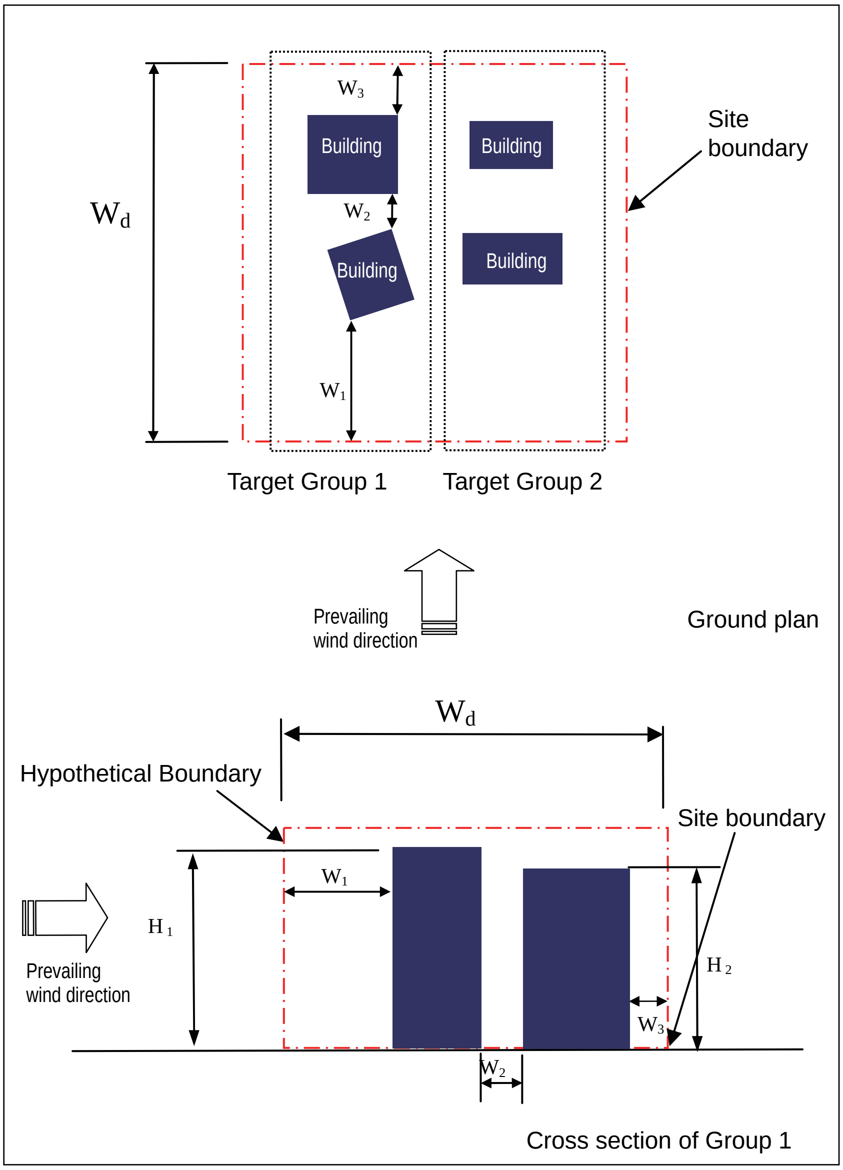


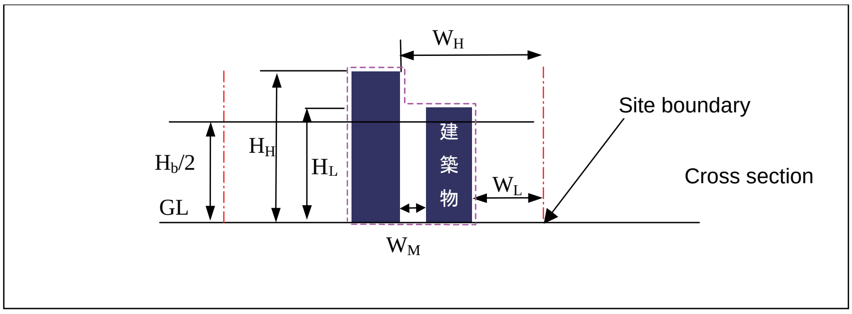
- In cases where multiple groups of building units on the site are in the direction of prevailing wind, evaluate each group individually.
- Apply the setback distance and the spacing (W) of the narrowest portion.
- Apply the height of the unit located on the upwind side as height (H) which corresponds 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 16.
- In cases where the higher portion of the building has a setback, evaluate according to the methods shown in Figures 13 and 14.
- Obtain the building spacing index Rw of a group of building units using the formula below (example: subject building units shown in Figure 10):

$$Rw = (W_1/H_1 + W_2/H_1 + W_3/H_2 + \cdots + W_{N+1}/H_N)/N$$

(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 15 Assessment method for sites with multiple building units



- When two units, with a significant height difference at $H_b/2$ or higher, are closely positioned, the two units are considered as one building with a setback (refer to Figure 14).
- 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 16 W/H calculation method in cases where two units with a significant height difference are closely positioned

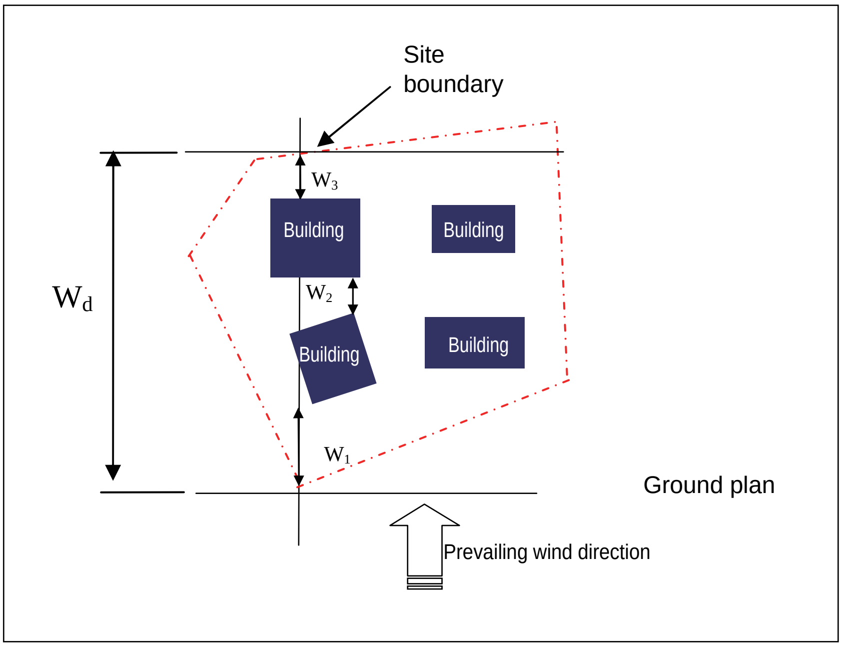


Figure 17 Maximum site width W_d and setback distance for multiple units on irregularly-shaped lot

LR-3

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> + <percentage of water-covered area> +
<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>/<Total site area> x 100 (%)
<Percentage of water-covered area> = 2.0 x <Water surface area>/<Total site are> x 100 (%)
<Percentage of horizontal projection area of mid-height/tall tree> =
3.0 x <Horizontal projection area of mid-height/tall tree>/<Total site area> x 100 (%)
<Water retention area> = <Area with water-retentive materials>/<Total 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>/<Total 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).

In this assessment, evaluate by combining areas of ground covered with evaporative cooling materials and with high solar reflectance materials.

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:

<u>A. Percentage of roof area covered with evaporative materials</u>

- 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> + <percentage of water-covered area> +
<percentage of horizontal projected area of medium and tall trees> +
<percentage of water retention area>

- Obtain each of the above percentages using the same formula described in Item 3 (use the total roof area as the denominator).

<u>B. Roof area with high solar reflectance materials</u>

- 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 On-Site Thermal Environment. 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 Rainwater Discharge Loads

☐Assessment stage	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct · 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 rainwater 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 rainwater percolation and similar measures were implemented voluntarily)

2.3.2 Sewage Load Suppression

☐Assessment stage	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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

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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 0.2 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 5 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	0 point 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

Item	Content	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>
○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 management 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

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·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

Item	Content	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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition

Evaluate buildings that include designated facilities regulated under the Noise Regulation Law and buildings regulated under the Large-Scale Retail Stores Location Law. All other buildings are considered as level 3.

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 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**

Assessment under this item covers buildings which include designated facilities subject to regulation under the Noise Regulation Law (see reference 2) and buildings subject to regulation under the Large-Scale Retail Stores Location Law. All other buildings should receive a flat 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 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).

If this item is evaluated as level 5, attach documents which can be checked by a third party indicating that noise is substantially below the current regulation standards.

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■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.	do.
				Vibration isolation	Place anti-vibration devices between the vibrating body and the stationary body to put the vibration transfer rate below 1.	do.
				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 by design
				Acoustic isolation Sealed type	Surround the sound source with materials having the necessary transmission losses (covers, hoods, structures).	do.
				Acoustic isolation Partial	Erect barriers (walls, building) sound reduction index of at least 10 dB from the source volume.	do. 25 dB is the limit.
				Acoustic isolation 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 55)

3.1.2 Vibration

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

! Application condition
Evaluate buildings that include designated facilities which are regulated under the Vibration Regulation Law (Reference 2) and buildings which are regulated under the Large-Scale Retail Stores Location Law. All other buildings are excluded from this assessment.

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Vibration level exceeds the current regulation standard*1 specified under the Vibration Regulation Law or the Large-Scale Retail Stores Location 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 or the Large-Scale Retail Stores Location Law
Level 4	(No corresponding level)
Level 5	Vibration level is significantly below*2 the current regulation standard specified under the Vibration 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 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.
Assessment under this item covers buildings which include designated facilities subject to regulation under the Vibration Regulation Law (see reference 2) and buildings subject to regulation under the Large-Scale Retail Stores Location Law. <u>All other buildings are excluded from assessment.</u>
When using CASBEE for 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).

If this item is evaluated as level 5, attach documents which can be checked by a third party indicating that vibration is substantially below the current regulation standards.

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■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 adequate for level 3	Not adequate for 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 adequate for level 3	Not adequate for 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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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 · Hsp · Htl · Fct · 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 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. <u>All other buildings are excluded.</u>

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■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	$qt = 275 \times H_0^2$	$qt = 357 / Fmax$	Odor index 26
Type 2 zone	Odor index 12	Odor index 33	Odor index 27	Odor index 24	$qt = 436 \times H_0^2$	$qt = 566 / Fmax$	Odor index 28

Type 3 zone	Odor index 13	Odor index 35	Odor index 30	Odor index 27	qt＝549×H_0^2	qt＝712／Fmax	Odor index 29

Enforced from 1st July 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 = 10xlog 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 Damage & Daylight Obstruction

3.2.1 Restriction of Wind Damage

☐Assessment stage	Building type
PD, ED and CC	Off･Sch･Rtl･Rst･Hal･Hsp･Htl･Fct･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･Hsp･Htl･Fct･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.

[Appended 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.

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■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 56)

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

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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 56)

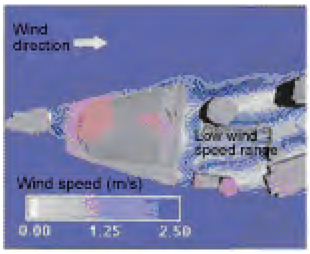
■Reference 4) Conduct a preliminary survey of wind sped and direction and related factors in the area.

＜Saitama Super Arena＞

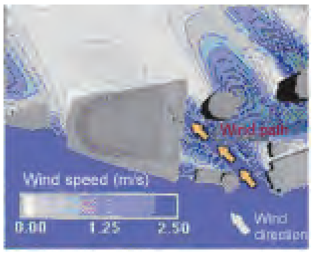
The building roof configuration and its plan form were determined on the basis of the results of a wide-area atmospheric simulation, as countermeasures against the north wind, which is the prevailing wind in winter. The wind from the sea in summer is deliberately drawn in through the front opening of 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 56), 57)

3.2.2 Sand and Dust

☐**Assessment stage**	Building type
PD, ED and CC	Sch

! 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 point)
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	Descriptions	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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

! Application condition
Evaluate level 3 if there are no shade regulations in the region.

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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.

*Note: "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

☐**Assessment stage**	Building type
PD, ED and CC	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · Apt

Building type	Off · Sch · Rtl · Rst · Hal · Hsp · Htl · Fct · 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.

The Ministry of the Environment of Japan 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 the Ministry of the Environment of Japan 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 point: 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? ☐Is the illuminated range appropriate? Is it wider than necessary? ☐ Does the chosen light source have high overall efficiency? ☐Was the installation of lighting equipment with high coefficient of utilization, or of equipment for increasing coefficient of utilization, considered?	→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. →Reconsider the illuminated range. → Reference 2) Choose overall efficiency higher than that in the Guide to outdoor lighting equipment. → 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. ☐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? ☐ 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?	→Select lighting equipment which satisfies upward light output ratio in the “Guide to outdoor lighting equipment” reference 2). Alternatively, consider installation of the following. → Reconsider the selection of lighting equipment and the direction of light projection. If necessary, use louvers and hoods etc. for shading. → 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

Regulations	Assessment	Content
Overall efficiency	Evaluate for overall efficiency. Lamp output/(lamp power + power losses in the lighting circuit)	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.
Coefficient of utilization	Coefficient of utilization = effective used output/total lamp output = (lit area x average brightness)/total lamp output.	Coefficient of utilization is the proportion of the light generated by the lamp which reaches areas or objects which require illumination.
Upward light output ratio	Evaluate according to ULOR (upward light output/lamp output)	Lighting environment I*: 0%
		Lighting environment II*: 0-5%
		Lighting environment III*: 0-15%
		Lighting environment IV*: 0-20%
Glare and impact on human activities	"Standard for Exterior Public Illumination for Pedestrians" by the Illumination Engineering Institute of Japan.	
	Following the points under "Glare restriction" in the Basically, follow existing JIS and technical guidance.	
Impact on flora and fauna	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.	

*Note: Reference 3 shows the classifications of lighting environments I-IV.

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■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. ☐Select the shining directions appropriately. ☐Apply detailed measures to reduce the total usage of artificial lighting.	→In particular, do not use searchlights, lasers or other equipment which leak light over a wide area and have a strong impact. → Take care when placing internally-illuminated signs and exposed fluorescent tubes. →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. ☐Light must not move. ☐Projected light must not be colored.	→Do not allow flashing light sources. →Do not move the range illuminated by the light source. →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 58)

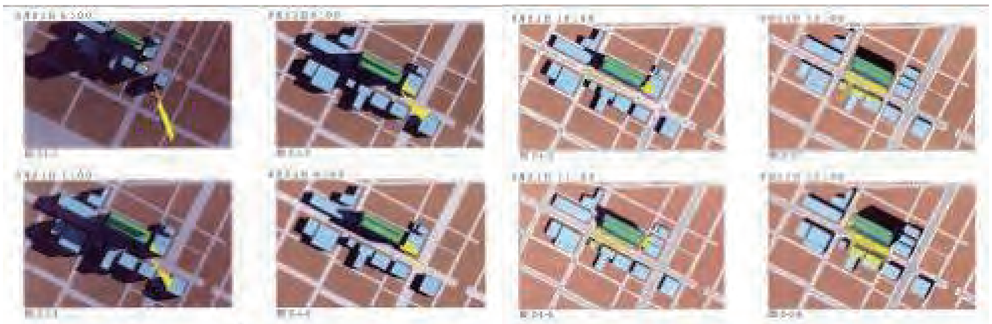
3.3.2 Measures for Reflected Solar Glare from Building Walls

☐**Assessment stage**	Building type
PD, ED and CC	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt

Building type	Off·Sch·Rtl·Rst·Hal·Hsp·Htl·Fct·Apt
Level 1	Reflected glare from exterior walls (including glass surfaces) affects the surrounding areas
Level 2	(No corresponding level)
Level 3	Reflected glare from building walls (including glass surfaces) does not affect the surroundings.
Level 4	(No corresponding level)
Level 5	Reflected glare from building walls (including glass surfaces) is not generated.

☐**Commentary**
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.

■Reference 1) 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)

The following are the main countermeasures against reflected light.

	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.

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Appendix Documents

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.	
			30	Counterweight concrete	BELCA	
		Waterproof sheet	15	Exposed,silver coating	BELCA	Ronloop or equivalent, T = 20
		Tile	30		Gov.Bld.Dept.	Service life is 10 years -10% repair for the waterproof course, mortar bed and tiles.
			30		BELCA	Service life is 10 years -10% repair for the waterproof course, mortar bed and tiles.
		Aluminum coping	40		Gov.Bld.Dept.	
			40		BELCA	
	Outer walls	Stones	65	Granite	Gov.Bld.Dept.	Inada type or equivalent Polished finish
			60	Granite	BELCA	Inada type or equivalent Polished finish
		Tiling	40	Embedded porcelain tile	Gov.Bld.Dept.	
			60	Embedded porcelain tile	BELCA	40 years for floating method construction
		Synthetic resin spraying	15	Mortar setting bed	Gov.Bld.Dept.	Emulsion finish
			30	Mortar setting bed	BELCA	Acrylic lysin
		Epoxy-type sprayed tile	15	Concrete setting bed	BELCA	
	Curtain wall	Aluminum	40		BELCA	Panel mounting
		PC sheet	65	Embedded mosaic tiles	Gov.Bld.Dept.	
			60	Small embedded tiles	BELCA	
	Exterior ceilings (eaves)	Aluminum Moulding	30		Gov.Bld.Dept.	
			40		BELCA	
		Stainless steel Moulding	40		Gov.Bld.Dept.	
			40		BELCA	
		Boarding	20	Flexible board	Gov.Bld.Dept.	Ep Finish
			25	Flexible board	BELCA	EP Finish
	Exterior fittings	Steel fittings	30		Gov.Bld.Dept.	OP coating
			35		BELCA	Ready-mixed synthetic resin paint
		Aluminum fixtures	40		Gov.Bld.Dept.	
			40		BELCA	
		Stainless steel entry/ exit doors	40	4,400 x 2,500	Gov.Bld.Dept.	Automatic staineless steel double-opening doors
			60	4,334 x 2,800	BELCA	Stainless steel entrance unit
		Synthetic resin on steel (Painting)	5		Gov.Bld.Dept.	
			3		BELCA	
	Exterior Misc	Roof railings (steel)	30		Gov.Bld.Dept.	Painted every 5 years
			25		BELCA	Painted every 3 years
		Roof railings (Stainless steel)	65	H = 1,100	Gov.Bld.Dept.	
			60	H = 1,100	BELCA	
		Roof railings (Aluminum)	40	H = 1,100	Gov.Bld.Dept.	
			40	H = 1,100	BELCA	
Building Interior	Floors	Granite	65	Inada type or equivalent	Gov.Bld.Dept.	
			60	Inada type or equivalent	BELCA	
		Marble	65		Gov.Bld.Dept.	
			60		BELCA	
		Terrazo block	65		Gov.Bld.Dept.	
			50		BELCA	
		Tiling	65	Ceramic tile	Gov.Bld.Dept.	
			50	Ceramic tile	BELCA	
		Mortar finish	30	Mortarboard	Gov.Bld.Dept.	
			30	Mortarboard	BELCA	
		PVC tiling	20	Mortar setting bed	Gov.Bld.Dept.	Semi-hardened
			30	Mortar setting bed	BELCA	Semi-hardened
		Vinyl flooring sheet	20	Mortarboard	Gov.Bld.Dept.	Polyvinyl chloride sheet (LONLEUM) or equivalent
			30	Mortarboard	BELCA	Polyvinyl chloride sheet (LONLEUM) or equivalent
		Carpet	20	Mortar setting bed	Gov.Bld.Dept.	Tile carpet
			30	Mortar setting bed	BELCA	コントラクトカーペット

Classification		By construction type	Service life	Specifications etc.	Source	Notes
	Inner walls	Granite	65	Inada type or equivalent	Gov.Bld.Dept	
			60	Inada type or equivalent	BELCA	
		Marble	65		Gov.Bld.Dept	
			60		BELCA	
		Terrazo block	65		Gov.Bld.Dept	
			50		BELCA	
		Tiling	65	Porcelain tile	Gov.Bld.Dept	
			50	Porcelain tile	BELCA	
		Mortar finish	65	EP coating	Gov.Bld.Dept	Repainted every 10 years
			30	EP coating	BELCA	Repainted every 5 years
		Multi-layer painted finish	20	Mortar setting bed	Gov.Bld.Dept	Service life, including undercoat (repainted every 10 years (60%))
			30	Mortar setting bed	BELCA	Service life, including undercoat (repainted every 10 years (90%))
		Vinyl wallpaper	20	Plywood underlay	Gov.Bld.Dept	Service life of underlays (replaced every 10 years)
			30	Plywood underlay	BELCA	Service life of underlays (replaced every 10 years)
		Vinyl wallpaper	20	GL construction method, PB T = 12	Gov.Bld.Dept	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	Gov.Bld.Dept	
			20	T = 9, with furrring strips	BELCA	
		Melamine-faced board	30	T = 9, with furrring strips	Gov.Bld.Dept	
			30	T = 9, with furrring strips	BELCA	
	Ceilings	Aluminum Moulding	30	Light steel underlay	Gov.Bld.Dept	
			60	Light steel underlay	BELCA	
		Boards	30	Faced plasterboard	Gov.Bld.Dept	
			30	Faced plasterboard	BELCA	
		Vinyl wallpaper	30	PB underlay, T = 9	Gov.Bld.Dept	Service life of underlays (replaced every 10 years)
			30	PB underlay, T = 10	BELCA	Service life of underlays (replaced every 10 years)
		Synthetic resin spraying	20	Concrete underlay	Gov.Bld.Dept	
			60	Concrete underlay	BELCA	
	Interior fixtures	Aluminum fixtures	40		Gov.Bld.Dept	
			50		BELCA	
		Steel fixtures	30	Op Coating	Gov.Bld.Dept	
			40	Op Coating	BELCA	
		Wooden fixtures	30		Gov.Bld.Dept	Flush door
			30		BELCA	Flush door
	Misc. other	Toilet screens	65	Terrazo block panel	Gov.Bld.Dept	
			30	Terrazo block panel	BELCA	However, related finishes have a large influence
		Toilet screens	30	Faced sheet steel panel	Gov.Bld.Dept	
			40	Faced sheet steel panel	BELCA	
		Suspended shelves	20	Faced sheet steel panel	BELCA	
		Sinks	(30)		Gov.Bld.Dept	From documents calculating refurbishment costs for government buildings.
			20		BELCA	
		FRP bathtubs	15		Gov.Bld.Dept	
		Stainless steel bathtubs	25		Gov.Bld.Dept	
Electrical Equipment	High -pressure devices	High-voltage power input equipment	25	Interior cubicles	Gov.Bld.Dept	
			30	Interior cubicles	BELCA	
		High-voltage power input equipment	25	Interior cubicles	Gov.Bld.Dept	
			20	Interior cubicles	BELCA	
		Distribution board	25		Gov.Bld.Dept	
			30		BELCA	
		Transformer	30		Gov.Bld.Dept	
			30		BELCA	Interior
		Condenser	25		BELCA	
	Home electrical appliances equipment	Private generators (Diesel-engines)	30		Gov.Bld.Dept	25 years for the engine
			30	For emergency use	BELCA	
	DC power supply devices	Storage batteries (lead)	7	Sealed lead (HS]	Gov.Bld.Dept	
			7	Sealed lead (HS]	BELCA	
		Storage batteries (alkaline)	25	Sealed, AHH	Gov.Bld.Dept	
			15	Pocket alkaline	BELCA	
	Boards	Power control board	25		Gov.Bld.Dept	

Classification		By construction type	Service life	Specifications etc.	Source	Notes
			30		BELCA	
		Lighting distribution board	25		Gov.Bld.Dept	
			30		BELCA	
		Terminal board	30		Gov.Bld.Dept	
			60		BELCA	
	Lighting fixtures	Fluorescent light fixtures	20		Gov.Bld.Dept	
			30		BELCA	
		Incandescent light fixtures	20		Gov.Bld.Dept	
			30		BELCA	
		Guide lamps	20		Gov.Bld.Dept	
			30		BELCA	
	Light electrical appliances	Telephone switchboard	15	Electronic pushbutton telephone	Gov.Bld.Dept	
			30		BELCA	
		Amplifier	20	Rack type	Gov.Bld.Dept	
			25	Rack type	BELCA	Broadcasting amplifier
		Speakers	20	Embedded in ceiling	Gov.Bld.Dept	
			25	Embedded in ceiling	BELCA	
		Intercom	20	Base and satellite system	Gov.Bld.Dept	
			20	Base and satellite system	BELCA	
		Electric clocks	20	Base and satellite system	Gov.Bld.Dept	
			25	Base and satellite system	BELCA	
		TV antennae	10		Gov.Bld.Dept	20 years for masts
			15	With mast	BELCA	
		TV amplifiers	20		Gov.Bld.Dept	
			15		BELCA	
		Mergers and splitters	20		Gov.Bld.Dept	
			20		BELCA	
	Automatic fire detection	Sensors	20	Differential type	Gov.Bld.Dept	
			20	Differential type	BELCA	
		Receivers	20	50L	Gov.Bld.Dept	
			20	P-1 grade, 50 L	BELCA	
	Wiring Appliances	Switches	(30)	Tumbler switch	Gov.Bld.Dept	From documents calculating refurbishment costs for government buildings.
			20	With P	BELCA	
		Sockets	(30)		Gov.Bld.Dept	From documents calculating refurbishment costs for government buildings.
			20	With P	BELCA	
	Wiring and plumbing	Electrical wiring	30		Gov.Bld.Dept	
			40	With P	BELCA	
		Pipes	65	Thin steel cable duct	Gov.Bld.Dept	
			60	Thin steel cable duct	BELCA	
		Cable racks	65	Steel	Gov.Bld.Dept	
			60	Steel	BELCA	
Mechanical Equipment	Heating and cooling sources Equipment	Steel plate boilers	15		Gov.Bld.Dept	
			15		BELCA	
		Cast iron boilers	30	Steam	Gov.Bld.Dept	
			25	Steam	BELCA	
		Smoke tube boilers	20		Gov.Bld.Dept	
		Turbo chillers	20		Gov.Bld.Dept	
			20		BELCA	
		Reciprocating chillers	15		Gov.Bld.Dept	
			15		BELCA	
		Absorption chillers	20		Gov.Bld.Dept	
			20		BELCA	
		Hot air heating Pump chillers	15		Gov.Bld.Dept	
			15		BELCA	
		Cooling tower	13	FRP counterflow	Gov.Bld.Dept	
			15	FRP	BELCA	
	Air conditioning equipment	Compressed air handling unit	20		Gov.Bld.Dept	
			15		BELCA	
		Packaged air conditioning system (water-cooled type)	20		Gov.Bld.Dept	
			15		BELCA	

Classification		By construction type	Service life	Specifications etc.	Source	Notes
		Packaged air conditioning system (hot air heat pump)	15		Gov.Bld.Dept	
			15		BELCA	
	Heating and cooling	Fan coil unit	20		Gov.Bld.Dept	
			15	Exposed, floor mounted	BELCA	
		Fan convector	20		Gov.Bld.Dept	
			15	Exposed, floor mounted	BELCA	
	Total enthalpy heat exchanger	Total enthalpy heat exchanger	20	Rotating	Gov.Bld.Dept	
			15	Rotating	BELCA	
		Heat exchanger unit	20	Embedded in ceiling	Gov.Bld.Dept	
			15	Embedded in ceiling	BELCA	
	Air supply and venting equipment	Blower	20	Centrifugal	Gov.Bld.Dept	
			20	Forward curved fan	BELCA	
		Smoke extractor	25		Gov.Bld.Dept	
			25	Forward curved fan	BELCA	
	Pumps	Lifting pump	20		Gov.Bld.Dept	
			15	Multi-level	BELCA	
		Hot and cold water pump	20		Gov.Bld.Dept	
			15		BELCA	
		Hot water supply and recirculating pump	20		Gov.Bld.Dept	20 years for the motor
			15	Line pump	BELCA	
		Cooling water pump	20		Gov.Bld.Dept	
			15	Volute	BELCA	
		Misc. waste water pump	15		Gov.Bld.Dept	
			10	Submerged	BELCA	
		Fire extinguishing pump	20	Unit-type	Gov.Bld.Dept	
			27	Unit-type	BELCA	
	Water tanks	Water intake tanks, elevated water tanks (made of steel plate)	20	Panel-type	Gov.Bld.Dept	
		Water intake tanks, elevated water tanks (made of FRP)	25	Panel-type	Gov.Bld.Dept	
			20	Panel-type	BELCA	
		Water intake tanks, elevated water tanksmade of stainless steel)	30	Panel-type	Gov.Bld.Dept	
			20	Panel-type	BELCA	
	Tanks,	Oil tanks	30		Gov.Bld.Dept	
		(Underground)	25		BELCA	
		Hot water tank (made of stainless steel)	20		Gov.Bld.Dept	
			15		BELCA	
		Hot water tank (made of stainless steel)	25		Gov.Bld.Dept	
			15		BELCA	
	Pipes	Carbon steel pipes (white) (Water supply)	12		BELCA	
		Carbon steel pipes (white) (water drainage and ventilation)	30		Gov.Bld.Dept	
			20		BELCA	
		Carbon steel pipes (white) (Firefighting)	30		Gov.Bld.Dept	
			25		BELCA	
		Carbon steel pipes (white) (Coolant water)	20		Gov.Bld.Dept	
			20		BELCA	
		Carbon steel pipes (black) (Steam)	20		Gov.Bld.Dept	
			20		BELCA	
		PVC-lined steel pipes (Water supply)	25		Gov.Bld.Dept	
			30		BELCA	
		Copper pipes (hot water)	30	M	Gov.Bld.Dept	
			15	M	BELCA	
		Copper pipes (coolant)	30	L	Gov.Bld.Dept	
			30	L	BELCA	
		Stainless steel pipes (Cold and hot water supply)	30		Gov.Bld.Dept	
			30		BELCA	
		Vinyl pipes (water supply)	20	HIVP	Gov.Bld.Dept	
			30	HIVP	BELCA	
		Vinyl pipes (water drainage)	30	VP	Gov.Bld.Dept	
			25	VP	BELCA	

Classification		By construction type	Service life	Specifications etc.	Source	Notes
		Cast iron pipes (drainage)	40		Gov.Bld.Dept.	
			30		BELCA	
		Fume pipes (water drainage)	28		AIJ	
			40		Gov.Bld.Dept.	
			30		BELCA	
	Air ducts	Air conditioning ducts	30		Gov.Bld.Dept.	
			30		BELCA	
		Pan-type air vent	30		Gov.Bld.Dept.	
			20		BELCA	
		Universal-type air vents	30		Gov.Bld.Dept.	
			20	VHS	BELCA	
	Water boilers	Gas water heaters	10		Gov.Bld.Dept.	
			10		BELCA	
		Electric water heaters	10		Gov.Bld.Dept.	
			10		BELCA	
	Fire extinguishers	Indoor fire hydrants	30		Gov.Bld.Dept.	
			20		BELCA	
		Siamese connection	30		Gov.Bld.Dept.	
			20		BELCA	
		Halogen fire extinguisher spray head	20		Gov.Bld.Dept.	
			25		BELCA	
		Halogen fire extinguisher trigger system	20		Gov.Bld.Dept.	
			25		BELCA	
	Hygienic equipment	Toilet bowl	30	Japanese-style	Gov.Bld.Dept.	
			25	Japanese-style	BELCA	
		Urinal	30		Gov.Bld.Dept.	
			30		BELCA	
		Wash basins	30		Gov.Bld.Dept.	
			25		BELCA	
		Vanity wash basin	15		Gov.Bld.Dept.	
		Faucets	15		Gov.Bld.Dept.	
			20		BELCA	
	Amc Control equipment	Sensors	15	Electronic, temperature	Gov.Bld.Dept.	
			10	Electronic, temperature	BELCA	
		Regulators	15	Electronic, temperature	Gov.Bld.Dept.	
			10	Electronic, temperature	BELCA	
		Controllers	12	Electronic	Gov.Bld.Dept.	
			10	Electronic	BELCA	
		Control panels	10		Gov.Bld.Dept.	
		Central monitoring board	10		Gov.Bld.Dept.	
Elevators	Elevators	Elevators	30	General	Gov.Bld.Dept.	
			25	Standard type	BELCA	

Source for the table: Values of BELCA and 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	Specifications 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 management).
			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	
		Waterproof sheet	20		Kobayashi	Polymer waterproof sheet
			20	Exposed	NTT	Synthetic polymer waterproof roofing sheet
		Painted waterproofing	15		Kobayashi	Polymer coating waterproofing
			20		NTT	Urethane-type x1
		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
	Outer walls	Stones	25	Granite	AIJ	
			25	Granite	NTT	
			25	Granite	Kobayashi	
		Tiling	50	Dry, rectangular, biscuit fired	AIJ	Including partial terracotta finish
			60	4.7 cm square tiles	NTT	
			50	Porcelain	Kobayashi	
		Synthetic resin spraying	25		AIJ	Lysin finish
			25	Mortar setting bed	NTT	Lysin finish
			25		Kobayashi	Lysin finish
	Curtain wall	Aluminum	40		Kobayashi	
	Exterior ceilings (eaves)	Boarding	25	Plasterboard	AIJ	
	Exterior fittings	Steel fittings	35		AIJ	
			50		NTT	
			30		Kobayashi	
		Aluminum fixtures	40		Kobayashi	
		Synthetic resin on steel Painting	5		NTT	
			6		Kobayashi	
	Exterior Misc	Roof railings (made of steel)	25	Wire mesh	AIJ	Steel columns
			25	Wire mesh	Kobayashi	
		Steel fire escape staircase	30	Aluminum	Kobayashi	
Building Interior	Floors	Terrazo block	30		AIJ	
			30		NTT	
			30		Kobayashi	
		Tiling	30	Hard	AIJ	
			30		NTT	
			30		Kobayashi	
		Mortar finish	20	Mortarboard	AIJ	
			25	Mortarboard	NTT	
			20	Mortarboard	Kobayashi	
		PVC tiling	20	Mortar setting bed	NTT	Semi-hardened
			20	Mortar setting bed	Kobayashi	
		Vinyl flooring sheet	18	Mortarboard	AIJ	
			20	Mortarboard	NTT	
		Carpet	15	Mortar setting bed	Kobayashi	Needle-punched carpet

Classification		By construction type	Service life	Specifications etc.	Source	Notes
	Inner walls	Terrazo block	40		AIJ	
		Tiling	30	White narrow tile	AIJ	
			10		NTT	
			50		Kobayashi	
		Mortar finish	20		AIJ	
			36		NTT	
		Multi-layer painted finish	10		NTT	Service life for paint only
		Vinyl wallpaper	10		NTT	Service life for wallpaper only
	Ceilings	Boards	25	Plasterboard	AIJ	
			25		NTT	
			25		Kobayashi	
	Interior fixtures	Aluminum fixtures	50		Kobayashi	
		Steel fixtures	45		AIJ	
		Wooden fixtures	28		AIJ	Flush door
			30		NTT	
			28		Kobayashi	
	Misc. other	Toilet screens	40	Terrazo block panel	AIJ	
		Bath units	20		Kobayashi	From refurbishment costs for apartments (equipment and management No.8804)
Electrical Equipment	High-pressure devices	High-voltage power input equipment	25		AIJ	
			25		Kobayashi	
		Distribution board	25		AIJ	
			25		Kobayashi	
		Transformer	25		AIJ	
			25		Kobayashi	
			30		Kuboi	
		Condenser	20		AIJ	
			20		Kobayashi	
			25		Kuboi	
		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	
	DC power supply devices	Storage batteries (lead)	10		AIJ	
			10		Kobayashi	
			7		Kuboi	
			13	Sealed lead (HS)	BCS	
		Storage batteries (alkaline)	15		Kuboi	
			15	Pocket alkaline	BCS	
	Boards	Power control board	25		AIJ	
			25		Kobayashi	
			20		Kuboi	
	Lighting fixtures	Fluorescent light fixtures	10		AIJ	
			10		Kobayashi	
		Incandescent light fixtures	15		AIJ	
			15		Kobayashi	
	Light electrical appliances	Amplifier	17		AIJ	
		Speakers	18		AIJ	
		Intercom	20	Base unit	AIJ	
			20	Base unit	Kobayashi	
		Electric clocks	20	Base unit	AIJ	
			20	Base and satellite system	Kobayashi	
			15	Base and satellite system	Kuboi	
	Automatic fire detection	Sensors	20	Distributed	AIJ	
			20	Differential type	Kobayashi	
		Receivers	20	Distributed	AIJ	
			20		Kobayashi	
	Wiring Appliances	Switches	5		AIJ	
			6		Kobayashi	

Classification		By construction type	Service life	Specifications etc.	Source	Notes
			17		BCS	
		Sockets	6		AIJ	
			6		Kobayashi	
			16		BCS	
	Wiring and plumbing	Electrical wiring	20		AIJ	
			20		Kobayashi	
		Pipes	20		AIJ	
			20		Kobayashi	
Mechanical Equipment	Heating and cooling sources Equipment	Steel plate boilers	25		AIJ	
			15		BCS	
		Cast iron boilers	10	Sectional boiler	Kobayashi	
			20		Kuboi	
			21.1	Sectional boiler	BCS	
		Smoke tube boilers	15		Kuboi	
			18.9		BCS	
		Turbo chillers	25		Kobayashi	
			20		Kuboi	
			21.1		BCS	
		Reciprocating chillers	15		Kuboi	
			15		BCS	
		Absorption chillers	15		Kuboi	
			17.5		BCS	
		Cooling tower	20		Kobayashi	
			13	FRP	Kuboi	
			14.4		BCS	
	Air conditioning equipment	Compressed air handling unit	15		Kobayashi	
			18		Kuboi	
			17.5		BCS	
		Packaged air-conditioning system (Water-cooled type)	15	Semi-sealed	Kuboi	
			13.4		BCS	
	Heating and cooling	Fan coil unit	20		Kobayashi	
			18		Kuboi	
			15.8		BCS	
		Fan convector	13.6		BCS	
		Cast-iron radiator	30		AIJ	
			20.8		BCS	
	Air supply and venting equipment	Blower	20		AIJ	
			20		Kobayashi	
			18		Kuboi	
			18.6	Sirocco fan	BCS	
	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	
		Hot and cold water pump	17		BCS	
		Hot water supply and recirculating pump	15		AIJ	20 years for the motor
			15		Kobayashi	20 years for the motor
		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	
		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
	Water tanks	Water intake tanks, elevated water tanks (Steel plate)	20		AIJ	
		Water intake tanks, elevated water tanks (made of FRP)	20		Kobayashi	
	Tanks	Hot water tank (made of steel plate)	15		AIJ	
			15		Kobayashi	
			17.1		BCS	

Classification		By construction type	Service life	Specifications etc.	Source	Notes
		Hot water tank (made of stainless steel)	18.7		BCS	
	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	
		Carbon steel pipes (white) (water drainage and ventilation)	18		AIJ	
			18		Kobayashi	
			18.4		BCS	
		Carbon steel pipes (white) (Firefighting)	20		AIJ	
			25		Kobayashi	
		Carbon steel pipes (white) (Coolant water)	18		BCS	
		Carbon steel pipes (black) (Steam)	15		AIJ	
			17.8		BCS	
		PVC-lined steel pipes (Water supply)	18.3		BCS	
		Cast iron pipes (drainage)	28		AIJ	
			28		Kobayashi	
		Fume pipes (water drainage)	28		AIJ	
	Air ducts	Air conditioning ducts	20		AIJ	
			20		Kobayashi	
	Water boilers	Gas water heaters	8.2		BCS	
	Hygienic equipment	Toilet bowl	25	Japanese-style	AIJ	
			25	Japanese-style	Kobayashi	
		Urinal	30		AIJ	
			30		Kobayashi	
		Wash basins	25		AIJ	
			25		Kobayashi	
Elevators	Elevators	Elevators	20		AIJ	
			20		Kobayashi	
			25		Kuboi	

Source for the table: Values of AIJ, NTT, Kobayashi, Kuboi and BCS 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.

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

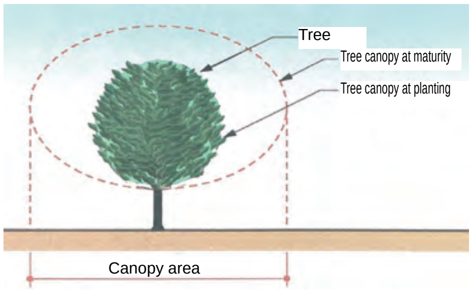
In the CASBEE assessment, tree canopy sizes and green spaces are evaluated focusing on healthy, long-term growth of plants as aimed for by the planners and facility administrators. Thus, calculation in this assessment is largely based on Method A above, with some elements of Method B and other considerations.

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)

[1] Horizontal projected area of medium/tall trees (canopy area)

- 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).

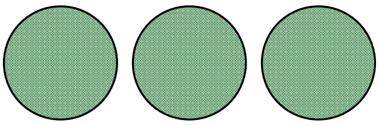


Anticipated radius of tree crown

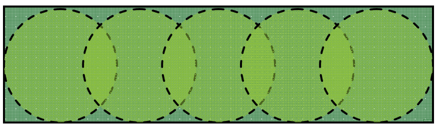
Tree height at time of planting	Anticipated radius of tree canopy	Anticipated area of tree canopy
4.0 m or taller	2.1m	13.8 m^2
2.5 m or taller but lower than 4.0 m	1.6m	8.0 m^2
1.0 m or taller but lower than 2.5 m	1.1m	3.8 m^2

*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).



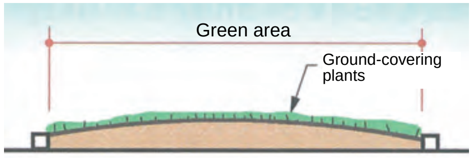
Canopies do not overlap:
Total area of all tree canopies



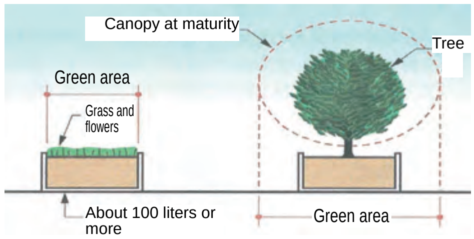
Canopies overlap:
Area of within the canopy perimeter
(bounded by straight lines)

[2] Calculation of green area with ground-covering plants or low trees

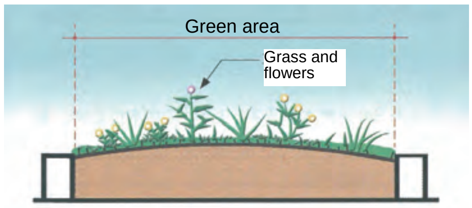
a. Green area with ground-covering plants (e.g. lawn) or low trees
- Apply the horizontal projected area that ground-covering plants (e.g. lawn and other plants) or low trees are expected to cover at the time of maturity (method based on Regulation 23; partially modified for CASBEE).



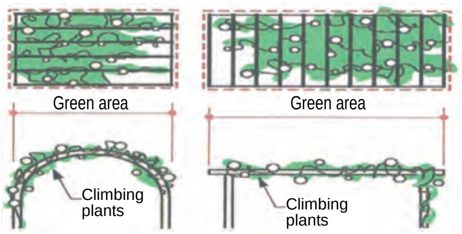
b. Green area with planters/containers
- In cases where planters or containers with a volume of 100 liters or more are used, calculate the area using the method described in [1] or [2]-a.
- In cases where a planter or container is used for a wall, apply the calculation method described in [5] (Regulation 23).



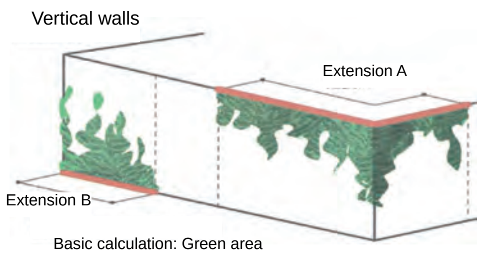
c. Green area of flower beds, etc.
- Apply the horizontal projected area of soil designated for flowers and other plants or of a green facility that is covered with other type of materials (Regulation 9).



d. 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).

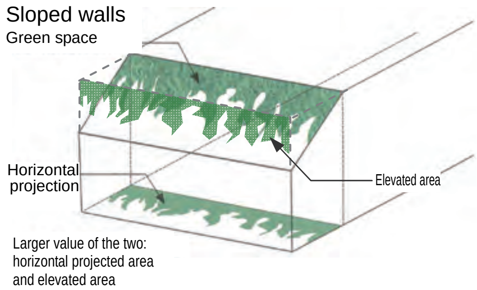


e. Green area of walls
i. Vertical walls
- In cases where plants grow upward from the ground or downward from the rooftop along the walls, calculate green area with the horizontal length of planned green area multiplied by 1.0 m (Regulation 23).
- However, when the said depth is clearly more than 1.0 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., Ministry of Land, Infrastructure, Transport and Tourism, 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. 6.3. 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. 6.4 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.6.3 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.6.4 Examples of Standard Values for Water-Retentive Paving[1)]

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)

*Note: Performance standard not required in water-retentive building materials for roofs, verandas and balconies.

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: 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: 780-2500nm)	—	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〉

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) 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.
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] in the UK, LEED™ (Leadership in Energy and Environment Design[*2] in the USA, and SB Tool (Sustainable Building Tool[*3] 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.

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[*4], starting from the pre-design stage and continuing through design and post design stages.

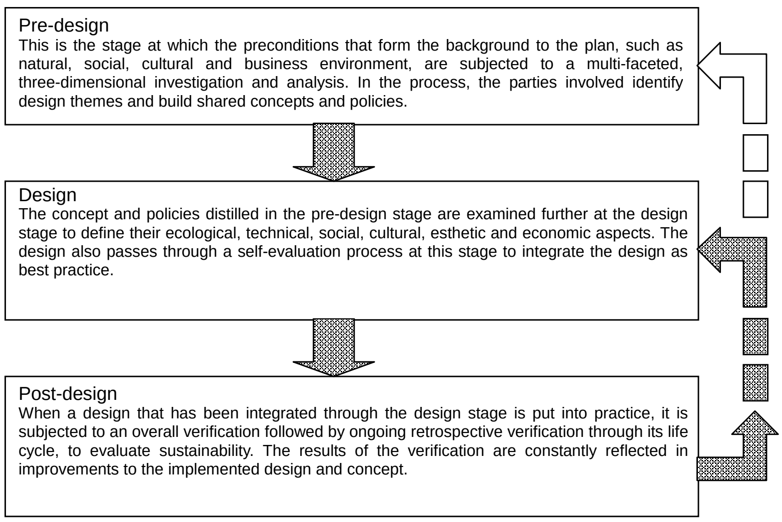


Figure III 1.1 The cyclical process of building design

*1) Building Research Establishment (UK), 1990
*2) US Green Building Council, 1997

*3) "Green Building Challenge" National Resource Canada, 1998 (Name of the organization has changed from GT Tools (Green Building Tools) 2007.

*4) 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 New Construction, CASBEE for Existing Building and CASBEE for Renovation, and to serve at each stage of the design process (figure III 2.2). “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.

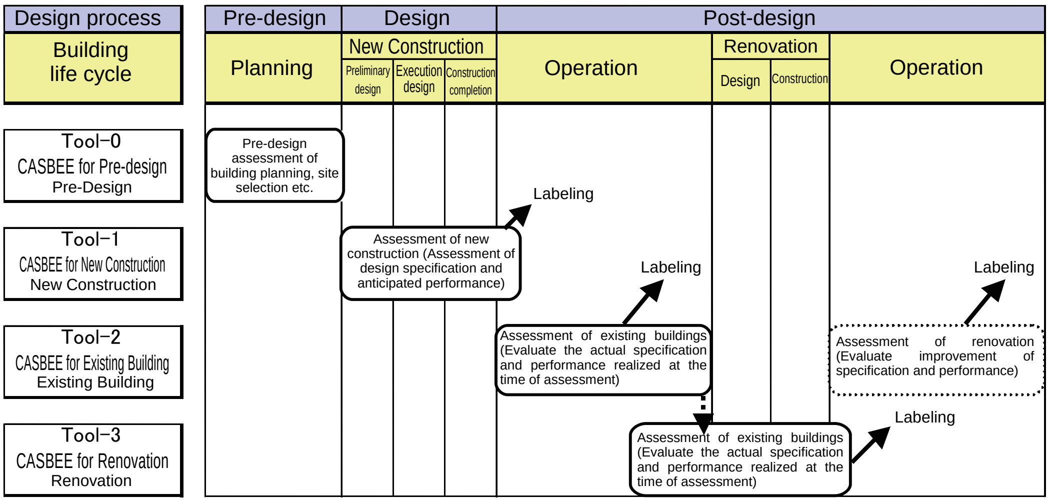


Figure III 1.2 Building Lifecycle and Four Assessment Tools

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 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 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 Renovation

There is growing demand for building stock renovation, especially in Japanese market. In the same way as “CASBEE for 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) Application to buildings for short-term use

The tool "CASBEE for Temporary Construction," was developed as an extension to CASBEE for New Construction for evaluating temporary buildings constructed specifically for short-term use.

(2) Brief versions

Assessment using CASBEE for New Construction may take 3-7 days, including the time required to prepare documents necessary as the basis for scoring. CASBEE for New Construction (Brief version) was developed to meet the growing need for a tool to handle objectives such as those below. It makes a simplified, provisional assessment possible in around two hours (excluding time for the preparation of an Energy Saving Plan).

1) The need for simplified setting of the Built Environment Efficiency level (as a tool for consensus forming between owners, designers and builders, etc.).
2) The need for setting environmental design targets and evaluating attainment (as a proposal management tool etc. under ISO14001).
3) The need for preparation of documents for submission to government agencies, etc. (Environmental measures under construction administration, such as CASBEE-Nagoya and CASBEE-Osaka).

In addition to the above, brief versions of CASBEE for Existing Building, Renovation and Urban Development have also been developed.

(3) Consideration for regional character

As noted above, CASBEE for New Construction (Brief version) 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.

(4) 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-HI 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.

(5) 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. CASBEE for Urban Development was devised to make broader assessments, encompassing measures delivered through urban renewal and district-wide efforts covering multiple buildings.

(6) Detached houses

The CASBEE Basic Tools covered assessment of apartment complexes, but not detached houses. CASBEE for Detached Houses was developed as an assessment tool for detached houses.

Table III 1.1 Expansion of CASBEE for specific purposes (as of July 2010)

Application	Name
Short-term use	CASBEE for Temporary Construction
Brief versions	CASBEE for New Construction (Brief Version), for Existing Buildings (Brief version), for Renovation (Brief version)
For individual areas	CASBEE-Nagoya, CASBEE-Osaka, CASBEE-Yokohama, etc.
Assessment on the efforts in alleviating the heat island phenomenon	CASBEE for Heat Island Relaxation
Assessment on building groups (urban scale)	CASBEE for Urban Development
Assessment on detached houses	CASBEE for Detached Houses (for New Construction, for Existing Building)

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 GB 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" 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 hypothetical 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 hypothetical 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 "the negative environmental impact that extends outside to the public environment beyond the hypothetical enclosed space." The improvement of environmental performance within the hypothetical enclosed space is defined as "the improvement in living amenities for building users." Dealing with both factors, the stage 4 environmental assessment clearly defines these two factors, and distinguishes one from the other as defined by BEE in Equation 1 of the following section. This makes the philosophy of assessment at stage 4 much clearer, and it has been used to form the framework for CASBEE, and it is the basis of the CASBEE framework.

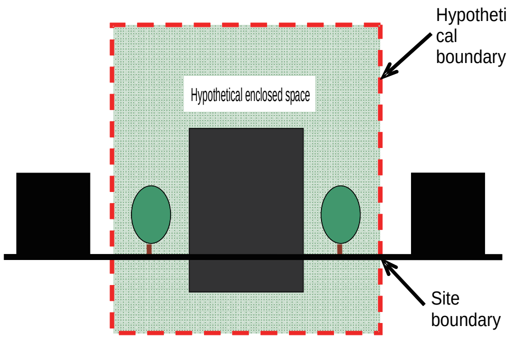


Figure III 1.3 Hypothetical enclosed space divided by the site boundary

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.*[5] 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 "(beneficial output)/(input + non-beneficial 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.

*5 From the World Business Council for Sustainable Development (WBCSD)

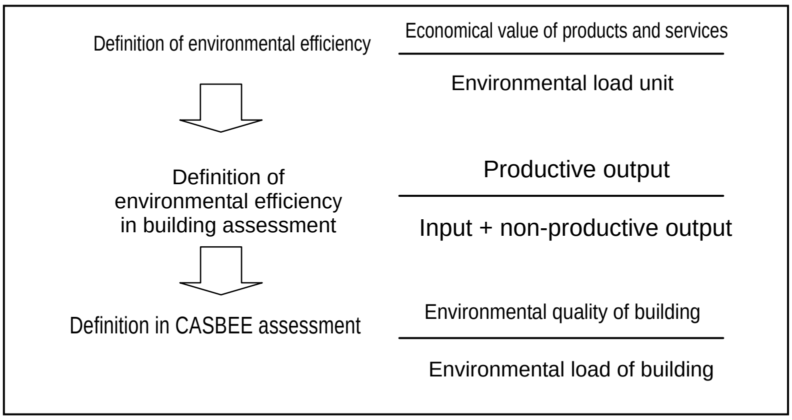


Figure III 1.4 Development from the Eco-efficiency concept to BEE

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 hypothetical 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 which go beyond the hypothetical enclosed space to the outside (the public property)" and "improving living amenity for the building users" 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): Built Environment Quality :
Evaluates "improvement in living amenity for the building users, within the hypothetical enclosed space (the private property)."
L (Load): Built Environment Load:
Evaluates "negative aspects of environmental impact which go beyond the hypothetical enclosed space to the outside (the public property)."

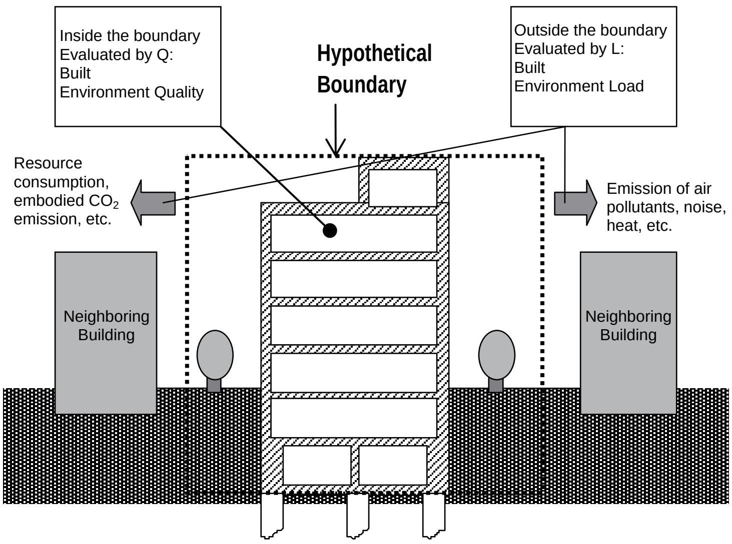


Figure III 1.5 Division of the assessment categories for Q: Built Environment Quality and L: Built Environment Load based on the hypothetical boundary

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 (Built environment quality) and BEE denominator L (Built environment load). Q is further divided into three items for assessment: Q1 Indoor environment, Q2 Quality of services and Q3 Outdoor environment on site. Similarly, L is divided into L1 Energy, L2 Resources & Materials and L3 Off-site Environment.

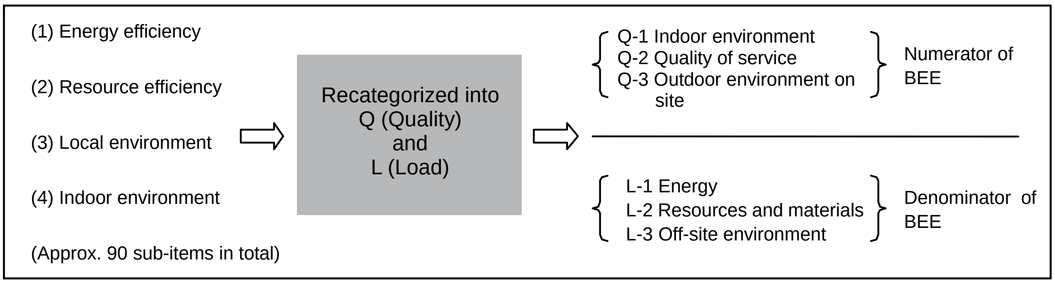


Figure III 1.6 Classification and rearrangement of assessment items into Q (Built environment quality) and L (Built environment load)

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 (built environment quality) as the numerator and L (built environment load) as the denominator.

$$\text{Built Environment Efficiency (BEE)} = \frac{\text{Q (Built environment quality)}}{\text{L (Built environment load)}}$$

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.

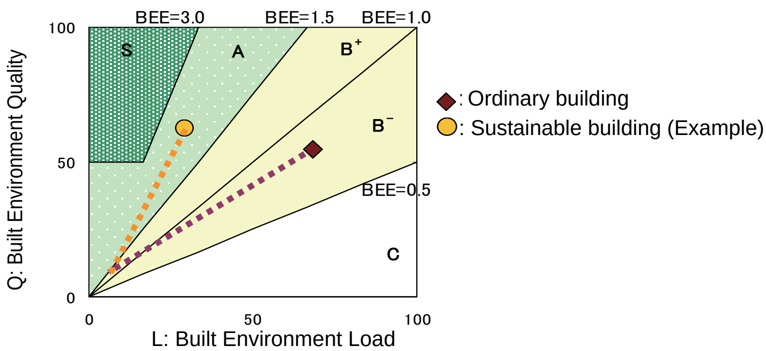


Figure III 1.7 Environmental Labeling Based on Built Environment Efficiency (BEE)

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 living 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, which has been developed as one such evaluation system, is intended to serve applications such as those listed 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 September 2011, 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 designing for the 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 by third-party agencies as an environmental performance assessment tool for labeling buildings when they are valued as assets. The aim is to make assessment by CASBEE for Existing Building a tool that can be used in 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 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. Furthermore, municipal authorities and owners in the private-sector can propose target performance levels as design conditions. Based on environmental performance assessment using CASBEE, designers with optimal performance within a given budget can be awarded high points in competitions.

(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. 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. A wide range of buildings are subject to certification, including those covered by existing buildings, renovation, urban development and home (detached houses), not just new construction.

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. The current categories are CASBEE Building Accredited Professionals, who are specialist engineers and use CASBEE for New Construction, for Existing Buildings, for Renovation, and New Construction (brief version), and CASBEE Detached House Accredited Professionals, who use CASBEE for Detached Houses. The qualification for taking the examination for a CASBEE Building Accredited Professional is that the examinee must have a Japanese first-class architect license.

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 greenhouse gas, 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 an 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.

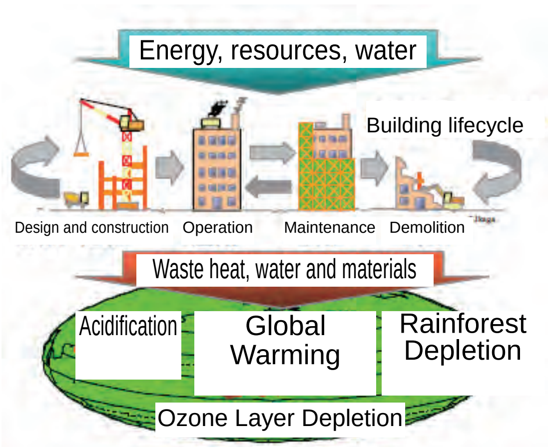


Figure III.2.1 Impact on the global environment generated from buildings

2.2 Basic Approach to Lifecycle CO_2 Assessment Using CASBEE for 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 volume 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 volume 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.

*Note: In this manual, the CO_2 emission volume per unit weight of material is called the CO_2 emission unit, while the CO_2 emission volume per unit energy consumption for each energy type is distinguished as the CO_2 emission coefficient.

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 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 volume, reduction effects, and other aspects related to CO_2 emission.
[3] If the assessor personally gathers detailed data and calculates a more accurate $LCCO_2$ value, that value can be displayed in CASBEE for New Construction as “Individual Calculation” on the Evaluation Results Presentation Sheet under “2-3 Lifecycle CO_2 (Global Warming Impact Chart)”. The results of individual calculations are not reflected in “LR3 1. Consideration of Global Warming” and BEE.
[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 New Construction evaluates the following items within the building’s lifecycle. The total of these three types is the lifecycle CO_2, which is used in the assessment of LR3-1, and is displayed by the assessment software as a graph bar in the Global Warming Impact Chart.

Construction: Manufacture, transportation and construction of materials and components used at the new construction stage.
Repair, renewal/demolition: Manufacture and transportation of materials and components used at the maintenance and refurbishment 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 New Construction.

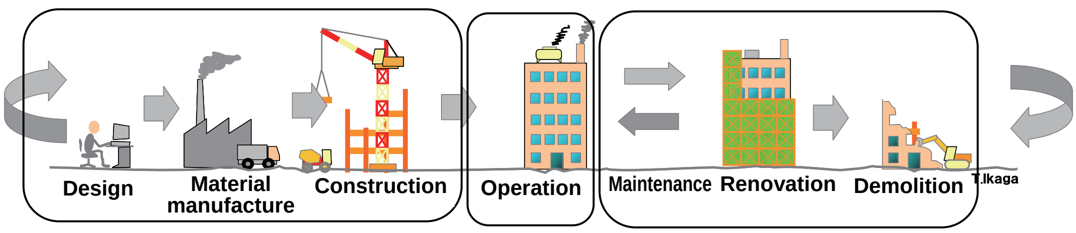


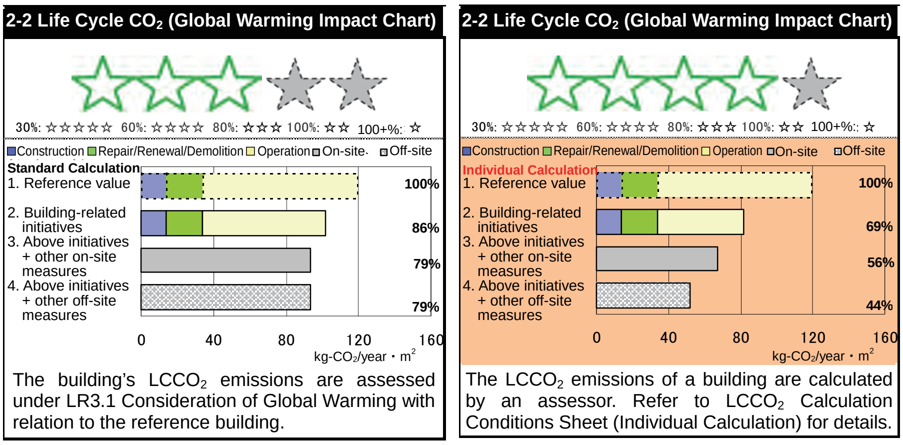
Figure III.2.2 Range of $LCCO_2$ assessment in CASBEE for New Construction

2.3.1 Basic components of $LCCO_2$ assessment

An example of $LCCO_2$ assessment results using CASBEE for New Construction is shown in Figure III.2.3. The 2010 edition now includes the following $LCCO_2$ assessment items:

[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, operation, maintenance and demolition)
[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, operation, maintenance and demolition)
[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 green power certificates and carbon credits)

CO_2 reduction using off-site measures [4] was not yet included in the previous CASBEE assessment, and as the addition of further off-site measures is expected, the 2010 edition allows this assessment only in individual $LCCO_2$ calculations. With the standard calculation, the same value is presented in Item 3 and 4.
Furthermore, bar graphs in Item 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 New Construction (2010 Edition)

2.3.2 CO_2 Emission Volumes at the Construction and Repair, Renewal/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 emission volumes 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 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.4.04"

(Architectural Institute of Japan). Figure III.2.4 shows the method of totaling CO_2 emission volumes using the calculation tools concerned. At each stage, multiply the quantities of materials required for the construction and repair, renewal/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 volume calculations (Standard Calculation).

- CO_2 emission units are analysis results produced by the Architectural Institute of Japan from the 1995 Industrial Input-Output Table (compliant with "AIJ-LCA&LCW_ver.4.04"), 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.4.04."
- 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.

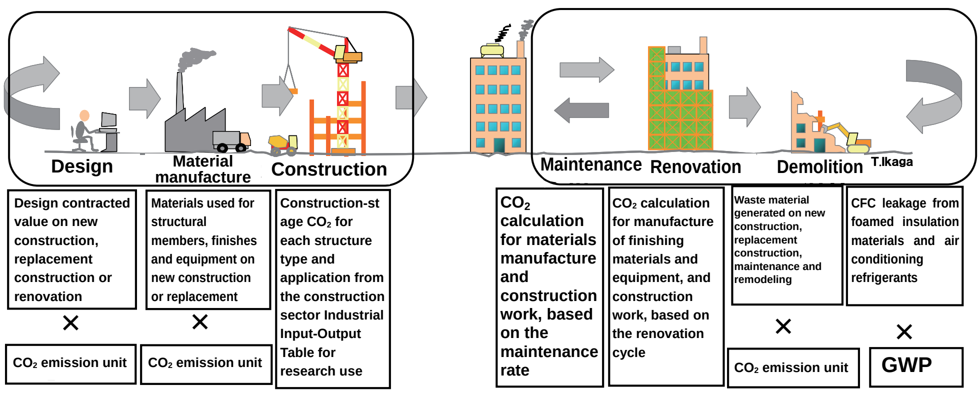


Figure III.2.4 Total of CO_2 mission volumes in the building LCA Guidelines ("Construction" and "Repair, renewal/demolition" stages)

Table III.2.1 CO_2 emission units for representative materials

Regular concrete	282.00	Kg-CO_2/m^3
Blast furnace cement concrete	206.00	Kg-CO_2/m^3
Steel frame*	0.90	Kg-CO_2/kg
Steel reinforcement	0.70	Kg-CO_2/kg
Formwork	7.20	Kg-CO_2/m^2

*Note: 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 reinforcement (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

*Note: 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, meeting halls --- Fixed 60 years.
- Retailers, restaurants, factories ---- Fixed 30 years
- Houses --- 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 “2.3 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 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)	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 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)	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 354 issued in 2009, regarding Section 3. Reduction of Deterioration in the Japan Housing Performance Standards, under the Housing Quality Assurance Law)	Lifespan of structure and foundation: 90 years

[2] Resource-saving efforts

“Continuing Use of Existing Structural Skeletons etc.” and “Use of Recycled Construction Materials" are evaluated under Resources and Materials (LR2), 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 emission volumes 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 maintenance/renewal/demolition stage

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 emission volumes at the construction stage (kg-CO_2/year m^2)

Building type			S/Wood	RC	SRC
Offices			13.61	13.85	13.92
	LR2/2.2 Existing building structural skeletons	100%	6.54	6.67	6.57
	LR2/2.3 Recycled materials (blast furnace cement	100%	12.71	12.60	12.81
Schools			10.24	12.66	14.51
	LR2/2.2 Existing building structural skeletons	100%	5.45	5.48	5.48
	LR2/2.3 Recycled materials (blast furnace cement)	100%	9.68	11.28	12.98
Retailers			16.13	24.24	16.74
	LR2/2.2 Existing building structural skeletons	100%	8.57	8.75	8.61
	LR2/2.3 Recycled materials (blast furnace cement)	100%	15.04	21.36	15.76
Restaurants			16.13	24.24	16.74
	LR2/2.2 Existing building structural skeletons	100%	8.57	8.75	8.61
	LR2/2.3 Recycled materials (blast furnace cement)	100%	15.04	21.36	15.76
Halls			10.96	13.47	13.59
	LR2/2.2 Existing building structural skeletons	100%	5.61	5.72	5.64
	LR2/2.3 Recycled materials (blast furnace cement)	100%	10.41	12.03	12.22
Factories			18.18	22.71	23.15
	LR2/2.2 Existing building structural skeletons	100%	9.73	9.74	9.76
	LR2/2.3 Recycled materials (blast furnace cement)	100%	17.06	20.28	21.04
Hospitals			10.39	13.24	14.18
	LR2/2.2 Existing building structural skeletons	100%	6.56	6.69	6.59
	LR2/2.3 Recycled materials (blast furnace cement)	100%	9.88	12.00	12.88
Hotels			10.92	13.97	13.89
	LR2/2.2 Existing building structural skeletons	100%	5.81	5.92	5.83
	LR2/2.3 Recycled materials (blast furnace cement)	100%	10.23	12.35	12.58

Apartments

			S/Wood	RC	SRC
Level 3			15.93	21.94	24.55
	LR2/2.2 Existing building structural skeletons	100%	9.55	9.37	9.30
	LR2/2.3 Recycled materials (blast furnace cement)	100%	14.88	19.61	22.19
Level 4			8.06	11.07	12.37
	LR2/2.2 Existing building structural skeletons	100%	4.88	4.78	4.75
	LR2/2.3 Recycled materials (blast furnace cement)	100%	7.54	9.91	11.19
Level 5			5.47	7.47	8.35
	LR2/2.2 Existing building structural skeletons	100%	3.35	3.28	3.26
	LR2/2.3 Recycled materials (blast furnace cement)	100%	5.12	6.70	7.56

Table III.2.5 CO_2 emissions at repair/renewal/demolition stage (kg-CO_2/yr-m^2)

Building type	S/Wood	RC	SRC
Offices	20.23	20.67	20.39
Schools	16.68	17.14	17.21
Retailers	12.20	13.19	12.20
Restaurants	12.20	13.19	12.20
Halls	17.39	18.04	17.84
Factories	13.62	14.27	14.15
Hospitals	20.24	20.89	20.71
Hotels	18.11	18.80	18.48

Apartments

	S/Wood	RC	SRC
Level 3	13.58	14.10	14.12
Level 4	14.94	15.09	15.05
Level 5	16.22	16.23	16.17

2.3.3 CO_2 Emission Volumes at the Operation Stage

1. Basic guidelines and key points

The key points of the calculation method (standard calculation) for CO_2 emission volume at the operation stage are described below.

[1] Calculate CO_2 emission volume on the basis of assessment results for the four medium-level 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 2010 edition allows use of the most recent actual emission coefficients and alternative values (i.e. the actual 2008 values and the published values announced in December 2009). 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 operational 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 operational stage obtained according to the Energy Conservation Law.

As indicated above in Item 3, evaluation of energy efficiency in CASBEE is based on PAL and ERR values (energy reduction rates), thus calculation and CO_2 conversion of primary energy consumption of reference and target buildings is required. This approach enables an easy calculation of CO_2 emissions using energy efficiency calculation data. At the same time, however, it means that the energy composition ratio of the assessment subject is no longer reflected in the results. 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.
These issues, arising from the simplification of CASBEE LCCO_2 evaluation, were not sufficiently rectified in the 2010 edition. As such, a further review is currently underway.

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] As with the reference building, the energy consumption ratio of targeted building specific to energy and building types is obtained based on the same statistical data.
[3] The CO_2 emissions figure of the targeted building is based on increase or decrease in the levels of the secondary assessment items in LR1 as compared to the CO_2 emissions of the reference building.

A. CO_2 emission volume for the reference building

[1] Estimation of the CO_2 emission volume for the reference building
For each building type, this is derived from the primary energy consumption unit per floor area, based on statistical data (the average value for all samples) and the mix of energy source types used (Table III.2.6). Based on this data, the consumption of each energy source type is estimated for each building type, and multiplied by the CO_2 emission coefficient to produce the CO_2 emission volume.
The CO_2 emission coefficient used in the standard calculation are as shown in Table III.2.7.

CO_2 emission volume for the reference building (kg CO_2/year)
= Σ (primary energy consumption by the reference building (MJ/year)
× Ratio of primary energy consumption of energy source type i by building type
× CO_2 emission coefficient for energy source type i (kg CO_2/MJ))

[2] Estimation of CO_2 conversion factor for each building type
The CO_2 conversion factor (CO_2 emission volume per unit of primary energy consumption) for each building type were derived from the primary energy consumption values for each building type in the reference building, found in [1] above, and the CO_2 emission volumes. Energy consumption volumes are estimated from LR1 scoring levels for the evaluated building. When estimating CO_2 emission volume in the evaluated building, use this CO_2 conversion factor to convert primary energy consumption to CO_2.

Conversion factor for each building type in the reference building (kg CO_2/MJ)
= CO_2 emission volume from the reference building (kg CO_2/year) /
Primary energy consumption in the reference building (MJ/year)

Table III. 2.6 Statistical data of primary energy consumption

Building type	No. of documents	Primary energy consumption	Primary energy composition ratio per energy source		
	2003	[MJ/m²-yr]	Electricity	Gas	Other
Offices	558	1,936	87%	11%	1%
Schools	28	1,209	87%	9%	3%
Elementary, junior high and high schools*1	-	367	50%	50%	0%
Retailers	20	3,225	92%	7%	1%
Restaurants	28	2,923	89%	10%	1%
Halls	188	2,212	80%	14%	6%
Factories*2	―	330	100%	0%	0%
Hospitals	45	2,399	67%	15%	18%
Hotels	50	2,918	66%	19%	15%

(Source: 2004 Building Energy Consumption Survey Report, The Building-Energy Manager's Association of Japan, March 2005)
*1 Primary energy consumption data are based on the DECC data-based ranking of application-specific energy consumption in existing buildings, 2009 Architectural Institute of Japan Lecture Digest (D1 Environmental Engineering). Electricity and gas ratios are uniformly set at 50% due to large regional fluctuations.
*2 Only lighting is included. Actual values in office areas are applied.

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	*Note: Value converted at 9.76 MJ/kWh (All Japan average for 2009 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	
Other	0.0686	kg-CO_2/MJ	(Average value for kerosene + type A heavy oil)

B. CO_2 emission volume from the evaluated building

The CO_2 emission volume from the evaluated building is evaluated by assuming the reference building to be equivalent to the PAL/CEC standard value under the Energy Saving Law, and totaling the CO_2 reduction effects yielded by the use of each energy-saving method in the evaluated building. Thus, as Figure III.2.5 shows, start from energy consumption quantity $\boxed{A}$ for the reference building, then estimate the CO_2 reduction quantities (effect magnitudes) for the energy-saving effects under each of the four items in LR1 assessment, and subtract those reduction quantities from $\boxed{A}$ to derive energy consumption $\boxed{E}$ for the evaluated building. Multiply the E value by the CO_2 conversion factor to find the CO_2 emission volume.

CO_2 emission volume E’ for the evaluated building (kg CO_2/year)
＝ CO_2 emission volume for the reference building $\boxed{A'}$ (kg CO_2/year)
－ CO_2 reduction due to the control of Building Thermal Load (kg CO_2/year)
－ CO_2 reduction due to Efficiency in Building Service System (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 the control of Building Thermal Load (a) (MJ/year)
－ Primary energy consumption reduction due to Efficiency in Building Service System (b) (MJ/year)
－ Annual Natural Energy Usage (c) (MJ/year)
－ Primary energy consumption reduction due to Efficient Operation (d) (MJ/year)
× CO_2 conversion factor for each building type in the reference building (kg CO_2/MJ)

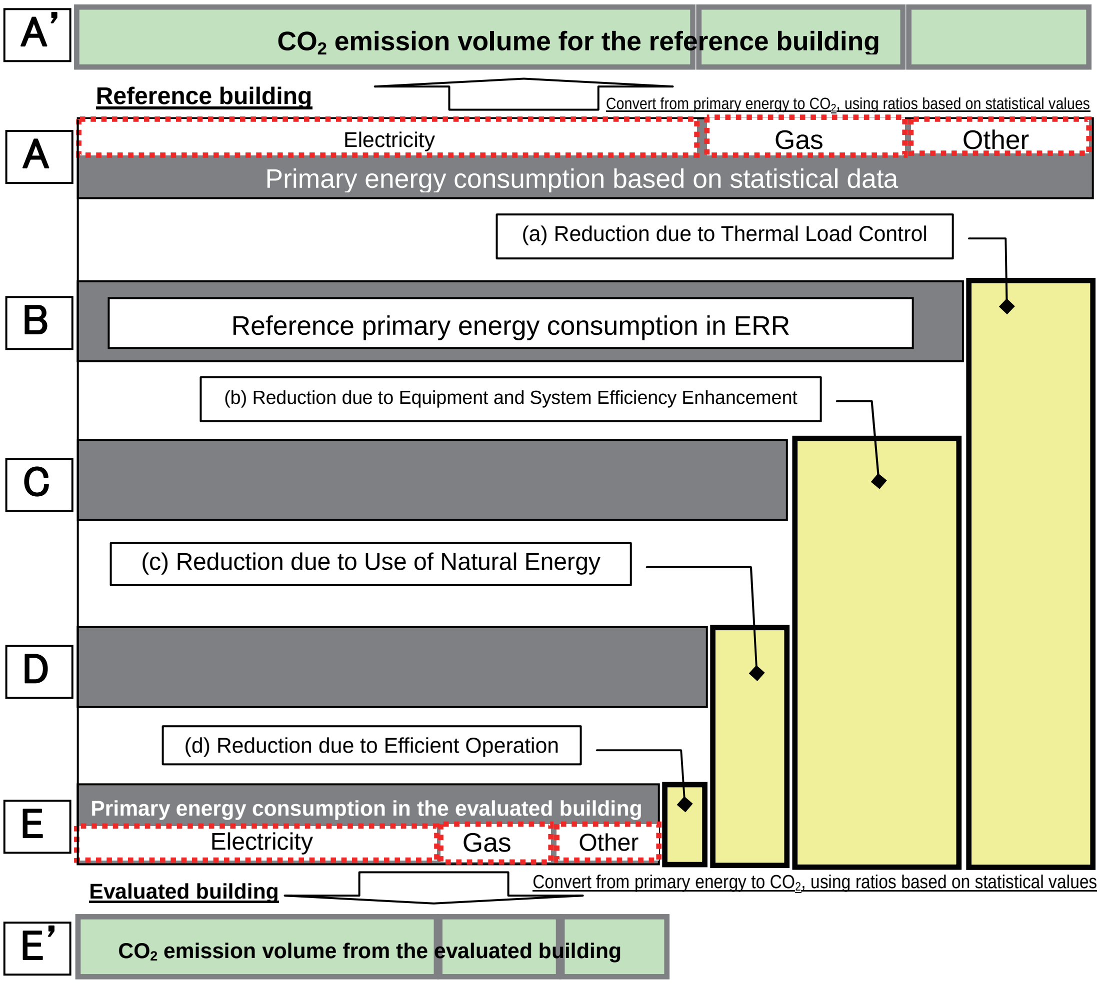


Figure III.2.5 Approach to calculating CO_2 emissions of the evaluated building

[1] Calculation method for effect magnitudes

(a) Building Thermal Load

As we have assumed that the reference building has a specification equivalent to the performance standards (PAL values), we can correct according to the PAL of the evaluated building. If the PAL value of the evaluated building is lower than the standard, the energy consumption for the air conditioning is reduced for the amount of the thermal load reduction. The primary energy consumption corrected for the amount of thermal load control, which is the reduction in air conditioning energy due to PAL, is calculated by the following formula.

Primary energy consumption reduction due to the control of Building Thermal Load (a) (MJ/year)
＝(Reference PAL value [MJ/year-m^2] – PAL value of the evaluated building [MJ/year-m^2])
×perimeter area of the evaluated building [m^2] x CEC-AC standard value [-]

The perimeter area is already calculated in the PAL calculation process for each building, but if it cannot be calculated by the specification standards (Point values) or in similar circumstances, simplification is required in order to perform the calculation. In this case, we have decided to employ the following approximation:

Perimeter area [m^2] = Average perimeter area per above-ground floor [m^2/floor]
x Number of above-ground stories [N]

The average perimeter area per above-ground floor [m^2/floor] is obtained with the following formula using an established average floor length [m] based on assumption that the floor is

square-shaped.
Average perimeter area per above-ground floor [m^2/floor] =
(2 x average above-ground floor length [m] - 10) x 5 [m] ÷ 2 x 4

However, in cases where the average above-ground floor length is less than 10 m, apply the following formula:
Average perimeter area per above-ground floor [m^2/floor] = Average floor area per above-ground floor Af_{ave} [m^2/floor]

Average floor area per above-ground floor [Af_{ave}] specific to building types is calculated using number of above-ground stories N.
Average floor area per above-ground floor [Af_{ave}] specific to building type
＝Total floor area of building type i, excluding underground floors [ΣAf] ÷Total number of floors of building type i, excluding underground floors [N]

(b) Efficiency in Building Service System
Use ERR to evaluate Efficiency in Building Service System.
In cases where assessment of ERR and the k value (energy-efficiency obtained via specific service systems) within the ERR evaluation includes natural energy utilization, evaluate by subtracting the corresponding values from annual natural energy usage (do not duplicate; this category includes use of solar heat in hot water supply systems, solar power generation system, daylight use in lighting systems, etc.).

Primary energy consumption reduction due to Efficiency in Building Service System (b) [MJ/year]
＝ERR of the evaluated building [-] x (primary energy consumption by the reference building [MJ/year]
－Primary energy consumption reduction due to the control of Building Thermal Load (a) [MJ/year])

(c) Natural Energy Utilization
Use annual natural energy usage (primary energy usage standard, per unit floor area) at the Execution Deign and Construction Completion stages for the calculation.
In cases where assessment of ERR and the k value (energy-efficiency obtained via specific service systems) within ERR evaluation includes natural energy utilization, evaluate by subtracting the corresponding values from annual natural energy usage (do not duplicate; this category includes use of solar heat in hot water supply systems, solar power generation system, daylight use in lighting systems, etc.).

(d) Efficient Operation
To evaluate Efficient Operation, use the energy consumption of the evaluated building, after taking the three items of the control of Building Thermal Load, Natural Energy Utilization and Efficiency in Building Service System into account, as the parameter. 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.2.8 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 methods to use with the specification standards (Point values)

For small-scale buildings, and for buildings with certain building types, LR1 can be evaluated using the specification standards (Point values), or qualitatively on a checklist basis, without calculating the values of PAL, ERR etc. Table III.2.9 shows the method for converting the values necessary for the assessment described in [1] in such cases. Follow that method to convert to a PAL value or ERR value, and use it to calculate the CO_2 emission volume for the evaluated building. Furthermore, in individual assessments of direct and converted use of natural energy, apply the formula below to convert the assessed values to annual usage in order to calculate CO_2 emissions.

Table III.2.9 Method to convert qualitative assessment data into quantitative assessment data

Assessment Item		Assessme	Conversion to quantitative assessment data	Notes
1. Thermal load control		Level 1	PAL = Standard value x 1.1	Level 1 (exceeding standard value)
		Level 2	PAL = Standard value	Level 2 (up to standard value x 0.95)
		Level 3	PAL = Standard value x 0.95	Level 3 (up to standard value x 0.85)
		Level 4	PAL = Standard value x 0.85	Level 4 (standard value x 0.85 or below)
		Level 5	—	(No corresponding level)
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 (15 MJ/m^2 or more)
	Converted 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	Level 5 (15 MJ/m^2 or more)

[3] Conversion of primary energy consumption into CO_2 emissions

To estimate CO_2 emissions of the targeted building at the operational stage, multiply the energy consumption of the building, as calculated in [1] and [2] above, by the CO_2 conversion factor specific to building type (Table III.2.6).

3. For apartment complexes

A. CO_2 emission volume for the reference building

Assessment of apartment complexes begins with setting the CO_2 emission volumes related to energy consumption for each use of energy in an ordinary home (heating and cooling, hot water supply, lighting, electrical appliances, cooking and ventilation for private areas, and equipment in common areas) for each energy-saving area and category, as shown in Table III.2.10. (This is called the “Standard Calculation”.)

CO_2 emission volume from the reference building at the operation stage

= (CO_2 emission volume standard value for private areas + CO_2 emission volume standard value for common areas) x Floor area of private areas
= ((CO_2 emission volume standard value for heating applications + CO_2 emission volume standard value for cooling applications + CO_2 emission volume standard value for hot water supply + CO_2 emission volume standard value for lighting, electrical appliance and cooking applications + CO_2 emission volume standard value for ventilation) + CO_2 emission volume standard value for common areas) x Floor area of private areas

The standard values of building service systems, excluding heating systems, used in CASBEE for new detached houses are applied in the above calculation. The values are based on data from IBEC's Design Guideline for Self-Sustainable Houses (hereinafter referred to as the Sustainability Guideline) and the Calculation Conditions for Primary Energy Consumption in High-Efficiency Energy Systems for Residential and Other Buildings published in 2010 by New Energy and Industrial Technology Development Organization (hereinafter NEDO Energy Calculation Conditions). The values are specific to each power producer/supplier. Furthermore, the standard values used for heating systems are adjusted for apartment use. For common areas of the building, the rate of 820 kWh/yr/unit (assuming 80 m^2/unit) is set as the standard.*

*Note: The value is based on high/mid-rise apartment analysis cited in Planning Guide for Housing Co-generation Systems published in 1997 by the Institute of Building Environment and Energy Conservation.

B. CO_2 emissions of subject building

CO_2 emissions for each energy application of the targeted building (e.g. heating and cooling, hot water supply, lighting, electrical appliances, cooking and ventilation for private areas, and service systems in common areas) are calculated with increase or decrease as compared to the corresponding standard values specific to energy application type. For this calculation, the selected LR1 scoring items related to CO_2 emissions at the operational stage of the building are used as calculation conditions as shown in Table III.2.10. The standard values, without increase/decrease, are applied to energy applications with no scoring items indicated in the table below (i.e. lighting, electrical appliances, cooking and ventilation).

CO_2 emissions of the subject building at the operation stage
= CO_2 emissions in private areas + CO_2 emissions in common areas
= (CO_2 emissions for heating systems + CO_2 emissions for cooling systems + CO_2 emissions for hot water supply systems
+ CO_2 emissions for lighting/appliances/cooking devices + CO_2 emissions for ventilation)
+ CO_2 emissions in common areas

Table III.2.10 Scoring items used for calculation of CO_2 emissions at the operation stage

Energy application		Assessment item in LR1 Energy
Private areas	Heating	1. Building Thermal Load
	Cooling	2.1 Direct Use of Natural Energy
	Hot water supply	3.c Hot Water Supply System
	Lighting	—
	Electrical appliances	—
	Cooking	—
	Ventilation	—
Common areas		3.a/3.b ERR in Common Areas

The CO_2 emission volume calculation methods for each application are stated below.

(a) Heating

For heating applications, find the consumption rate from the assessment level for “1. Building Thermal Load” and multiply by the standard value to find the CO_2 emission volume.

CO_2 emission volume for heating = LR1/1.1 consumption rate x standard value for heating applications x private floor area

Table III.2.11 Relationship between scoring level and consumption rate for heating applications

	Level 1	Level 2	Level 3	Level 4	Level 5
LR1/1.1 Building Thermal Load	150	125	100	-	69

(b) Cooling

Consider natural ventilation and air movement as assessment subjects for cooling applications, find the consumption rate from the assessment level for “1.2.1 Direct Use of Natural Energy,” and multiply it by the standard value to find the CO_2 emission volume.

CO_2 emission volume for cooling = LR1/1.2.2 consumption rate x standard value for cooling applications x private floor area

Table III.2.12 Relationship between scoring level and consumption rate for cooling applications

	Level 1	Level 2	Level 3	Level 4	Level 5
LR1/1.2.1 Direct Use of Natural Energy	-	110	100	90	80

(c) Hot water supply

For hot water supply, find the consumption rate from the assessment level for “3.c. Hot Water Supply System” and multiply by the standard value for each type (individual/central) to find the CO_2 emission volume.

CO_2 emission volume for hot water supply = LR1/3.4 consumption rate x standard value for hot water supply x private floor area

Table III.2.13 Relationship between scoring level and consumption rate for hot water supply applications

		Level 1	Level 2	Level 3	Level 4	Level 5
LR1/3.c Hot Water Supply System	Individual	117	100	83	-	71
	Central	110	100	95	85	65

(d) Common areas

For common areas, ERR is obtained based on the assessment results of applications included in 3. Efficiency in Building Service System (i.e. ventilation and lighting systems, elevators and energy efficiency improvement systems) and then applied to the calculation using the following formula:

CO_2 emissions in common areas
= CO_2 consumption rate in common areas x Standard value in common areas
x Floor space of private areas

In this case,
CO_2 consumption rate [%] in common areas = 100 - ERR

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 operational 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 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. 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.

In standard calculation, energy-saving effects are calculated automatically by applying emission coefficients when the value of annual solar-generated electricity (kWh) is entered in the Energy Calculation Sheet used for energy-saving assessment. 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 green power 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. As such, these efforts are categorized as off-site initiatives and included in $LCCO_2$ assessment in the 2010 edition of CASBEE.
The following off-site measures are evaluated in this category:

[1] Measures implemented by building owners or users
- Green electricity/heat certifications
- Kyoto credits
- Domestic credits, offset credits, 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 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 emission coefficients*[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 (Ministry of the Environment et al).
*2 Values are based on Article 20-2 of the Ordinance on Reporting of Greenhouse Gas Emissions (Ministry of the Environment 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 the Ministry of Environment 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 2010 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.2.14 Actual/adjusted CO_2 emission coefficients per power provider

(t-CO_2/kWh)

General PPS	Real emission coefficient	Adjusted emission coefficient	Specified PPS	Real emission coefficient	Adjusted emission coefficient
Hokkaido Electric Power Co., Inc.	0.000588	0.000588	eREX Co., Ltd.	0.000462	0.000462
Tohoku Electric Power Co., Inc.	0.000469	0.00034	Eneserve Corp.	0.000422	0.000422
Tokyo Electric Power Co., Inc.	0.000418	0.000332	Ennet Corp.	0.000436	0.000436
Chubu Electric Power Co., Inc.	0.000455	0.000424	F-Power Co., Ltd.	0.000352	0.000352
Hokuriku Electric Power Co., Inc.	0.00055	0.000483	Oji Paper Co., Ltd.	0.000444	0.000444
Kansai Electric Power Co., Inc.	0.000355	0.000299	Summit Energy Corp.	0.000505	0.000505
Chugoku Electric Power Co.,Inc.	0.000674	0.000501	GTF Green Power Co., Ltd.	0.000767	0.000767
Shikoku Electric Power Co., Inc.	0.000378	0.000326	Showa Shell Sekiyu K.K.	0.000809	0.000809
Kyushu Electric Power Co., Inc.	0.000374	0.000348	Nippon Steel Engineering Co., Ltd.	0.000759	0.000759
Okinawa Electric Power Co., Inc.	0.000946	0.000946	Nippon Oil Corporation	0.000433	0.000433
			Diamond Power Corp.	0.000482	0.000482
			Japan Wind Development Co., Ltd.	0	0
			Panasonic Corp.	0.000679	0.000679
			Marubeni Corp.	0.000501	0.000412

(2008 actual data published on December 28, 2009)

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. 4.04 developed by the Architectural Institute of Japan)
- Reference for CO_2 emission units (e.g. 1995 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 reinforcement (t/m^2), etc.
- Environmental load of main materials: regular concrete (kg-CO_2/m^3), blast furnace cement concrete (kg-CO_2/m^3), steel frame (kg-CO_2/t), steel frame (electric furnace) (kg-CO_2/t), steel

reinforcement (kg-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 (other use), etc.
- CO_2 emissions at maintenance/renewal/demolition stage (calculation results)
- Maintenance period (yr) (exterior/interior/service systems)
- Average repair rate (%/yr) (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 operational 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 unit per energy type (electricity, gas and other sources)
- Other

■LCCO2 Calculation Conditions Sheet (Individual Calculation) ■Building Name XX Building

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Item		Reference Value (Standard Building)	Subject	Note
Building Overview	Building type	Office,	Office,	
	Total floor area	15,000m²	15,000m²	
	Structure	RC	RC	
Life Cycle	Estimated service life			
Construction Stage	CO_2 emissions	30.00	30.00	kg-CO_2/yr-m²
	Embodied CO_2 calculation method			
	Reference for CO_2 emission unit			
	Boundary			
	Main Materials			
	Regular concrete	XX	〃	m³/m²
	Blast furnace cement concrete	XX	〃	m³/m²
	Steel frame	XX	〃	t/m²
	Steel frame (electric furnace)	XX	〃	t/m²
	Steel reinforcement	XX	〃	t/m²
	XX	XX	〃	t/m²
	XX	XX	〃	kg/m²
	Environmental Load of Main Materials			
	Regular concrete	XX	〃	kg-CO_2/m³
	Blast furnace cement concrete	XX	〃	kg-CO_2/m³
	Steel frame	XX	〃	kg-CO^2/kg
	Steel frame (electric furnace)	XX	〃	kg-CO^2/kg
	Steel reinforcement	XX	〃	kg-CO^2/kg
	Wood	XX	〃	kg-CO_2/yr-m²
	XX	XX	〃	kg-CO^2/kg
	Main Recycled Materials and Usage			
	Blast furnace cement (structural use)	XX	XX	
	Existing skeleton materials (structural use)	XX	XX	
	Electric furnace steel (reinforcement)	XX	XX	
	Electric furnace steel (other use)	XX	XX	
Maintenance & Demolition Stage	CO_2 emissions	10.00	10.00	kg-CO_2/yr-m²
	Maintenance period (yr)			
	Exterior			
	Interior			
	Service system			
	Average repair rate (%/yr)			
	Exterior			
	Interior			
	Service system			
	Calculation method for demolition-related CO2 emissions			
Operation Stage	CO2 emissions			
	1. Reference value/2.Building-related initiatives	30.00	20.00	kg-CO_2/yr-m²
	3. Above + other on-site initiatives	—	-15.00	kg-CO_2/yr-m²
	Reference	Solar power-related reduction		
		incl. in-house consumption		
		incl. surplus trade		
		Other renewable energy		
	4. Above + other off-site measures	—	-25.00	kg-CO_2/yr-m²
	Reference	(a) Carbon offsetting with green power certificate		
		(b) Carbon offsetting with green heat certificate		
		(c) Other carbon credit		
		(d) Difference between actual and adjusted emissions (obtained using the adjusted emission coefficient)		
	Calculation method for energy consumptions	Based on XX	Based on XX	
	Primary energy consumptions	XX	XX	MJ/yr-m²
	CO_2 emission unit per energy type			
	Primary energy	XX	As reference value	kg-CO_2/MJ
	Electricity	XX	As reference value	kg-CO_2/kWh
	Gas	XX	As reference value	kg-CO^2/MJ
	Other energy ( )	XX	As reference value	kg-CO^2/MJ
	Treated water			
Other				

Figure III. 2.6 $LCCO_2$ Calculation Conditions Sheet (Individual Calculation)

〈Reference〉 Values available for individual calculation

Operation Stage	Reduction in CO2 emissions with use of solar power			
	Solar-generated power	Total	110,000	kWh/yr
		In-house consumption	110,000	kWh/yr
		Excess power sold	0	kWh/yr
	Reduction in CO2 emission	Total [1]	9.00	kg-CO_2/yr-m²
		In-house consumption	8.51	kg-CO_2/yr-m²
		Excess power sold	0.00	kg-CO_2/yr-m²
	Difference over emission value (using adjusted coefficient)			
	Electricity consumption of the subject building (3)		640,066	kWh/yr
	Emission coefficient	Real emission coefficient	0.418	kg-CO_2/kWh
		Adjusted emission coefficient	0.332	kg-CO_2/kWh
	Difference over real emission	Entire building	55,046	kg-CO2/yr
		Per gross floor area (2)	10.19	kg-CO2/yr-m²

Figure III. 2.7 Examples of reference values used in $LCCO_2$ Calculation Conditions Sheet (Individual Calculation)

Afterword

This publication is developed by the CASBEE Research Committee established as part of a joint industrial/government/academic project with the support of the Housing Bureau of the Ministry of Land, Infrastructure, Transport and Tourism and led by the Japan Sustainable Building Consortium (chaired by Shuzo Murakami, President of Building Research Institute). 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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Project Organization

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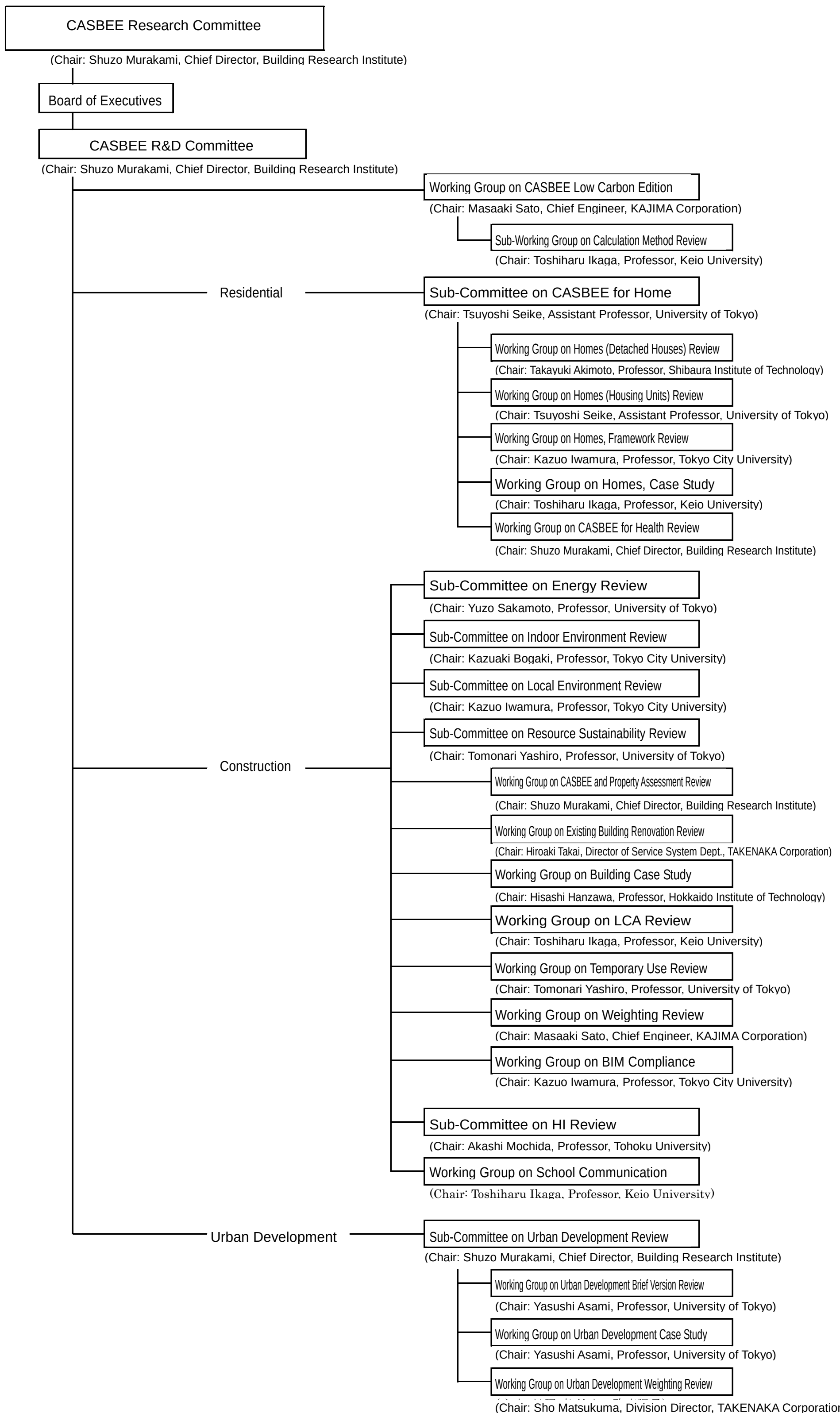

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