CASBEE® for an UrbanArea+Buildings Technical Manual 2007 Edition

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CASBEE® for an UrbanArea +Buildings

Comprehensive Assessment System for Buildimg Environmental Efficiency

●Technical Manual 2007 Edition

Tool-21+

Institute for Building Environment and Energy Conservation (IBEC)

Introduction

Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) is a tool for evaluating and rating buildings in terms of their environmental performance. It has been developed since 2001 as a joint project between industry, government and academia, under the guidance of the Ministry of Land, Infrastructure and Transport and Tourism.

CASBEE for Urban Development was developed as one of its expanded tools, to evaluate groups of buildings, but it mainly specializes in assessment of outdoor spaces.

Therefore, we have established a new sub-tool, CASBEE for an Urban Area + Buildings, which works together with building scale CASBEE tools such as CASBEE for New Construction to evaluate the environmental performance of streets and district in their entirety, including the buildings themselves.

We anticipate that it will be of use in large-scale projects, such as urban renewals, used together with conventional tools to contribute to the promotion of sustainable urban development and city planning.

1. Summary of CASBEE for an Urban Area + Buildings

1) What is CASBEE?

CASBEE assessment tools are based on the following three principles:

[1]Assessment can continue through the lifecycle of the building.

[2]Assessment can consider both the “Environmental quality of the building(Q)” and the “Environmental load of the building(L)”.

[3]The idea of environmental efficiency is employed to evaluate on the basis if Building Environmental Efficiency (BEE), a newly-developed indicator. Furthermore, the introduction of the closed-system concept of the hypothetical closed space clarifies the subjects of assessment, giving a grasp of environmental quality inside the hypothetical boundary and the environmental loads imposed outside that boundary.

CASBEE comprises four basic tools, as shown in Figure 1, which correspond to building lifecycle stages (pre-design, new construction, existing buildings and renovation), together with expanded tools adapted to specific purposes. These tools are known collectively as the “CASBEE Family.”

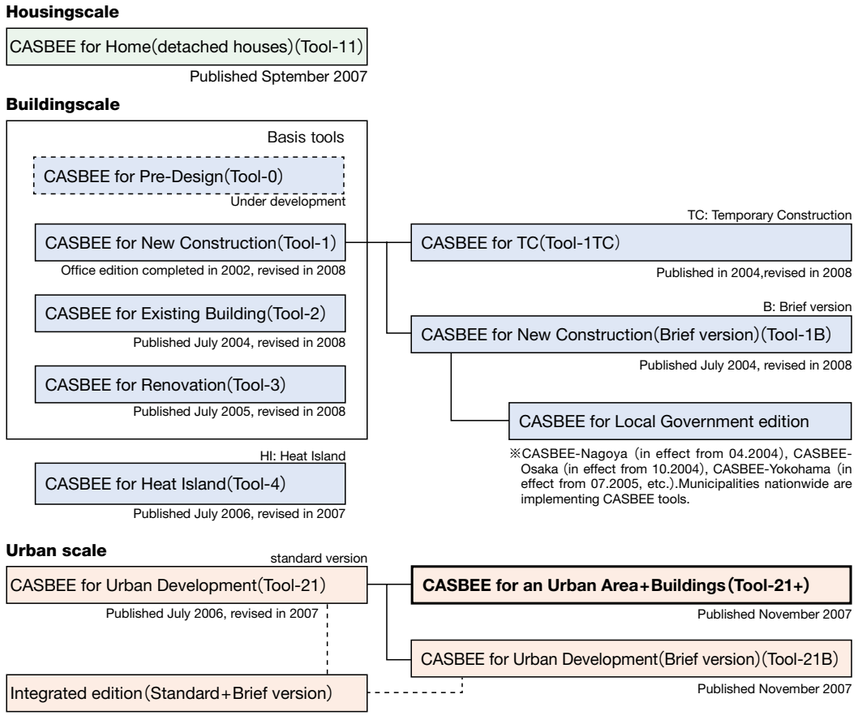


Figure 1 Structure of the CASBEE family

2) What is CASBEE for Urban Development?

From the initial development stages, CASBEE was based on an awareness of the importance of environmental performance assessment for building groups(urban scale), in addition to assessment of individual buildings. CASBEE for Urban Development was launched in July 2006, as a new expanded tool carrying on the principles and methodology of the previous CASBEE tools that subject for evaluating single buildings. For convenience, previous CASBEE versions are refered as “CASBEE(building scale)”, to distinguish them from CASBEE for Urban Development, which considers building groups(urban scale).

The assessment fields for CASBEE for Urban Development are [1] Exterior spaces on the district scale(roads, plazas and other public spaces, and exterior spaces within building sites) and [2] Effect of collectiveness (phenomena which occur when buildings form groups). CASBEE(urban scale) avoided evaluating the individual buildings within the subject district, for which CASBEE(building scale) was already established as the assessment method.

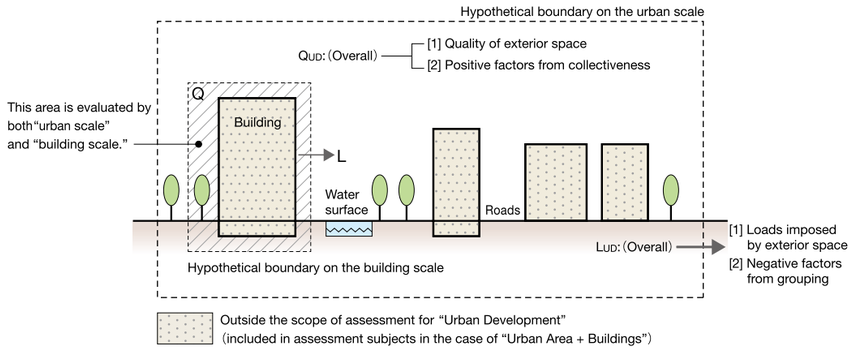


Figure 2 Concept of assessment subjects for CASBEE for Urban Development

3) The necessity of assessing “Urban Area + Buildings”

As described above, CASBEE for Urban Development makes a rule of not evaluating buildings themselves, but there is an emerging need for a way to express “assessment of the designated area as an entire “town,” including the individual buildings which exist within the district”.

Also, even in fields not covered by CASBEE (building scale), CASBEE for Urban Development takes into account aspects which should be considered from the perspective of city and regional planning, and aspects making the kind of community contribution that are emphasized in urban regeneration projects. In projects with a strong element of public interest (high impact on society), such aspects should be considered regardless of whether the project is an individual building or a group. Then a need emerged for application of CASBEE for Urban Development to individual buildings, which we had not envisaged at the start of tool development.

To meet that need, we decided to clarify the rules for using CASBEE for Urban Development together with CASBEE (building scale) and enable the presentation of integrated assessment results as CASBEE for an Urban Area + Buildings.

The symbols, superscripts and subscripts are used in this text as follows:
Q:Quality L:Load LR:Load Reduction
UD:Urban Development BEE:Building Environmental Efficiency
BEE_{UD}:Building Environmental Efficient of Urban Development

2. Assessment Subjects for CASBEE for an Urban Area + Buildings

CASBEE for Urban Development sets the hypothetical boundary according to the laws, systems and methods etc. set for the project area and applicable to the evaluated project. As such, it may not match the hypothetical boundary set for CASBEE (building scale). The subject projects can be divided into four types, according to such discrepancies in the boundary conditions and the combination of individual and multiple buildings, and CASBEE for an Urban Area + Buildings can cover all of the types.

1. Areal urban development type
This is the typical urban development type, which works on multiple building (or building site) groups, and the public spaces around and between them, as a single entity. In general, it depends on systems and methods such as district planning.

2. Campus type
In this type, multiple buildings, apparently independent, stand within one site, such as a university campus. Under conventional systems, lot merger system designs also fall under this type.

3. Individual urban development type
This is the type seen in many urban district regeneration plans, in which an individual building and the public spaces beyond its site boundaries are treated as a single entity.

4. Large-scale individual type
In this type, the large scale of the building means that CASBEE for Urban Development is applied in addition, to evaluate the impact on, and contribution to, the surrounding area, but the designated 1area does not include public spaces etc. around the site.

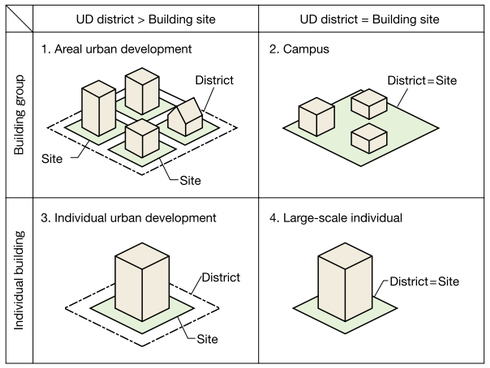


Figure 3 An illustration of project types covered by CASBEE for an Urban Area + Buildings

Table1 Assessment items of CASBEE for Urban Development

QUD:Environmental quality in urban development	
QUD1 Natural Environment (microclimates and ecosystems)	1.1 Consideration and conservation of microclimates in pedestrian space in summer
	1.2 Consideration and conservation of terrain
	1.3 Consideration and conservation of water environment
	1.4 Conservation and creation of habitat
	1.5 Other consideration for the environment inside the designated area
QUD2 Service functions for the designated area	2.1 Performance of supply and treatment systems (mains water, sewerage and energy)
	2.2 Performance of information systems
	2.3 Performance of transportation systems
	2.4 Disaster and crime prevention performance
	2.5 Convenience of daily life
	2.6 Consideration for universal design
QUD3 Contribution to the local community (history, culture, scenery and revitalization)	3.1 Use of local resources
	3.2 Contribution to the formation of social infrastructure
	3.3 Consideration for nurturing a good community
	3.4. Consideration for urban context and scenery
LRUD:Load reduction in urban development	
LRUD1 Environmental impact on microclimates, façade and landscape	1.1 Reduction of thermal impact on the environment outside the designated area in summer
	1.2 Mitigation of impact on geological features outside the designated area
	1.3 Prevention of air pollution affecting outside the designated area
	1.4 Prevention of noise, vibration and odor affecting outside the designated area
	1.5 Mitigation of wind hazard and sunlight obstruction affecting outside the designated area
	1.6 Mitigation of light pollution affecting outside the designated area
LRUD2 Social infrastructure	2.1 Reduction of mains water supply (load)
	2.2 Reduction of rainwater discharge load
	2.3 Reduction of the treatment load from sewage and graywater
	2.4 Reduction of waste treatment load
	2.5 Consideration for traffic load
	2.6 Effective energy use for the entire designated area
LRUD3 Management of the local environment	3.1 Consideration of global warming
	3.2 Environmentally responsible construction management
	3.3 Regional transportation planning
	3.4 Monitoring and management system

Table2 Assessment items of CASBEE for New Construction

Q:Quality	
Q1 Indoor Environment	1.1 Noise & Acoustics
	1.2 Thermal Comfort
	1.3 Lighting & Illumination
	1.4 Air Quality
Q2 Quality of Service	2.1 Service Ability
	2.2 Durability & Reliability
	2.3 Flexibility & Adaptability
Q3 Outdoor Environment on Site	3.1 Preservation & Creation of Biotope
	3.2 Townscape & Landscape
	3.3 Local Characteristics & Outdoor Amenity
LR:Load Reduction	
LR1 Energy	1.1 Building thermal load
	1.2 Natural energy utilization
	1.3 Efficiency in building service system
	1.4 Efficient operation
LR2 Resources & Materials	2.1 Water resources
	2.2 Reducing Use of Non-renewable Resources
	2.3 Avoiding the Use of Materials with Pollutant Content
LR3 Off-site Environment	3.1 Consideration of Global Warming
	3.2 Consideration of Local Environment
	3.3 Consideration of Surrounding Environmnet

- Table 1 is from the CASBEE for Urban Development Assessment Manual (2008 edition).
- Table 2 is from the CASBEE for New Construction (2007 provisional edition), which is the representative tool for the "building scale."
- In either case, the main and secondary categories are shown here, but in practice, assessment is performed on the detailed assessment item units which make up the intermediate categories.

3. Assessment procedure

CASBEE for Urban Development and CASBEE (building scale) share common assessment category names and similar assessment content, as shown in tables 1 and 2, but they have their own independent assessment systems. Therefore, it is possible to use both tools for separate and simultaneous assessments of a given project, and they can be used for the same purposes.
Therefore, the method employed for CASBEE for an Urban Area + Buildings maintains the independence of the two tools, but enables straightforward presentation of assessment results integrating the two sides. The assessment procedure is as follows:

Step 1
Use both CASBEE for Urban Development and CASBEE (building scale) to evaluate the target project. When evaluating on the building scale with multiple designated buildings, take the assessment results (point scores) for each building under "Assessment of multi-use buildings" using CASBEE for New Construction, then take a weighted average according to the ratio of their floor areas. (Refer to chapter 5 for information on the tools used).

Step 2
Calculate the BEE values for "urban development" and for "building scale", and rank each one on the five-rank scale, as S(Excellent), A(Very Good), B+(Good), B-(Fairly Poor) or C(Poor).

Step 3
Plot both ranks on the matrix illustrated in Figure 4, in which "urban development" is the horizontal axis and "building scale" the vertical axis. The five-level rankings set in advance for each category in the matrix are the BEE rankings for the target project under CASBEE for an Urban Area + Buildings. (Assessment results under "Urban Area + Building" are only expressed as ranks, and are not converted into numerical equivalents).

Assessment under CASBEE (building scale)

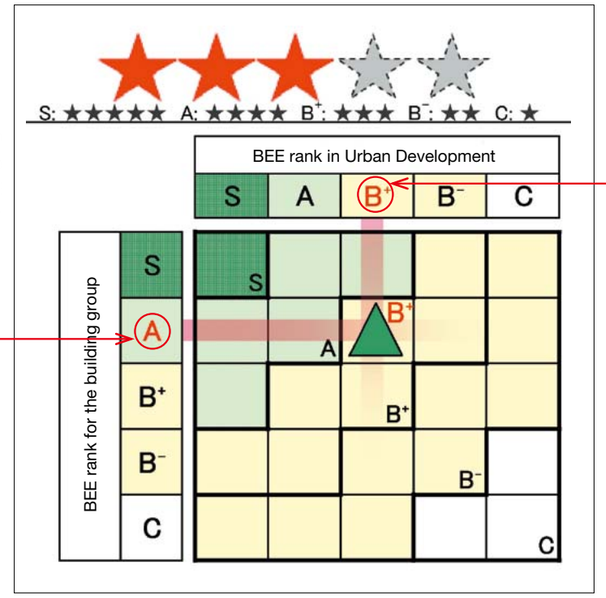
$$BEE = \frac{Q}{L}$$

The assessment here is a weighted average of all the assessed buildings, as BEE values can be calculated for each building.

For example,
Building 1
Q=70, L=43
BEE=1.6
Building 2
⋮
Building n
Weighted average of building 1∼n by floor area
$\overline{Q}$1∼n=68
$\overline{L}$1∼n=34

$$\overline{BEE} = \frac{68}{34} = 2.0$$

→ Rank A



Assessment by CASBEE for Urban Development

$$BEE_{UD} = \frac{Q_{UD}}{L_{UD}}$$

For example,
Q_{UD}=65
L_{UD}=46

$$BEE_{UD} = \frac{65}{46} = 1.4$$

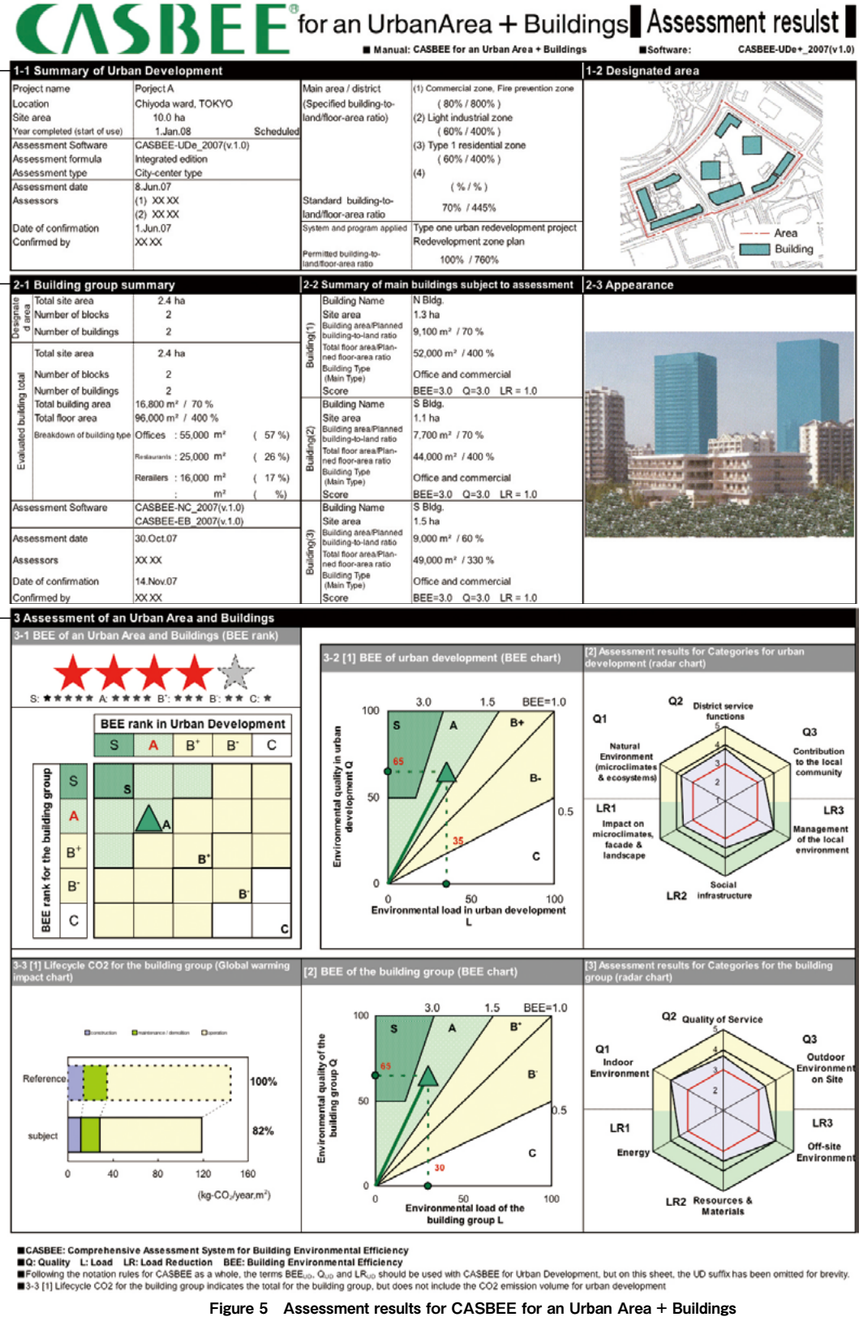
→ Rank B+

Figure 4 Environmental efficiency (BEE ranks) under Urban Area + Buildings

4. Indication of Assessment Results

Assessment results under CASBEE for an Urban Area + Buildings are indicated in the form shown in Figure 5. Presentation in this form, together with assessment presentation sheets for “urban development” and individual “building scale” for the assessment subjects, expresses the environmental characteristics of the target project as a whole.

1-1 Summary of Urban Development
1-2 Designated area
2-1 Building group summary
2-2 Summary of main buildings subject to assessment
2-3 Appearance
3-1 BEE of an Urban Area and Buildings (BEE rank)
3-2 [1] BEE of urban development (BEE chart)
[2] Assessment results for Categories for urban development (radar chart)
3-3 [1] Lifecycle CO2 for the building group (Global warming impact chart)
[2] BEE of the building group(BEE chart)
[3] Assessment results for Categories for the building group (radar chart)



■CASBEE: Comprehensive Assessment System for Building Environmental Efficiency
■Q: Quality L: Load LR: Load Reduction BEE: Building Environmental Efficiency
■Following the notation rules for CASBEE as a whole, the terms BEE_{UD}, Q_{UD} and LR_{UD} should be used with CASBEE for Urban Development, but on this sheet, the UD suffix has been omitted for brevity.
■3-3 [1] Lifecycle CO2 for the building group indicates the total for the building group, but does not include the CO2 emission volume for urban development

Figure 5 Assessment results for CASBEE for an Urban Area + Buildings

5. Assessment Tools (manuals and assessment software)

1) Assessment tools for urban development

CASBEE for Urban Development is available in standard version, brief version and integrated edition, and any of them can be used. However, we recommend use of the standard version whenever the state of progress in planning and development permits.

2) Building-scale assessment tools

Use “New Construction” or “Existing Building,” according to the state of the designated building at the time of assessment. If multiple buildings are involved, both “New Construction” and “Existing Building” could be used.
If the designated area includes detached houses, CASBEE for Home (detached houses) could also be applied, but for the time being, building-scale assessment using CASBEE for an Urban Area + Buildings does not include detached houses.

3) Manuals

Refer to the corresponding assessment manuals for details of assessment methods used with CASBEE for Urban Development and CASBEE (building scale).

4) Assessment software

Assessment software prepared for each manual can be used for the assessment operations (Microsoft® Excel® version 2000 or later is required for software use). The assessment software consists of Scoring Sheet etc. for input, Score Sheet for output, and Assessment Results Sheet.
For CASBEE for an Urban Area + Buildings, the assessment results from urban development and building scale can basically be transferred, and the transfer sheets can be downloaded from the CASBEE website. The assessment software for CASBEE for Urban Development also has sheets for Urban Area + Building, which are linked to other sheets, making transfer of urban development-related data more convenient. However, note that the following additional tasks are necessary to complete the result presentation, and they are not necessarily supported by the automatic calculation functions.

[1]Statement of the building under assessment
The designated building group is indicated in color on the designated area diagram (layout diagram). Cases can be envisaged in which restrictions on data collection etc. would make assessment of some buildings difficult, so the buildings actually evaluated must be clearly indicated.
[2]Summary indication of the buildings under assessment
・Indicate the number of buildings under assessment, the overall size (total floor area), mix of applications (shares for major applications) and similar information.
・Present summaries of individual major buildings (up to three buildings)

Transfer sheets for Urban Area + Building can be downloaded from the following URL:
(CASBEE for Urban Development website) http://www.ibec.or.jp/CASBEE/english

The following CASBEE manuals, currently in publication, are available for reference.
Manuals and assessment software are subject to change without notice. Check for the latest information on the CASBEE website.

CASBEE for Urban Development Assessment manuals
[1]CASBEE for Urban Development (2007 Edition)
[2]CASBEE for Urban Development (2007 Edition) (Brief version)

CASBEE (building scale) Assessment manuals
[3]CASBEE for New Construction (2008 Edition)
[4]CASBEE for New Construction (Brief version) (2008 Edition)
[5]CASBEE for Existing Building (2008 Edition)
[6]CASBEE for Renovation (2008 Edition)

CASBEE for Home (detached houses) Assessment manuals
[7]CASBEE for Home (detached houses) (2007 Edition)

Manuals and assessment software for items [2], [4] and [7] on the left can be downloaded free of charge from the CASBEE website (only part of the manual is available for [7]). Other manuals (with the corresponding assessment software) can be purchased from IBEC.
Refer to the following address for details.

CASBEE website address
http://www.ibec.or.jp/CASBEE

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Tools recommended for application to Urban Area + Buildings
Tools which can be applied to Urban Area + Buildings