STUDIES CONCERNING 'THE STATUS OF UTILIZING CASBEE EVALUATION' AND 'THE PREVALENCE OF ASSESSMENT TOOL' IN DESIGN DIVISIONS WITHIN LARGE CONTRACTORS IN JAPAN

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Summary

Every year since 2004, the Building Contractors Society (BCS), an industry organization (public service corporation) of general contractors working in building construction throughout Japan, has conducted a questionnaire survey of 23 member companies having in-house architectural design divisions with regard to the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). The questionnaire covers a wide range of topics, including the projects subject to assessment, reasons for introducing CASBEE, in-house education, targets if any, numbers of buildings evaluated, assessment results, opinions concerning positive and negative aspects of CASBEE, time spent on assessment work, and the future outlook. Through these surveys, we have learned that many companies are actively introducing CASBEE, and that some are using CASBEE to evaluate all of the buildings they design. The unstructured comments from survey respondents are taken into consideration when deciding how to further promote the use of this assessment tool in the future.

1. About CASBEE

CASBEE•Comprehensive Assessment System for Building Environmental Efficiency••has been developed since 2001 in Japan with the support by Ministry of Land, Infrastructure and Transport. CASBEE distinguishes environmental load (L) and quality of building performance (Q) as the major assessment targets, and applied the concept of eco-efficiency as BEE (Building Environmental Efficiency). Give L and Q, BEE is defined as Q/L to indicate the overall result of environmental assessment of buildings.

2. About BCS

2.1 Building Contractors Society (BCS) and its design and construction activities

The Building Contractors Society (BCS) is an industry organization (public service corporation) of general contractors working in building construction throughout Japan. It has 69 member companies (as of March 2008), which employ a total of about 122,000 employees (as of July 2007) and handle approximately ¥14,660.068 billion in construction orders (FY 2006, including civil engineering projects), about three-quarters of which consists of building construction orders (approximately ¥10,853.015 billion).

One important characteristic of Japan's large-scale construction companies is that they include in-house architectural design divisions. With this kind of corporate organization, they can provide design and construction in so-called "full turnkey" services according to the client's preferences. The architectural design divisions of BCS member companies are involved in the design of 44% of all of the building construction orders they handle. The buildings designed by BCS member companies include some architecturally and technologically outstanding buildings which have won a variety of awards. For example, about 17% of the buildings in "Selected Architectural Design 2007" by the Architectural Institute of Japan (AIJ) were designed and built by leading companies which are members of BCS.

2.2 Promotion by BCS of environmental responsibility throughout a building's life cycle

BCS has adopted an action plan indicating its goals and the role of its activities with regard to society; and is implementing this plan in collaboration with member companies. The second of five goals under the BCS action plan is "to contribute to the global environment through sustainable architecture." To protect the global environment, it is essential to implement environmental measures throughout a building's life cycle. Because BCS is involved not only in construction, but also in planning, design, and operation after a building is completed, it is taking the following three specific actions to achieve this goal: promoting environmentally friendly planning, programming, and design; pursuing environmentally friendly construction processes; and promoting improved environmental performance at the operational stage. Many BCS member companies have in-house architectural design divisions and are capable of involvement for the sake of environmental responsibility at all stages, having organizations that facilitate the effective application of lessons learned through experiences and information at each stage.

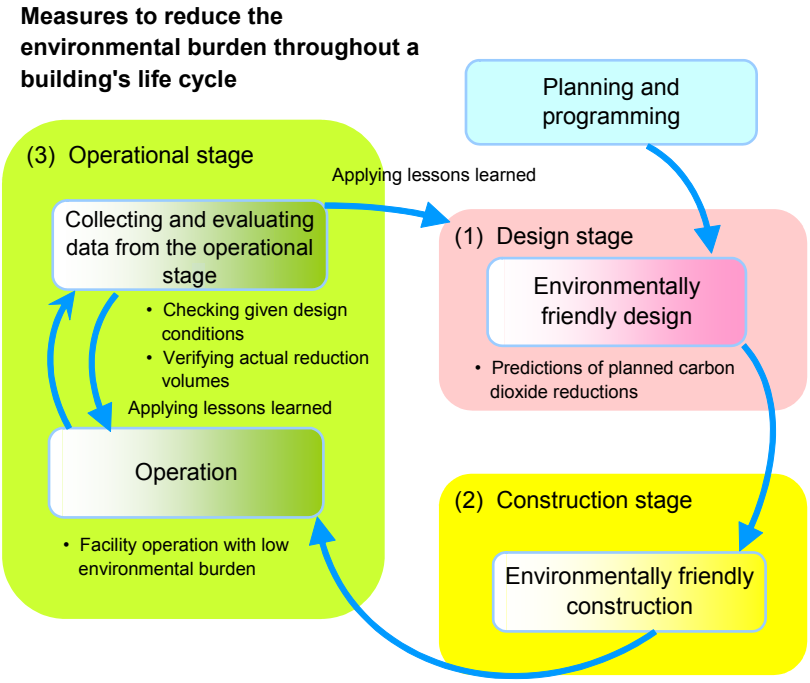

Figure 1. Measures to reduce the environmental burden throughout a building's life cycle

2.3 Survey of BCS companies regarding CASBEE utilization

Considering the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) to be an effective tool for promoting environmentally friendly planning, programming, and design, BCS believes that the widespread adoption of CASBEE is important, not only among its member companies but also in society at large. Therefore, every year since 2004, BCS has used questionnaires to survey 23 of its member companies with regard to CASBEE. The 23 surveyed firms have active in-house architectural design divisions. The volume of building design and construction orders taken by these 23 companies accounts for over 90% of the total handled by these BCS member companies.

The questionnaire covers a wide range of topics, including the projects subject to assessment (voluntary decision or based on administrative guidance), reasons for introducing this assessment system, acquisition of evaluator qualifications, in-house training, targets, the evaluated properties (about 500 buildings) categorized by purpose of use and assessment results, opinions concerning positive and negative aspects of CASBEE, time spent on assessment work, increases in assessment staffing, and future expectations.

Here, we report the findings from surveys conducted over the past four years. When no fiscal year is specified, the results from the FY 2006 survey are indicated.

3. Survey results

The survey results are reported in four categories: situation of CASBEE use, analysis of past assessment records, opinions concerning the assessment system, and unstructured comments.

3.1 Situation of CASBEE use

Several local governments in Japan (12 local governments as of January 2008) require CASBEE evaluations for construction projects above a certain size; and some clients specify the use of CASBEE. In addition, 16 of the 23 surveyed companies (70%) actively utilize CASBEE based on their own criteria, even without these external factors. These companies have established a wide variety of criteria, including the use of CASBEE for certain specified projects (e.g., based on annual target numbers of projects), or for projects of certain purposes or sizes (e.g., at least 5,000 square meters of total floor area). Also, four companies stated that they use CASBEE for all their projects. (Figure 2)

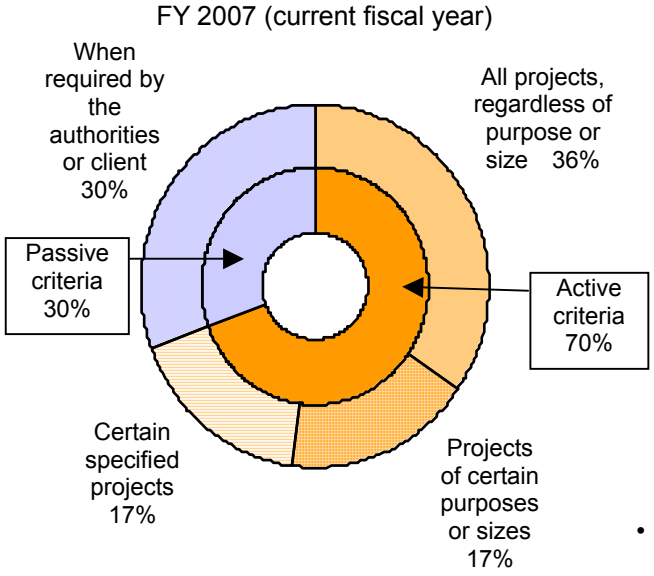

Figure 2. Criteria for conducting CASBEE evaluations

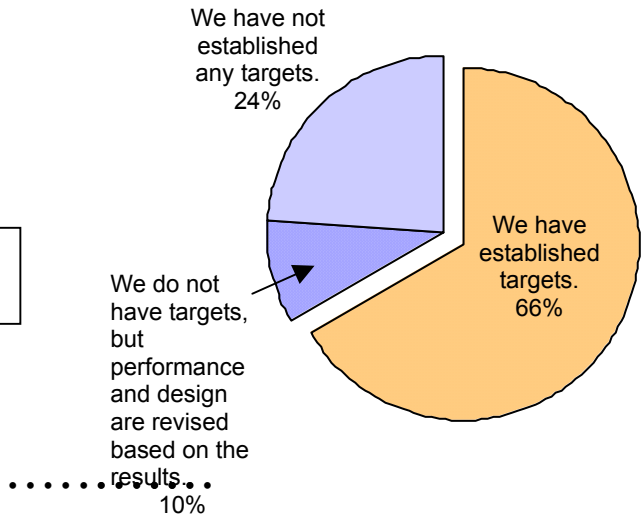

Figure 3. Targets for assessment results

14 companies (66%) have established targets regarding CASBEE evaluation results. Seven companies have no targets, but two of these companies revise performance and design in some cases according to the results obtained. This means that the companies conduct design with an awareness of CASBEE evaluations. Eight companies have selected targets of a certain rank (at least B+, or BEE scores of at least 1.0, etc.), and four companies establish targets according to the project. (Figure 3)

Concerning internal measures for the implementation of CASBEE evaluations, 18 companies recommend or encourage the acquisition of evaluator qualifications; 12 companies participate in external training sessions; nine companies incorporate this into internal programs such as ISO 14001; and nine companies hold in-house training sessions.

22 of the 23 companies surveyed have environmentally friendly design tools and include them in ISO 14001 documentation. Ten companies correlate these environmentally friendly design tools with CASBEE or plan to do so in the future; and eight of these companies use the simplified edition of CASBEE as is.

3.2 Analysis of past CASBEE evaluation records

Figure 4 shows trends in the numbers of properties evaluated using CASBEE by the surveyed companies since CASBEE was first published. There were 591 properties in FY 2006, bringing the cumulative total up to 1,090 properties. About 1.5 times as many properties were evaluated using CASBEE in FY 2006 as in FY 2005.

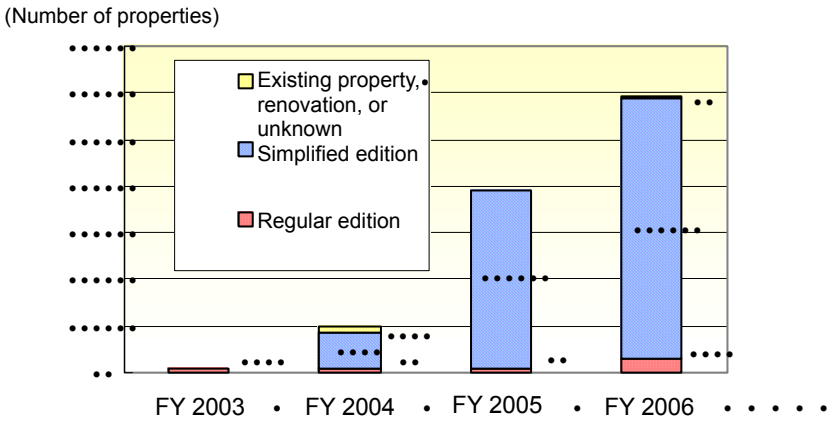

Figure 4. Trends in numbers of assessments by year

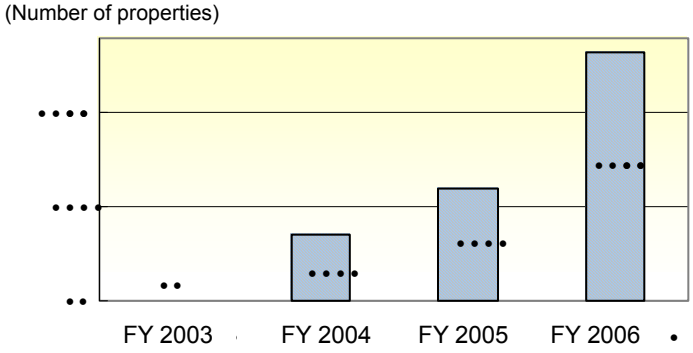

Figure 5. Trends in numbers of assessments submitted to local governments

Figure 5 shows annual trends in the numbers of assessments submitted to local governments. Reflecting the increasing number of local governments that have adopted environmentally friendly programs using CASBEE, twice as many assessments were submitted to local governments in FY 2006 as in FY 2005.

Figure 6 shows past CASBEE evaluations by rank. The most frequent rank has been B+ at over 40%, and nearly as many properties have been ranked A. Ranks of B+ or higher account for about 90% of the total.

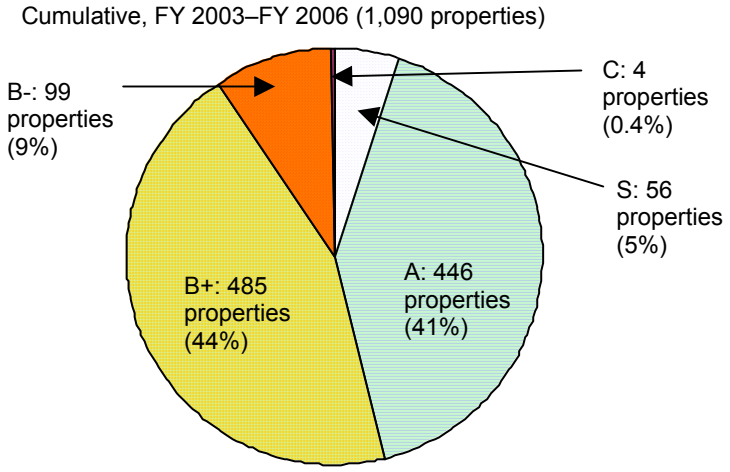

Figure 6. Breakdown of evaluated result by rank

Figure 7 is a scatter plot of environmental efficiency rates (Q/L) in FY 2006. Most (87%) earned a rank of A or B+, and about 4% were ranked S. About 9% were ranked B-, and practically none were ranked C. The number of points plotted rises sharply for environmental efficiency rates (Q/L) of 1.0 and higher, implying efforts at the design stage to meet a standard of at least 1.0.

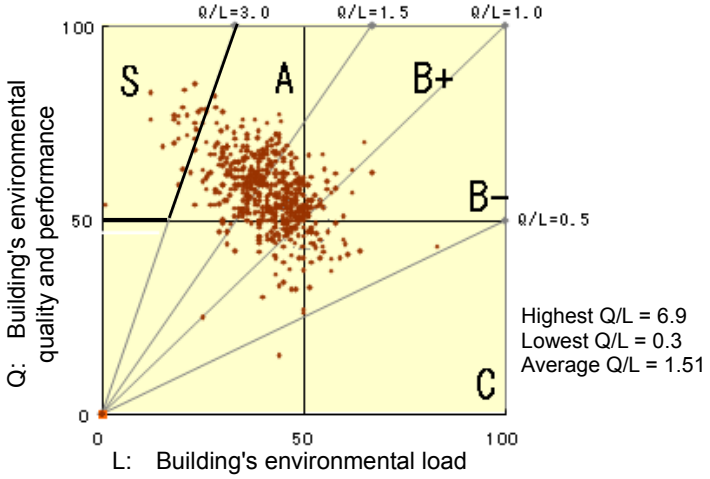

Figure 7. Q/L scatter plot

Figure 8 shows the assessment results of the past four years classified by the building's purpose of use. Schools and assembly halls have tended to earn high CASBEE scores. Apartment buildings and factories account for the largest numbers of projects, but fewer than half of them earned scores of A or higher, a lower proportion than other purposes of use. This could be attributed to the greater difficulty of obtaining a high score in these purposes of use; nevertheless, further improvement is needed in the environmental performance of buildings for these purposes of use in the future.

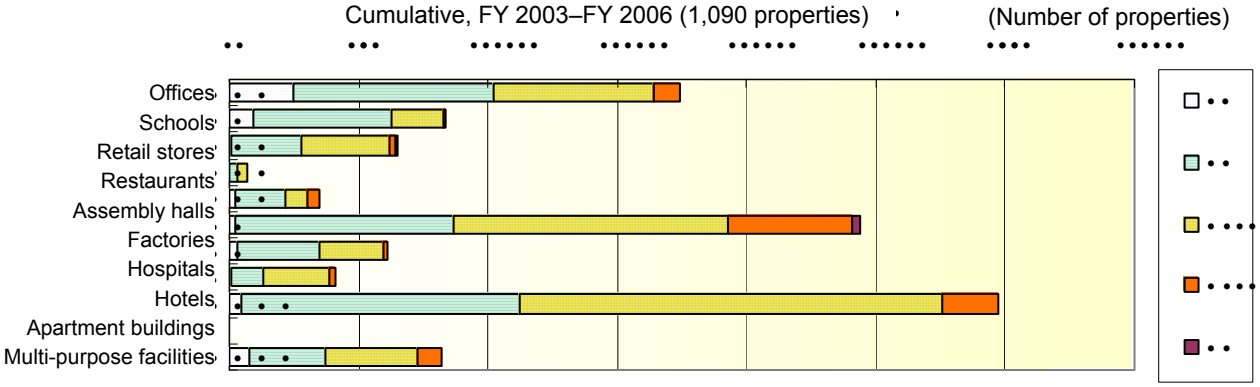

Figure 8. Assessment results by purpose of use

Figure 9 shows the assessment results of the past four years classified by the building's total floor area. Larger-size buildings have tended to achieve better assessment results, with a higher proportion of S and A ranks. Some companies use 2,000 square meters as the cutoff point for deciding whether to perform a CASBEE evaluation. There is a trend toward lower ranks among buildings of less than 2,000 square meters.

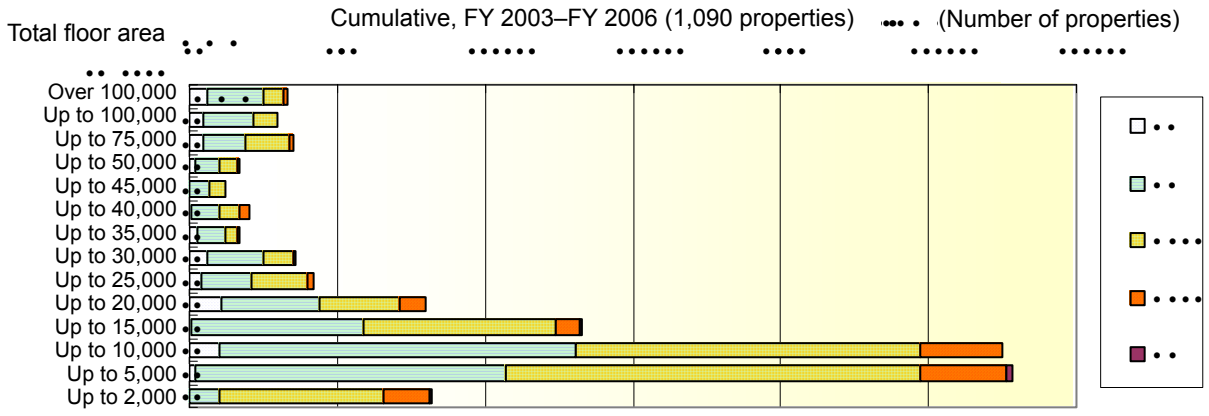

Figure 9. Assessment results by size

3.3 Opinions concerning the CASBEE evaluation system

Among the 16 companies which have actively incorporated CASBEE evaluation, 11 firms said the most important reason was that they consider CASBEE to be an effective tool for promoting environmentally friendly design.

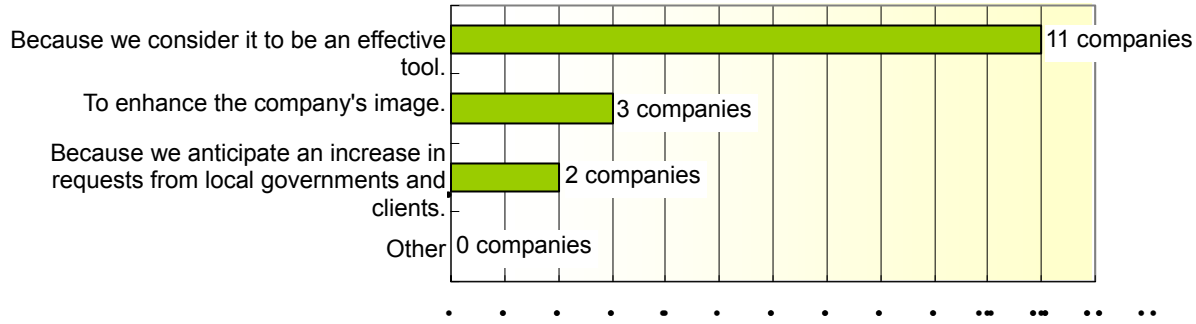

Figure 10. Reasons for actively incorporating CASBEE evaluation

Figure 11 shows the positive aspects of CASBEE evaluations, with the greatest number of respondents indicating the fact that results of environmentally friendly design can be expressed in numerical terms, followed by the facts that it helps to educate architects with regard to environmentally friendly design, and that the evaluation is relatively simple.

Figure 12 shows the negative aspects of CASBEE evaluations, with the greatest number of respondents indicating the difficulty of subjective evaluation judgments, followed by the burden on architects, and the lack of quantification of the reduction in carbon dioxide emissions.

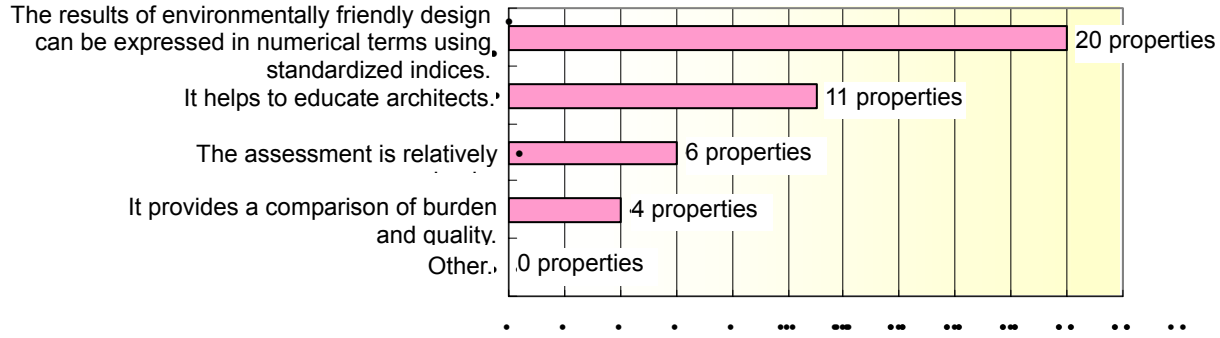

Figure 11. Positive aspects of CASBEE evaluations

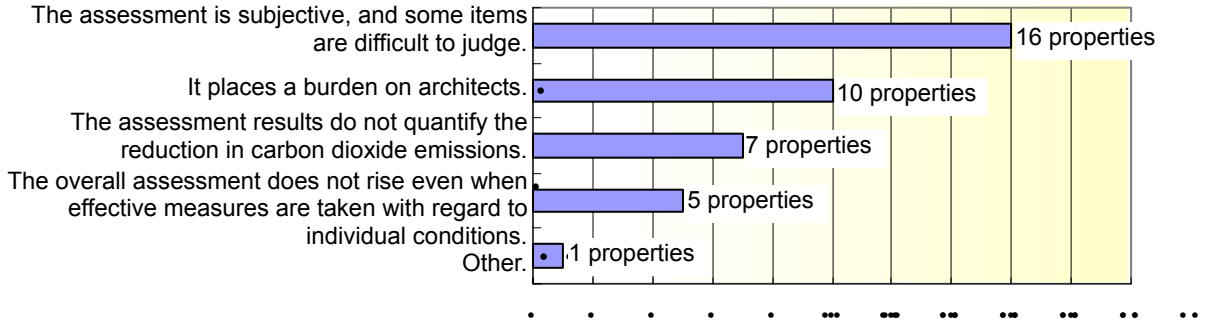

Figure 12. Negative aspects of CASBEE evaluations

Figure 13 indicates the approximate working hours required for CASBEE evaluations (assuming that PAL and CEC data are already in place at the time of CASBEE evaluation work). The simplified edition is indicated as requiring about two hours, but in fact, 60% spent half a day and 20% spent an entire day, while only about 10% completed it within about two hours (no non-responders). Among the eight companies responding that they spent either about eight hours or more than eight hours, the most time-consuming tasks were

understanding the manual and gathering back data. Under "other," responses included document preparation, coordination with the architectural and M&E divisions, discussions and guidance from the authorities concerning documents to be submitted and the resulting additional document preparation time, and coordination regarding the views of government authorities.

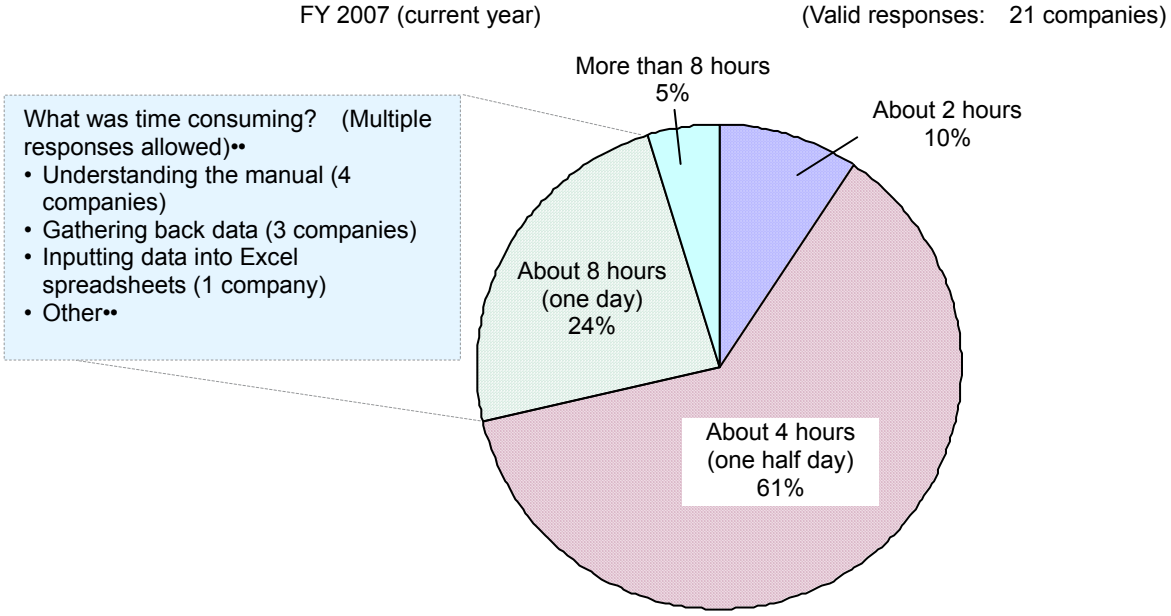

Figure 13. Working hours for "CASBEE, New Construction: Simplified Edition"

3.4 Unstructured comments concerning CASBEE

Table 1 shows the unstructured comments of 23 companies in the BCS design subcommittee regarding CASBEE this fiscal year, by category. The following were the most frequent types of responses:

[1] The CASBEE evaluation system should clarify the effects with regard to reducing carbon dioxide emissions, etc.

[2] Efforts should be made to promote dissemination among a wide range of interested parties including clients, managers, and financial institutions.

[3] Building facility engineers should also be permitted to take the CASBEE evaluator examination.

[4] The local government editions of CASBEE should use the same tools in order to allow the work to be standardized, from the applicant's standpoint.

Regarding item [1], the developer of CASBEE (Japan Sustainable Building Consortium) published "CASBEE, New Construction" (FY 2007 Provisional Edition) in September 2007, clearly indicating evaluation items for the prevention of global warming and incorporating a standard method for calculating life-cycle carbon dioxide emissions. The official edition is scheduled to appear in July 2008.

Many CASBEE users within BCS would agree with items [2] and [3]. Item [4] reflects some level of apprehension regarding the differences in CASBEE content among different local governments which require these assessments.

Table 1

Wishes regarding the CASBEE evaluation system:
• The assessment does not clearly indicate the extent of effects regarding the prevention of global warming. A clear indication is desirable, such as stating the amount of reduction in carbon dioxide emissions resulting from a certain assessment rank.
• The layout and composition of the evaluation sheet should be improved to allow the input work to be handled mechanically.
• Some items, such as consideration for scenic aesthetics, are subjective and difficult to evaluate, and this should be improved if possible.

Wishes regarding promotion and dissemination:

- Although CASBEE is becoming more prevalent in the building industry, most clients still do not understand CASBEE evaluations. Measures should be taken to provide benefits to clients, in addition to encouraging local governments to adopt CASBEE.
- Widespread adoption and utilization of CASBEE should be promoted not only among government authorities and the building industry (design, construction, and manufacturing), but also among clients, end users, maintenance and management providers, and financial institutions.
- Eligibility for CASBEE evaluator testing is limited to first class architects, but it should be opened to building facility engineers as well.

Wishes regarding local governments:

- Different local governments use different standards regarding the size of buildings to be evaluated. The trend toward widely varying approaches among local governments is problematic in terms of the reputation of CASBEE.

Other

- Environmentally friendly design should be actively promoted in competitions for energy efficient and environmentally friendly buildings, based on assessment results.

4. Future outlook

No other organization in Japan conducts a survey that rivals the BCS survey regarding CASBEE, excluding certain local governments. In this survey, the third annual survey since its full-scale launch, we see that CASBEE is becoming increasingly prevalent among BCS member companies. The number of buildings evaluated has also increased to nearly 600 per year, including many certified buildings and buildings published by local governments. It is becoming possible to measure progress in the prevalence of CASBEE by means of these large numbers of cases and assessment results.

This survey has been discussed at symposia held by the CASBEE development committee, and it is also noted by the Ministry of Land, Infrastructure and Transport, financial institutions, and real estate appraisal organizations. BCS will continue to actively communicate these findings to all types of stakeholders (CASBEE development committee, local governments, builders, financial institutions, real estate appraisal organizations, end users, etc.) and listen to their reactions.

Some of the future issues are included under the summary of unstructured responses. Another important future issue is to increase assessments of existing buildings.

Today, there is growing demand for truly effective performance from buildings that are planned with an eye to preventing global warming. In other words, it is becoming imperative to measure energy consumption in completed buildings, publish these figures, and promote further reductions.This suggests the importance of assessments under the "CASBEE, Existing Buildings" edition. It is important for BCS to increase the number of properties evaluated in this way. Meanwhile, it is also important for CASBEE tools to include ways to evaluate the performance of existing buildings.

5. Acknowledgment

This article is based on the BCS's research conducted by a committee of BCS. We are grateful to the following members for their efforts."Working Panel for Environment Issues" in Design Committee of BCS -Panel Chair: Kenichi KAJIMOTO(Maeda Corporation), Vice-Chair: Tadayuki SUZUKI(Toda Corporation), Members: Yasuhiro IMAI(Obayashi Corporation), Kunihiko KAGAWA(Kumagai Gumi), Masaru KIKUIRI(Tokyu Construction), Tomonori MIYAZAKI(Tekken Corporation), Hiroshi MIYAHARA(Sumitomo Mitsui Construction), Hisayoshi SAKUMA(Taisei Corporation), Hiroaki TAKAI(Takenaka Corporation), Masaki TAKEUCHI(Shimizu Corporation), Akira TOKESHI(Hazama Corporation)