

GREENSHIP ASSESSMENT OF INDOOR HEALTH AND COMFORT AT GREENHUB SUITED OFFICES

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Abstract. Implementation of Green Building can reduce global warming and create health and comfort workplace in order to improve employee performance. Greenhub Suited Office has the potential to get high points in achieving the Indoor Health and Comfort Aspect on the Greenship Interior Space 1.0. This research was done during work activities with 60% occupancy rate. This paper aims to analyze the achievements on indoor health and comfort aspect based on the Greenship rating tools Interior Space version 1.0. The descriptive approach on this research was implemented by collecting data through the interview with an expert and occupants, literature study, the data retrieval with comparative study according to GBCI standard, fields survey directly, and field measurements. Based on the assessment, almost all the Indoor health and comfort criterias had been achieved by Greenhub Suited Offices. The results showed that Greenhub obtained a total index of 23 points with a percentage of 85%. Greenhub must earn 85% of Greenship Rating Tools percentage for the other five aspects on the GBCI standard to get a platinum rating.

Keywords: green building; greenship interior space 1.0; indoor health and comfort aspect

1. INTRODUCTION

Most of people spend about 70–90% of their time activities indoors [1]. A health and productivity of users can be affected by Indoor environment quality [2]. This reason makes indoor health and comfort aspect is very important for users and has become the concern of Green Building Council Indonesia with a focus on assessing Greenship Interior Space 1.0. Buildings with a green building concept not only give the impression of comfort, but as a solution to create a healthy life for the future [3]. Greenship interior space 1.0 is a rating tools that utilized in ensuring more sustainable, healthy and comfort indoor space [4]. Green Building Council Indonesia (GBCI) is required as a reference and assessment to optimize building design [5].

According to the GBCI Standard, total point based on the Greenship ratings tool for Interior Space are 103 points. The following rankings can be accomplished namely Platinum with a percentage of 73% with a minimum score of 75 points; Gold with a percentage of 57% with a minimum score of 59 points; Silver with a percentage of 46% with a minimum score of 47 points; Bronze with a percentage of 35% with a minimum score of 36 points [6]. The assessment for Greenship interior space contains 6 aspects. The aspects are Appropriate site development, Energy efficiency and conservation, Water conservation, Material and resources cycle, Building and environment management, Indoor health and comfort (IHC) which is the category with the highest rating points and index.

These aspects are intended to be the main reference for sustainable building design due to its ability to ensure energy and resource savings, reduce building costs, improve health, achievement and productivity of building occupants. "The Business Case for Green Building" declares The buildings with a green concept have the ability to improve the health and productivity of their occupants [7].

The research aims to analyze the achievements on indoor health and comfort aspect based on the Greenship rating tools Interior Space version 1.0. Moreover, it is conducted to determine the achievement potential and references for Greenhub Suited Offices on following Green Building Certification. Several studies have discussed The Greenship Existing Buildings at Universities [8], indoor health and quality in University [9], alternative to reduce level of noise at office [10], occupants' perception of Office green building [11], indoor pollutant source

control [12], factors that influencing level of the comfort in a University [13], indoor health and comfort effects for tenants productivities [14], and optimizing indoor health and comfort index point [15].

2. METHODS

The research was conducted at Greenhub Suited Offices in Tower A Kota Kasablanka, Jakarta using the descriptive analysis method with data collected through interview, observation, measurements, literature study and the data retrieval with comparative study according to GBCI standard. The research is focused on the Greenship interior space 1.0 assessment of the Indoor Health and Comfort aspect.

The stages carried out in this research are 5 stages. Stage I is the preparation stage. steps taken are identifying and formulating problems, determining research objectives, digging literature and making checklist

forms as data collection instruments; Stage II is called the stage of finding data and collecting data; Stage III is the recapitulation of data that has been collected, and scoring against the category that have been met by the project, as well as calculating the point value of each scope of the category; Stage IV is called the data analysis stage. The steps that taken are processing the results of the assessment from the recapitulated data to obtain the predicate results; Stage V is the stage of discussing the results of the data that has been analyzed. The steps that taken are discussing and describing the results of the analysis regarding the evaluation of the greenship category, making conclusions, and giving suggestions.

The following is a flow diagram of the research (Figure.1)

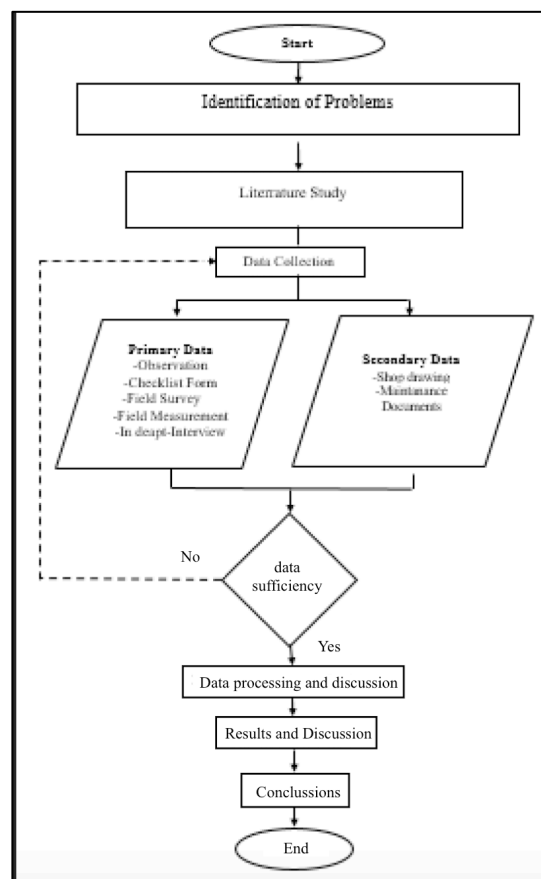


Figure 1. Flow Diagram Research

The primary data in this study were data obtained by the authors of the Greenhub Suited Offices which is related to the Greenship assessment. Several instruments were used to collect data. The visual comfort of lighting level was rated using lux meter. The thermal and humidity comfort was evaluated using a digital room thermometer and anemo meter, acoustic level was measured using sound level meter, biological pollutant was measured by using air sampler and colony counter though the blood agar plate, indoor air quality was measured using air quality meter and CO meter. The chemical quality was evaluated using air quality detector (Figure 2).



Figure 2. Measuring Tools

The results from the observation and measurements were compared with the Greenship Interior Space standards.

3. RESULTS AND DISCUSSION

3.1 Indoor Health and Comfort

Field measurement data in this research was conducted from 33 sample rooms and 90 measured point (Figure 3).



Figure 3. Sample Measured Rooms And Points.

Based on the results of collecting data through observations and field measurements, after being compared using the Greenship Interior Space 1.0 category, especially the Indoor Health Comfort, it can be explained as follows:

1. No Smoking Campaigns (IHC P)

The benchmark for Indoor Health and Comfort had been fulfilled by the commitment of management to set all rooms in the office smoke-free. No-smoking campaigns were proven in the form of stickers placed in several areas such as toilet and meeting rooms (point : P).

2. Outdoor Air Introduction (IHC 1)

Benchmark for IHC 1 had not been fulfilled due to the lack of clean air circulation at some small room area. This assessment was conducted by estimating the number of occupants calculated from the Net Lettable Area with Occupancy Density in accordance to the formula on ASHRAE Standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality. The results showed there were only 67% of the sample measured room reached the Standard (point : 0).

3. CO2 Monitoring (IHC 2)

This benchmark for IHC 2 had been fulfilled since Greenhub Indonesia had CO2 sensors installation as preventing shortages of fresh air and maintaining the health of the occupants. It had been discovered that good indoor air quality and low levels of CO2. Greenhub is also equipped smoke alarm detector installation that has a high level of sensitivity to ethanol gas or hydrogen gas. (point: 1). However, the sensors installation were not found in each room so that the second benchmark had not been fulfilled. This, therefore, meant this benchmark had not been fulfilled (point :0). IHC 2 assessment was supported by measurements of indoor air quality. The measurement result showed that 100% of the indoor air quality reached the standard which were less than 8 ppm for the CO parameter and the results were less than 65 µgram/m³ for the PM 2.5 parameter.

4. Chemical Pollutant (IHC 3)

Based on the observation, building finishing material documents and in -depth interview with Detail Engineering Design (DED) Building Consultant , Chemical Pollutantn criterion earned the maximum points for its benchmark, Greenhub Suited Offices uses almost all sustainable building finishing material . The wall uses bricks with low formaldehyde material and a-low VOC-containted finishing paint which has listed on greenlist product and SNI 3564:2009, the homogenous tile and carpet are used for the floor finishing material in accordance to The Carpet and Rug Institute.1999. The ceiling uses gypsum with low contents of VOC and formaldehyde, the furnish uses interior furnitur in accordance to SNI-01-7206-2006. There is no asbestos in the interior parts of the building and all the materials used were observed to had fulfilled the chemical pollutant criteria and were awarded 9 points (point: 9).

IHC 3 assessment was supported by measurements of chemical quality in accordance to SNI 19-0232-2005. The measurement result showed that 100% of the chemical quality reached the standard which are less than 0,37 mg/m³ for the TVOC parameter.

5. Indoor Pollutant Source Control (IHC 4)

Greenhub Suited Office did not earn the point in this criterion due to the lack of access to the exterior building because it is located on the 38th floor.

6. Biological Pollutant (IHC 5)

Based on the observation, the results showed that it was very rare to find dust on the furnitures and items in the room (Point:1). IHC 5 assessment was supported by the documents of repot cleaning filter, AC WCPU and cooling coils from dust, mold and dirt. The assessment was also supported by measurements of biological quality. The measurement result showed that 100% of biological quality reaches the standard which were less than 700 CFU in accordance to Permenkes RI Number 1077/Menkes/Per/V/2011.

7. Visual Comfort (IHC 6)

Benchmark for IHC 6 had not been fulfilled due to the lack of exposure to artificial lighting at some small roomss area. This assessment was conducted by measuring each measured point using lux meter in accordance to SNI 03-6197-2000 of Energy Conservation in Lightning System. The result showed there were only 76% of the sample measured room reached the standard (point: 0).

As observated, all individual rooms provide light settings easily accessible and there is a zonation system for lighting control system for multi occupant area (Point:1). There are some integrated automatic curtains for natural lighting at some office rooms (Point :1).

8. Outside View and Daylight (IHC 7)

As calculated, the spaces that had an outside view were 606,3 m² (58,5 %). However, the percentage of result was less than 75%. This, therefore, meant this benchmark had not been fulfilled (point :0). Second benchmark for IHC 7 had been fulfilled by Greenhub Indonesia . As measured, 100% office rooms that had an outside view get natural light instensity more than 300 lux in accordance to SNI 03-6197-2000 of Energy Conservation in Lightning System (Point :1).

9. Thermal Comfort (IHC 8)

This criterion aims to ensure stable room temperature and humidity conditions to increase user productivity as measured, the result showed the office temperature and humidity wereset in line with greenship benchmark which is 25 ° C ± 1°C and 60% ± 10% respectively in accordance to SNI 03-6390-2011 (Point:1). As Observated, the office building uses a central AC WCPU system with AC ducting in the central of the office (Point: 1). There is

an individual air temperature control system following the needs and preferences users (Point:1) Individual air temperature control system is in front of each room (Figure 4).



Figure 4. General Conditioning of room temperature

10. Acoustic Level (IHC 9)

Based on the measurement, the results showed noise level at Greenhub Suited Offices was 100% in accordance to the design criteria recommended by SNI 03-6386-2000 (Point: 1).

11. Interior Plants (IHC 10)

Workers with indoor plants have better mood levels and feel more comfortable in the office than without plants (Larsen et al. 1998). Based on the observation, Greenhub Suited Offices had fulfilled all the benchmarks for interior plants criterion. There are plants in every office room and many vertical green walls at the office (Point :1) (Figure 5).

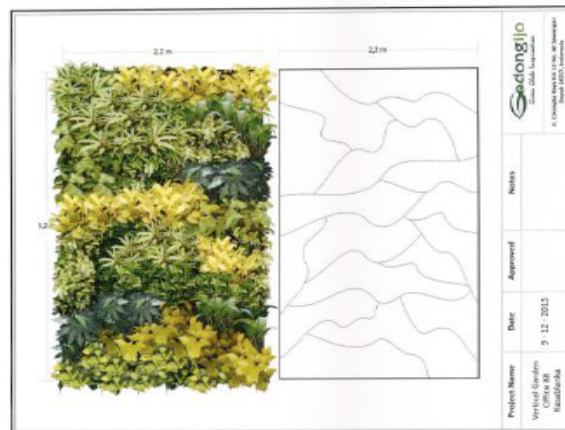


Figure 5. Green Wall Layout

All plants that is used has been based on the interior plants lists (Point: 1). The office management has implemented regular indoor plant maintenance once a week to ensure the plants in a healthy condition (Point 1).

12. Pest Management

As interviewed, Greenhub Suited Office management have and apply SOP/ Standard Operating Procedures to manage and control pests regularly (Point :1) (Figure 6).



Figure 6. Maintenance Documents

13. Room Occupant Survey

As interviewed, the office management had conducted a survey of room tenant' comfort by distributing questionnaires. There were 5 categories that was asked on the questionnaire such as about air temperature, room cleanliness, room lighting levels, glare and noise levels (Point 1). The results showed there were 1,9 % of respondents felt not comfortable , about 32,8 % of respondents felt comfortable and 65,3 % of respondents felt very comfortable working at the Greenhub Suited Offices (Point :1).

3.2 Indoor Health and Comfort at Greenhub Suited Offices

Table 1. Indoor Health and Comfort Aspects in Greenhub Suited Offices

Code	Creteria	Max. Point	Credit
IHC P	No Smoking Campaign	P	P
IHC 1	Outdoor Air Introduction	1	0
IHC 2	CO ₂ Monitoring	2	1
IHC 3	Chemical Pollutant	9	9
IHC 4	Indoor Pollutant Source Control	-	-
IHC 5	Biological Pollutant	1	1
IHC 6	Visual Confort	3	2
IHC 7	Outside View and Daylight	2	1
IHC 8	Thermal Confort	2	2
IHC 9	Acoustic Level	1	1
IHC 10	Interior Plant	2	2
IHC 11	Pest Management	1	1
IHC 12	Room Occupant Survey	3	3
Point Total		27	23

IHC aspect as the highest rating points, has become an important element for Greenship Interior Space 1.0 assessment. This study showed Greenhub Indonesia was able to get 23 points out of 27 total points of assessment.

4. CONCLUSION

Greenhub Suited Office at Jakarta has many potentials to get a platinum rating on GBCI certification. This potential had been proven by obtaining a high score in Indoor Health and Comfort assessment . Greenhub had fulfilled almost all the criterias for Indoor Health and Comfort on Greenship Rating Tools 1.0. It is also possible to maximize the visual comfort by using office room lights with a greater power and replace the wooden door to the frameless glass door and another alternative is to make air ventilation between 2 small rooms in order to maximize the outdoor air introduction points and maintain better air circulation for room occupants. Further research is required on efforts to enhance the index of indoor health and comfort towards green building. The focus

of improving performances of the aspect can be reviewed from many aspects, such as social, economic, environmental conditions, and city policies.

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