

Green Building Analysis of PT United Tractors on Existing Building Based on the Latest Rating Tools Green Building Council Indonesia

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Abstract—PT United Tractors building has received a Platinum predicate for the GreenShip New Building Category. However, the more advanced the development and growth of the company, research must continue to be done to see if the building is still feasible in its current condition. The method used in this research is to compare the condition of the existing building with the GreenShip New Building Assessment tool. After comparisons, a new category suitability analysis was carried out for existing buildings. The analysis was carried out by direct measurement methods, interviews and using secondary data. From the results of the study, the PT United Tractors building received a Gold rating, because it met five building eligibility requirements, including Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation, Material Resources and Cycle, Indoor Air Health and Comfort. The assessment of the suitability of the criteria in each category showed a result of 65 points (57%). For this reason, it needs improvement in order to reach the highest point in Platinum rank.

Keywords—green building, greenShip, existing building, criteria, points, recommendations.

I. INTRODUCTION

UT Head Office in Fig.1 is the head office building owned by PT United Tractors Tbk which has received a platinum rating in the GreenShip New Building ver.1.1 certification. As one of the requirements to maintain the platinum rating, it is necessary to simulate energy saving calculations using calculation and software. In accordance with the provisions of the latest version of GreenShip Existing Building ver.1.1, the calculation of energy savings is carried out by obtaining the difference between the annual energy consumption value of the baseline building with the building design and the latest application which is summarized in the existing building along with the acquisition of new renewable energy values.



Fig. 1. UT head office building

This study will discuss details about the energy simulation carried out on UT Head Office. For the record, the baseline building has parameters based on the rules and regulations referred to by GREENSHIP. While the design building is a building that has parameters based on the design and planning set by the planner.

The Objectives of this work are:

- Provides information regarding the Green Building concept based on Green Building Council Indonesia (GBCI).
- Analyze the requirement and feasibility of the UT Head Office Building to be able to threaten as ad Green Building.
- Conduct a suitability analysis of the UT Head Office Building based on Green Building Criteria.
- Provide recommendations related to effort to repair the UT Head Office Building to achieve a certified rating.

II. LITERATURE REVIEW & RESEARCH METHODOLOGY

A. Green Building

Green building is a building that is planned and implemented immediately by taking into account environmental environmental factors that meet criteria such as land use, energy efficiency and conservation, water conservation, material sources and cycles, health and comfort in space, environmental management.

Green building is a concept that leads to structures and processes by taking into account the environment, from site selection to construction design, operation, renovation, and designation. a concept that complements and expands building design in terms of economy, utility, durability and comfort.

B. Greenship

Greenship from GBCI has 2 types of rating tools, namely Greenship for existing buildings and new buildings. Based on the standard, there are 7 categories with the achievement of 100 points (100%), namely Development of Appropriate Locations (17%), Efficiency and Energy Conservation (26%), Water Conservation (20%), Material Resources and Cycles (14%), Indoor Health and Comfort (10%), Environment and Building Management (13%).

The rating system or benchmarking device is a tool containing items from an aspect of the rating called rating. Each rating has a value (credit point). Benchmarking devices in relation to green buildings are assessment tools that assess a building's rating against the building concept's achievement. GBC Indonesia issues a rating called Greenship.

The four bases are expected to be a trigger for building industry players to implement the green building concept because they do not meet the criteria required in the ranking in obtaining certification. There are four ranks of version 1.1 greenship which later became the target for construction, namely:

TABLE I
GREENSHIP RATING [12]

Rating	Minimum Point	%
Platinum	74	73%
Gold / Emas	58	57%
Silver / Perak	47	46%
Bronze / Perunggu	35	35%

C. Research Methodology

The research will be carried out in September-December 2020 at the Head Office Building of PT United Tractors, Jalan Raya Bekasi KM22, Cakung, East Jakarta. following is the research method of each benchmark carried out. Research instrument used for data collection.

And assessment purposes consist of 2 (two) types, namely:

1. Checklist.
2. Testing equipment.

The compilation of the two research instruments was based on several references, including:

1. Greenship Rating Tools Existing Building
2. National regulations and standards (SNI) related to each of the criteria in the Green Building
3. Some other supporting literature/references

The following are the equipment/instruments used to find out primary data from the existing condition of the building.

TABLE II
NAME OF TOOLS AND INSTRUMENTS IN RESEARCH

No. Tool / Instrument Name	Function
Hardware	
1 GPS	Know the coordinates of the building site for determine the site plan.
2 Tape Measure	Length measuring tool
3 Power Logger Analyzer	Measure the quality of electricity
4 Sound level meter	Measure noise levels in office space
5 Room thermometer	Measure the air temperature in the office space
6 Luxmeter	Measure the level of lighting in an office space
Software	
7 Autocad Vers.2011	Describe the condition of the site / site plan as well building plans in 2 dimensions
8 Sketch Up Pro Vers.8	Depict buildings in shape 3 dimensions for the purposes of calculating OTTV
9 Microsoft Excel	Processing existing primary and secondary data specified in the criteria

Source: tools requirement

The suitability analysis is obtained by comparing the results of the checklist with existing tools, that is the Greenship Rating Tools Existing Building Version 1.1. After adjustments are made, points are obtained for each criterion and then the results are added up into total points and a ranking category will be obtained in GREENSHIP.

Following are the 6 (six) categories of Green Building that will be reviewed for each criterion and benchmark

1. Land Use Category
2. Energy Category Efficiency and Conservation
3. Water Conservation Category
4. Source Category and Material Cycle
5. Indoor Category Health and Comfort
6. Building Environment Category

After analyzing the suitability of the UT Head Office Building with the Greenship Rating Tools Existing Building Version 1.1, it will be known the deficiencies that occur in the field, so that recommendations emerge as an effort to improve the building to increase the value/points of the Green Building so that it can meet the requirement and criteria to reach the rating that are in Greenship.

D. Research Flow Chart

The following is Fig 2 which shows the research flow diagram:

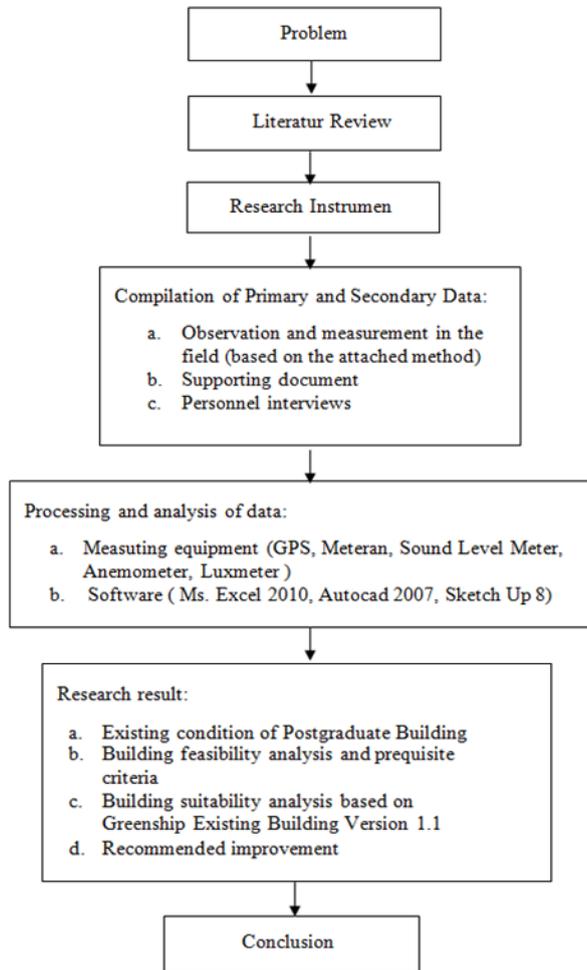


Fig. 2. Research flow diagram

The stages of the research carried out are as follows:

- a. Initial survey and application for permission to conduct research
- b. Collect various references, data and literature reviews about Green Building
- c. Compile research designs and determine research methods
- d. Develop research instruments
- e. Review and study the implementation of the Green Building in the UT Head Office Building by conducting field observations and measurements for certain criteria, as well as conducting personnel interviews and document evaluation
- f. Conduct a study on the feasibility of a building based on the conditions specified in the Greenship Existing Building
- g. Conducted a study on the Prerequisite Criteria in Greenship Existing Building Version 1.1
- h. Perform processing, data analysis and calculations of several criteria based on the Greenship Rating Tools for Existing Building Version 1.1 with the help of measurement equipment and computer software (Microsoft Excel 2010, AutoCAD 2011, and Sketch Up Pro8)
- i. Provide research results in the form of information about the existing conditions of the UT Head Office Building, building feasibility analysis and prerequisite criteria
- j. Provide research results in the form of points obtained in existing conditions and gap analysis that appears between existing conditions and Green Building standards
- k. Providing recommendations for improvements to the UT Head Office Building as an effort to improve the quality and performance of the building, so that it can achieve good quality as a Green Building
- l. Draw conclusions that answer the initial research objectives and provide suggestions

III. RESULTS

A. Analysis of Criteria Fit in Greenship

1. Land Use Appropriate Category

In the appropriate land use category, there are 7 criteria that have a total maximum value of 17 points. After being analyzed from the calculation results in the Appropriate Land Use (ASD) category, several criteria meet the predetermined benchmarks, so that the points obtained are 15 (five teen) points, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
ASD P	Basic Green Area	Prerequisite	Prerequisite
ASD 1	Site Selection	2	1
ASD 2	Community Accesbilty	2	2
ASD 3	Public Transportation	2	2
ASD 4	Bicycle	2	2
ASD 5	Site Landscaping	3	2
ASD 6	Micro Climate	3	3
ASD 7	Storm Water Management	3	3
TOTAL		17	15

2. Energy Category Efficiency and Conservation

In this category, there are 5 (five) criteria that have a total maximum score 26 points. After being analyzed from the calculation result, so that the point obtained are 17 (seventeen) point, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
EEC P1	Electrical Sub Metering	Prerequisite	Prerequisite
EEC P2	OTTV Calculation	P	P
EEC 1	Energy Efficiency Measure	20	11
EEC 2	Natural Lighting	4	4
EEC 3	Ventilation	1	0
EEC 4	Climate Change Impact	1	1
EEC 5	On Site Renewable Energy	5	0
TOTAL		31	17

3. Water Conservation and Material Cycle

In this category, there are 6 criteria that a total maximum score 21 point. After being analyzed from the calculation result, so that the point obtained are 19 point, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
WAC P1	Water Metering	Prerequisite	Prerequisite
WAC P2	Water Calculation	Prerequisite	Prerequisite
WAC 1	Water Use Reduction	8	8
WAC 2	Water Fixture	3	3
WAC 3	Water Recycling	3	3
WAC 4	Alternative Water Resource	2	1
WAC 5	Rainwater Harvesting	3	3
WAC 6	Water Efficiency Landscaping	2	1
TOTAL		21	19

4. Material Resources and Cycle Category

In this category, there are 6 criteria that a total maximum score 14 point. After being analyzed from the calculation result, so that the point obtained are 9 point, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
MRC P	Fundamental Refrigerant	Prerequisite	Prerequisite
MRC 1	Building and Material Reuse	2	0
MRC 2	Environmentally Processed Product	3	2
MRC 3	Non ODS Usage	2	2
MRC 4	Certified Wood	2	2
MRC 5	Prefab Material	3	2
MRC 6	Regional Material	2	1
TOTAL		14	9

5. Indoor Health and Comfort Category

In this category, there are 7 criteria that a total maximum score 10 point. After being analyzed from the calculation result, so that the point obtained are 5 point, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
IHC P	Outdoor Air Introduction	Prerequisite	Prerequisite
IHC 1	CO2 Monitoring	1	0
IHC 2	Environmental Tobacco Smoke Control	2	2
IHC 3	Chemical Pollutants	3	1
IHC 4	Outside View	1	1
IHC 5	Visual Comfort	1	0
IHC 6	Thermal Comfort	1	1
IHC 7	Acoustic Level	1	0
TOTAL		10	5

6. Environment and Building Management Category

In this category, there are 7 criteria that a total maximum score 13 point. After being analyzed from the calculation result, so that the point obtained are 5 point, with the following details:

CODE	CRITERIA	PROJECT POINT	PROJECT POINT
		MAXIMUM	ACTUAL
BEM P	Basic Waste Management	Prerequisite	Prerequisite
BEM 1	GP as a Member of The Project Team	1	0
BEM 2	Pollution of Construction Activity	2	0
BEM 3	Advanced Waste Management	2	0
BEM 4	Proper Commissioning	3	0
BEM 5	Green Building Data Submission	2	0
BEM 6	Fit out Agreement	1	0
BEM 7	Occupant Survey	2	0
TOTAL		13	0

B. Comparison Before Audit and After Audit

From the result below, there is a difference between the audit assessment carried out before this research began, using the Greenship New Building version 1.0 tools with the Greenship Existing Building version 1.1 tools

No.	Greenship Category	Greenship Point	Greenship New Building	Greenship Existing Building
		Maximum	Actual	Actual
1	Appropriate Site Development	17	15	15
2	Energy Efficiency & Conservation	26	16	17
3	Water Conservation	21	19	19
4	Material Resources and Cycle	14	8	9
5	Indoor Health and Comfort	10	6	5
6	Building Environment & Management	13	10	0
TOTAL		101	74	65

IV. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

- Received a GOLD PREDICATE after conducting research based on tools from Greenship Existing Building version 1.1
- Building has now implemented the green building criteria as specified in the Existing Greenship assessment tool. However, indirectly, several benchmarks have not been implemented.
- Based on the analysis of 7 building feasibility requirements, the UT Head Office Building has met all the requirements, including site area, IMB availability, building suitability to spatial planning, building suitability to safety standards for fire and earthquake resistance.
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- Based on the analysis, of the 6 categories meet the prerequisites, namely the category Appropriate for Land Use, Material Sources and Cycles, Health and Comfort in Space and Environmental and Building Management, the category of Energy Efficiency and Conservation and Water Conservation.
- Based on the results of the analysis, of the 38 criteria in the category, the UT Head Office Building received a total of 65 points, so it is included in the criteria for a Green Building with a Gold rating.

B. Recommendation

Recommendations that can be made to meet Platinum criteria in green buildings are as follows:

- Increase and utilize solar energy with photovoltaics technology with a capacity of 1000 kilowatts.
- Replacing the San Ei brand wall faucet whose output capability is above the maximum standard, with energy-efficient faucets, so that savings can reach 30.03%
- Provide CO₂ gas sensors in high density rooms
- Optimizing the lighting during lectures and increasing the number of lights in the library so that the lighting level reaches a predetermined standard.

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