SPIRIT PRO PATRIA (E-jurnal)
Volume 11, Nomor 1 – Maret 2025
E-ISSN 2443-1532
LPPM - Universitas Narotama
https://jurnal.narotama.ac.id/index.php/patria

PUBLIC BUILDING DAMAGE ANALYSIS AND MAINTENANCE COSTS ESTIMATION

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ABSTRACT

Based on the Regulation of the Minister of Public Works Number: 24/PRT/M/2008 related to the Guidelines for Maintenance and Maintenance of Buildings, a building is a physical form of construction work that is united with its position, part or all of it is above and/or in the soil and/or water, which is useful for human space to carry out activities either for space or residence, religious activities, business activities, social, cultural activities, or certain activities. (Hening, 2021). In line with the service life of a building, whether it is a new building or a long time old, it will have an impact on the use of the building which will cause damage, meaning that it is needed as early as possible related to the analysis of building damages that will have an impact on the less than optimal function of the building's performance so that it requires optimal maintenance.

Keywords: Building Performance; Building Service Life; Building Damage.

1. INTRODUCTION

Public buildings are buildings that are not made for the benefit of private residences. There are various types of public building classes reviewed from the activities carried out in the building facilities. The need for buildings for various activities is increasing from time to time. From period to period, new facility buildings often arise with various shapes and sizes, where the aesthetics and completeness of the building facilities are the form of the activities of the people who live there.

The Regulation of the Minister of Public Works Number: 24/PRT/M/2008 related to the Guidelines for the Maintenance of Buildings describes that a building is a physical form of construction work that is united with its position, part or all of it is above and/or in the soil and/or water, which is useful for human space to carry out activities either for space or residence, religious activities, business activities, social, cultural activities, or certain activities. (Hening, 2021). One classification of Public Buildings is Commercial Buildings. Commercial buildings include buildings that are planned and used for business or commercial, for example carrying out trade, service, or other economic activities. Commercial buildings are usually used to earn income or profit for the owner. The types of commercial buildings can be wide-ranging from small businesses such as shops, cafes, and offices, to larger buildings such as shopping malls, hotels, convention centers, high-rise office buildings, and others.

The Public Building that will be discussed in this study is a hotel building in Semarang City, namely the Whiz Hotel Semarang which is located on Jl. Kapten Piere Tendean No.9. Whiz hotel Semarang is a 2-star hotel that has 10 floors and 148 rooms. It has three types of room, namely Whiz Single, Whiz Double, and Whiz Twin. (www.whizhotels.com)

In line with time, whether it is a new or old building, it will have an impact on the building performance because of damages and usage. Therefore, it is importance to study the building's damages that will bring an effective maintenance procedure. It is important to take care of the building which is a process to replace or repair parts of the building until the building is still unbiased to be used properly, meaning that supervision of building and infrastructure maintenance needs to be reviewed and must be carried out so that it is of maximum benefit to those who use the building. The needs of a well-maintained building can certainly accommodate the activities and functions in the building.

To achieve optimal building performance, an efficient repair and maintenance system is required, including planned repair and maintenance preparation, maintenance scheduling, repair cost estimation, and inspection of the cause of damage.

With the existence of the Building Maintenance Department which regularly takes care of all components inside and outside Whiz Hotel Semarang, it is unfortunate that the repair handling system is still not optimal. This process only involves inspection and repair without investigating the root cause of the damage and without any cost estimate before the repair is carried out. Technicians only rely on material price estimates without making accurate calculations of needs beforehand.

Based on information from the management of the Whiz Hotel Semarang, it is said that in carrying out repairs or maintenance, the expenses are only approximately and there is no written data on expenditure. They need to find out the needed materials and costs. Therefore, the field observation is needed starting from damage identification, damage cause identification, damage volume identification, maintenance scheduling and calculation of needs and cost estimates for improvement. When the repair budget is not optimally planned, not only the repair process is affected, but it can cause a decrease in the quality of services provided.

2. RESEARCH METHODS

In this study, primary and secondary data will be needed. The primary data was obtained from field observations by reviewing the existing physical conditions and identifying damage to the Whiz Hotel Semarang Building. In addition, an interview was also conducted with the Engineering Department for more details regarding the condition of the existing damage. As for secondary data, it was obtained from the documentation of the components of the Whiz hotel Semarang building that were damaged, as well as working drawings that consisting of architectural drawings, drawings of electrical installation systems, and drawings of water installation systems to help calculate the cost of materials for calculating cost estimates.

After making observations, then processing data, for the architectural components and utilities that are damaged in the existing and calculating the number of damage points on each floor. The process of collecting components that often occur damage from the results of the interview with the head of engineering is obtained data on components that often occur in the planning of scheduling will be prioritized.

In the next stage, the calculation of the existing volume is carried out based on the working drawings that have been obtained, processing the volume data on each floor and obtaining the total volume on each component. Furthermore, the identification of the risk of damage to the repair of the Whiz Semarang Hotel involves the process of recognizing potential problems or obstacles that may arise during hotel operations. Risk identification is a key step in risk

management to minimize the negative impact on Hotel Whiz Semarang.

Furthermore, maintenance planning is carried out based on the assessments that have been carried out, namely weekly, monthly and annual maintenance planning. After the maintenance time on each component is known, then cost planning is carried out based on the maintenance plan according to the maintenance classification by processing survey price data which will be multiplied by the calculation of the volume that will be totaled in each component of the work and cost recapitulation is carried out according to the scheduling where there are Weekly, Monthly, Annual. It will be totaled and added VAT 11% which will get the results of the maintenance cost plan for 1-year period.

From the results of the subsequent research, conclusions can be drawn in accordance with the formulation of the desired problem.

The following figure 1 is a flow chart plan in conducting research.

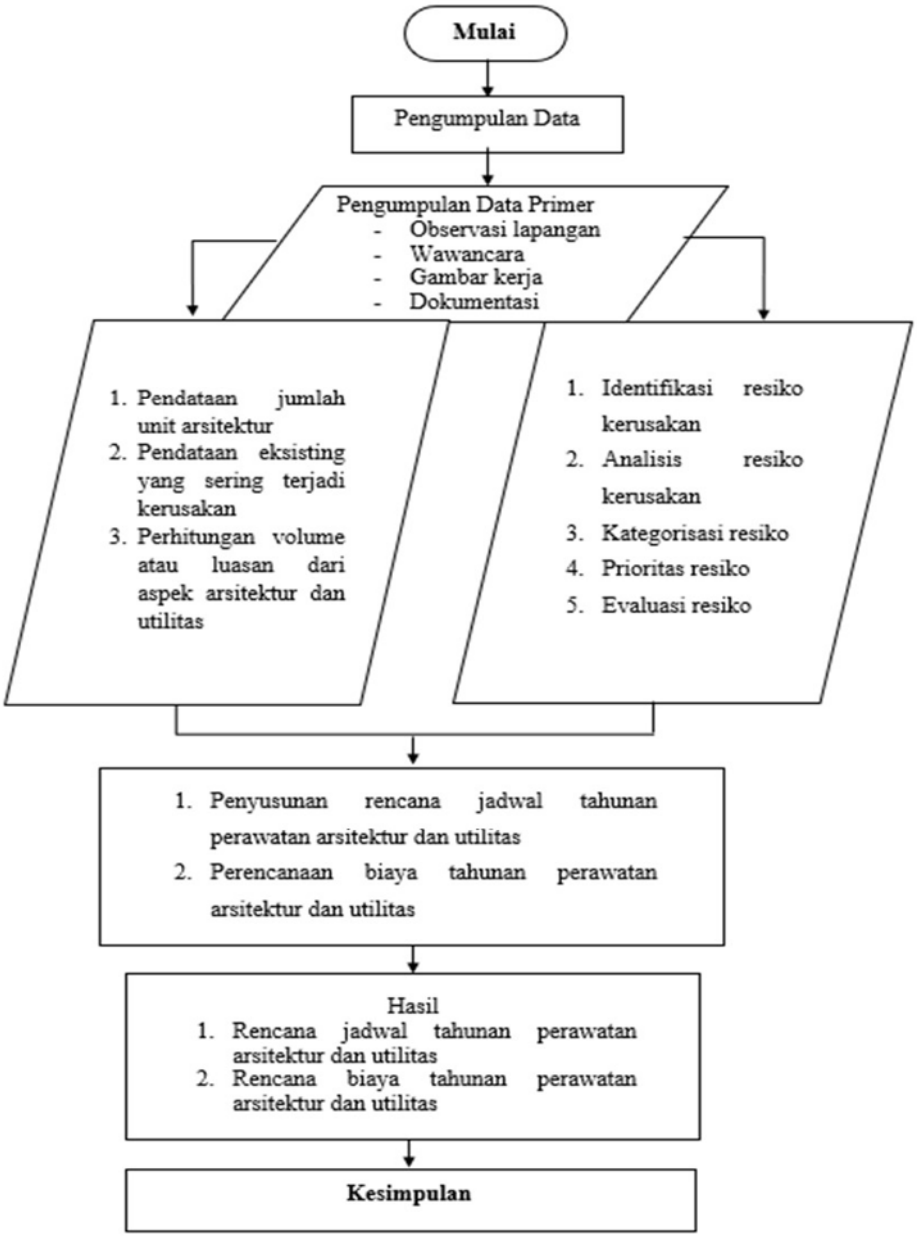

Figure 1. Research Flow Diagram

3. RESULTS AND DISCUSSION

Probability and impact analysis were carried out by utilizing data obtained from the main questionnaire survey involving 15 respondents in contractor X. To measure the frequency of probability and impact, the Likert scale method was used. The categories of the Likert scale used in the main questionnaire can be seen in the table 1 and table 2.

Table 1. Value categories Severity Index for frequency (probability)

No	Category	SI Percentage Value	Value
1	Very Often (SS)	87.5% ≤ X ≤ 100%	5
2	Frequent (S)	62.5% ≤ X ≤ 87.5%	4
3	Enough (C)	37,5% ≤ X ≤ 62,5%	3
4	Rare (J)	12,5% ≤ X ≤ 37,5%	2
5	Very Rare (SJ)	0,00% ≤ X ≤ 12,5%	1

Source: (Majid & Caffer, 1997)

Table 2. Category Severity Index for impact

No	Category	SI Percentage Value	Value
1	Very Large (SB)	87,5% ≤ X ≤ 100%	5
2	Large (B)	62,5% ≤ X ≤ 87,5%	4
3	Medium (S)	37,5% ≤ X ≤ 62,5%	3
4	Small (K)	12.5% ≤ X ≤ 37.5%	2
5	Very Small (SK)	0.00% ≤ X ≤ 12.5%	1

Source: (Majid & Caffer, 1997)

The results of the analysis show (table 3), that of the 20 risk variables analyzed based on probability and impact, there are 4 risk variables that are included in the high category or "HIGH", 3 risk variables in the medium category or "MODERATE", and 13 risk variables in the low category or "LOW".

Table 3. The analysis results

NO	VARIABEL FAKTOR AWAL NAMA KEJADIAN	Hasil	P	Hasil	I	P x I	Ket
1	Terdapat garis garis halus pada permukaan cat	SS	5	SB	5	25	HIGH
2	Retak rambut atau retakan besar pada dinding	S	4	B	4	16	HIGH
3	Permukaan cat tidak merata/gelembung	S	4	B	4	16	HIGH
4	Terdapat lubang pada plafond	S	4	B	4	16	HIGH
5	Plesteran dinding terkelupas	C	3	S	3	9	MODERATE
6	Komponen pintu longgar, tidak terpasang dengan kuat	C	3	S	3	9	MODERATE
7	Kompresor terlalu panas akibat sirkulasi udara buruk atau beban kerja berlebih	C	3	S	3	9	MODERATE
8	Permukaan plafond tidak rata/melengkung	J	2	S	3	6	LOW
9	Pintu atau jendela tidak bisa dibuka atau ditutup dengan lancar	J	2	S	3	6	LOW
10	Permukaan lantai vynil menggembung	J	2	K	2	4	LOW
11	Lapisan vynil terangkat dari dasar lantai, biasanya di tepi atau sambungan	J	2	K	2	4	LOW
12	Berkurangnya bahan pendingin yang menghambat proses pendinginan pada AC	J	2	K	2	4	LOW
13	Air AC menetes dari unit indoor karena saluran drainase tersumbat atau kondensasi berlebihan	J	2	K	2	4	LOW
14	Nozzle tersumbat pada sistem sprinkler	J	2	K	2	4	LOW
15	Detektor pada fire alarm tidak berfungsi	J	2	K	2	4	LOW
16	Pemanas tidak berfungsi dengan stabil pada water heater	J	2	K	2	4	LOW
17	Pipa tersumbat atau bocor pada water heater	J	2	K	2	4	LOW
18	Valve tidak berfungsi pada sistem hydrant	SJ	1	K	2	2	LOW
19	Rangka aluminium, baja, atau bahan lain yang melengkung, longgar, atau berkarat.	SJ	1	SK	1	1	LOW
20	Kaca lepas dari rangka pagar balkon	SJ	1	SK	1	1	LOW

Here are some work items based on priority scale:

Priority scale of the "*High*" category are:

1. Fine lines on the paint surface
2. Hair cracks and large cracks in the walls
3. The paint surface is uneven/gele, dude
4. Holes in the ceiling

Priority scale of the "*Moderate"* category are:

1. Peeling wall plaster
2. Door components are loose/not securely attached
3. Compressor overheating due to poor air circulation or overload

"Low" *category priority scale* are:

1. Layers of vinyl are raised from the base of the floor
2. The detector on the fire alarm does not work
3. The heater does not work stably on the water heater

After getting priority work items that require periodic maintenance, the next step is to determine the cost of maintenance according to the priority scale. The following is a recap of the maintenance cost budget plan and a recap of the existing architectural and utility repair cost budget plan (table 4).

Table 4. Budge plan

No	Item Pekerjaan	Total Biaya sekali perawatan	Frekuensi Perawatan selama 1 tahun	Total Perawatan selama tahunan
A	**Skala prioritas kategori "High"**			
1	Terdapat garis garis halus pada permukaan cat	90.336.819	3	271.010.457
2	Retak rambut atau retakan besar pada dinding	107.220.351	3	321.661.053
3	Permukaan cat tidak merata/gelembung	90.336.819	3	271.010.457
4	Terdapat lubang pada plafond	31.487.216	3	94.461.648
	Sub Total Kategori "High"	**319.381.205**		**958.143.615**
B	**Skala prioritas kategori "Moderate"**			
1	Plesteran dinding terkelupas	107.220.351	2	214.440.702
2	Komponen pintu longgar, tidak terpasang dengan kuat	17.556.720	2	35.113.440
3	Kompresor terlalu panas akibat sirkulasi udara buruk atau beban kerja berlebih	136.935.000	2	273.870.000
	Sub Total Kategori "Moderate"	**261.712.071**		**523.424.142**
C	**Skala prioritas kategori "Low"**			
	Lapisan vynil terangkat dari dasar lantai, biasanya di tepi atau sambungan	26.072.717	1	26.072.717
	Detektor pada fire alarm tidak berfungsi	7.248.000	1	7.248.000
	Pemanas tidak berfungsi dengan stabil pada water heater	1.560.000	1	1.560.000
	Sub Total Kategori "Low"	**34.880.717**		**34.880.717**
	Total Keselurahan rencana anggaran perawatan	**615.973.993**		**1.516.448.474**

The comparison of the investment value with the cost of maintenance for the next one year is calculated as in the following details.

Investment Value : Rp. 50,000,000,000,-

Value of treatment cost : Rp. 1,516,448,474,-

So, the annual value of the maintenance cost of the Whiz Hotel Semarang:

(1,516,448,474/ 50,000,000,000) x 100 % = 3.0329 %

4. CONCLUSION

The conclusions obtained from the results of the study are as follows:

a. In realizing a functional building, it is necessary to have good maintenance of building components so that the components work optimally. With the limitation of time in conducting analysis and calculations, the components that are analyzed and calculated according to the existing are only a few of the architectural components consisting of the floor as a foothold to be safe and comfortable, the walls and wall coatings as partitions between spaces must be strong, clean and not moldy so that they are comfortable, safe for the health of visitors and safe for the building itself, The ceiling is used as a cover for utility channels and floor plates so that the aesthetics of the building are maintained. Doors as room coverings to maintain visitor privacy, windows as air circulation and light in the room, glass balcony railings as balcony security. The components consist of air conditioners as guards of room air conditions, fire extinguishers and hydrants as fire extinguishers in the event of a fire, lights as indoor lighting when the sun does not enter the room or at night, water heaters as water heaters for visitors who want warm water.

b. Analysis of existing damage is carried out starting from analyzing the cause of damage, making repairs, and maintaining components. Analysis of the causes of damage to architectural components includes falling walls and moldy and damp wall coatings, cracking of the walls and not using water proofing, damage to peeled vinyl floors, perforated and moldy ceilings, room doors with peeled plywood and peeled HPL, doors that are difficult to open because the door handle uses electronics which uses batteries that when run out need to be replaced, Windows often have damage, namely glass vibrating due to the age of the window and often opening and closing. For utility, air conditioners need to be serviced such as cleaning, checking channels, and filling Freon, fire extinguishers need to be serviced and need to be replaced, Hydrant Box also needs to be maintained such as checking the entire system so that in the event of a fire the fire extinguisher is ready to be used. The lamp also needs to be replaced because the lamp has a lifespan. The water heater needs to be serviced because sometimes water cannot flow due to clogged channels and it is necessary to clean the channel.

c. For the calculation of the maintenance cost plan, Rp. 1,516,448,474 is obtained for the next 1 year. For Whiz Hotel itself, it has a development investment cost of Rp. 50,000,000,000, so that the maintenance cost of Whiz Hotel is 3.0329% of the investment cost.

REFERENCES

Ariyanto, A. S. (2020). Analysis Of Damage Types In Multi-Story Buildings (Case Study On Candiland Apartment And Hotel Building, Semarang). Bangun Rekaprima: Scientific Journal Of Engineering, Social, And Humanities Development, 6(1, April), 45-57.

Firmansyah, I. (2015). Decision Support System For Building Rehabilitation At Universitas Muhammadiyah Purwokerto Using The Weighted Product Method (Doctoral Dissertation, Universitas Muhammadiyah Purwokerto).

Fernandi, I. (2011). Study On The Effect Of Building Maintenance Factors On The Comfort Of

Lecture Activities.

Hardiman, G. (2006). Comfort And Safety Of Buildings In Terms Of Site Conditions, Materials, And Utilities. Journal Of Design And Construction, 5(1), 47-57.

Kawedar, H. P. R., Trisiana, A., & Arifin, S. (2022). Analysis Of Damage Level And Maintenance Cost Estimation For The Rusunawa Putri Building At Universitas Jember. Journal Of Applied Civil Engineering And Infrastructure Technology, 3(1), 1-6.

Maulana. (2019). Damage Analysis And Maintenance Cost Estimation Of The Faculty Of Engineering Building, Indralaya Campus, Universitas Sriwijaya.

Zulkarnain, M. I. N. (2021). Damage Analysis And Cost Maintenance Of Male Dormitory, Uii Yogyakarta.

Sucipto. (2009). Building Reliability Analysis. Universitas Sumatera Utara, Medan.

Sulaiman. (2005). Construction Quality Of Educational Buildings. Institut Pertanian Bogor, Bogor.

Taufiqullah. (2019). Building Maintenance And Care System. Tneutron Civil, Tasikmalaya.

Regional Regulation Of Semarang City No. 5 Of 2009. Ministerial Regulation No. 15/Prt/M/2015.

Ministerial Regulation No. 6 Of 2006 On Building And Environmental Planning. Ministerial RegulationNo.24/Prt/M/2008.Https://Www.Intiwhiz.Com
Https://Www.Whizhotels.Com/Semara Ng/