THESIS SUMMARY

SUITABILITY ANALYSIS OF OFFICE BUILDING DESIGN AGAINST MAINTENANCE COST

(Case Study: Institution of Serayu Opak River Basin Organization, Water Resources Field and Water Resources Management Center in Yogyakarta Special Region)

Proposed to fulfill part of the Bachelor Master degree requirement
on Infrastructure and Materials Technology

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CHAPTER I
INTRODUCTION

1.1 Background

Regulation of the Minister of Public Works No. 24/PRT/M/2008 Year 2008 concerning Building Maintenance Technical Guidelines states that the maintenance of the building aims to maintain the reliability of the building and its infrastructure and facilities to always function and avoid proper damage to the building. Based on the above, the researcher wanted to know the relation of building design against the maintenance cost. The buildings that will be used as research objects are located in Jalan Solo Km.6, Caturtunggal, Sleman District, Yogyakarta Special Region and consists of 4 buildings, namely Serayu Opak River Basin Organization (SORBO) building, PKSDA building, PJSA and Water Resources Field (WRF) building, and Water Resources Management Center (WRMC) building.

1.2 Problem Formulation

The problem formulation from the background explanation of the research is what is the inappropriateness of the design that affects the cost of building maintenance and then find a solution for building maintenance activities can take place efficiently. From this study will also answer the question of whether the budget of building maintenance cost available from 2014 - 2016 is in accordance with the required.

1.3 Research Objectives

The purpose of this research is to know the inaccuracy of building design, to know the suitability of budget of building maintenance cost, to know the influence of the inaccuracy of building design and to give solution for building maintenance activity in the institution of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) can take place efficiently.

CHAPTER II
LITERATURE REVIEW

2.1 Building Design

Rachmayanti (2011) conducted a study entitled Interior Design of Jakarta Art Building (JAB). The study aims to analyze the interior design of JAB based on data obtained from the literature and interviews with JAB manager. Starting from the terrace area, there are 2 main entrances measuring 181 cm x 250 cm and painted in black. From the proportion of the door size to the whole, it appears at the front of this

terrace looks less harmonious because the door looks short when compared with the proportion of GKJ front space. As the main entrance, the authors recommend the design changes and the proportion of the main terrace room. Next up is the lobby area. Ceiling plan in the lobby of Gedung Kesenian Jakarta feels less appropriate, because the ceiling height is only 2.4 meters, thus giving the impression of pressing and narrow.

Next is the foyer area or waiting room of the audience, is a space that use as a waiting room for tea break or room to snack at rest between the show. The selection of marble floors is appropriate because the room is used to serve food and drinks, so if there is spilled water on the floor, it can be easily cleaned. Then there is the auditorium room which is divided into 2 parts, namely the audience area and the stage area. The auditorium has a capacity of 395 seats at the bottom and 77 seats on the balcony. Auditorium space has a height of 10 m to the highest ceiling position, making this room memorable and spacious. The floor area of the audience using a red carpet. The drawback of the auditorium is that the carpet seems old and smells damp. This may be a consideration from the JAB manager to do renovations in some parts.

2.2 Building Maintenance Cost

Amal (2015) in his research entitled Building Maintenance Cost Analysis at Government and Private Offices (Case Study: Meteorology, Climatology and Geophysics Building and Palma Tower Building, Jakarta) analyzed the amount of building maintenance cost, and whether the cost was appropriate With applicable guidelines or regulations. The study used two buildings as a case study, the government-owned building at Main Operational Building of Central Meteorology and Geophysics Agency (CMGA) Central Jakarta and private building in Palma Menara Tower Building, South Jakarta.

The study revealed that the maintenance cost of CMGA Building in 2013 and 2014 amounted to Rp 3,210,336,000. The cost of 2013 and 2014 has not changed since it already has a predetermined budget of Rp 133,764/m^2. While the cost of maintaining Palma Tower Building in 2013 is Rp 96.643/m^2 with a budget amounting to Rp 4,369,337,799 and in 2014 amounting to Rp 101,475/m^2 with a budget amount of Rp 4,587,804,678. If the maintenance cost of CMGA Building and Palma Tower Building is compared with the regulation of the Ministry of Public Works and Ministry of Finance regulations, the result is still in the prevailing standard.

CHAPTER III
RESEARCH METHODS

3.1 Survey and Data Collection

At this stage there are two things to do, namely:

a. Primary Data Collection
   1) Field survey
   2) Interviews with building managers and users

b. Secondary Data Collection

   The secondary data required in this study, include:
   1) Building plan and specification.
   2) Organizational structure.
   3) Detail of activities and building maintenance cost per year during 2012 - 2016.

3.2 Analysis and Discussion

a. Building Design Analysis

   Office building design analysis based on the provisions contained in the book Architects Data Edition 33 Volume 1 and 2 by Ernst Neufert and using four basic laws, namely:
   1) Government Regulation No. 36/2005 on the Implementation of Law Number 28 Year 2002 regarding Building.
   2) Regulation of the Minister of Public Works No. 45/PRT/M/2007 year 2007 on Technical Guidance of State Building Building.
   3) Guidance for Planning and Operation of Parking Facilities 1998.
   4) Standard of Public Toilets Indonesia Year 2004.

b. Building Maintenance Cost Analysis

   Building maintenance cost analysis in this study using 3 Regulation of the Minister of Finance on Input Cost Standard, namely:
   1) Regulation of the Minister of Finance Number 84/PMK.02/2011 on Standard Cost Input of Fiscal Year 2012.
   2) Regulation of the Minister of Finance Number 37/PMK.02/2012 on Standard Cost Input of Fiscal Year 2013.
   3) Regulation of the Minister of Finance Number 72/PMK.02/2013 on Standard Cost Input of Fiscal Year 2014.
   4) Regulation of the Minister of Finance No. 53/PMK.02/2014 on Standard Cost Input of Fiscal Year 2015.

5) Regulation of the Minister of Finance No. 65/PMK.02/2015 on Standard Cost Input of Fiscal Year 2016.

c. Analysis of Building Design Influence against Maintenance Cost

This analysis serves to determine the maintenance costs used to minimize the effects of building design inaccuracy.

3.3 Conclusions and Suggestions

From the results of data collection which is then analyzed, it can be concluded and suggestions in the form of recommendations for better office building design so that building maintenance activities can take place effectively and efficiently.

BAB IV
RESULTS AND DISCUSSION

4.1 Building Design Inaccuracy Analysis

Buildings design that are less in accordance with the requirements required at the institutions of the Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) can be seen in the explanation below.

a. Inaccuracy Design Cause the room became hot

1) The heavy use of transparent glass on the side of the building

Buildings that became the object of research using a lot of clear glass as a cover of the building so that the rooms are exposed to the sun's heat during the afternoon, so the room becomes hot and glare. The hot and glare room is not suitable with the comfort requirements of the building contained in Government Regulation No. 36/2005 on the Implementation of Law Number 28 Year 2002 regarding Building. Image of the exposed part of the building can be seen in Figure 4.1.

Figure 4.1 Side of the Serayu Opak River Basin Organization building

Glass used in the building is clear glass 3 mm. Clear glass has the nature of continuing 90% of visible waves and 85% of the sun's radiation into the room thus making the room become glare and room temperature increases. To reduce the heat and the glare in the room, the best solution that can be done is to install window film. In order not to reduce the aesthetics should use a clear window film with a large TSER value on building glass. *Total Solar Energy Rejection* (TSER) is the total capacity of film glass to resist VLT, ultraviolet and infrared rays

2) The absence of heat insulators on the roof

Buildings was designed without using heat insulator on the roof so that the heat from sunlight that enters through the roof will impact on the heat of the room below. To reduce the heat, the building managers should use heat insulators made from polyurethane foam to inhibit the rate of heat transfer from outside into the building. Polyurethane foam is the most effective heat insulator material, especially in buildings which are quite difficult to be given sheets-shaped insulators because polyurethane foam is powder-shaped and mounted in spray form so it can reach a difficult position on the roof of the building.

b. Inaccuracy Design of Rainwater Gutters

Figure 4.2 Rainwater gutters without vertical pipes
at Serayu Opak River Basin Organization building

In Figure 4.2 we can see the design of less suitable gutters because the outlet pipe (funnel) is located at an altitude of ± 7 m from the soil surface so that the rain flow from the roof will fall inappropriately in the rain drain. Should be on the gutters mounted vertical pipe to approach the sewer so that rain water from the roof can be entirely wasted into the sewer. Should be on the gutters mounted vertical pipe to approach the sewer so that the rain water from the roof can be entirely wasted into the sewer and then flowed to the city drainage channel.

c. Inaccuracy Toilet Design

1) Less suitable of urinal location

The location of the urinal at the end of the toilet and facing directly into the corridor is less unsightly, especially when there are employees who use it to urinate.

Figure 4.3 Location of urinal in PJSA and Water Resources Field (WRF) building facing corridor

2) The lack of sink layout and size

The sink position in Water Resource Management Centre (WRMC) building is not in accordance with Indonesian Public Toilet Standards because it is installed in the corner and too close to the wall making it difficult for users to wash their hands and or faces. To be more clear, the position of the sink can be seen in Figure 4.4.

Figure 4.4 The location of the sink in the Water Resources Management Centre (WRMC) building

The width of the sink room in the toilet room of the Serayu Opak River Basin Organization which is only 75 cm in size is not suitable with the recommended size in Indonesian Standard Public Toilet by 90 cm. The width of the sink room in the toilet of Serayu Opak River Basin Organization can be seen in Figure 4.5.

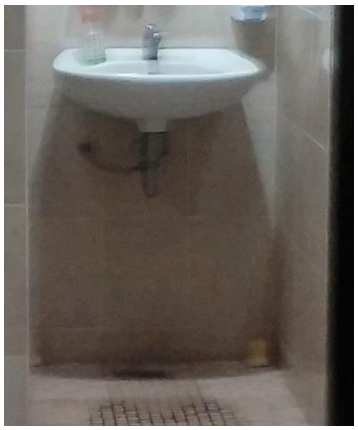

Figure 4.5 The sink room in the toilet of the Serayu Opak River Basin Organization building

3) Incomplete toilet facilities

Public toilets in the office should be designed to suitable to the requirements set by the Indonesian Public Toilet Standards. The completeness of public toilets facilities in Serayu Opak River Basin Organization (SORBO) building, PKSDA building, PJSA and Water Resources Field (WRF) building, and Water Resources Management Center (WRMC) building can be seen in Table 4.1.

Table 4.1 The completeness of public toilets facilities in Serayu Opak River Basin Organization (SORBO) building, PKSDA building, PJSA and Water Resources Field (WRF) building, and Water Resources Management Center (WRMC) building

Buildings	Toilet Facilities										
	Man Bathroom	Woman Bathroom	Disability Bathroom	WC	Water Container	Scoop	Spigot	Trash Can	Urinal	Sink	Mirror
SORBO	2	2	-	v	v	v	v	v	-	v	v
PJSA & WRF	1	2	-	v	v	v	v	-	v	-	v
PKSDA	5	5	-	v	-	-	v	v	-	v	v
WRMC	2	2	-	v	v	v	v	v	-	v	v

d. Inaccuracy Accessibility Design

1) The absence of guiding block and Braille facilities around the building
   Can reduce accessibility for the visually impaired.
2) There is a step on the access to the entrance and toilets.
   This makes it difficult for wheelchair users to enter the building without assistance. It should be at the entrance of the building made ram so that wheelchair users can enter the building with ease.

Figure 4.6 The steps at the entrance of Serayu Opak River Basin Organization toilet and building

3) There is a parking lot of vehicles blocking access to the entrance.

This is due to the absence of signs, parking borders and information boards so that workers park vehicles freely.

Figure 4.7 Access to entrance of PKSDA building blocked by vehicle

e. Inaccuracy of Rescue Facility Design

1) The corridor design is less wide

The corridor of Serayu Opak River Basin Organization (SORBO) building area has only 1.7 m width. Not in accordance with the Regulation of the Minister of Public Works No. 45/PRT/M/2007 Year 2007 on Technical Guidelines Development of the State House, which requires a minimum width of 1.8 m net corridor.

Figure 4.8 The corridor of Serayu Opak River Basin Organization (SORBO) building

2) Stair design is less wide

Residential building / building consisting of 2 floors or more, the size of the stairs used has a minimum width of 1.25 m. However, the staircase in the Water Resources Management Office building is only 85 cm wide.

Figure 4.9 Stair in Water Resources Management Building

3) No emergency lighting and a signpost EXIT

All buildings located in the institutions of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) have no emergency lighting and EXIT signposts.

The condition of the staircase and corridors that are not in accordance with the provisions and without being equipped with emergency lighting and signposts EXIT will complicate the evacuation process in case of an emergency.

4.2 Building Maintenance Cost Analysis

Building maintenance cost analysis aims to determine whether the required maintenance budget in accordance with the available budget. The comparison between the amount of maintenance budget required and the amount of maintenance budget available can be seen in Table 4.2.

Table 4.2 The comparison between the amount of maintenance budget required and the amount of maintenance budget available 2012 - 2016

Buildings	Budget Amount Required (Rp x 1000)					Budget Amount Available (Rp x 1000)				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
SORBO	80.155	98.974	98.974	105.247	105.247	64.135	98.974	98.974	105.247	105.247
PKSDA	118.560	120.042	121.524	128.934	128.934	78.000	120.041,6	121.524	128.934	128.934
PJSA	48.640	49.248	49.856	52.896	52.896	50.081,1	49.248	49.856	52.896	52.896
WRF	45.040	45.603	46.166	48.981	48.981	-	-	-	-	-
WRMC	77.510	95.708	95.708	101.774	101.774	94.250	95.708	95.708	101.774	101.774

Table 4.2 shows that the required maintenance budget of the building is the same as the available maintenance budget of the building except the agency of Water Resources Field because the agency shares the same building with PJSA agency, so that if there is damage to building components, PPK Ketatalaksanaan from Serayu Opak River Basin Organization agency will repair it.

4.3 The Influence of Building Design Inaccuracy against Maintenance Costs

Inaccuray of building design especially occurs on the the worker's room, namely the use of a lot of clear glass on the side of the building and the design of the roof without heat insulator so the room becomes hot and glare. Due to budget constraints, what can be done to reduce the heat and glare of the room is by installing the room cooler device and a barrier of sunlight. The amount of cost used to install the room cooler device and the barrier of sunlight can be seen in Table 4.3.

The total maintenance budget used to reduce heat and glare indoors from 2012 to 2016 is Rp. 43.529.082. From these results, it can be concluded that the buildings design of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) does not meet the requirements and regulations of the applicable regulations.

Table 4.3 Recapitulation of building maintenance cost of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) which is used to reduce heat and glare indoors from 2012 - 2016

Name of Activity	Building Maintenance Cost (Rp)																			
	SORBO					PJSA and WRF					PKSDA					WRMC				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Making of AC drainage	-	-	705.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Install the Electric Socket	-	-	-	-	229.100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Install *Exhaust Fan*	-	-	-	-	409.300	-	-	1.391.400	-	-	-	-	927.600	-	-	-	-	-	-	-
Install *Vertical Blinds*	-	10.800.000	-	-	924.672	-	15.996.000	-	-	-	-	1.000.000	2.152.000	-	-	-	-	-	-	-
Install Curtains	-	-	-	-	-	-	-	-	-	4.661.760	-	750.000	-	-	-	-	-	-	-	-
Install Rail Curtain + Buffer	-	-	-	-	-	-	-	-	-	1.275.000	-	-	-	-	-	-	-	-	-	-
Install *ventilating fan*	2.207.250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Windows repair	-	100.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2.207.250	10.900.000	705.000	-	1.563.072	-	15.996.000	1.391.400	-	5.936.760	-	1.750.000	3.079.600	-	-	-	-	-	-	-
Overall Total	43.529.082																			

BAB V
CONCLUSIONS, SUGGESTIONS AND REFERENCES

5.1 CONCLUSIONS

a. Based on this research, there are less suitable building design in the form of:

   1) Working room employees become hot due to 2 things, namely the use of clear glass 3 mm on the side of the building and the absence of heat insulators on the roof.

   2) The gutter design of the Serayu Opak River Basin Organization (SORBO) building is less suitable because there is no vertical pipe to drain rainwater from the roof to the sewer.

   3) The location, room size and completeness of toilet facilities are not in accordance with Indonesian Public Toilet Standards.

   4) Accessibility design is less appropriate due to:

      a) The lack of guiding block and Braille facilities around the building.

      b) There is a step on the access to the entrance and toilets.

      c) There is a parking lot of vehicles blocking access to the entrance.

   5) The corridor in Serayu Opak River Basin Organization (SORBO) and staircase of Water Resource Management Office building is less wide and there is no signs of EXIT in all buildings.

b. The required budget for the building maintenance of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) are equal to the available budget.

c. The effect of the inaccuracy design against building maintenance cost is the presence of jobs to install air conditioning equipment and a barrier of sunlight, which source of funds comes from building maintenance budget.

d. The design of Serayu Opak River Basin Organization (SORBO), PKSDA, PJSA and Water Resources Field (WRF), and Water Resources Management Center (WRMC) buildings are not in compliance with the terms and conditions of the applicable regulations.

5.2 SUGGESTIONS

a. Renovate the roof and side of the building by installing a heat insulator on the roof and coated glass with clear film glass.

b. Replace / redesign the gutter by adding a vertical pipe to the outlet pipe (funnel) to allow rain water to enter fully into the drain.

c. Equip toilets with facilities in accordance with Indonesian Public Toilet Standards.

d. Increase access for PwDs.

e. Install the alarm for emergency situations so that the evacuation process can be done earlier and faster.

f. Make clear signs and parking limits.

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