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EVALUATION OF CHURCH BUILDING CONDITION IN WEST JAKARTA USING CONDITION SURVEY PROTOCOL (CSP) 1 METHOD

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Abstract

The number of churches in West Jakarta shows an increase. Despite the growth in quantity, the decline in the quality of church buildings is a concern. This decline is mainly caused by aging structures, climate conditions, and lack of maintenance and preservation. The collapse of the ceiling is one of the impacts. This research applies the CSP 1 matrix, a visual assessment method, to examine the condition of church building components systematically. CSP 1 matrix enables researchers to evaluate defects, prioritize repairs, and assess the overall rating of church buildings. Research indicated that 63% of churches are in good condition, while 37% are in fair condition and none classified as dilapidated. Issues identified include discoloration and peeling of paint on architectural components, structural cracks ranging from 0.2 to 1 millimeter, and loose electrical sockets. These defect results are due to weather, material quality, building age, and inadequate maintenance planning, compounded by financial constraints in churches with smaller congregations. Matrix value variations reveal different levels of maintenance for each church building. Higher matrix values require better planning and prioritized repairs to maintain quality and ensure functionality and safety.

Keywords: Church Building, Evaluation, West Jakarta, Condition Survey Protocol 1

Introduction

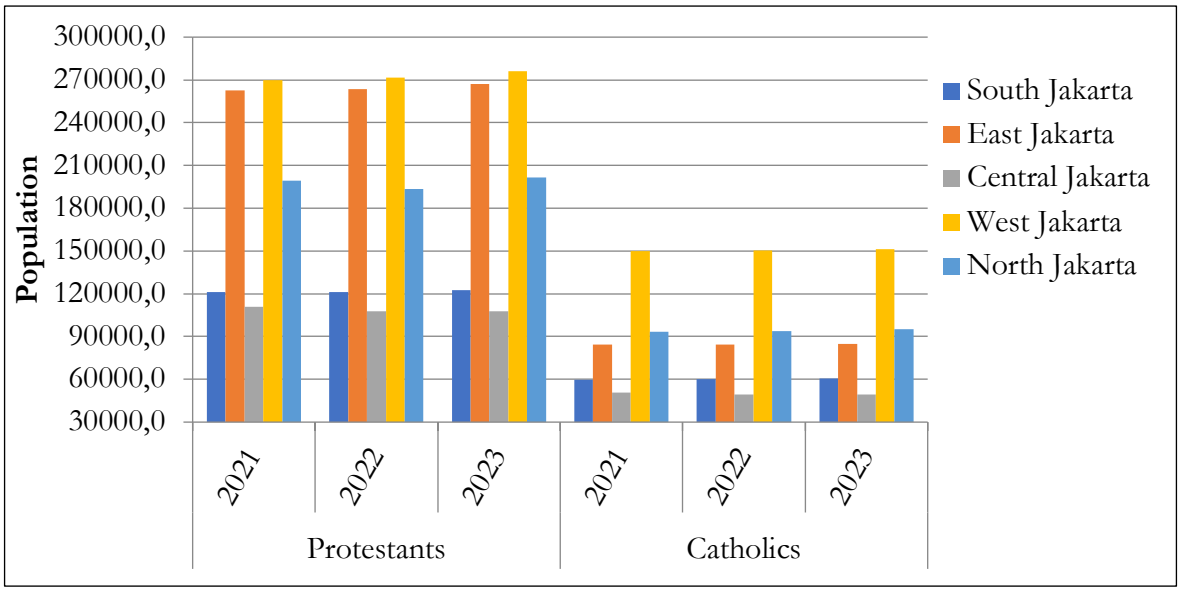

Figure 1. The Population of Protestants and Catholics in Jakarta, Indonesia
(BPS Provinsi DKI Jakarta 2024)

The growth of the Christian population in DKI Jakarta from 2021 to 2023 shows an increase, albeit not significant. West Jakarta is the largest area with Protestant and Catholic Christians. The increasing number and quality of churchgoers and the quantity of church buildings will increase (Fengky Luky Masengi, 2022). The existence of churches reflects the effort to develop the spiritual needs of the Christian community. Migration, urbanization, and demographic changes can be the causes of this transformation. Cultural diversity and positive interfaith interaction also contribute to the increasing openness of society towards various beliefs. (Manurung et al., 2021).

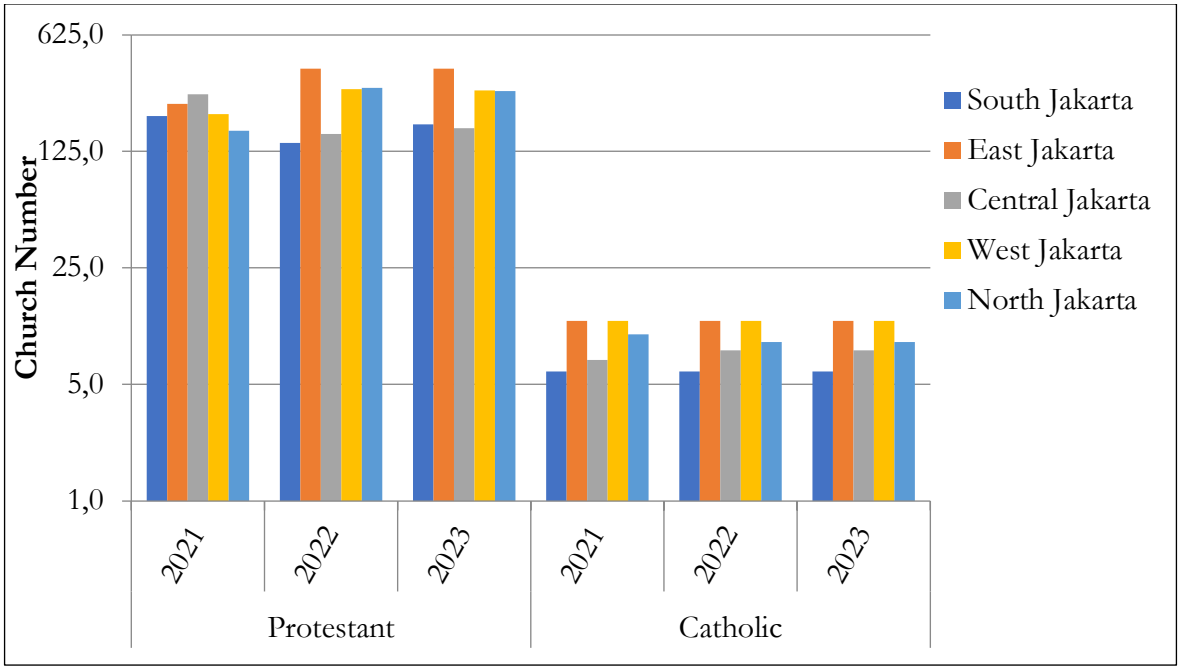

Figure 2. The Number of Protesctant and Catholic Church in Jakarta, Indonesia
(BPS Provinsi DKI Jakarta 2024)

Despite the increasing quantity of church buildings, there has been an impact on the decreasing quality of buildings. Due to the buildng's age, continuous usage and factors related to human and nature, which are unaligned to proper maintenance and preservation of the church buildings. The collapse of the ceiling at Maria Kusuma Karmel Church in Kembangan, West Jakarta, which resulted in injuries to two persons, is one of the impacts. (Suara.com, 2020). Occurred at St. Kristoforus Church, which was submerged to a height of 60 centimeters due to heavy rain (Suara.com, 2020).

The weather in Indonesia, consisting of dry and rainy seasons, has an impact on buildings, causing defects to building components and expediting the decomposition of building materials (Ariyanto, 2020), such as decayed roofs rafter, fascia, soffits, doors, and windows, insect or termite attacks on timber elements, finishing changes color shortly and peeling of paint.

The assessment of a building's condition or quality can be conducted through the application of visual methods, destructive tests, non-destructive tests, as well as monitoring and structural analysis using sensors or specialized software. In this study, the assessment of building quality is conducted through visual methods, which tend to be more economical and efficient. (Wiyanto and Yesaya, 2022).

The visual method aims to obtain initial information about the quality of the buildings and level of defect, potential for improvement and the need for further investigation. The condition of building quality can be visually analyzed through capturing images using a digital camera. Components with damage will be systematically observed and documented (Alkhaly, 2013).

Condition survey protocol 1 matrix method is one of the visual methods that can be used for various building structures, classifying data based on levels and damage assessment. CSP 1 matrix accelerates data interpretation and shortens field inspection time, and diverse building elements do not pose a hindrance (Kaamin et al., 2020). A lot of researchers have used this method on various types of buildings such as mosques, schools, houses, and shopping centers. The results obtained from the method include overall building rankings, dominant damage that occurs, and categorizing building component damages that require periodic maintenance or immediate attention.

Research using the application of the CSP 1 matrix method is one of the strategies for evaluating the maintenance and preservation of churches. This enables a systematic assessment of the architectural, mechanical, electrical, plumbing, and structural condition of the church building. By implementing this method, various aspects of defects that occur in the church building can be identified. The use of the condition survey protocol 1 method facilitates prioritizing repairs based on the level of defect.

This research will provide an understanding of the church's condition and necessary guidance for designing or planning effective maintenance strategies and controlled long-term preservation to ensure the sustainability and safety of the church building.

Research Methods

This research method begins with a literature reviews and visual observation of church buildings. Literature review from journals, books, articles, and government regulations and guides are carried out as references for the development and determination of the condition values of structural, architectural, mechanical, electrical and plumbing components. Visual observation to obtain data on church damage, supported by defect measurement and documentation, facilitates research in determining the condition value and prioritizing damage. Subsequently, the result of damage identification and assessment will be processed using the matrix method of CSP 1 to determine the overall ranking of church buildings condition, categorized as good, fair, or dilapidated based on the ranking results.

Assessment of defect and building condition is conducted using a scale of one to five, in accordance with observation, measurements, and documentation of defect or damage to the church building, presented in the following table:

Table 1. Condition Assesment Building (Hamzah et al., 2010)

Condition Value	**Scale**	**Description**
1	Good	Minor servicing
2	Fair	Minor repair
3	Poor	Replacement
4	Very Poor	Malfunction
5	Dilapidated	Damage

Based on Table 1, scale and description of building condition asssessment are based on researchers to develop condition values for sub-elements/components that will be assessed, namely the sub-components of structural, architectural, mechanical, electrical, and plumbing components. The development of sub-components scale conditions refers to government regulation and guidelines. Representative of subcomponents presented in Tables 2, 3, 4, 5, and 6.

Table 2. Condition Assessment Sub-Structural Component
(Panduan Penilaian Kerusakan A5-PUPR, 2020)

Condition Scale	**Description of Sub-Component: Column**
1	Corner defective and plaster crack less than 0.2 mm
2	Cracks 0.2 mm to 1.0 mm
3	Cracks more than 1.0 mm
4	Concrete cover defect and some reinforcement visible
5	Concrete cover chrushed at some points and 4 side of reinforcementare visible at 1 point

Table 3. Condition Assessment Sub-Architectural Component
(Panduan Penilaian Kerusakan A5-PUPR, 2020)

Condition Scale	**Description of Sub-Components: Wall, Ceiling, and Floor Finishing**
1	Color changes on some layers of the finishing and floor coverings have scratches

2	Changes to the paint layer are extensive, and the floor covering is partially cracked or broken
3	Layer of paint is peeling, the floor covering and ceiling are partially detached
4	peeling layer is extensive, mossy, and the slack of ceiling cover
5	Finishing layers come off, floor coverings come off in large amounts & ceiling frames collapse

Table 4. Condition Assessment Sub-Mechanical Component (Peraturan Menteri PUPR No. 16, 2010)

Condition Scale	**Description of Sub-Component: Water Pump**
1	Corrosion to the pump house and impeller
2	Seal Defect
3	Improper placement of the motor and pump
4	Vibrating or noisy
5	Malfunction

Table 5. Condition Assessment Sub-Electrical Component (Peraturan Menteri PUPR No. 16, 2010)

Condition Scale	**Description of Sub-Component: Box Panel**
1	Missing or incorrect labels
2	Loose connection
3	Corrosion
4	The insulation or cables Burnt
5	Water or moisture

Table 6. Condition Assessment Sub-Plumbing Component (Panduan Penilaian Kerusakan A5-PUPR, 2020)

Condition Scale	**Description of Sub-Component: Sanitation**
1	Pipe leaks are confined to visible or easily accessible locations, small faucets are harmed
2	Small parts of piping leaked, the pump motor burned, small was faucet defective

3	Pumps, motors, pipes, and faucets defective
4	Most of the pumps and some motors were on fire, the main pipes were leaking in the open area, and some faucets were malfunction
5	Water pumps are completely defect, the motor is burnt, the pipe leaks, and the faucet malfunctions

Defect priority assessment is conducted based on a priority scale evaluated by selecting a scale one to four, presented in Table 7.

Table 7. Priority Assessment (Hamzah et al., 2010)

Priority Values	**Scale Value**	**Description**
1	Normal	Functional, minor defect only
2	Routine	Minor defect, but could become serious if left unattended
3	Urgent	Serious defect, doesn't function at an acceptable standard
4	Emergency	Component or element doesn't function, presenting risk that could lead to fatality and/or injury

The assessment result of the matrix is obtained by multiplying the assessment of building condition value with priority values, the equation:

$$M = C \times P$$

Explanation:
M = Matrix Value
C = Condition Value
P = Priority Value

The total matrix score is divided by the amount of defect to obtain the overall building rating, the equation:

$$TS = \Sigma M/n$$

Explanation:
TS = Total Score
ΣM = Total Matrix Value
n = Number of Defect

The building rating calculations are classified into three categories, accompanied by color codes and matrix explanations or descriptions. This information describe the steps need be taken for treatment of church building. Presentes in Table 8.

Table 8. Peringkat Keseluruhan Bangunan Gedung (Hamzah et al., 2010)

Score	Overal Building Rating	Color Code	Matrix
1 to 4	Good		Planned maintenance
5 to 12	Fair		Monitoring of Condition
13 to 20	Dilapidated		Serious attention

This research can suggest or provide input for church building management to prioritize repair or replacement of buildings with poor or dilapidated conditions. It is hoped that the measure will prevent severe defects that would require significant repair costs and reduce the number of dilapidated churches.

The research population includes all district in West Jakarta Administrative City, total 8 district. The total population obtained by researchers from Persekutuan Gereja Indonesia Wilayah (PGIW) DKI Jakarta and Keusukupan Agung Jakarta (KAJ) is 63 populations.

Sample in this study is determined using the "slovin" equation, which goal to obtain a representative sample size from the populations. In applying the "slovin" equation, researchers sets a margin of error is 10%, with the condition that the number of samples not less than 30 sample or minimum 30 samples.

Scope of this research samples is the data of church buildings in West Jakarta from 2021 to 2023, obtained from PGIW and KAJ. The church building should have permits, not part of commercial building, apartements, malls or shopping centers. The Component of the church buildings to be observe are structural, architectural, mechanical, electrical, and plumbing components. The churches being researched have either not under renovation in the past a year or are currently under renovation.

Research Results and Discussion

An evaluation of the church building condition in West Jakarta revealed total 35 church building as research objects. Overall, the total matrix value obtained was 4154, with 889 number of defects. The identified defects encompass various components of the churhc buildings. Figure 3 diplays the result of the dominant defect components.

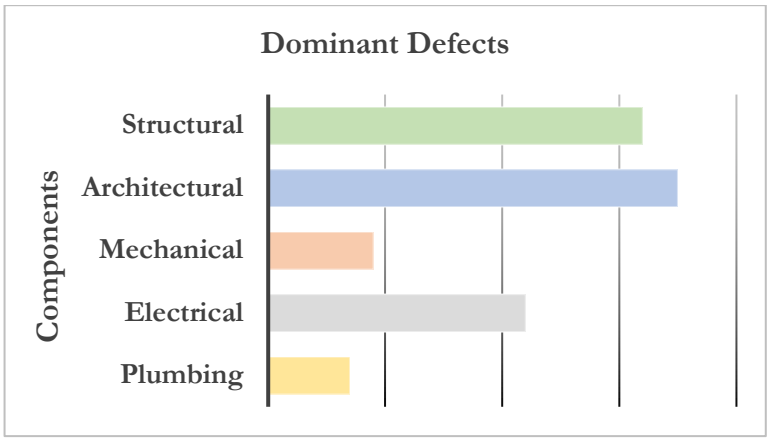

Figure 3. Types and Dominant Defect.

According to Figure 3, architectural component defects are the most common issue in church buildings. These defects are characterized by color changes or discolouration and peeling of paint. This phenomenon may be caused by climate conditions in West Jakarta.
Structural components ranked second in terms of defect occurrence, with an average defect size of cracks ranging from 0 to 1 millimeter. These defects could be attributed to suboptimal material quality, poor workmanship, or temperature fluctuations.
Poor installation or dampness penetration causes a loose electrical socket detached from the wall to be the predominant defect in the third rank, although it still functions.

Table 10. Representative of Structural Component

Structural Component: Sub-Component Column			
			
Condition Survey Protocol 1 Matrix Method			
Condition Value	Priority Value	Matrix Value	Color Code
3	2	6	

The researcher assessed the condition value score as 3 and the priority value score as 2 because a crack in one of the church building structures can become serious if left untreated. The matrix value of 6 is the result of multiplying the condition value and the priority value, and this value falls within the yellow color code.

Table 11. Representative of Architectural Component

Component Architectural: **Sub-Component Finishing**			
			
Condition Survey Protocol 1 Matrix Method			
Condition Value	Priority Value	Matrix Value	Color Code
3	2	6	

The researchers assigned a condition score of 3 and a priority score of 2, noting that Table 11 explains peeling paint.
The assessment considers the potential impact of paint peeling on the building structure and the external environment. Heavy rain could affect the columns or building structure, causing cracks due to dampness penetration if left unattended.

Table 12. Representative of Electrical Component

Component Electrical: **Sub-Component Power Socket and Switch**			
			
Condition Survey Protocol 1 Matrix Method			
Condition Value	Priority Value	Matrix Value	Color Code
1	2	2	

The researcher assigned a condition score of 1 and a priority score of 2 to the power socket, which was found to be in a loose condition, although still functioning. The degradation of the socket casing, which may wear out or become detached, poses a potential long-term risk for users of the church building, such as the possibility of electric shock due to plugging and unplugging devices.

Table 13. Sample Name and Code

Church	Code	Church	Code	Church	Code	Church	Code
GPIB Yahya	S1	GPIB Siloam	S6	POUK Tomang	S11	St. Matias Rasul	S16
GKNS Fajar Kemuliaan	S2	GKPI Cengkareng	S7	GKPI Satria Grogol	S12	St. Maria de Fatima	S17
HKBP Petojo	S3	GPIB Silo	S8	St. Andreas	S13	HKBP Kapuk Sawah	S18
GPIB Shalom	S4	Santo Kristoforus	S9	GKPI Jelambar	S14	GKPdI Bojong Indah	S19
GK Petamburan	S5	GKI Tubagus Angke	S10	Maria Bunda Karmel	S15	GK Taman Kota	S20

Table 14. Sample Name and Code

Church	Code	Church	Code	Church	Code
GPIB Sangkakala	S21	GKPI Green Garden	S26	GKJ Grogol	S31
Damai Kristus	S22	HKI Kapuk	S27	GKRI Haleluya	S32
GKI Kepa Duri	S23	HKI Kalideres	S28	POUK Bojong Indah	S33
Kristus Salvator	S24	GKRI Tritunggal	S29	GBIS Mirinda	S34
GPIB Sion	S25	GTM Jakarta	S30	GIA Cengkareng Indah	S35

This research provides a visualization of the percentage of component defects that can be seen in the following figures 4 to 10.

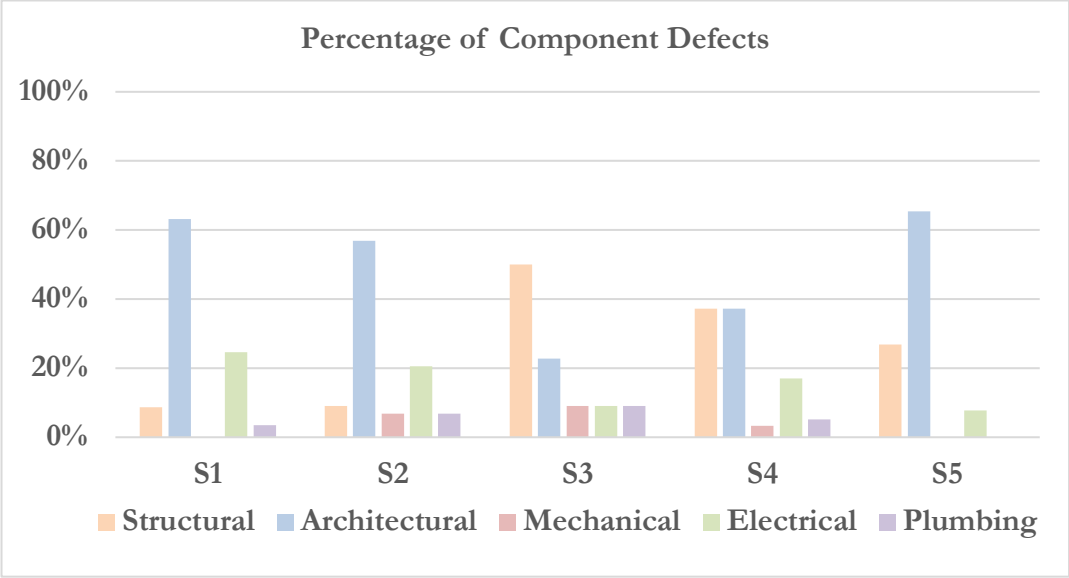

Figure 4. Percentage of Component Defects for Sampel 1 to 5.

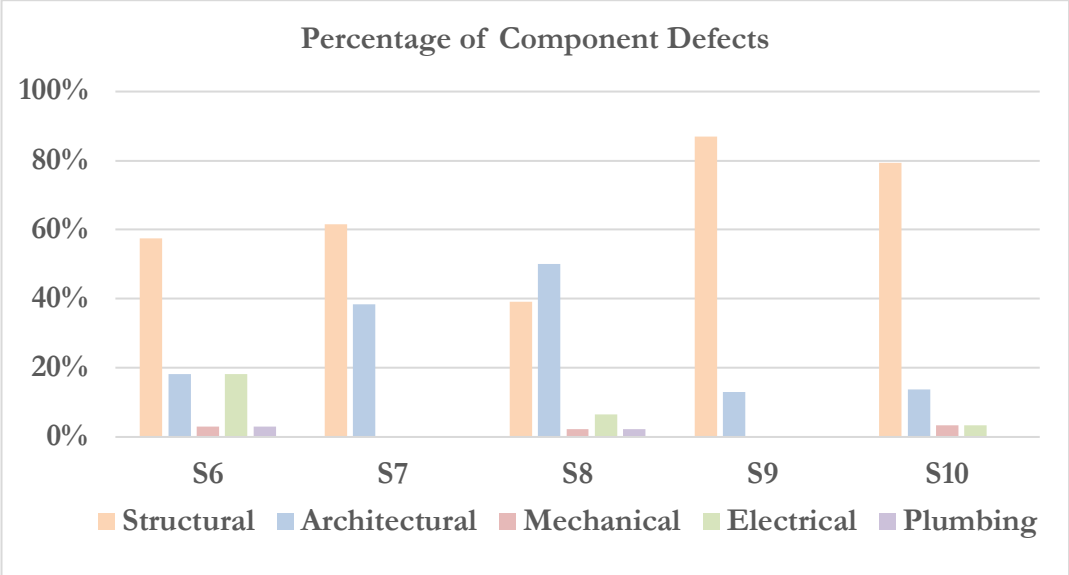

Figure 5. Percentage of Component Defects for Sampel 6 to 10.

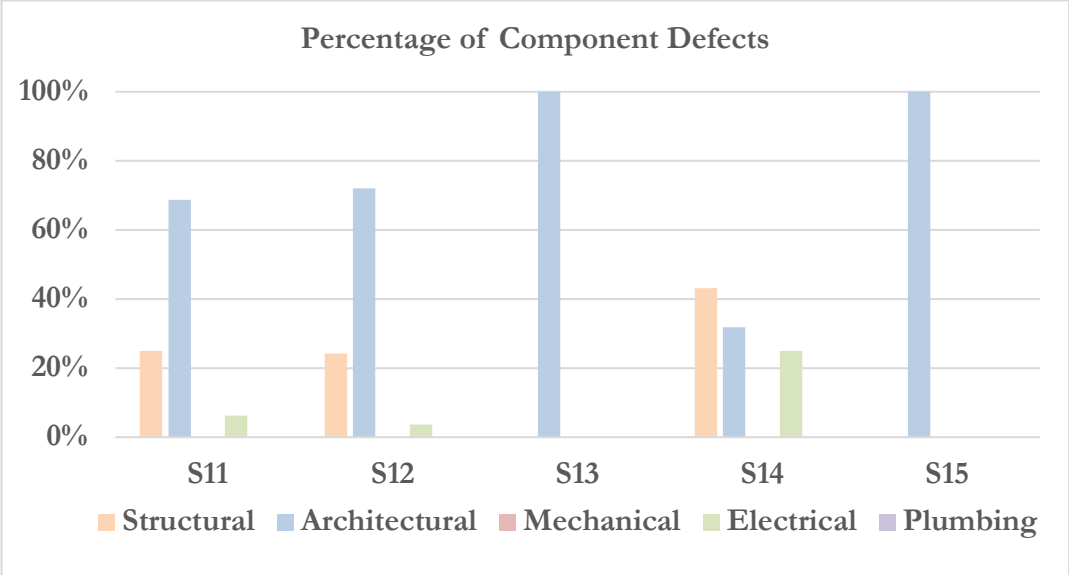

Figure 6. Percentage of Component Defects for Sampel 11 to 15.

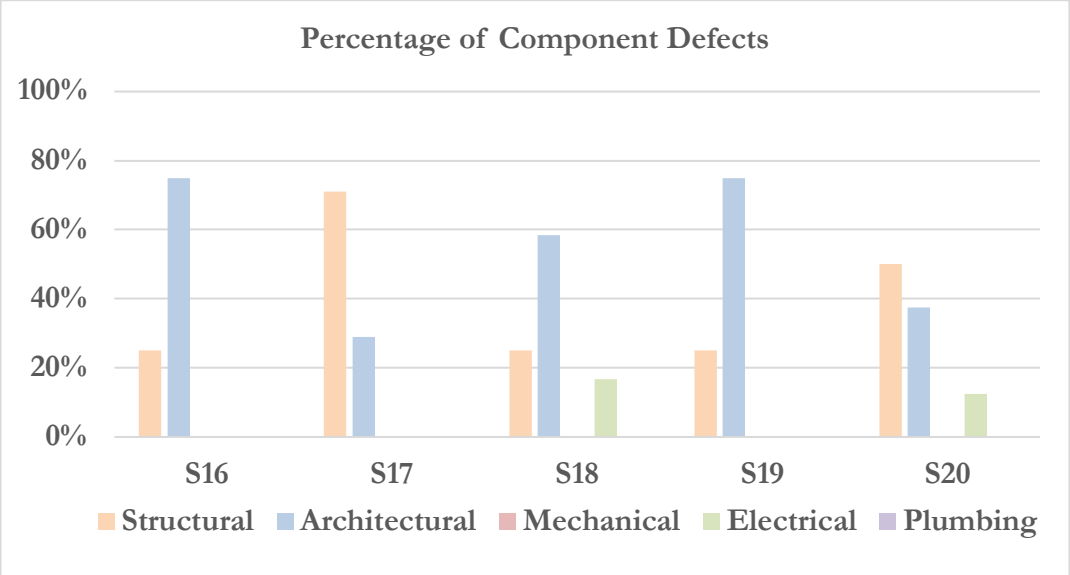

Figure 7. Percentage of Component Defects for Sampel 16 to 20.

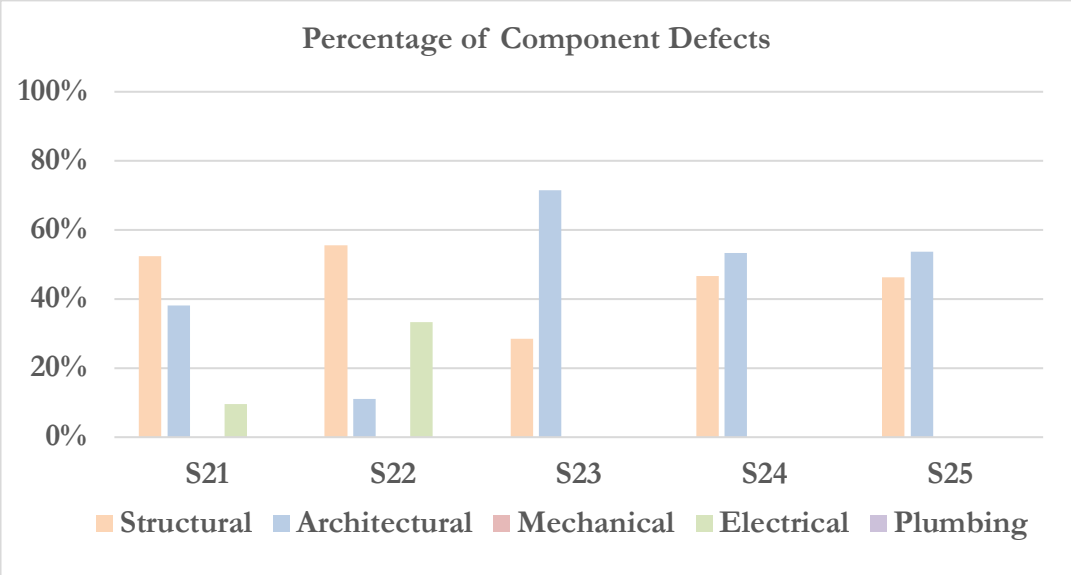

Figure 8. Percentage of Component Defects for Sampel 21 to 25.

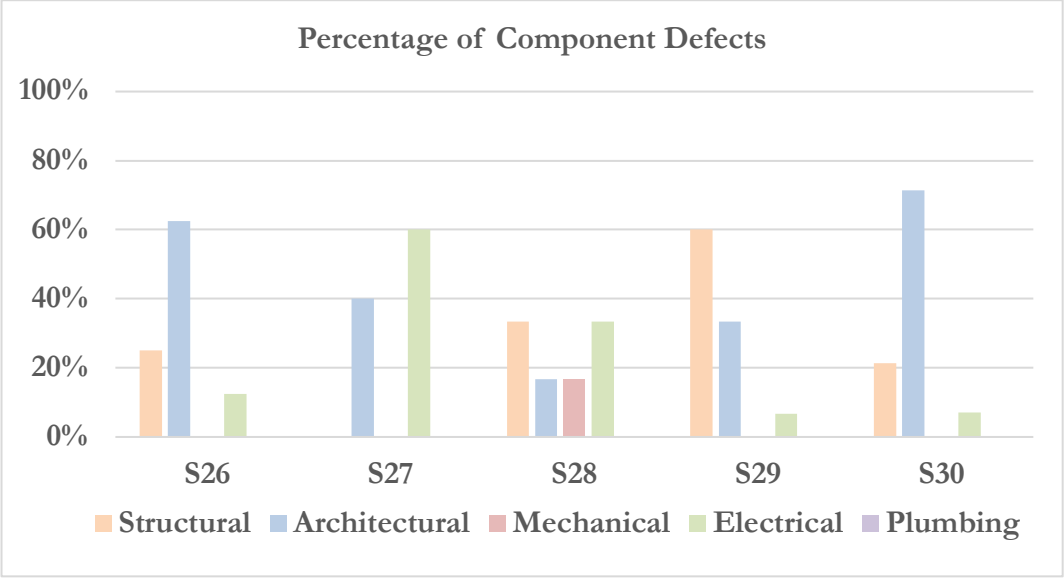

Figure 9. Percentage of Component Defects for Sampel 26 to 30.

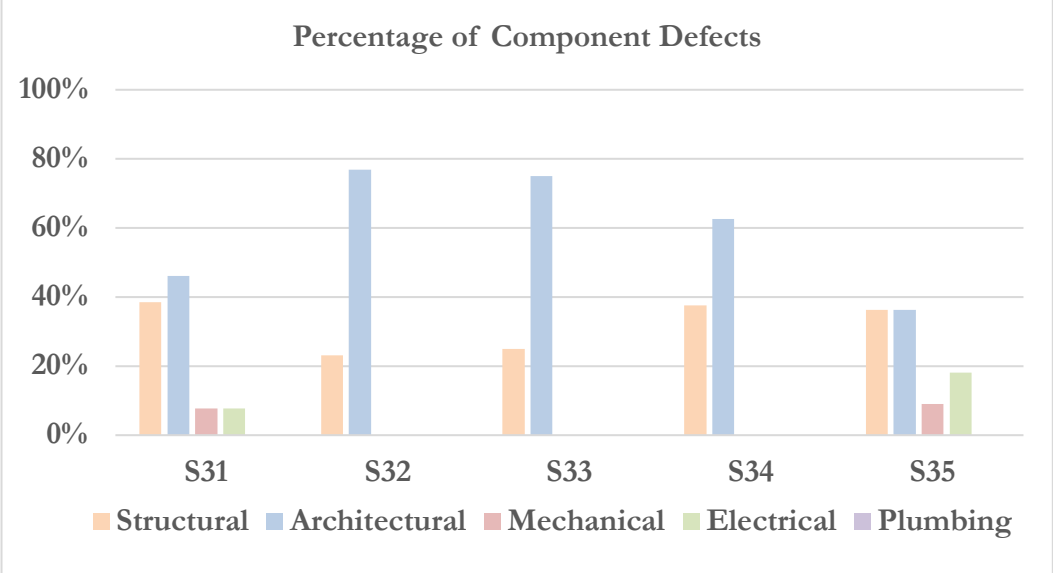

Figure 10. Percentage of Component Defects for Sampel 31 to 35.

An analysis of Figures 4 to 10 reveals the extent of defect to the various components of the church building's. The data provides a comprehensive overview of the most prevalent types of damage, serving as a reference for conducting inspections and prioritizing repairs by the church and government for components with the highest damage percentages.

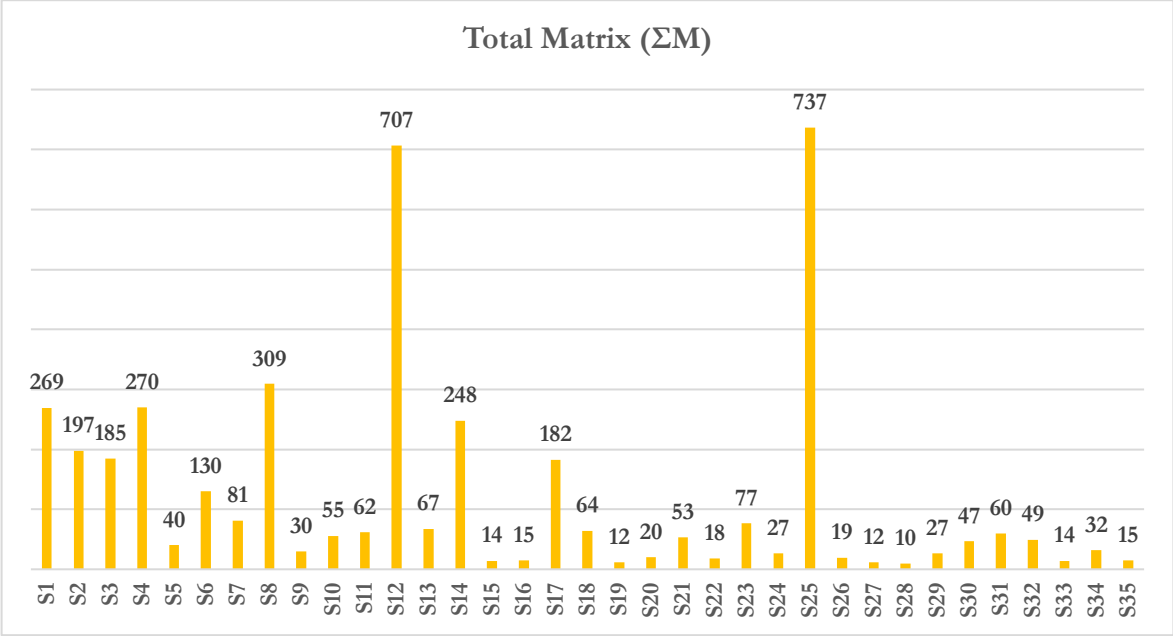

Figure 11. Total Matrix Values (ΣM) Sample

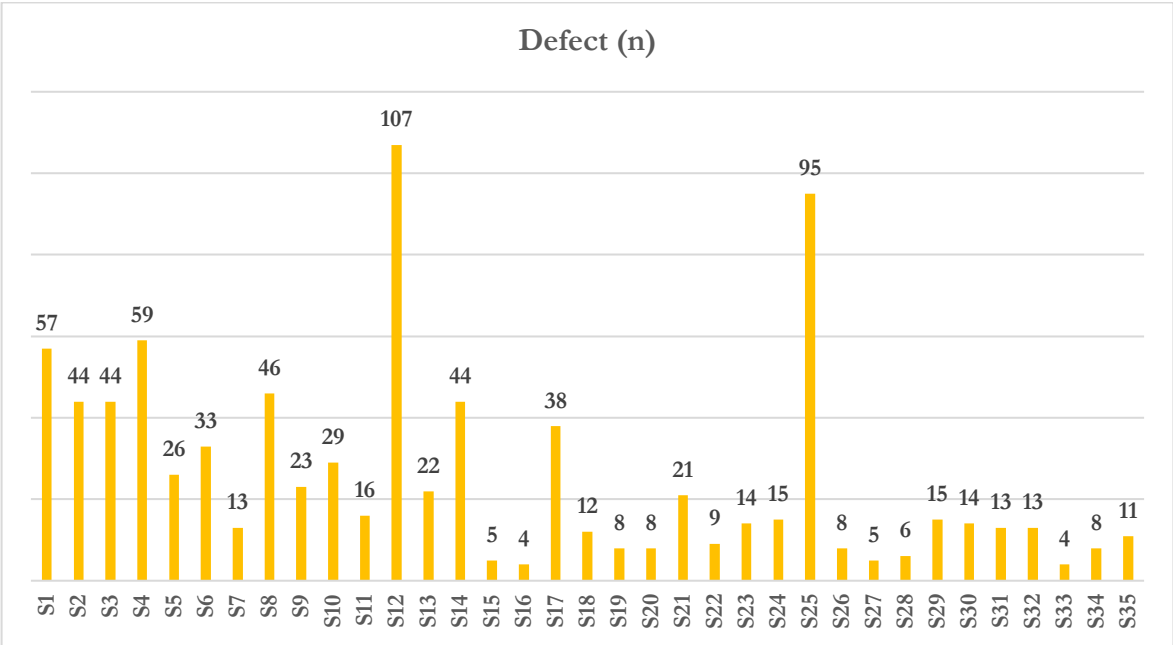

Figure 12. Total Number of Defect (n) sample

The analysis of Figure 11 and Figure 12 reveals variations in the quantity of matrix values and defect obtained from the research samples. The research object "S25" had the highest recorded total matrix value, reaching 737. The sample code "S12" had the highest damage count, reaching 107.

Factors that cause or affect matrix values and defects are as follows:

a. The age of the church building's and materials is a contributing factor to the deterioration of its components over time.

b. In regions of West Jakarta characterized by high rainfall intensity and prolonged sun exposure. Discoloration, paint peeling, and cracking are common effects.
c. It has been observed that certain church building's are not maintained according to a scheduled maintenance plan, which can result in minor damage escalating into significant issues. Additionally, some churches conduct maintenance and repairs once a year.
d. Church with small congregations encounter budgetary constraints, which can lead to delays or limitations in the maintenance and repair of church building's. Additionally, there is often a lack of willingness among congregants to collaborate in the execution of maintenance tasks, which further exacerbates the situation.
e. The process of repairing components or elements that deviate from established procedures and are not carried out by experts.
f. Aside from the church area. There are church building's that are adjacent to other buildings have limited access for maintenance and are exposed to the risk of structural and architectural deterioration due to environmental and moisture changes.
g. Several church's does not possess a specialized department or division, and the condition of the building's components is not regularly monitored. There is no maintenance schedule, the management of financial resources is unoptimal, and there is a lack of technical expertise.

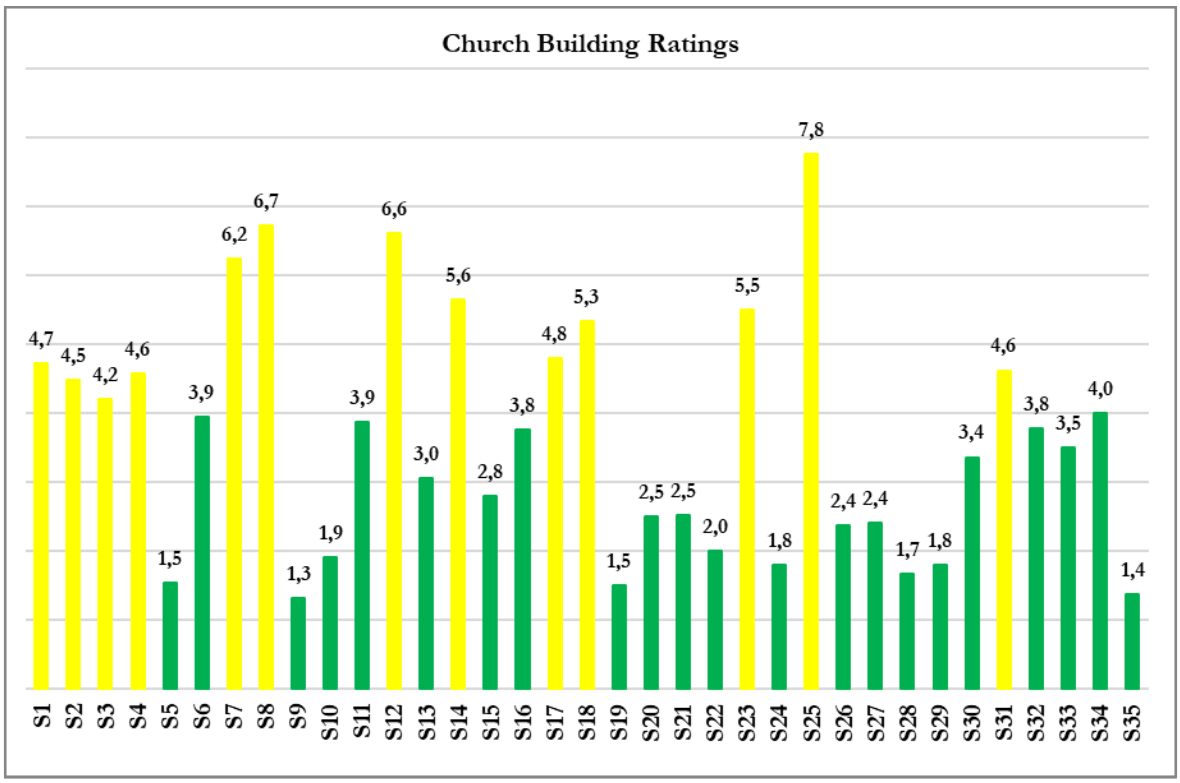

Figure 13. Overall Church Building Rating

According to Figure 13, sample code S25 in the Church Building has the highest score of 7.76. This is because of the high frequency of defects, such as cracks in the walls at multiple points, window decay caused by termites, and the aging of wooden materials in the roof structure. The research object "S25" is a 329 years old church, making it one of the oldest churches in West Jakarta.

In second place, with a score of 6.72, is Building with sample code S8. The defects include discoloration, peeling of paint, map cracking, moss or vegetation growth, and cracks exceeding 1 millimeter in column structures..

Researchers categorized church buildings as good to satisfactory overall, with no severely damaged churches found. Each church should plan for systematic maintenance and monitor specific conditions, especially for key components.

Conclusion

Most church buildings in West Jakarta, 63%, are in good condition. Church buildings in the fair condition category, 37%, were found. No dilapidated church buildings were found. Therefore, West Jakarta church buildings are adequate for users in terms of condition.

The highest frequency of defect found is architectural, structural and electrical defect. This is due to climate condition, material quality, the aging of components in church buildings and unoptimal maintenance planning, and financial constraints faced by churches with lack congregations.

The church building's maintenance and preventive measures are assessed by the variation matrix. Buildings with high scores require action plans to repair priority defects, enhancing quality and ensuring proper functioning of building components.

The results of this research suggest that churches with a fair condition should consider enhancing their maintenance strategy. Specifically, it is recommended that these churches implement a more systematic approach to maintenance, including regular inspections of structural components every six or twelve months and architectural and electrical components every three or six months. This recommended schedule aims to ensure the safety and comfort of the congregation. Additionally, the involvement of congregation members who possess expertise or comprehension in the maintenance of these three components is strongly recommended. It is imperative that building maintenance in these three components conforms to the provisions outlined in Government Regulation of The Republic of Indonesia Number 24 of 2008.

Development for further research is recommended to assess the research object with a similar area to the varying age of buildings, and research objects that are not adjacent to other buildings. Thus could compare the impact of age to the overall ranking of the building.

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