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Article

Structural Safety Analysis of Pahlawan University Apartment Building

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ABSTRACT (font size 11 pt)

The Rusunawa Putri Building at Universitas Pahlawan serves as a student residence operating 24 hours a day, providing essential accommodation facilities. Current physical conditions show several damages, including wall cracks, water seepage, damaged doors, and ceiling deterioration. This study aims to identify the factors influencing building reliability and to assess the reliability level of the Rusunawa Putri Building. A descriptive quantitative and qualitative method was applied, involving field observations, interviews, and questionnaires distributed to 28 residents. The assessment refers to the Ministry of Public Works Regulation No.29/PRT/M/2006, which includes five aspects: architecture, structure, utilities and fire protection, accessibility, and building and environmental layout. The findings show reliability values of 75% for architecture, 78% for structure, 82% for utilities and fire protection, 76% for accessibility, and 76% for building and environmental layout. Overall, the building achieved a reliability score of 82%, which falls into the less reliable category (75–<95%). This study recommends periodic maintenance and the provision of essential components such as hydrants, sprinklers, evacuation facilities, and disability-accessible amenities to improve building safety and reliability.

1. Introduction

Pahlawan Tuanku Tambusai University (UP) is a university under the auspices of the Pahlawan Tuanku Tambusai Foundation. Although the name UP was only officially used since the 2017 Academic Year based on the permission of the Directorate General of Higher Education Number: 97/KPT/I/2017 dated January 20, 2017, this university is actually the result of the merger of two educational institutions, namely the Tuanku Tambusai Health Sciences College (STIKes) which was founded in 2006 and the Pahlawan Tuanku Tambusai Teacher Training and Education College (STKIP) which was founded in 2012.

To date, UP has several buildings with various functions. These include the Rectorate Building, the UP Primary Clinic, the Women's Apartment Building, and the learning building. The Women's Apartment Building, which operates 24/7, primarily serves as student housing and provides basic needs such as shelter and privacy for its residents. The interaction between residents and their residences naturally shapes perceptions of the building's physical condition.

Building reliability is a crucial aspect that must be met to ensure safety, health, comfort, and ease of use. This is in accordance with Law Number 28 of 2002 concerning Buildings, Article 3, which states that to create a functional and harmonious building with its surrounding environment, building reliability must be guaranteed in terms of safety, health, comfort, and ease of use.

A Certificate of Functional Worthiness (SLF) is a legal instrument issued by the regional government to certify the functional worthiness of a building, both administratively and technically, before it is used. This is regulated in the Minister of Public Works Regulation Number: 25/PRT/M/2007 concerning Guidelines for Building Functional Worthiness Certificates. However, buildings in the UP area, particularly the Putri Rusunawa Building, have never been evaluated for their reliability. The current physical condition shows several damages, such as cracks in the walls, water seepage, damaged toilet doors, and a damaged attic. This damage is caused by various factors, including extreme weather and possible structural failure.

Therefore, it is crucial to conduct a building reliability assessment of the UP Women's Flats Building. This assessment will serve as the basis

for consideration for repairs and ensure the building is functionally fit and safe for use. Based on these conditions, the researcher is interested in conducting a study entitled "Physical Reliability Analysis of the Women's Flats Building at Pahlawan University."

2. Literature Review

2.1 Construction Projects

A construction project is a complex, non-routine business activity, with limitations in terms of time, budget, and resources, and specific project specifications (Nurhidayat, 2021). Completing a construction project requires a crucial project management system, known as construction project management. According to Indrajad and Sari (2019), construction project management is the effort undertaken to manage management functions to achieve time control, quality control, cost control, and zero accidents.

2.2 Buildings

According to the Regulation of the Minister of Public Works No. 29/PRT/M/2006 concerning Guidelines for Technical Requirements for Building Construction, a building is a physical form resulting from construction work that is integrated with its location, partly or wholly located above and/or in land and/or water, which functions as a place for humans to carry out their activities, whether for housing, or residence, religious activities, business activities, social activities, culture, or special activities.

2.3 Building Reliability

In Law Number 28 of 2002 concerning Buildings, every building must meet administrative and technical requirements in accordance with the building's function. These administrative requirements include land rights status, building ownership status, and building permits. Meanwhile, technical requirements for buildings include building layout requirements and building reliability requirements. Building reliability refers to the condition of a building that meets the requirements for safety, health, comfort, and convenience of the building in accordance with the needs of its designated function.

2.4 Validity Test

Validity testing is used to measure the validity of a questionnaire. A questionnaire is said to be valid if the questions in the questionnaire are able to reveal something that the questionnaire will measure. Or it can be said that validity is the extent to which a measuring instrument is accurate in measuring data, in other words, whether the measuring instrument used actually measures what is intended to be measured. In validity measurement tests there are two types: First, correlating between the scores of the question items with the total items. Second, correlating between each item indicator score with the total score of the construct.

Validity Testing Criteria: Validity testing that correlates each indicator item score with the total construct score. The significance level used is 0.05.

2.5 Reliability Test

According to Sugiyono (2019), reliability is the extent to which measurements made with the same measuring instrument produce the same data. Reliability tests are used to determine the level of reliability, accuracy, precision, and consistency of the indicators contained in a questionnaire. Research requires truly valid and reliable data. To address this urgency, the questionnaire was first tested on a sample before being used as primary research data. This test was conducted to obtain evidence of the accuracy and precision of the measuring instrument in carrying out its measurement function.

3. Research Methodology

3.1 General object description

In this case, to evaluate the reliability of the building, an analysis was conducted using interviews and questionnaires related to the evaluation of the reliability of the building with the analysis technique in this study using descriptive analysis, namely a method for solving an existing problem by collecting data, compiling it, explaining it, processing it, and analyzing it to obtain the final result. This study aims to evaluate the reliability of the building, which is whether the building is reliable, less reliable, or unreliable.

3.2 Research Location

This research was conducted in the women's flats building at Pahlawan Tuanku Tambusai University.



Figure 1. Research Location

3.3. Research methods

The research method used in this study is descriptive with a quantitative approach.

Generally, descriptive methods are divided into two types: descriptive methods with a qualitative approach and descriptive methods with a quantitative approach. A qualitative approach produces data in the form of written or spoken words from people and observable descriptions of objects. A quantitative approach, on the other hand, allows for the recording and analysis of numerical data, followed by calculations. This study employed a descriptive research method with both quantitative and qualitative approaches to evaluate the reliability of the building.

3.4. Research framework

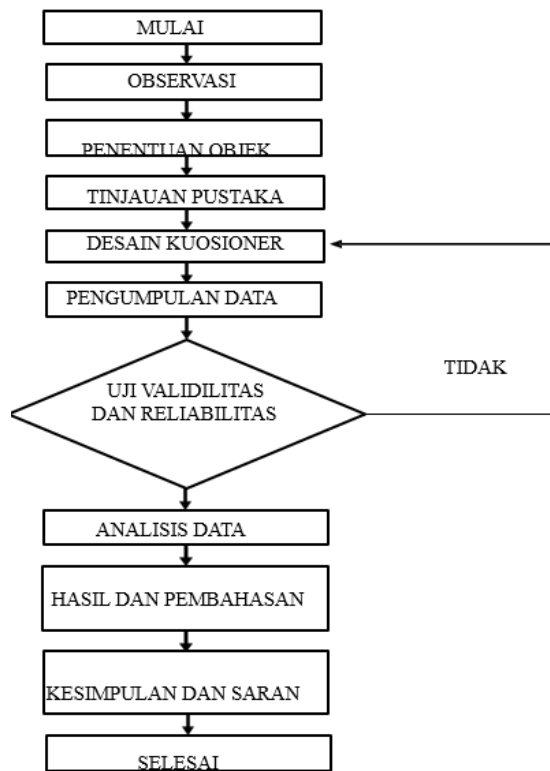


Figure 2. Research framework

4. Results and Discussion

4.1 Data analysis

The data analysis for this research was conducted using two methods: Interviews and Questionnaires. In the interviews, the research sample employed was Purposive Sampling, with the sample consisting of parties involved in the management of Development.

The questionnaire used is a closed-ended questionnaire. The instrument used to measure this research variable uses a 5-point Likert scale. In the questionnaire, the sample used was Simple random sampling, with a sample of 30 building users.

4.2 Validity and Reliability Tests

Reliability test is used to determine the consistency of the measuring tool, whether the measuring tool to be used gives consistent results in measuring the research object even if used repeatedly. SPSS provides a facility to measure reliability with Cronbach's Alpha statistical test. A construct or variable is said to be reliable if it gives a Cronbach Alpha value ≥ 0.60 .

Architecture, Structure, Utilities and Fire Protection, Accessibility, as well as Building

and Environmental Planning have Pearson correlation values greater than 0.361. This indicates that the statements in the questionnaire have met the validity requirements and are capable of revealing what is measured by the questionnaire.

4.3 Building structural reliability

In the research regarding the reliability level of the Putri Rusunawa building at Pahlawan University, data was collected using a questionnaire. The questionnaire results, where this assessment covers architecture, structure, utilities and fire protection, accessibility and building layout, as well as environmental layout. In the architectural assessment with 12 components, a weight of 1297 was obtained; with this known, calculations were performed, resulting in a final reliability score for architecture of 75%, which is categorized as less reliable (75 - < 95%). In the structural assessment with 10 components, a weight of 1179 was obtained; with this known, calculations were performed, resulting in a final reliability score for structure of 78%, which is categorized as not reliable (>85%).

In the assessment of utility and fire protection with 15 components, a weight of 1862 was obtained. Based on this, calculations were performed, resulting in a final reliability score for utility and fire.

Table 1. Building structural reliability

Reliability Factor	Score	Range	Description
Architecture	75%	(75 - < 95%)	Less Reliable
Structure	78%	(< 85%)	Not Reliable
Utilities and Fire Protection	82%	(< 95 %)	Not Reliable
Accessibility	77%	(75 -< 95%)	Less Reliable
Building and Environmental Layout	70%	(< 75 %)	Not Reliable

Based on the above data, the total value of the five reliability factors (architecture, structure, utility and fire protection, accessibility, and building and environmental layout) is 382% with an average of 76%. Therefore, the reliability of the Gedung Rusunawa Putri Universitas Pahlawan building is considered less reliable (75 - < 95%).

5. Conclusion

Based on the analysis conducted, the following conclusions can be drawn:

1. The factors that affect the reliability of the Rusunawa Putri building at Universitas Pahlawan include the reliability of the architecture, the reliability of the structure, the reliability of the utilities and fire protection, the reliability of accessibility, the reliability of the building's layout and environment. Where these five factors are the building's reliability requirements, which are the requirements for safety, health, comfort, and ease of the building according to the predetermined functional needs.
2. The reliability level of Rusunawa Putri Building at Pahlawan University is divided into five categories, namely: architectural reliability of 75% (including less reliable), structural reliability of 78% (including unreliable), utility and fire protection reliability of 82% (including unreliable), accessibility reliability of 76% (including less reliable), and building and environment reliability of 70% (including unreliable). The total reliability value is 76%, making Rusunawa Putri Building at Pahlawan University classified as Less Reliable (75 - < 95%).

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