RELIABILITY ANALYSIS OF ASN RESIDENCE AFTER BEING USED AS A TEMPORARY HOSPITAL FOR HANDLING COVID-19 CASES

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Abstract - At the beginning of the construction of *Rusunawa ASN* (State Civil Apparatus), it was planned to be operational in 2020, but it had not yet been used as a residence. The building was used as a temporary hospital to handle COVID-19 by the Government of Malang Regency. The use of *Rusunawa* as a temporary hospital makes it necessary to know the alignment of building reliability between rental flats and hospitals. Administrative requirements in the form of SLF (Certificate of Functional Fitness) are a measure of the feasibility of a building running properly; this has been regulated in the Law of the Republic of Indonesia, Number 16 of 2021, Article 84. The suitability of a building can be assessed from various angles, including safety aspects, health aspects, convenience aspects, and comfort aspects.

The method used is the descriptive analysis method by testing using tools and referring to the checklist in accordance with PP No. 16 of 2021. The results obtained from the test show the alignment of reliability between hospitals with *Rusunawa* and office buildings from the aspects of health, convenience, and comfort, indicating reliable results with the need to repair some component damage. For the results of the structural crack test, the average number of cracks is 59 mm, and the results of the concrete quality test are included in the doubtful classification with an acquisition of 3378 m/s. The reliability results of fire protection safety include reliability with complete fire detection and prevention components.

Keywords: SLF, building reliability, *rusunawa*, temporary hospital.

1. INTRODUCTION

The existence of SLF issues means that the owner has fulfilled one of the legal requirements that must be issued so that the building that has been built can be operated properly without any disturbances that can cause losses in the future. *Rusunawa* ASN is expected to have met the requirements, considering that the building is owned by the government. *Rusunawa* ASN, which in the initial plan was used as a residence for ASN in Malang Raya who did not have a house and was still single, was later used as a temporary hospital during the COVID-19 case in 2020–2022, is currently used by Dispora as an operational office, and is then planned to be used as an athlete's guesthouse. In 2010, the government determined to enforce SLF as a document that must be owned by every building, both new buildings and long-established buildings, in order to maintain the safety of building users [2]. The Government Regulation No. 16 of 2021 on Building Regulations is used as a reference to determine the requirements for building reliability. Building reliability requirements consist of four aspects, which are safety, health, convenience, and comfort. If these four aspects can be fulfilled, then the building is suitable for operation.

2. LITERATURE REVIEW

2.1 Building Reliability

Building reliability is a condition where the building and its equipment, which guarantee the safety, function, and comfort of a building and its environment during the lifetime of the building, have reached a perfect value or a value that is in accordance with the requirements set out in the building SLF. Therefore, building reliability is calculated based on aspects of safety, health, convenience, and comfort. In safety testing, the test is carried out on the part of the building structure that is the column to determine the quality of the concrete and cracks that occur in the concrete structure. The components tested in the health aspect include lighting and natural ventilation in the room; in the aspect of convenience, including convenience from, to, and in the room, as well as facilities and infrastructure, horizontal and vertical convenience; and the last is the calculation of the comfort aspect in terms of room temperature and humidity, space for movement, and comfort against noise [5].

3. RESEARCH METHODOLOGY

This research uses a quantitative descriptive approach, and the methods used in the research are desk evaluation for checking documents in the office (data

confirmation) and on-site evaluation, which involves conducting direct observations at the research location to see the physical reliability of the building and as supporting data for research. In the testing process, using several test equipment such as a lux meter, hygrometer, sound level meter, UPV TEST, and a tape measure, testing with the available tools refers to the checklist as follows:

Table -1 Aspects Tested Location

No	Aspects Tested	Test Location
1	Lighting	Rooms, living room, bathroom, kitchen, corridor, stairs, 1st floor office, courtyard.
2	Air conditioning	
3	Moisture	
4	Temperature	
5	Noise	
6	Space	
7	Active fire protection system	
8	Column structure cracks	
9	Column concrete quality	
10	Measurement of doors, windows, room dimensions	
11	Component damage check	

4. RESULTS AND DISCUSSION

4.1 Safety Aspects

In the test on the building column, it was stated that the quality of the concrete fell into the doubtful category with a classification measured based on the longitudinal wave speed of 3037 m/s.

Table -2 Classification of Concrete Quality

Longitudinal Wave Velocity		Quality of Concrete	Test results
km/sec³	Ft/sec		
>4,5	> 15	Very Good	
3,5 – 4,5	12 – 15	Good	
3,0 – 3,5	10 – 12	**Doubtful**	**3,037**
2,0 – 3,0	7 – 10	Bad	
< 2,0	<7	Very Bad	

Source: *International Atomic Energy Agency*

Cracks in the structure, if left unchecked, will continue to spread, and as a result, these cracks affect the bearing capacity of the layer, and the lower the bearing capacity, the stability of the structure also decreases [7]. Measurement of crack depth using UPV TEST test equipment involves working to provide longitudinal wave vibrations through electro-acoustic transducers in the form of gels, petroleum jelly, or other types of pastes that are applied to the concrete surface before testing [9]. When waves propagate through different media, such as gel on concrete, there will be a reflection of shear waves and longitudinal waves, where shear waves propagate perpendicular to the track while longitudinal waves propagate parallel to the track [9]. The methods that can be done with UPV TEST are indirect method, semi-direct method, and direct method. Of the three methods, only the position of the transmitter and receiver differs. The same way of working is used. The test illustration can be seen in the figure below:

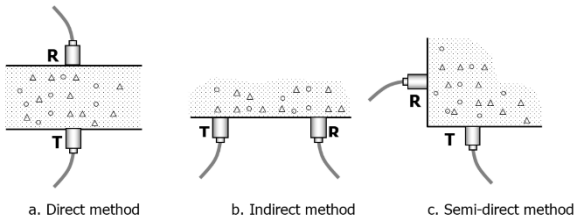

Fig -1 UPV Test Method

In this study, testing was carried out using the indirect method when conducting crack testing. Then, for the assessment of cracks in the structure, the average crack depth is about 59 mm; if it is known that the concrete blanket is 40mm, the crack has passed the concrete blanket and needs corrective action to protect the reinforcement. The cracks in the column have different directions, as can be seen in the figure.

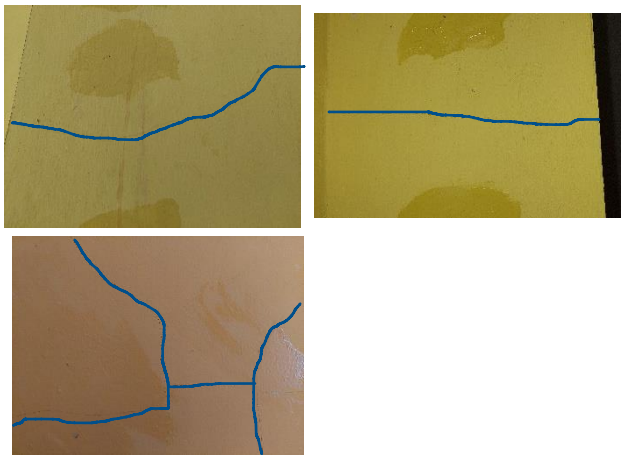

Fig -2 Wall Crack

In addition to structural safety, safety reliability also needs to be taken into account in terms of the availability of equipment (an active protection system) and means of fire prevention (a passive protection system). Therefore, it is necessary to study the standardization of fire safety regulations in tall buildings and their application to obtain the value of building reliability [7]. So that the occupants, the contents of the furniture in the building, the building structure, and the building near the location of the fire can be saved because these four things are factors that need to be considered in relation to fire [4].

Table -3 Availability of an Active Fire Protection System

No	Fire Protection	Suitability
1.	Smoke detector	Suitable
	Distance to the wall	Suitable
	Number of each floor	Suitable
2	APAR	Suitable
	Distance from the floor	Suitable
	Total	Not Suitable
3	Hydrant	Suitable
	Roll fire hose	Available
	Hose nozzle	Available
	Hydrant valve	Available
	Hose rack	Available
	Fire alarm	Available
	Total	Available

From the results of visual observations on the availability of active fire protection systems, it can be declared *reliable* in fire protection because each available component is appropriate in terms of installation, quantity, and completeness. The detector is well installed, spaced, and clean from dirt and paint so that it is able to function to detect fires from the appearance of smoke as a sign of a fire in the building. Therefore, it makes it easier and more efficient to evacuate residents [1]. The existence of fire extinguishers and fire alarms also makes the active fire protection system in the flat complete and appropriate. The passive protection system is in the form of rescue facilities that are easy to pass when evacuating. Corridors, doors, and stairs that are in accordance with PP No. 16 of 2021 become a reference for the reliability of passive protection against fire [5].

4.2 Health Aspects

Lighting in the apartment is included in the Reliable category, but in some rooms the lighting aspect is less reliable, and additional lighting needs to be provided to support the adequacy of light in the room. In accordance with Permenkes No. 2 of 2023, the need for light in the inpatient room is 100–250 lux, and in accordance with the test results in the *rusunawa*, in some rooms there are rooms that are below 100 lux and some are above 250 lux [6].

The air conditioning in the residence has been declared reliable with a minimum provision of 10–20% air conditioning in accordance with Permenkes No. 2 of 2023, and the test obtained a room airing rate of 11.5% in room one and 18% in room two [6].

4.3 Comfort Aspects

In terms of room space, it is included in the reliable category, and in accordance with PP No. 16 of 2021, residents can move freely in the room without being disturbed by existing furniture.

In addition to the comfort of movement space, the air conditions seen in the temperature and humidity of the room are appropriate and reliable. Humidity and room temperature are strongly influenced by weather conditions, so when conducting research during extreme weather, according to BMKG, the normal room temperature in Indonesia today is 16–35 °C. The results of the room temperature test obtained a value of 28.7–31.4 °C, which is < 35 °C. From the results of testing, the room temperature obtained a value of 28.7–31.4 °C, where this figure is < 35 °C. Then, for humidity testing, the numbers obtained are 51-66% and are in accordance with PP No. 16 of 2021, which states that room humidity in Indonesia ranges from 40–70%.

Furthermore, the comfort assessment of noise in the *Rusunawa* obtained a value of 37.7 dB to 67.2 dB, which means that the noise at the location is appropriate and reliable according to regulations that allow the maximum noise value for hospitals and residences to be a maximum of 65 dB and is allowed up to 85 dB if the position of the room is near noise sources such as generators and construction activities.

4.4 Convenience Aspect

In the aspect of convenience, it is included in the reliable category with tests on horizontal and vertical convenience in accordance with PP No. 16 of 2021 regulations. The following are the specifications for horizontal convenience testing carried out in the field:

Table -4 Horizontal Convenience Aspect Result

Measurement Results	Suitability
Building main door	Suitable
Room door	Suitable
Living room door Bathroom door	Suitable
Kitchen door	Suitable
Door handles are mounted 100 cm from the floor surface	Suitable
Bathroom slope 0.41%	Suitable
Corridor dimensions	Suitable

For the vertical test, stairs with components calculated as follows are carried out:

Table -5 Vertical Convenience Aspect result

	Measurement Results	PP No. 16 of 2021	Suitability
Step height	17 cm	15 cm ≥ t ≤17 cm	Suitable
Step width	120 cm	Minimal 30 cm	Suitable
Number of steps to the balcony	7 steps	Maximum 12	Suitable
Handrail height	100 cm	80-100 cm	Suitable
Stair slope	34°	Maximum 35°	Suitable

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

From the test data that has been analyzed and adjusted to PP No. 16 of 2021 as a reference for assessing the reliability of buildings, the reliability of buildings in *Rusunawa,* which was once used as a hospital and is currently operated as a *dispora* office (youth and sports agency), can be declared reliable and appropriate in terms of aspects of health, comfort, and convenience between residential buildings, hospitals, and offices. However, in some spaces, it is necessary to make improvements and adjustments to lighting, such as bathrooms, corridors, and 1st floor office space. Artificial lighting is needed to support the suitability of reliability from the health aspect.

However, different from other aspects, the safety aspect in terms of calculating the quality and depth of cracks found in the building column structure needs to be improved because it is not in accordance with the requirements. The quality of concrete from the results of field testing falls into the doubtful category, referring to the International Atomic Energy Agency's classification of concrete quality as seen from the longitudinal wave speed at the UPV TEST test [3].

5.2 Suggestions

1. Change the color of the artificial lighting in the bathroom and office space on the 1st floor.
2. Providing artificial lighting in the corridor.
3. Installation of curtains in each room so that the comfort of the view is maintained and can ward off most of the light entering the room space.
4. Repairs to several damaged components, such as moldy and perforated asbestos, non-functional door handles, and several outlets that were loose from the wall.
5. Increase the number of fire extinguishers to meet fire protection reliability requirements.

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