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Reliability Assessment Analysis of Gunung Harta Building in Malang City

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Abstract*—Undang-undang Regarding buildings in Indonesia it has been approved and elaborated in detail within. Undang-Undang No. 28 Tahun 2002 tentang Bangunan Gedung. This regulation needs to be implemented in the Local Regulations of all cities and districts across Indonesia. Presently, numerous occurrences persist wherein building structures suffer partial or complete collapse due to natural calamities like strong winds, earthquakes, landslides, alterations in functionality, and similar factors stemming from structural deficiencies. It is crucial to conduct reliability checks on both multi-story and single-story buildings. This study emphasizes the assessment of building reliability, encompassing five aspects: architectural, structural, utility, accessibility, and building and environmental layout. Evaluation will be based on the relevant functional weights assigned to each of these assessment aspects. In general, the methods employed in this research involve visual observation assessment, while for the utility aspect, document study methods will be used additionally. The reliability of each aspect will be classified according to predefined criteria. Subsequently, a qualitative analysis will be conducted by evaluating each aspect. Comprehensive reliability assessment will be carried out, taking into account relevant functional weights. The building can be classified as reliable, less reliable, or unreliable based on the established reliability classification. Additionally, it will be determined whether the building is suitable for use or not based on the assessments conducted on the building Gunung Harta in Kota Malang*.

***Keywords*—** *Reliability, Buildings, Reliability Assessment, Architecture, Structure, Utility, Accessibility, Building and Environmental Layout*.

I. INTRODUCTION

Every building utilized by humans in their daily activities must ensure both comfort and safety. Comfort implies that individuals residing or engaging in activities within it feel content and can enjoy their living environment [1]. Meanwhile, safety means that building users will not experience accidents or unexpected incidents while inside. To ensure comfort and safety for users, a building must be equipped with infrastructure and facilities that support its functions. This can provide and ensure a sense of security and comfort for its occupants [1]. Building infrastructure and facilities encompass various amenities both inside and around the building that support the fulfillment of its functions.

With the fulfillment of infrastructure and facilities, all activities carried out within the building can be executed effectively. Infrastructure and facilities comprise several components. To achieve this objective, buildings must adhere to and meet the standards stipulated in the regulations Undang-Undang No. 28 Tahun 2002 tentang Bangunan Gedung and its implementing regulations, including Peraturan Pemerintah No. 36 Tahun 2005.

II. LITERATURE REVIEW

Property reliability is an analytical approach used to assess the extent to which a property or property asset can be trusted to perform its functions safely, efficiently, and sustainably throughout its service life. By definition, reliability according to ISO 8402 is the ability of a building to perform the required functions under given environmental and operational conditions and for a specific period of time. Investment risk assessment in the property reliability model enables property owners or investors to make more accurate risk assessments related to property ownership. By considering various factors such as the physical condition of the property, market changes, and environmental factors, this model helps identify potential risks that can affect the property's value over time. For property owners and investors, maintaining the reliability and viability of the property is a top priority, as it is crucial in minimizing risks, maximizing investment value, and preserving the quality of property assets in the long term. By understanding the reliability of various property components, owners can determine the appropriate timing for maintenance or repairs to avoid more serious damage [2]. Undang-undang Nomor 28 Tahun 2002 tentang Gedung A building condition that meets the requirements of safety, health, comfort, and convenience of the building according to the designated functional needs. Undang-Undang RI No. 28 Tahun 2002 [3] It is drafted in general to regulate building construction to ensure orderly implementation and guarantee the reliability of the building structure. Key aspects regulated in this law include the classification of buildings based on their functions, technical and administrative requirements that must be fulfilled, building management, the role of the community in building management, and sanctions imposed for violations in building management. Below are the requirements for building reliability based on Undang-undang RI Nomor 28 Tahun 2002 [3] Tentang Bangunan Gedung.

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Safety Requirements

Safety requirements for buildings encompass the building's ability to prevent and mitigate fire hazards and lightning hazards.

A. Structural Resilience

The structure of the building must be designed to be strong, sturdy, and stable in carrying and combining loads to meet the requirements. The building structure must be meticulously planned so that under maximum planned loading conditions, if a collapse occurs, the structural condition still allows building occupants to evacuate safely.

B. Fire Hazard Protection

Buildings must be protected against fire hazards with passive and active fire protection systems. The application of passive fire protection systems is based on the function/classification of fire risks, spatial geometry, installed building materials, and/or the number and condition of occupants within the building. Active fire protection systems are based on the function, classification, area, height, volume of the building, and/or within the building.

C. Lightning Protection

Every building, based on its location, geographic characteristics, shape, height, and usage, is at risk of being struck by lightning and should be equipped with lightning protection installations. The lightning protection system designed and installed must significantly reduce the risk of damage caused by lightning strikes to the building and its protected equipment, as well as protect people inside it.

D. Electrical Installation

Every building equipped with electrical installations, including its power sources, must be ensured to be safe, reliable, and environmentally friendly.

E. Explosive Materials

Every building equipped with explosive material detectors, including their countermeasures, must be ensured to be safe, reliable, and environmentally friendly.

Health Requirements

The health requirements for buildings encompass provisions for ventilation systems, lighting, sanitation, and the use of building materials.

A. Ventilation

Buildings must have natural and/or mechanical/artificial ventilation systems according to their functions to meet ventilation system requirements.

B. Lighting

A building must have natural and/or artificial lighting, including emergency lighting, according to its function.

C. Sanitation

Buildings must be equipped with a sanitation system that includes a clean water system, wastewater disposal system, waste and trash management, and rainwater drainage.

D. Material Usage

The use of building materials must be safe for the health of building users and must not have negative impacts on the environment.

Comfort Requirements

The comfort requirements for buildings encompass the comfort of movement and spatial relationships, indoor air conditions, views, as well as levels of vibration and noise [9].

A. Comfort in Movement Spaces and Inter-Room Connections refers to the level of comfort obtained from the spatial dimensions and layout that provide ease of movement within the room. Comfort in inter-room connections is the level of comfort obtained from the spatial layout and circulation between rooms in the building to facilitate its functions.

B. Indoor Air Conditions

Comfort in indoor air conditions refers to the level of comfort obtained from the temperature and humidity within a space to facilitate the functions of the building.

C. View

Comfort is the view as it is the condition in which the personal rights of individuals to carry out activities within their building are not disturbed by other buildings in their vicinity.

D. Vibration Levels and Noise Levels

Comfort in vibration and noise levels refers to the level of comfort determined by a condition that does not disrupt the users and functions of the building due to vibrations and/or noise arising from either within the building or its surroundings.

Convenience Requirements

Convenience requirements encompass ease of access to, from, and within the building, as well as the completeness of facilities and infrastructure for utilizing the building.

A. Horizontal Accessibility

Horizontal connectivity between rooms in a building is a requirement for the building to provide doors and/or corridors between rooms. The provision regarding the quantity, size, and technical construction of doors and corridors is adjusted to the functions of the building's rooms.

B. Vertical Accessibility

Vertical connectivity within a building, including the provision of stairs, ramps, and similar facilities as well as elevators and/or escalators within the building. Multi-story buildings must provide stairs that connect one floor to another while considering the ease, safety, and health of users.

C. Emergency Evacuation Access in Fire Emergencies

Emergency evacuation access must be provided within the building, including hazard warning systems for users, emergency exits, and evacuation routes in the event of fire disasters and/or other disasters, excluding residential homes. The provision of evacuation access must be easily accessible and equipped with clear directional signs.

D. Facilities and Accessibility for Persons with Disabilities

The provision of facilities and accessibility for persons with disabilities and the elderly is a requirement for all buildings except residential homes (Keputusan Menteri PU No.30/KPTS/2006 tentang Persyaratan Teknis Fasilitas dan Aksesibilitas Bangunan Umum dan Lingkungan) [4].

To achieve a building's reliability requirement, several aspects are needed, namely administrative aspects, architectural aspects, structural aspects, utility aspects,

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accessibility aspects, and building and environmental layout aspects. Several technical guidelines govern building inspection procedures, including Undang – Undang Nomor 28 Tahun 2002 tentang Gedung [1], Departemen PU 1998 [5], Peraturan Menteri PU No.29/PRT/M/2006 [6], Peraturan Menteri PU No.45/PRT/M/2007 [7], Peraturan Menteri PU No.26/PRT/M/2008 [8], Permen PU No. 30/PRT/M/2006 [9] dan Peraturan Menteri Pekerjaan Umum No.24/PRT/M/2008 [10]. Each aspect will be evaluated against existing classification criteria.

Administrative Aspects

As stated by Frederick S. Merritt and Jonathan T. Ricketts (1994), the administrative reliability aspects outlined in building regulations include compliance with permits, tax settlements, validity of ownership certificates, security aspects, change procedures, maintenance, approval of construction plans, work stoppage orders, and permissible load limits within building structures [11].

Architectural Aspects

Examination of architectural aspects is limited to the finishing of buildings, both interior and exterior. Architectural inspection focuses on evaluating the completion of the building, both internally and externally. This assessment includes examining the building's functionality regarding the adequacy of its layout and interior design, including the finalization of floors, walls, doors, windows, and ceilings. Exterior assessment involves evaluating the finalization of walls, floors, and fences.

Aspek Struktur

The requirements for building reliability in structural aspects are regulated in Peraturan Menteri PU No.29/PRT/M/2006 [6] tentang pedoman persyaratan teknis bangunan gedung. Determination regarding construction details, types, intensity, and load-bearing methods is specified. Every building structure must be planned to be strong and stable in carrying loads or combinations of loads and must meet service requirements according to existing regulations during the planned service life. Consideration should also be given to the building's function, location, durability, and construction feasibility.

Utility Aspects

Another aspect reviewed in building reliability assessment is the utility aspect. Building utilities are essential to complement a building, especially multi-story buildings. The completeness of utilities in a building will provide safety and comfort assurance for its occupants or users. Building utilities consist of various components, namely fire prevention installation systems, vertical transportation systems, plumbing systems, electrical installation systems, air conditioning systems, lightning protection installation systems, and communication installation systems.

Accessibility Aspect

Evaluation is conducted on the accessibility elements system found in building structures, in accordance with the provisions of Permen PU No. 30/PRT/M/2006 [9] tentang Pedoman Teknis Fasilitas dan aksesibilitas pada Bangunan Gedung dan Lingkungan. The assessment covers room size, pedestrian pathways, parking areas, ramps, stairs, etc.

Building and Environmental Layout Aspect

The value of the building and environmental layout condition is a specific value based on the condition of each part of the building layout and its environment. There are three items assessed in the building and environmental layout aspect in building reliability inspections, namely the Coefficient The Base Area Ratio (KDB), Building Floor Coefficient (KLB), and Green Base Coefficient (KDH).

III. METHODS

The methodology used in this article employs both observational and quantitative approaches. The process involves several steps. In the first stage, there are two data collection phases: field data collection and literature review as secondary data. Field data collection involves visually observing the physical condition of the building. The reliability assessment process begins with determining the assessment classification, followed by collecting project data such as the maintenance and repair history of the building, visual inspections in the field, and then conducting assessments using the assessment classification. The assessment results indicate the category of the building's reliability level assessed. The reliability level categories are divided into 3: Reliable, Less Reliable, and Not Reliable. In this case study, the research was conducted at Gunung Harta building located in Malang City.

IV. DISCUSSIONS

PT. Gunung Harta Transport Solution is located at Jl. Panglima Sudirman No. 99, Malang City. The Gunung Harta building has a total land area of 1,499 m2 and consists of 4 floors with a height of 80 meters. The building functions as a travel and freight forwarding service, along with supporting facilities such as a minimarket, cafe, and meeting rooms. The first floor is used for parking, service area and mechanical and electrical rooms, freight forwarding office, and minimarket. The second floor serves as the transportation service office and cafe. The third floor is utilized as the operational office area. Meanwhile, the fourth floor functions as an outdoor cafe. The Gunung Harta building is a new construction built in the year.

The assessment of building reliability is conducted by assigning values in a table with weightings for each building function, as determined by Priyo, M. and Wijatmiko, I.H (2011) and Lutfi and Syaifullah (2020), as shown below [12]

1. Administration Aspect

TABLE I. Reliability Assessment of Administration Aspects.

No.	Component	Score
1	IMB	Yes
2	PBB	Yes
3	PBG	Yes
4	Ownership letter	Yes

(Source: author, 2024)

2. Architectural aspect assessment results

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TABLE 2. Reliability Assessment of Architecture Aspects.

No	Component Functional Conditions	Function Weight (%)	Existing Condition (%)	Existing Damage (%)	Weight (%)
1	Compatibility of functions	10	100	0	10
2	Wall	8	100	0	8
3	Floor	8	100	0	8
4	Roof covering	8	80	0	6.4
5	Rainwater Gutters	6	100	0	6
6	Wall Plastering	6	80	0	4.8
7	Floor Plastering	6	100	0	6
8	Wall Coatings	6	50	0	3
9	Floor Coatings	6	100	0	3
10	Doors and Rolling Doors	8	100	0	8
11	Window	7	60	0	4,2
12	Vent	7	0	0	0
13	Ceiling	6	80	0	14
14	Stairs/ Lift	8	100	0	8
Total architectural reliability value					92.4

(Source: author, 2024)

3. Structural aspect assessment results

TABLE 3. Reliability Assessment of Structure Aspects.

No	Component Functional Conditions	Function Weight (%)	Existing Condition (%)	Existing Damage (%)	Weight (%)
1	Structural Foundation	25	100	0	25
2	Structural Column	20	100	0	20
3	Structural Beam	15	100	0	15
4	Joint Column Beam	15	100	0	15
5	Floor Plate	5	100	0	5
6	Ceiling Hangers	5	100	0	5
7	Plate and Beam Stairs	6	80	0	6
8	Console Beam, Canopy, Others	5	100	0	5
9	Joist	4	100	0	4
Total structural reliability value					100

(Source: author, 2024)

4. Utility and fire protection aspect assessment results

TABLE 4. Reliability Assessment of Utility and Fire Protection Aspects.

No	Component Functional Conditions	Function Weight (%)	Existing Condition (%)	Existing Damage (%)	Weight (%)
1	Fire Equipment Systems	10	50	0	5
2	Sprinkler	10	90	0	9
3	Hydrant	10	10	0	1
4	Fire Tube	10	10	0	1
5	Stairs	10	100	0	10
6	Clean Water	5	100	0	5
7	Grey and Black Water	5	100	0	5
8	PLN Resources	5	100	0	5
9	Generator Resources	5	0	0	0
10	Direct Cooling System	5	50	0	2.5
11	Lightning Protection System	5	100	0	5
12	Lightning Protection Installation	5	100	0	5
13	Sound Installation	10	100	0	10
14	Telephone Installation	5	70	0	3.5
Total utility and fire protection reliability value					67

(Source: author, 2024)

5. Accessibility aspect assessment results

TABLE 5. Reliability Assessment of Accessibility Aspects.

No	Component Functional Conditions	Function Weight (%)	Existing Condition (%)	Existing Damage (%)	Weight (%)
1	Basic dimensions of space	15	100	0	15
2	Pedestrian paths and ramps	15	100	0	15
3	Parking area	15	100	0	15
4	Supplies and equipment	10	100	0	10
5	Toilet	20	100	0	20
6	Lift	10	100	0	10
7	Door	15	100	0	15
Total accessibility reliability value					67

(Source: author, 2024)

6. Building and environment planning aspect assessment results

TABLE 6. Reliability Assessment of Building and Environmental Planning Aspects.

No	Component Functional Conditions	Function Weight (%)	Weight (%)
1	Conformity with basic building coefficient (KDB)	40	34
2	Conformity with building floor coefficient (KLB)	40	40
3	Conformity with building boundaries (GSB)	20	14
Total building and environmental planning reliability value			88

(Source: author, 2024)

7. Building Reliability Classification

TABLE 7. Reliability Assessment of Building Aspects.

No	Rated aspect	Unreliable Category (100%)	Weighting of Assessment 100%	Reliability Level Value	Reliability Level value Total
1	Architecture	<75%	10	9.24	Reliable
2	Structure	<85%	30	30	Reliable
3	Utility	<95%	50	32	Unreliable
4	Accessibility	<75%	5	5	Reliable
5	Building and Environmental Planning	<75%	5	4.4	Reliable
Building Reliability Value					Reliable

(Source: author, 2024)

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The results above can be evaluated and summarized based on the following aspects:

1. Safety Requirements

Based on the above results, in terms of building safety, the Gunung Harta building qualifies as reliable. This is because the Gunung Harta building is newly constructed, and its structural component has a weight of 100%, indicating that it is still very suitable and functioning well according to the applicable regulations. Furthermore, in terms of utility capabilities and fire hazards, it has a weighting of 67%, which is still below the reliable threshold. There are several aspects that do not fully meet the reliability as a fire protection building, such as having only one hydrant, one fire extinguisher, and still incomplete and not evenly distributed fire equipment system. Therefore, for fire protection, it does not meet the qualification. However, for lightning protection, the Gunung Harta building already has lightning protection installations. Overall, safety aspects meet the reliable qualification except for fire protection.

2. Health Requirements

In terms of the building's health aspect, the Gunung Harta building meets the reliable qualification. Regarding lighting requirements, the Gunung Harta building has numerous openings and windows to receive good natural lighting. However, there are still some rooms that require artificial lighting to achieve adequate illumination. For ventilation, the first and fourth floors of the building receive natural ventilation, while parts of the second and third floors receive natural ventilation due to being private areas, supplemented by artificial ventilation. Regarding sanitation, it is well-built and can protect the surrounding environment from pollution, where wastewater is filtered and directed to soak wells, while rainwater is directed to soak wells. Overall, in terms of the building's health aspect, the Gunung Harta building meets the reliable qualification, adhering to the applicable regulations.

3. Comfort Requirements

For the aspect of comfort, Gunung Harta meets the qualifications for comfort aspects. In terms of comfortable space and good inter-room relations that are accessible to building occupants. The Gunung Harta building is designed for visual comfort even with limited land by utilizing the concept of transportation operation visuals and there are plants along the edges of the floor. The interior is designed to be visually appealing to visitors with a modern concept and a mix of Balinese culture. Meanwhile, for comfort in terms of vibration and noise levels, it is well-designed with steel structures and the use of tempered glass to reduce noise in semi-public and private areas.

4. Convenience Requirements

The Gunung Harta building meets the reliable qualification in terms of the building's accessibility, allowing easy access for visitors. Vertically, visitors can access between floors using stairs and elevators to facilitate those with disabilities. Additionally, the completeness of facilities and infrastructure meets the minimum requirements of the applicable regulations.

V. Conclusions and Recommendations

Based on the reliability assessment conducted on the Gunung Harta building in Malang City across 5 different assessment aspects, it can be concluded that:

The reliability level of the architectural component of the Gunung Harta building in Malang City has an average score of 92.4% with a category of less reliable.

The reliability level of the utility component of the Gunung Harta building in Malang City has an average score of 64% with a category of not reliable.

The reliability level of the utility component of the Gunung Harta building in Malang City has an average score of 64% with a category of not reliable.

The reliability level of the structural component of the Gunung Harta building in Malang City has an average score of 100% with a category of reliability.

The reliability level of the accessibility component of the Gunung Harta building in Malang City has an average score of 100% with a category of reliability.

The reliability level of the building layout and environmental component of the Gunung Harta building in Malang City has an average score of 88% with a category of less reliable.

There is a need for additional utilities in the Gunung Harta building to support safety at various points both outside and inside the building.

The Gunung Harta building falls into the category of buildings that are considered suitable in terms of building reliability, including aspects of safety, security, accessibility, and health.

Reference

[1]. M. R. Solomon, “Consumer Behavior Buying, Having, and Being,” Pearson International Edition, 2007.
[2]. Brown, Alan, Ton, V. D. Wiele, “ A Typology of Approaches to ISO certification and TQM,” Australian Journal of Management, vol. 21, no.1, page 57-73, 1996.
[3]. Pemerintah Indonesia, “Undang-Undang Republik Indonesia Nomor 28 tentang Bangunan Gedung,” Lembaran Negara RI Tahun 2002, No. 4247, Sekretariat Negara, Jakarta, 2002.
[4]. Menteri Pekerjaan Umum, “ Permen PU No. 30/PRT/M/2006 tentang Pedoman Teknis Fasilitas dan Aksesibilitas pada Bangunan Gedung dan Lingkungan,” Jakarta, 2006.
[5]. Menteri Pekerjaan Umum, “ Pola Perhitungan Harga Taksiran dan Penilaian Pengalihan Hak Rumah Negara Golongan III (tiga) Beserta Ganti Rugi atas Tanahnya,”, Jakarta, 1998
[6]. Menteri Pekerjaan Umum, “Permen PU No. 29/PRT/M/2006 tentang Pedoman Persyaratan Teknis Bangunan Gedung,” Jakarta, 2006.
[7]. Menteri Pekerjaan Umum RI, “Peraturan Menteri Pekerjaan Umum Nomor: 45/PRT/M/2007 tentang Pedoman Teknis Pembangunan Bangunan Gedung Negara,” 2007.
[8]. Direktorat Penataan Bangunan dan Lingkungan Direktorat Jenderal Cipta Karya Kementerian Pekerjaan Umum, “ Peraturan Menteri Pekerjaan Umum No.26/PRT/M/2008 Tentang Persyaratan Teknis Sistem Proteksi Kebakaran PadaBangunan Gedung Dan Lingkungan .Kementrian Pekerjaan Umum,” 2008.
[9]. Menteri Pekerjaan Umum, “ Permen PU No. 30/PRT/M/2006 tentang Pedoman Teknis Fasilitas dan Aksesibilitas pada Bangunan Gedung dan Lingkungan,” Jakarta, 2006.
[10]. Direktorat Penataan Bangunan dan Lingkungan Direktorat Jenderal Cipta Karya Kementerian Pekerjaan Umum, “Peraturan Menteri Pekerjaan Umum No.24/PRT/M/2008 Tentang Pedoman Pemeliharaan Dan Perawatan Bangunan Gedung,” Kementerian Pekerjaan Umum, 2008.

Setiono, Arief R.; Bisri, Muhammad; Djakfar, Ludfi; and Hasyim, Abdul W., “Reliability Assessment Analysis of Gunung Harta Building in Malang City,” *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 6, Issue 9, pp. 73-78, 2024.

[11]. S. Merrit, Ricketts, T. Jonathan, " Building Design and Construction Handbook," *McGraw-Hil*l, Inc.USA, 2006.
[12]. M. Priyo, I. H. Wijatmiko, "Evaluasi Keandalan Fisik Bangunan Gedung (Studi Kasus di Wilayah Kabupaten Sleman)," *Jurnal Ilmiah Semesta Teknika*, vol. 14, no. 2, page 150-159, 2011.
[13]. M. Lutfi, B. N. Z. Syaifullah, " Analisis Kelayakan Bangunan Gedung Pasar Sukasari Bogor Melalui Pendekatan Laik Fungsi Bangunan," *ASTONJADRO: Jurnal Rekayasa Sipil*, vol. 9, no. 1, page 14-23, 2020.

Setiono, Arief R.; Bisri, Muhammad; Djakfar, Ludfi; and Hasyim, Abdul W., "Reliability Assessment Analysis of Gunung Harta Building in Malang City," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 6, Issue 9, pp. 73-78, 2024.