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Analysis of Building Functional Suitability from a Structural Perspective for Compliance with the Certificate of Functional Suitability

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Abstract— *The rapid development of building construction in Samarinda City requires structural reliability assurance as one of the requirements for obtaining a Certificate of Feasibility Function (SLF). Therefore, this study aims to analyze the functional feasibility of the Holland Bakery Building Unit Samarinda from the structural aspect in fulfilling the requirements for the Certificate of Feasibility Function (SLF). The methods employed include visual inspection, non-destructive testing using the Hammer Test and Ultrasonic Pulse Velocity (UPV), verification of As-built drawings, and structural analysis using SAP2000. The results indicate that the concrete strength meets the design specifications, no structural damage was observed during the visual inspection, and the SAP2000 analysis shows that all structural elements are within safe limits without experiencing Over Stress (O/S). Based on these findings, the Holland Bakery Building, Samarinda Unit, satisfies the structural reliability requirements and is declared eligible for the Certificate of Building Feasibility (SLF).*

Keywords— *Hammer Test, Structural reliability, SAP2000, UPV.*

I. Introduction

The construction industry plays a vital role in supporting economic growth and urban development. As the number of multi-story buildings continues to increase, ensuring structural safety and reliability has become an essential requirement throughout a building's service life. A building that has been completed cannot be directly occupied without first demonstrating compliance with the applicable technical and administrative requirements. In Indonesia, this compliance is verified through the issuance of the Certificate of Building Worthiness (*Sertifikat Laik Fungsi*—SLF), which certifies that a building is safe and suitable for occupancy according to its intended function.

The Certificate of Building Worthiness (SLF) is an official document issued after a building has been evaluated and confirmed to satisfy the required standards of safety, health, comfort, and accessibility. According to Government Regulation Number 16 of 2021, structural reliability is one of the primary technical aspects considered during the evaluation process. Structural assessment is therefore necessary to verify that all structural components are capable of resisting the design loads and maintaining adequate performance throughout the building's operational life. This assessment can be performed through visual inspection, non-destructive testing (NDT), verification of construction documents, and structural analysis using engineering software.

Holland Bakery is one of Indonesia's largest bakery chains, operating hundreds of outlets throughout the country. To support its business expansion in East Kalimantan, a new multi-story building was constructed in Samarinda to accommodate production, commercial, and customer service activities. Since the building is newly completed, an evaluation of its structural condition is required before obtaining the Certificate of Building Worthiness (SLF). Such an evaluation ensures that the completed structure complies with the approved design documents and fulfills all applicable structural safety requirements.

In this study, the structural feasibility of the Holland Bakery Building, Samarinda Unit, was evaluated using an integrated assessment approach. The investigation included visual inspection to identify visible structural defects, Hammer Test and Ultrasonic Pulse Velocity (UPV) to estimate the in-situ concrete quality without damaging the structure, verification of Shop Drawings and As-Built Drawings to determine construction conformity, and structural analysis using SAP2000 to evaluate the structural performance under design loading conditions. Combining these methods provides a comprehensive evaluation of the building's structural reliability and its compliance with the technical requirements for SLF certification.

The objective of this research is to evaluate the structural condition of the Holland Bakery Building, Samarinda Unit, through non-destructive testing, structural analysis using SAP2000, and verification of construction documents. Furthermore, this study aims to determine whether the building satisfies the structural reliability requirements specified for the issuance of the Certificate of Building Worthiness (SLF). The findings are expected to provide a practical reference for structural feasibility assessments of newly completed reinforced concrete buildings and contribute to improving the implementation of building safety evaluations in Indonesia.

II. Materials And Methods

A. Study Object

This research was conducted on the Holland Bakery Building, Samarinda Unit, East Kalimantan, Indonesia. The study focused on evaluating the structural feasibility of the reinforced concrete building as one of the technical requirements for obtaining the Certificate of Building

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Worthiness (SLF). The structural elements evaluated included columns, beams, slabs, and foundations.

Figure 1. Research location

B. Data Collection

The study employed both primary and secondary data. Primary data were obtained through field observations, visual inspections, and non-destructive testing (NDT), while secondary data included Shop Drawings, As-Built Drawings, design specifications, and other technical documents related to the building.

C. Structural Evaluation

The structural evaluation consisted of four stages:

[1] Visual Inspection was performed to identify visible structural defects such as cracks, spalling, excessive deflection, and reinforcement corrosion.

[2] Non-Destructive Testing (NDT) was conducted using the Hammer Test and Ultrasonic Pulse Velocity (UPV) to estimate the in-situ concrete compressive strength and evaluate concrete quality without causing damage to the structure.

[3] Document Verification was carried out by comparing the Shop Drawings with the As-Built Drawings to verify the conformity of structural dimensions, locations, and structural layouts.

[4] Structural Analysis was performed using SAP2000 by developing a structural model based on the verified drawings. The analysis considered the applicable dead loads, live loads, and other design loads to evaluate the structural performance and determine whether any structural members experienced overstress conditions.

D. Data Analysis

The collected data were analyzed descriptively by comparing the field inspection results, non-destructive testing results, drawing verification, and SAP2000 structural analysis with the applicable Indonesian building regulations. The final evaluation was used to determine whether the Holland Bakery Building, Samarinda Unit, satisfies the structural reliability requirements for the issuance of the Certificate of Building Worthiness (SLF).

III. Results and Discussion

A. Visual Inspection

The visual inspection showed that the structural elements, including columns, beams, slabs, and foundations, were generally in good condition. No significant structural defects, such as major cracks, concrete spalling, excessive deformation, or exposed reinforcement, were observed. These findings indicate that the building structure has maintained satisfactory physical performance and is suitable for further structural evaluation.

B. Non-Destructive Testing Results

Hammer Test Result Concrete quality testing using the Hammer Test method was conducted to estimate the compressive strength of the existing concrete based on the rebound value of the concrete surface. The test results showed that the estimated concrete compressive strength met the specified concrete quality requirements. This indicates that the concrete condition in the structural elements still has adequate capacity to support the performance of the building structure.

TABLE 1. Average Hammer Test Results

Sampel	Concerete Quality (mpa)	Kg/cm²
Floor 1	35.7	429.880
Floor 2	34.9	420.482
Floor 3	35.5	427.470
Floor 4	35.2	424.337
Floor 5	33.8	407.229
Average	35.0	421.880

TABLE 2. Concrete Quality Results (Hammer Test)

Actual Concret Quality	>	Specified Concrete Quality	Remarks
K-422 kg/cm²		K-300 kg/cm²	Meet Specifications (Safe)
f'c 35 . mpa		f'c 25 mpa	

Ultrasonic Pulse Velocity (UPV) Test Results was conducted to evaluate the quality, density, and uniformity of concrete in the structural elements. The test results indicated that the concrete had good quality with a level of uniformity that met the required criteria. Based on the UPV test results, the existing concrete condition can be categorized as good and capable of supporting the structural reliability of the building.

TABLE 3. Average UPV Results

Average Velocity (m/s)	Average Velocity (km/det)	UPV-Based Concrete Quality
3587	3.587	31

TABLE 4. Classification of Concrete Quality Based on Wave Velocity

Pulse Velocity (km/det)	Result
<2.13	Poor
2.13-3.05	Fair
3.06-3.66	Good
3.67-4.57	Feery Good
>4.57	Excellent

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TABLE 5. UPV Concrete Quality Results

Average Wave Propagation Velocity	UPV-Based Concrete Quality	>	Specified Concrete Quality	Meets Specifications (Safe)
3.587 m/s	F'c 31 mpa		F'c 25 mpa	

Based on the results of both testing methods, namely the Hammer Test and Ultrasonic Pulse Velocity (UPV), the findings consistently indicate that the quality of the existing concrete in the Holland Bakery Building, Samarinda Unit, meets the required standards and is suitable to function as part of the building structural system.

C. *Checklist results*

Based on the results of the inventory, visual inspection, and verification between the Shop Drawing and As-Built Drawing, the structural condition of the Holland Bakery Unit Samarinda Building is generally in good condition. No changes were found in the number, position, dimensions, or layout of structural elements such as foundations, tie beams, columns, beams, and floor slabs. In addition, the results of the visual inspection did not indicate any significant structural damage, such as cracks, deformation, excessive deflection, or concrete peeling. Although some structural elements have been covered by finishing so that some elements cannot be observed directly, the suitability of the construction can be verified through the As-Built Drawing. Thus, the condition of the building structure still fulfills its service function and indicates that the construction implementation is in accordance with the planning documents.

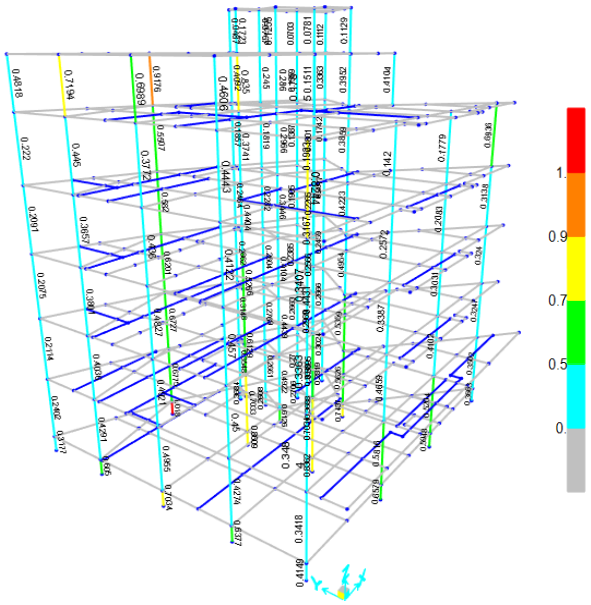

Figure 2. Demand/Capacity Ratio Results

D. *Structural Analysis Using SAP2000*

A three-dimensional structural model was developed in SAP2000 based on the verified construction drawings. The analysis considered the applicable design loads and load combinations according to the Indonesian standards. The analysis results indicated that all structural members were capable of resisting the applied loads without exceeding their design capacities. Furthermore, no structural members experienced Over Stress (O/S), demonstrating that the structural system satisfies the required strength and stability criteria.

E. *Structural Calculation of Columns and Beams*

the flexural capacity evaluation results indicate that the design moment capacity of the section (M_n = 287.73 kN/m) exceeds the ultimate moment due to loading (M_u = 208,1557 kN·m), thereby satisfying the requirement ($M_n > M_u$). This demonstrates that the beam element possesses sufficient capacity to resist the applied moment, thus meeting the flexural strength requirements of SNI 2847:2019 and confirming its safety against potential flexural failure.

F. *Structural Feasibility Evaluation*

The structural feasibility assessment was performed by integrating the results of the visual inspection, non-destructive testing, document verification, and SAP2000 analysis. The absence of significant structural defects, satisfactory concrete quality, conformity between the construction drawings and the completed building, and adequate structural performance indicate that the Holland Bakery Building, Samarinda Unit, fulfills the structural reliability requirements for the issuance of the Certificate of Building Worthiness (SLF). Therefore, the building can be considered structurally feasible for its intended function.

IV. Conclusion

This study evaluated the structural feasibility of the Holland Bakery Building, Samarinda Unit, as one of the technical requirements for obtaining the Certificate of Building Worthiness (SLF). The evaluation was conducted through visual inspection, non-destructive testing using the Hammer Test and Ultrasonic Pulse Velocity (UPV), verification of Shop Drawings and As-Built Drawings, and structural analysis using SAP2000.

The results showed that the structural elements were in good physical condition without significant defects. The Hammer Test and UPV indicated that the in-situ concrete quality satisfied the design requirements. Furthermore, the comparison between the Shop Drawings and As-Built Drawings confirmed that the completed structure was consistent with the approved design in terms of dimensions, locations, and structural layout. The SAP2000 analysis also demonstrated that all structural members were capable of resisting the applied design loads without experiencing overstress conditions.

Based on the integrated evaluation, the Holland Bakery Building, Samarinda Unit, fulfills the structural reliability requirements specified in the applicable Indonesian regulations. Therefore, the building can be considered structurally feasible and eligible for the issuance of the Certificate of Building Worthiness (SLF).

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