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Feasibility Analysis of Old Building Structures Manado State Polytechnic Campus

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ABSTRACT

This study analyzes the old building on the Manado State Polytechnic campus. The aim is to determine the level of feasibility of the old structure of the Manado State Polytechnic campus building. With the establishment of the Manado State Polytechnic campus building since 1987 and the age of the building is around 36 years, therefore it is necessary to re-examine the building to find out whether there are any structural changes or not. The assessment of the feasibility of the old building on the Manado State Polytechnic campus is to evaluate the condition of the materials used, both concrete materials and iron reinforcement materials and the structural system used, also to assess the level of safety and suitability of the materials and structures in each component of the existing structure to the standard load that will be applied in accordance with applicable regulations. The testing method used in evaluating this structure includes visual observation and data collection used during planning and data during implementation. Material testing is carried out using Hammer test and Core Drill to determine the strength of the concrete characteristics which are the basis for analyzing the safety of the building structure

INTRODUCTION

The increase in the construction of high-rise buildings in Indonesia continues from year to year. In planning a building, it is important to conduct an optimal analysis of the strength and feasibility of the structure to ensure the safety of its users.

Some of the buildings on the Manado State Polytechnic campus are more than 30 years old, one of which is the Civil Engineering Department building.

Structural feasibility evaluation is carried out to review the initial design according to planning needs, by carrying out identification in accordance with established standards.

The building structure evaluation method includes visual observation, structural mapping, and concrete core sampling. Dynamic response analysis is used to design earthquake-resistant structures if necessary, to assess the earthquake forces that affect the structure and the behavior of the structure during an earthquake. Pushover analysis is carried out by providing increased loads until they reach plastic conditions. This study aims to analyze the feasibility of existing building structures by evaluating the level of damage and deviations that occur through dynamic response analysis and pushover analysis. The study was conducted on one of the old buildings on the Manado State Polytechnic campus, namely the Civil Engineering Department building.

To assess the safety level of a building that has been standing for a long time, an evaluation of its structural feasibility is required. Typically, buildings that are more than twenty years old will experience significant material degradation, which directly affects the strength of the building in bearing loads. As the building ages, its stability and strength become increasingly vulnerable, therefore, an in-depth technical analysis of the structural strength factors is required. Through this approach, it can be identified whether there is a decline in structural performance, as well as preventing building collapse.

METHODS

The research object for the analysis of the feasibility of the old building structure is located on the Manado State Polytechnic campus and the more specific object is the Department Building.

Current Civil Service

The data sources obtained and collected in this study are primary data and

Secondary data, namely:

- Primary Data

Primary data is by conducting a direct survey then making a checklist and building drawings of the old building of the Manado State Polytechnic campus and conducting a structural feasibility assessment, namely visual observation and testing

the strength of the structure with a hammer test.

- Secondary Data

Secondary data is data from literature studies or reading materials that are directly related. with the title of the research, namely shop drawing, SNI 1726 2019, SNI 2847 2019, SNI 1727 2020, SNI Hammer Test 2012

Results and Discussion

Building Data

Manado State Polytechnic was founded in 1987 in Manado City.

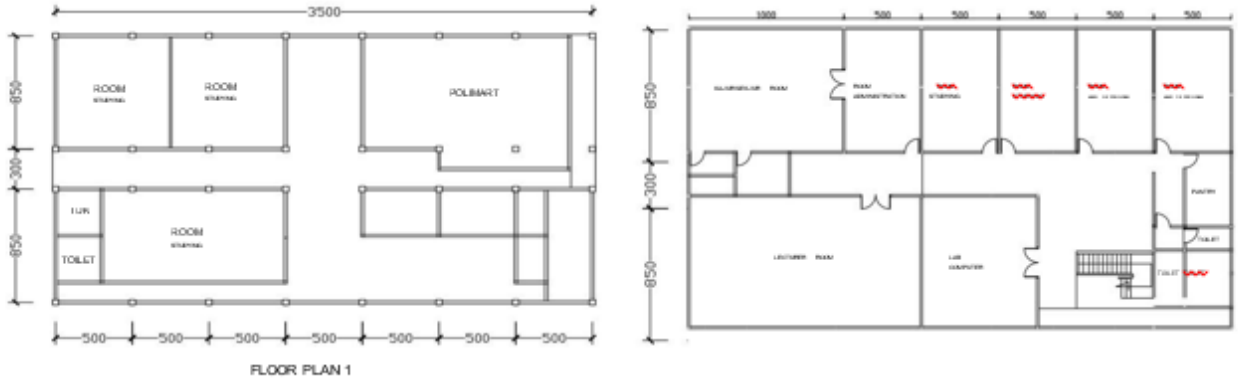
Manado State Polytechnic formally started providing education at Diploma II level consists of 4 (four) departments, each of which is Civil Engineering, Mechanical Engineering, Electrical Engineering and Business Administration. To support the implementation Education then the Office Building and Lecture Building were built.

The current Civil Engineering Department was built in 1987. Construction

The Civil Engineering Department building is built with a 3-story construction with an area of each floor as follows:

Floor 1 : 700 m2
2nd Floor : 700 m2
3rd floor : 700 m2

With a total area of 2100 m2



FLOOR PLAN 1

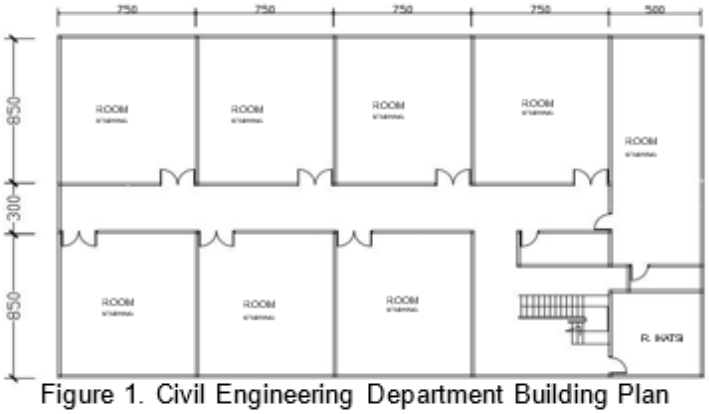


Figure 1. Civil Engineering Department Building Plan

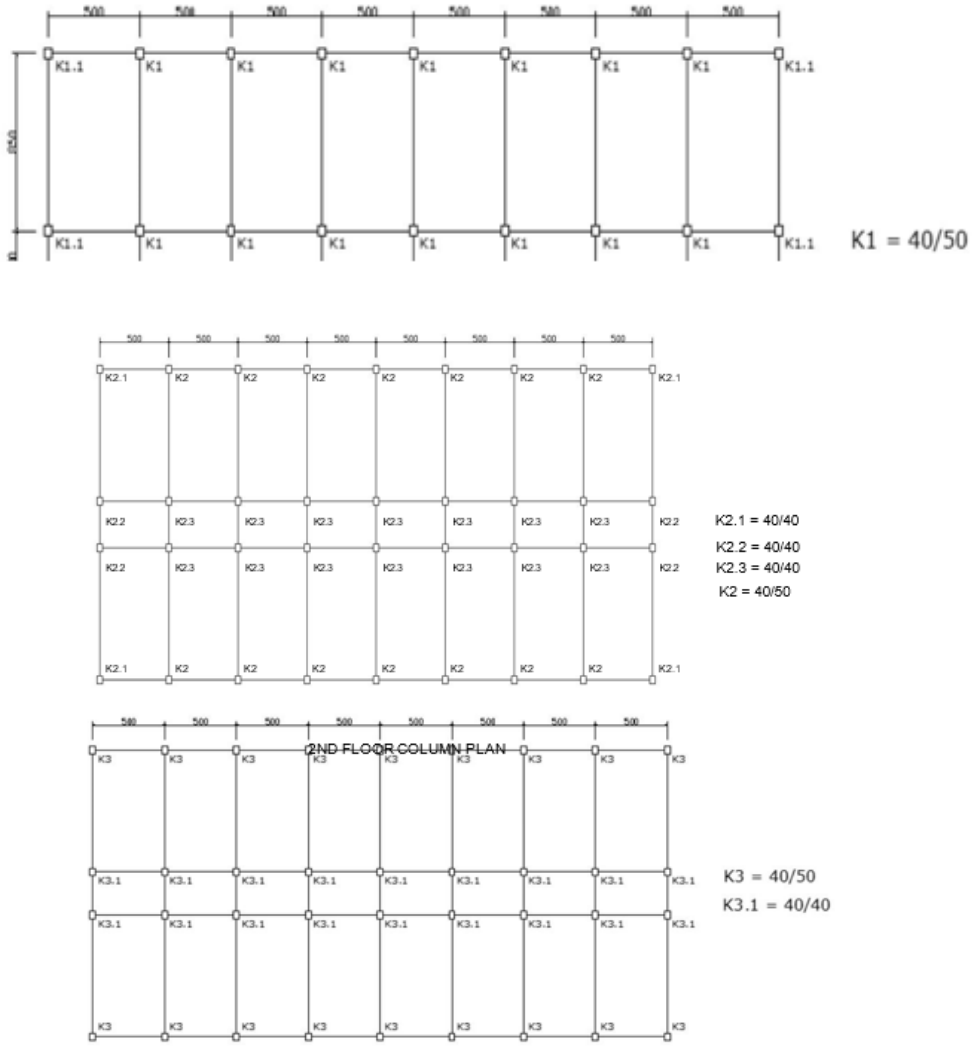


Figure 2. Column Plan of Civil Engineering Department Building

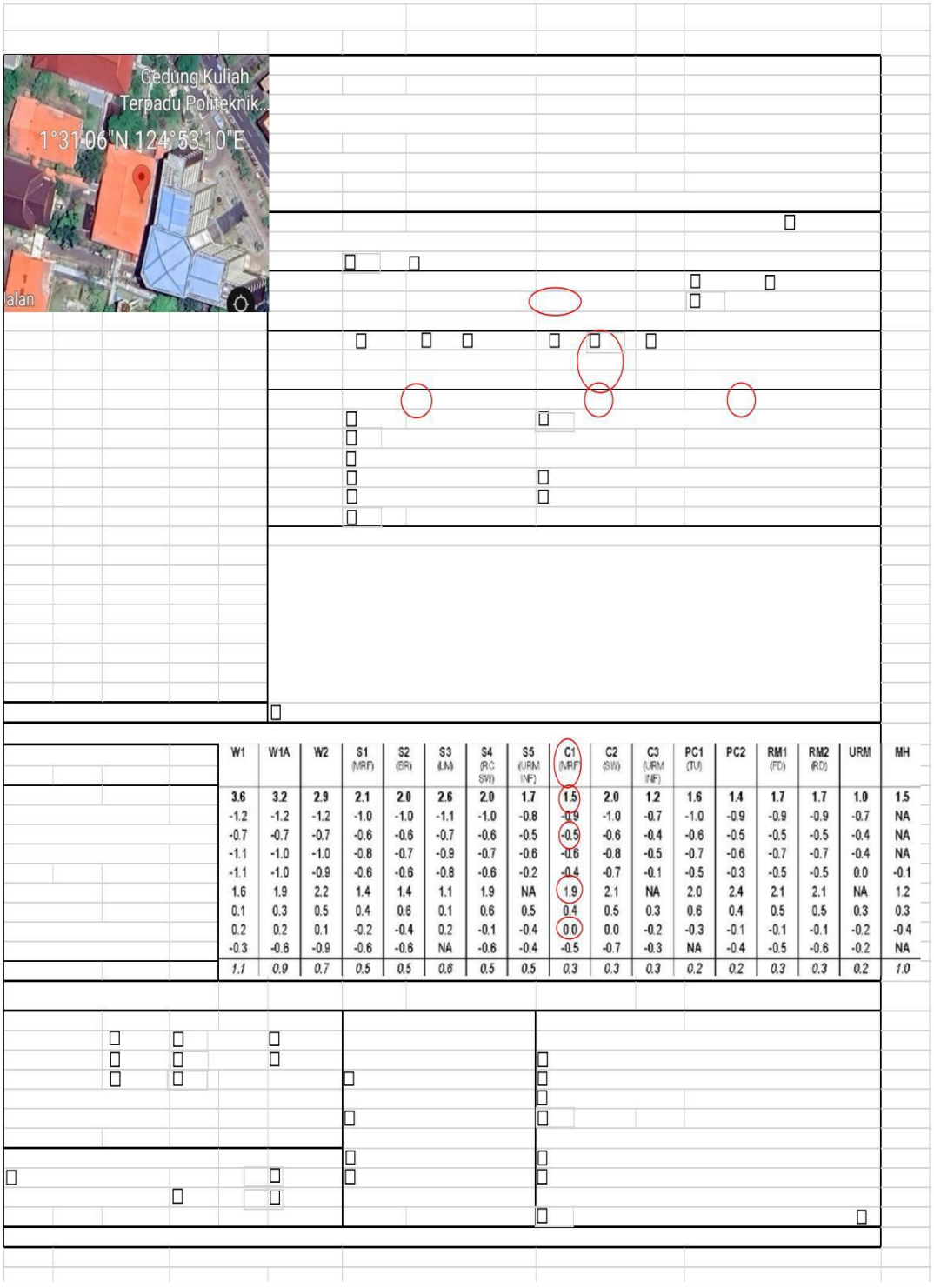
Checking the conformity of as-built drawings with the field After conducting an inspection in the field, no differences were found between As- Build Drawing with Civil Engineering Department Building, State Polytechnic Manado.

Table 1. Checking the Conformity of As-Built Drawings with the Field

No.	REVIEW	DESCRIPTION	
2	Floor Plans 1	According to the picture "#	
3	Floor Plans 2	According to the picture "#	
4	Floor Plans 3	According to the picture "#	

Federal Emergency Management Agency (Fema) 154

Fema 154 specifically addresses reducing the risk of building damage due to natural disasters. Be aware of the results of the screener that has been carried out on the building The Civil Engineering Department of Manado State Polytechnic is included in the safe category, and does not require further or detailed evaluation.



W1	W1A	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM	MH
3.6	**3.2**	**2.9**	**2.1**	**2.0**	**2.6**	**2.0**	**1.7**	**1.5**	**2.0**	**1.2**	**1.6**	**1.4**	**1.7**	**1.7**	**1.0**	**1.5**
-1.2	-1.2	-1.2	-1.0	-1.0	-1.1	-1.0	-0.8	-0.9	-1.0	-0.7	-1.0	-0.9	-0.9	-0.9	-0.7	NA
-0.7	-0.7	-0.7	-0.6	-0.6	-0.7	-0.6	-0.5	-0.5	-0.6	-0.4	-0.6	-0.5	-0.5	-0.5	-0.4	NA
-1.1	-1.0	-1.0	-0.8	-0.7	-0.9	-0.7	-0.6	-0.6	-0.8	-0.5	-0.7	-0.6	-0.7	-0.7	-0.4	NA
-1.1	-1.0	-0.9	-0.6	-0.6	-0.8	-0.6	-0.2	-0.4	-0.7	-0.1	-0.5	-0.3	-0.5	-0.5	0.0	-0.1
1.6	1.9	2.2	1.4	1.4	1.1	1.9	NA	1.9	2.1	NA	2.0	2.4	2.1	2.1	NA	1.2
0.1	0.3	0.5	0.4	0.6	0.1	0.6	0.5	0.4	0.5	0.3	0.6	0.4	0.5	0.5	0.3	0.3
0.2	0.2	0.1	-0.2	-0.4	0.2	-0.1	-0.4	0.0	0.0	-0.2	-0.3	-0.1	-0.1	-0.1	-0.2	-0.4
-0.3	-0.6	-0.9	-0.6	-0.6	NA	-0.6	-0.4	-0.5	-0.7	-0.3	NA	-0.4	-0.5	-0.6	-0.2	NA
1.1	*0.9*	*0.7*	*0.5*	*0.5*	*0.6*	*0.5*	*0.5*	*0.3*	*0.3*	*0.3*	*0.2*	*0.2*	*0.3*	*0.3*	*0.2*	*1.0*

Figure 3. Quick Visual Inapection

Hammer Test

Hammert test research was conducted on the Civil Engineering Department building of the Polytechnic Manado State, this test was carried out by taking samples from each on the slab beam column to get an idea of the concrete compressive strength. Each location was conducted at 9 points to obtain the test value. Hammer test which used Matest type N model

From the test results, an estimate of the concrete compressive strength for beam columns and plates was obtained. The results can be seen in the table:

Table 2. Test Results with Hammer Test a Tool

Structure Name		Civil Engineering Department Building Structure of Polytechnic	
		Manado State Column/	
R Average		30.8	40.8
R Average Corrected		38.7	34.7
Tool			
[illegible]		38.7	34.7
Concrete Compressive Strength Estimation			
Maximum, (kg/cm2)			
Minimum, (kg/cm2)			

Conclusion

From the results of the evaluation of the level of damage to the Civil Engineering Department Building The following conclusions can be drawn from the Manado State Polytechnic:

The damaged components in the Civil Engineering Department building of Manado State Polytechnic occurred in several structural elements, but this damage is still classified as minor non-structural damage because the damage that occurred was cracks in the plaster on the structure.

Building maintenance and care must be carried out, especially on structures that have cracks where water can seep in and enter, thus affecting the main structure.

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