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Implementation of Building Construction Management in soft soil

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Abstract: The problem of building construction on soft soil of the structure, so that at the planning stage it is known that there are quite a lot of design criteria, especially in the lower building structure and ground floor. Similarly, during the development phase, construction equipment and methods face the problem of a very high level of risk analyst on soft soil conditions and prone to subsidence. Resource risk plays an important role in the project time frame on infrastructure projects on soft soils during the construction phase. The use of Decision Support System (DSS) for construction project management with a Scientific Evolution Analysis approach., The methodology used is that building repair priorities can be used using the Analytical Hierarchy Process (AHP) and Profile Matching methods. The method is carried out by the implementation of building construction, which is analyzed using the Analytical Hierarchy Process (AHP) method with Excel application software. The decision-making system model was created by generating a computer-based Building Information Management (BIM) application with MySQL. The results of this study are several alternative construction design designs for the bottom of buildings on soft soil depending on the number of floors that greatly affect the type of underground building other than the type of soil, or without D walls and piles and the model developed makes it easy to choose the type of foundation because it is computer-based with PHP-MySQL program.

Keywords: *Construction, Management, Soft Soils*

1. Introduction

The use of the building repair priority decision support system can use the Analytic Hierarchy Process (AHP) and Profile Matching methods. The AHP method is used to determine the priority vector or priority weight of sub-elements, elements, and components, while Profile Matching is used to determine the ranking of buildings that are priority for repair based on the measurement of damage volume, type of damage, reduction and correction values as well as Mckay Condition Index Scale values on building sub-elements, elements, and components. There are three criteria, namely: measurement of the volume of damage, type of damage, reduction value and correction factor. This research can be developed by adding variables in the form of standard repair capabilities of each sub-element, element, and sub-component as well as the calculation of the volume of damage compared to the volume, area, or number of units of sub-elements, elements, and sub-components.

Based on the description of the background of the problem above, the problem identification in this study is that the construction project of buildings on soft soil has the characteristics of the level of implementation risk. The problem of building construction on soft soil is very complex, and many risks of the design and implementation of deep foundations on expansive soft soil depend on the detailed design results. Problems in the design and implementation of deep foundations on expansive soft soils are very frequent due to the lack of effective decision support systems to carry out construction management on buildings on soft soils.

The purpose of this study based on the formulation of the problem being researched is to analyze the types of underground construction in buildings on soft soil, to analyze the design of underground construction in buildings of all classifications of buildings (simple buildings, non-simple buildings, special buildings) on soft soil, to develop a method of implementing the construction of underground buildings on soft soil for all types of construction of underground buildings, Modelling the integration of design and implementation of subsurface construction in buildings on soft ground

2. Methods

The method by selecting the best from the planning and implementation of building construction, which is analyzed using SPSS statistical software and the Analytical Hierarchy Process (AHP) method with Excel application software. The model decision-making system is created by generating a computer-based Building Information Management (BIM) application with MySQL.

Data analysis according to type and purpose: At the identification stage, data analysis is carried out with Cronbrach Alpha Analysis to test the validation and reliability of the research instrument, as well as Sample Average testing to ensure appropriate variables. At the stage of formulating the relationship model between variables, the evaluation is carried out with the Structural Equation Modelling (SEM). Model validation is carried out to control and improve the model to make it better, by requesting assessment (improvement evaluation) from experts and practitioners, through seminars, interviews, discussions, trials and providing input for improvement.

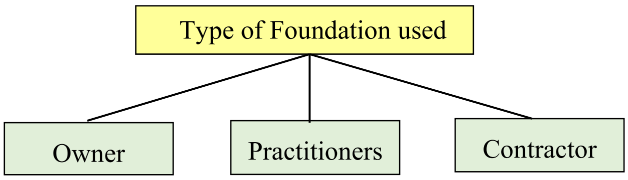

Fig. 1. Level 1 Stakeholder

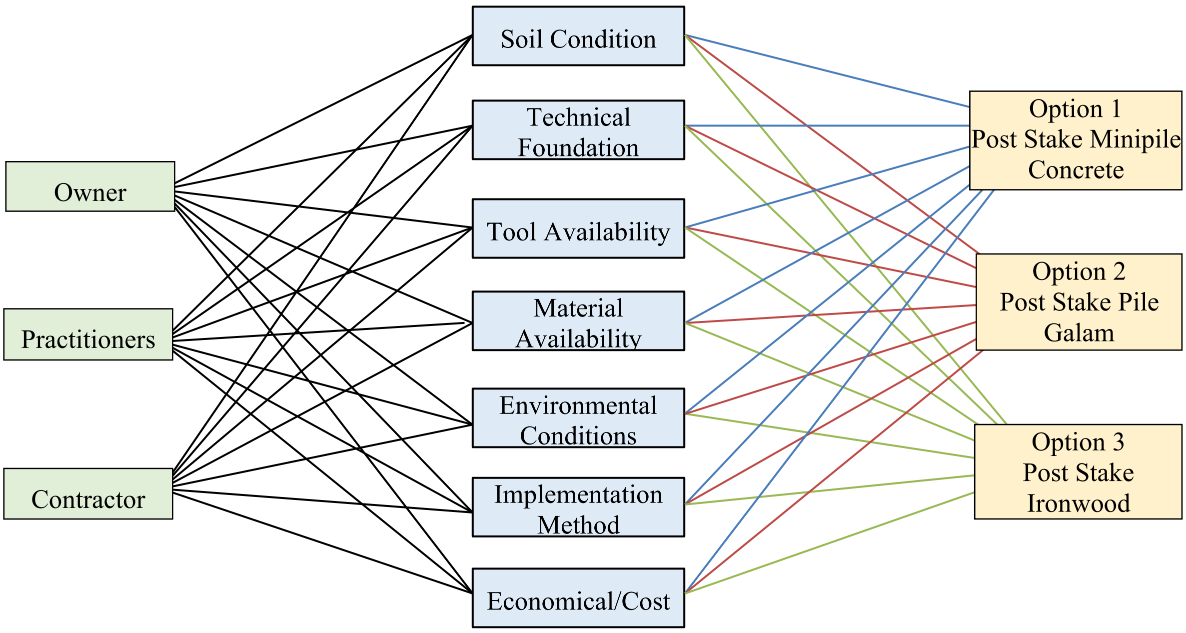

Fig. 2. Level 2 Criterion and Level 3Alternative

This condition aims to find out the best choice in the selection of foundation and reinforcement in modeling to get the best results in determining the foundation in soft soil conditions.

3. Modeling and Simulation

The use of modern technology, such as computer modeling and simulation, can help estimate the behavior of foundations under a variety of conditions. These simulations help evaluate how well the foundation can cope with earthquakes or changes in external loads. From various tests of building loads on soft soil with a carrying capacity of 0.5 kg/cm^2 – 1.2 kg/cm^2, the results are obtained as presented in the following table below :

Table 1. Foundations under variety of conditions

No	Pole alternatives	Concrete Buildings *)	Wooden Buildings *)
1	Mini Pile	1-2 floors	1-3 floors
2	Wood	1-2 floors	1-3 floors
3	piles	1-2 floors	1-3 floors
4	Precast	more than 2 floors	more than 3 floors
5	Bore/Strauss Pile	more than 2 floors	more than 3 floors
6	Steel	more than 2 floors	more than 3 floors
7	Full D-Wall	more than 2 floors	more than 3 floors
8	Partial D-Wall	more than 2 floors	more than 3 floors
9	Non-D-Wall	1-2 floors	1-3 floors

With these variables, a paired matrix questionnaire is prepared and the weighting results are obtained which are detailed in the indicator according to the criteria mentioned above, and can be seen in the table below. The criteria themselves consist of various indicators that will later be used to determine the criteria according to the location of the building to be built.

Table 2. Weights Criteria for soil type.

No	Criterion	Soil Type Criteria				Weight
		Silt soil hard soil depth < 10 m	Silt soil hard soil depth > 10 m	clay soil depth hard soil < 10 m	clay soil depth hard soil > 10 m	
1	Silt soil hard soil depth < 10 m	1.0000	1.4562	0.1490	0.2000	0.1153
2	Silt soil hard soil depth > 10 m	0.6867	1.0000	6.5977	0.3249	0.2137
3	clay soil depth hard soil < 10 m	6.7096	0.1516	1.0000	0.1327	0.1682
4	clay soil depth hard soil > 10 m	5.0000	3.0776	7.5373	1.0000	0.5027
	Number of verticals	13.3963	5.6854	15.2841	1.6576	1.0000

We will find out in the sample of the city of Banjarmasin, Indonesia, with several characteristics, the height of the floor of our building will be broken down into several conditions as below.

Table 3. Best Choice Final Result.

No	Alternative	Name	Vi*	Concrete Buildings	Wooden Buildings
1	A1	Post Minipile	0.559193954	2-storey building	3-storey building
2	A2	Raft Foundation	0.587201398	2-storey building	3-storey building
3	A3	Galam Pile Pole	0.570931219	2-storey building	3-storey building
4	A4	Ironwood Pole	0.509783728	3-storey building	3-storey building
5	A5	Precast Pole	0.428461538	3-storey building	3-storey building
6	A6	Steel Pole	0.420696326	3-storey > building	3-storey > building
7	A7	D-Wall	0.479242977	3-storey > building	3-storey > building
8	A8	Partial D-Wall	0.582031251	3-storey > building	3-storey > building
9	A9	Non D-Wall	0.551930762	3-storey > building	3-storey > building
10	A10	Borepile-Strauszzpile	0.488527723	3-storey > building	3-storey > building

* Preference Value (Vi) = Priority Selection

The final ranking is based on the Banjarmasin location criteria. Therefore, it can be concluded that for the selection of the type of building under the construction of low buildings for concrete buildings of 2 floors and wooden buildings up to 4 floors, according to the preferences of the ranking results, it shows that the most ideal alternative is to use a raft foundation (Non D-Wall) with a pile foundation of galam. The value of Vi for each alternative is A2 – Raft Foundation of 0.5872 and for A3 – Galam Piling Pile of 0.5709.

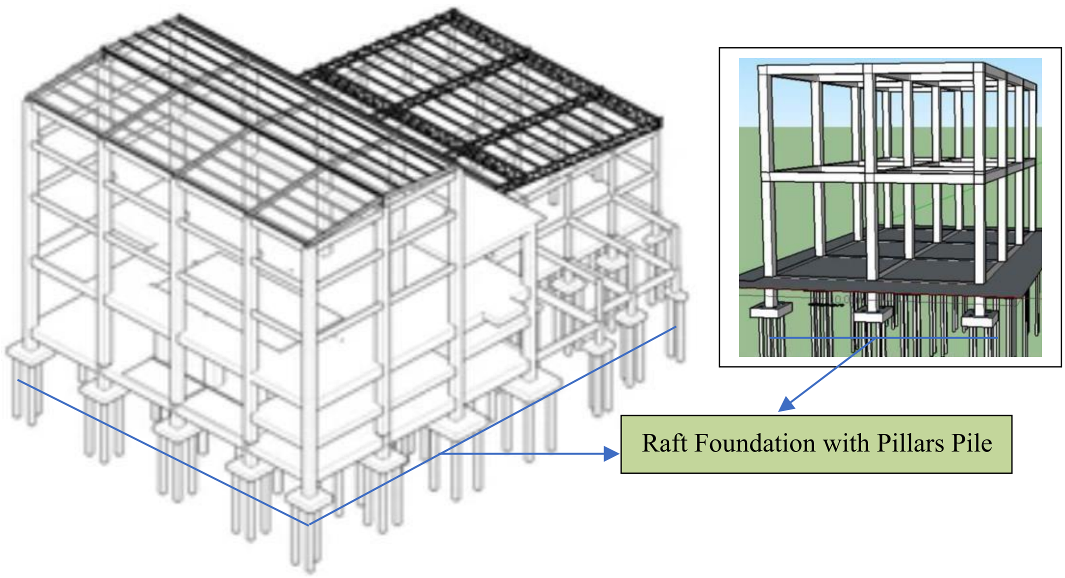

Fig. 3. Preference for the type of construstion under low-lying buildings on soft soil.

From the data obtained from the comparison of criteria with steering alternatives, it was processed using the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method.

Table 4. The differences between AHP and TOPSIS steps.

AHP	TOPSIS
Define the Objectives	the Criteria/Attributes matrix
Identify the Criteria/Attributes	the Alternative matrix
Establish the Hierarchy	Calculate Criteria vs Alternatives decision matrix
Design Questionnaire and survey	Calculate the normalized decision matrix
Construct the Pairwise Comparison matrices using Satty's 9-point scale	Calculate the weighted nirmalized decision matrix
Synthesize Judgments	Determine the Positive ideal Solution and Negative Ideal Solution
Calculate Consistency (C.I) Index	Calculate the separation measures for each alternative from the positive and negative ideal solution
Comparison between Criteria and Alternatives	Calculate the relative closeness to the ideal solution for each alternative
Calculate Final Rankings	Rank the preference order

4. Conclusion

Alternative design of the construction of the undercarriage of the building on soft soil depends on the number of floors which greatly affects the type of undercarriage in addition to the type of soil, and the cost factor for all classifications, namely:

a) Simple building, for structures < 4 floors; The order of choice of pile types is Galam piles, concrete minipiles and ironwood as well as without diaphragm or semi-diaphragm walls.
b) The building is not simple, for a structure ≥ 4 floors; The order of choice of pile types is drill piles, prestressed concrete piles and steel piles as well as with semi-wall diaphragm and full wall diaphragm.
c) Special buildings, for structures ≥ 9 floors; The order of choice of pile types is drill pile, and steel pile as well as with full diaphragm wall.

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