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INTEGRATED LABORATORY BUILDING FOUNDATION DESIGN OF LAMBUNG MANGKURAT UNIVERSITY IN BANJARBARU

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ABSTRACT

In planning a building construction, one of the aspects that must be considered is the characteristics of the soil where the building will be erected, which will play a role in supporting the structure. The foundation is a part of construction engineering that functions as a medium for channeling the load of the superstructure to the subsoil beneath it. Types of foundations are generally divided into two categories, namely, shallow foundations and deep foundations. A shallow foundation is chosen if the characteristics of the soil right under the building are categorized as hard soil.

In general, in the Banjarbaru area, a shallow foundation system is considered sufficient to support the construction of buildings due to the characteristics of the soil in Banjarbaru which is dominated by grainy soil types such as sand. So in planning the foundation of a building construction, it is expected to be sufficient if using a shallow foundation type.

In terms of soil texture, in the Banjarbaru area, there are 3 (three) soil textures namely, fine, medium, and coarse. Most of the central region has a soil texture that tends to be smooth, while a small portion in the south has a coarse soil texture.

Keywords: Building construction, Soil characteristics, Shallow foundation.

1. INTRODUCTION

In planning a building construction, one of the aspects that must be considered is the characteristics of the soil where the building will be erected, which will play a role in supporting the structure, even though the load from the building structure is not directly received by the soil, but transferred first through the foundation system to be used, but It is important to pay attention to this aspect.

The foundation is a part of construction engineering that functions as a medium for channeling the load of the superstructure to the subsoil beneath it. Types of foundations are generally divided into two categories, namely, shallow foundations and deep foundations. A shallow foundation is chosen if the characteristics of the soil

right under the building are categorized as hard soil. Whereas a Deep Foundation will be chosen if the position of the hard soil layer is far from the ground surface.

In general, in the Banjarbaru area, the shallow foundation system (palm and river stone foundations) is considered sufficient to support the construction of the building due to the characteristics of the soil in Banjarbaru which is dominated by grainy soil types such as sand. Grainy soil is a type of soil that is quite profitable for existing building construction because the soil carrying capacity is quite high and the possibility of settlement is very small. So in planning the foundation of a building construction, it is expected to be sufficient if using a shallow foundation type.

2. THEORITICAL STUDY

In terms of soil texture, in the Banjarbaru area, there are 3 (three) soil textures namely, fine, medium, and coarse. Most of the central area (88% of the total area) has a fine soil texture, while a small portion in the south (4% of the total area) has a coarse soil texture.

The foundation is the lowest element of a building which functions as an intermediary for the superstructure which distributes all the loads acting on it and resists external forces.

The foundation can be defined as a strong and stable structural unit that is located under construction which will be a channel for superstructure loads, then these loads must be spread to the supporting soil layer below.

The foundation system is designed based on the amount of load contained in a building structure. The loading that occurs depends on what components are contained in the superstructure of the building. The upper structure in question is the building structure that is above the ground surface such as floor slabs, columns, main beams, joist beams, notches, and roofs. Each of these components has a different function.

Generally, loads acting on structures such as dead loads, live loads, earthquake loads, and wind loads are the initial calculation material in structural planning to obtain the magnitude and direction of the forces. forces acting on each member of the structure. Then structural analysis can be carried out to determine the size of the

cross-sectional capacity and reinforcement needed by each structure, especially for foundations.

According to Terzaghi (1943), the ultimate bearing capacity of the soil can be defined as the overall strength of the soil capable of withstanding the load from the superstructure without causing shear failure. The concept of soil-bearing capacity and the shape of the shear failure that occurs can be seen in the foundation model.

In general, the equation proposed by Meyerhof still adopts what has been written by Terzaghi. However, there are several changes, namely in the carrying capacity factor, Meyerhof provides a new formula for the three carrying capacity factors, while Vesic and Hansen only improve the carrying capacity factor. This is because Terzaghi's formulation of the carrying capacity factor is too complicated and contains many unattractive and unclear coefficient values.

In planning the foundation, it is necessary to pay attention to the criteria that must be met, namely, the foundation can withstand the loads acting on it and the foundation does not experience a decrease until the required decrease in the permit value. Settlement in the foundation can be divided into total settlement (total settlement) and partial settlement (differential settlement). For buildings in general (not special buildings), mechanical engineering total settlement is not a critical problem. However, the total settlement will be related to other factors that are not related to the mechanics of the building structure.

3. METHOD

Data Collection

The data collected is in the form of data that is closely related to planning obtained either through government agencies, contractors (implementers), or planning consultants. The data needed include:

a. Land Investigation Data
b. Loading Data
c. Shop Drawings

Loading Calculation

Foundation design is highly dependent on the forces and moments originating from the superstructure. These forces and moments are analyzed based on the loading data previously described

a. Dead Load
b. Live Load
c. Wind Load

Structural modeling seeks to approach the structural conditions being analyzed or represent the actual structural behavior, to obtain valid analysis results.

Modeling a structure includes:

a. Determination of joint coordinates as relevant boundaries;
b. Determines the orientation of the elements in the structure coordinates;
c. Determination of element cross-sectional properties and elasticity;
d. Determination of structural loading (force acting on the structure);
e. Determination of the type of analysis used.

Determining Shallow Foundation Dimensions

The dimensions of the footing foundation must be planned in such a way as to include the width, thickness, and depth of the embedded foundation so that the stress that occurs at the bottom of the foundation does not exceed the soil's bearing capacity.

Foundation Dimensions < Available Area

The availability of space will also affect what type of foundation will be used. Do you use shallow foundations (palms) or deep foundations (poles)? If using a shallow foundation, it will depend heavily on the dimensions of the foundation that have been determined with the available area. This is intended so that there is no overlap of the foundation.

Calculation of Bearing Capacity and Settlement

To analyze the bearing capacity of shallow foundations, a formula based on field data is used in the form of sondir (see Chapter 2.8). If based on the calculations that have been done it turns out that using a shallow foundation is not safe, then we use a pile foundation. After the analysis of the bearing capacity

of the foundation to determine which foundation is safe to use has been completed, the foundation settlement will be calculated at that foundation point.

4. RESULT AND DISCUSSION

Loading Calculation

As explained in the previous chapter, the foundation design requires forces and moments that have been analyzed based on the superstructure. The upper structure in question is the building structure that is above the ground surface such as floor slabs, columns, main beams, joist beams, notches, and roofs. Each of these components has a different function.

Tributary Area

To ensure the results of structural load calculations using the SAP application 2000, then we will use the Tributary Area method. To be sure, we will only calculate a few load points as a representative. The SAP 2000 calculation is correct if the difference between the SAP 2000 calculation and the manual is not more than 20 %.

Palm Foundation Bearing Capacity

After obtaining the value of the loads at all points of the foundation, the calculation of the bearing capacity of the footing can be determined based on soil data.

Decline Analysis

Based on the soil data from drilling to a certain depth below the surface of the soil there is no water table and the resulting soil is of the type of silty sand, so there is no need to carry out consolidation calculations.

5. CONCLUSION

Based on the calculation results that have been obtained, it is concluded that the Integrated Laboratory Building at Lambung Mangkurat University, Banjarbaru, which was built using a pile foundation, can be planned using a shallow foundation in the form of a palm foundation. This is because the types of soil in the Banjarbaru area are dominated by granular soil types such as sand according to the soil data from the drilling results. Then it is strengthened again with the results of the calculation of the shallow foundation bearing capacity and

the immediate settlement that occurs is declared safe with the specified distortion conditions.

From the results of the analysis of the foundation design calculations at the Integrated Laboratory Building at Lambung Mangkurat University, Banjarbaru, obtained based on the results of soil drilling, the soil type is silty sand and the location of the water table is far below the foundation. This is evidenced by the drilling results not finding a water surface at a certain depth. So that the settlement calculation only calculates the elastic settlement (immediate decline) and does not need to calculate the consolidated settlement.

REFERENCES

[BSN] Badan Standarisasi Nasional. 2013. SNI 2847:2013. *Persyaratan Beton Struktural untuk Bangunan Gedung*. Jakarta: Badan Standarisasi Nasional.

[BSN] Badan Standarisasi Nasional. 2017. SNI 8460:2017. *Persyaratan Perancangan Geoteknik*. Jakarta: Badan Standarisasi Nasional.

Bowles, J. B. 1996. *Foundation Analysis and Design*. McGraw-Hill Companies, Inc.

Craig, R. F..2004. *Craig's Soil Mechanics*. Edisi Ketujuh. New York: Span Press.
Das, B. M. 1998. *Mekanika Tanah Jilid* 2. Jakarta: PT. Gramedia Pustaka Utama.

Das, Braja M. 2006. *Principle of Geotechnical Engineering*. Edisi Kelima. Canada: Thomson.

Das, Braja M. 1999. *Shallow Foundation Bearing Capacity and Settlement*. London, New York, Washington D.C.: CRC Press IL.C., Boca Raton.

Hakam, D. A. 2008. *Rekayasa Pondasi*. Padang: CV. Bintang Grafika.

Hardiyatmo, H. C. 1996. *Teknik Fondasi I* Jakarta: PT. Gramedia Pustaka Utama.

Meigh, D. A. 1987. *Cone Pendetration Testing.* Adlard & Son Ltd.