CHAPTER I
PRELIMINARY

A. Background

Surakarta city located on the Java island, Central Java Province, Indonesia. Surakarta city is pushing to become a tourist attraction from around the world. Infrastructure is needed in the city to accommodate the increasing number of tourists especially in the form of hotels.

The concept of vertical building is the main solution to overcome the limitations of land by using air space above. This concept could be residential building in number of units with limited land area.

Pile foundations consist of a number of piles connected by a pile cap. One method of construction is driven pile. The driven piles or also known as displacement piles are a type of construction foundation that is used with great frequency. This is responsible for providing the structures with the support they need; they do this by transferring their loads through the layers of the soil that do not have the bearing capacity to the layers of soil or rock that do have a considerable bearing capacity.

If the soil is characterized by being dense, it may be necessary to pre-drill in order for the pile to reach the depth stipulated in the design.

The driven piles are very adaptable and can be installed to adapt to compression, lateral loads or tension, with the specifications that are established according to the needs of the structure, the budget available and the conditions of the ground where the project is carried out.

The dynamic or static tests, which are carried out on the piles, are used in order to verify the capacity of the pile, this means the maximum load that a pile can support without excessive settlements or failures in the ground.

B. Formulation of the Problem

Based on the background reviewed previously, the project is required to accomplish the following:

a) What is the axial load subjected to the piles from the columns of a 12-story hotel building?
b) What are the soil properties in the building location?
c) What is the shaft friction, end bearing capacity and bearing capacity of a given single pile and its factor of safety?
d) What is safest design of piles in a group to with stand the load from the hotel building?
e) What reinforcement is used in driven pile design on site.

C. Research Objectives

The objective of this research is as follows:

To determine the axial load subjected to the piles from the columns of a 12-story hotel building using SAP software.

To identify the soil properties in cohesion soil to cohesionless soil before calculating bearing capacity.

To determine the shaft friction, end bearing capacity and in turn finding the bearing capacity of a given single pile and its factor of safety.

To determine the safest design of piles in a group to with stand the load from the hotel building.

To calculate the driven pile reinforcement.

D. Benefits of Research

The following are the benefits of this research:

i. To learn more about the different types of foundation design and which type should be used in which situation of the soil.
ii. To know how loads from the building are distribute to columns and how those loads affect the design of the pile foundation.
iii. To provide a well-researched report to those foundation designers in this university who might need to reference the work done in this project.

E. Limitation of The Research

1. The foundation design in this research is based on the soil data from the laboratory soil testing for the design of a hotel in Surakarta city.
2. The axial load from a column supporting 12 hotel stories is to be designed using SAP software.
3. The analysis is limited to only manual calculation design.
4. This research is limited to the use of onlyone type of pile foundation and that is **Driven concrete piles.**
5. The minimum factor of safety considered is 3.
6. There is no effect of ground water level on the design of piles.
7. The borehole depth is exactly 30 m deep.
8. Borehole 2 (BH-2) is to be used in this research.

F. Research Tools

The following software was used:

Microsoft Office 2016:

This program is used to create reports, charts, flowcharts, analysis data.

AutoCAD 2017:

This software is used to design the arrangement of piles in a pile cap.

SAP 2000 V20:

This software is used to design the building loads in order to acquire the axial load of the biggest loaded column.

The following is the data sample for the soil test made. The data is from two borehole pits drilled in the soil.

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BORE LOG

Project :	**Pekerjaan Pembangunan Hotel Sunan**	**Location : Jl. Jend. A. Yani No. 40 di Solo Jawa Tengah**	**Bore Hole No : BH. 1** Page 1
Date of drilling	Juli 2012	Descripted by : Andi RAS, ST	Coordinate X:
Bore Machine	Longer 24	Checked by : Ir. M u h r o z i, MS	Y:
Pump	Sunchin	Date of photograph :	Elevation Z :
Master bore	Slamet	Sample store at : Semarang	Inclination
Drilling methode	Rotary		
Diameter of hole	73 mm	Ground Water Depth : -2,00 meter	Azimuth

Date	Depth (m)	Depth (m)	Thickness (m)	sample	Symbol	Layer Tipe	DESCRIPTION	Field Test SPT Depth (m)	N
Juli 2012	1	0.00				PASIR kelanauan	lepas, warna coklat	2.00 – 2.45	6
	2								
	3								
	4	3.50						4.00 – 4.45	12
	5			4.50 – 5.00		LANAU kepasiran	teguh sampai kaku, warna coklat		
	6	6.00						6.00 – 6.45	60
	7					PASIR	padat, warna coklat abu-abu		
	8							8.00 – 8.45	46
	9								
	10			9.50 – 10.00		PASIR (TERURAI)	padat, warna abu-abu	10.00 – 10.45	47
	11								
	12							12.00 – 12.45	49
	13	12.50				LEMPUNG kelanauan	sedikit pasir dan kerikil, sangat kaku, warna abu-abu		
	14	13.50						14.00 – 14.45	30
	15			14.50 – 15.00		LANAU kepasiran	sangat kaku, warna coklat		
	16							16.00 – 16.45	47
	17	17.00				PASIR kelanauan	padat, warna coklat abu-abu		
	18							18.00 – 18.45	60
	19	19.00							
	20			19.50 – 20.00		PASIR kerikilan	padat, warna coklat	20.00 – 20.45	58
	21	21.00							
	22					PASIR	padat, warna coklat	22.00 – 22.45	52
	23								
	24							24.00 – 24.45	56
	25			24.50 – 25.00					
	26	26.00						26.00 – 26.45	>60
	27					PASIR kerikilan	padat, warna coklat abu-abu		
	28	28.00						28.00 – 28.45	>60
	29					LANAU	keras, warna coklat		
	30	30.00		29.50 – 30.00				30.00 – 30.45	>60
							End Off Boring		

NOTE :

Figure I. 1 Soil data for BH-1

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BORE LOG

Project :	**Pekerjaan Pembangunan Hotel Sunan**	**Location : Jl. Jend. A. Yani No. 40 di Solo Jawa Tengah**	**Bore Hole No : BH. 2** Page 1
Date of drilling	Juli 2012	Descripted by : Andi RAS, ST	Coordinate X:
Bore Machine	Longer 24	Checked by : Ir. M u h r o z i, MS	Y:
Pump	Sunchin	Date of photograph :	Elevation Z :
Master bore	Slamet	Sample store at : Semarang	Inclination
Drilling methode	Rotary		
Diameter of hole	73 mm	Ground Water Depth : -2,00 meter	Azimuth

Date	Depth (m)	Depth (m)	Thickness (m)	sample	Symbol	Layer Tipe	DESCRIPTION	Field Test SPT Depth (m)	N
Juli 2012	1	0.00				PASIR kelanauan	lepas, warna coklat	2.00–2.45	13
	2								
	3	3.00							
	4					LANAU kepasiran	kaku sampai keras, warna coklat	4.00–4.45	23
	5			4.50–5.00					
	6							6.00–6.45	57
	7	6.50				PASIR kelanauan	padat, warna coklat abu-abu		
	8							8.00–8.45	41
	9								
	10	10.00		9.50–10.00		PASIR HALUS	sangat padat, warna abu-abu kecoklatan	10.00–10.45	29
	11								
	12							12.00–12.45	27
	13	13.00				LEMPUNG	kaku, warna abu-abu tua		
	14							14.00–14.45	23
	15	15.00		14.50–15.00		LEMPUNG kelanauan	sangat kaku sampai keras, warna coklat abu-abu		
	16							16.00–16.45	26
	17								
	18	18.50						18.00–18.45	50
	19					PASIR	padat, warna abu-abu kecoklatan		
	20			19.50–20.00				20.00–20.45	51
	21								
	22							22.00–22.45	>60
	23								
	24							24.00–24.45	>60
	25	25.00		24.50–25.00		LANAU butir kasar	sedikit lanau, keras, warna coklat abu-abu		
	26							26.00–26.45	>60
	27								
	28	27.50				PASIR (TERURAI)	padat, warna abu-abu	28.00–28.45	>60
	29								
	30	30.00		29.50–30.00				30.00–30.45	>60
							End Off Boring		

NOTE :

Figure I. 2 Soil data for BH-2

G. The Originality of Research

There have been numerous researches done in this university that can in some ways resemble this undertaken project. The Similarities and Differences can be seen below:

Table I. 1similarities and differences with similar research.

NO	Title	Researcher	The purpose	Scope of problem
1	Bored Pile foundation designed using Geo5 program	Omar H.A Harb.	Redesigning pile foundation of the UMS Edutorium using bored piles in contrast to the driven piles which were actually used in the project.	1. The design is made using bored piles. 2. The piles are circular in design. 3. The data used is from borehole 1 for the soil investigation.
2	Driven Pile foundation designed using Geo5 program	NASSER ABU SHAMSEIE	Design optimum pile dimension to attain stability of the piles against sliding and any failure. This is done through several manual calculations and the use of Geo5. Comparing the results from manual calculations with Geo5 results to attain suitable design of piles	1. this design is done forUMS Edutorium , 2. In this research square piles are used , 3. The piles used are pre-cast from concrete.

3	Design of CPT driven pile foundation of 14 stories building near Jamuna bridge	MAJD EMAD DAOUD	Designing the pile foundation by determining the appropriate designing method and analyze the piles' capacity to distribute the loads subjected to the piles into the ground without failure.	The design of this particular foundation is based on the soil data gotten from the bridge and the calculated axial load from a column supporting 14 hotel stories. This research is limited to the use of onlyone type of pile foundation and that is CPT driven piles. The minimum factor of safety considered is 3.
4	Design of driven pile foundation of a 12-story hotel building in Surakarta.	AHMAD ABU SHANAB	Determine the axial load subjected to the piles from the columns of a 12-story hotel building and thereby determining the safest design of piles in a group to with stand the load from the hotel building.	The design in this research is based on the soil data from the laboratory soil testing for the design of a hotel in Surakarta city. The axial load from a column supporting 12 hotel stories is to be designed using SAP software. The analysis is limited to only manual calculation design. This research is limited **Driven concrete piles.** And bored pile reinforcement calculation and design. The minimum factor of safety considered is 3.