CHAPTER I
INTRODUCTION

A. Background

Foundation is the part of the building that is located under the soil surface which continous the load of the building to the earth. In the civil engineering world, there are two types of foundation that is commonly used in the structure of a building, those are shallow foundation and deep foundation. Shallow foundation usually used in the type of soil with good bearing capacity at the surface of the soil, the main idea of shallow foundation is to carry the load directly. The example of shallow foundations are spread footings, continous footings and raft footings. Deep foundation is defined as a foundation that carry the load of a building through the hard soil level because the bearing capacity of the soil at the surface is low or not safety enough to carry the load. The deep foundation has two types, e.g. pier foundation and pile foundation.

Soil bearing capacity has the most important role to determine the type of foundation. The bearing capacity means that the strength of soil to carry the load above them or in other words the bearing capacity refers on shear strength of soil against the settlement. So, if a certain area has a high value of bearing capacity it is mean the high settlement of the soil that might be happen in that area is low.

A strong and good foundation is a key of every structural design. To support the building's load and the soil movement needs a perfect calculation to make the foundation does not collapse. In shallow foundation that is commonly used in type of soil with good bearing capacity at the surface of the soil, it is important to know the limit of the shallow foundation and how to improve the strength of it.

By these explanation, it is important to find an effort of improvement in both sectors of fundamental area either it is on foundation or in soil itself. This research will be focused on the improvement of the cirucular footings. By adding the partially skirt (partially vertical plate) surroundings under the footings surface. This type of footings is known as partially-skirted footings. The hallmarks of the

partially-skirted footings are less of volume and assembly costs cheaper than the conventional skirted footings.

Bucket foundation or skirt foundation is one of the shallow footings type with speciality in improvement of the soil bearing capacity. El Wakil (2013) from Alexandria University has already tested the function of skirt foundation in order to improve the bearing capacity value of shallow footings.

B. Problem Formulation

To help focus on the basic problem of the research, the formulation of the problem should be designated, which are :

1. How does the partially skirt's effect towards the bearing capacity of circular footings ?
2. How does the influence of partially skirt's variation of Length/Diametertowards the bearing capacity of ciruclar footings ?
3. How does the effect of the usage of partially skirt on circular footings towards the settlement ?
4. How does the effect of partially skirt footings compared with previous research ?

C. Research Objective and Benefit

1. Research Objective
   a. To know the partially skirt's effect towards the bearing capacity of circular footings.
   b. To know the influence of partially skirt's variation of Length/Diameter towards the bearing capacity of ciruclar footings.
   c. To know the effect of the usage of partially skirt on circular footings towards the settlement.
   d. To know the effect of partially skirt footings compared with previous research.

2. Research Benefit

The benefit of the existence of this study is to provide the information based on fact and data about the effect of the partially skirted footings on improvement the bearing capacity value of footings.

D. Limitation Problem

In order to keep the discussion in of topic and to make a boundaries of the investigated issue, so this research should be given the following limitation :

1. The research is conducted in Soil Mechanics Laboratory of Civil Engineering Department, Universitas Muhammadiyah Surakarta.
2. Laboratory tests do on a small scale model with 9 models of partially skirt and 3 models of partially unskirt.
3. The type of foundation is circular footings.
4. The footings and skirt models are made from steel plate and assumed to be rigid.
5. The bin measurement is 500 mm height and 600 mm diameter.
6. The gap of partially skirt is 3 mm
7. The confinement of soil bin is neglected.
8. The sand is assumed homogeneous with the same amount the water addition 1000 ml each layer and the same amount of compaction, 100 times each layer. The total layer is 9 layers.
9. The type of load is centric load.
10. The vertical loadings are measured by Frame Loading Testing Machine and the vertical displacements of footings are measured by two-dial gauges that attached vertically on the top surface of footings.
11. The compaction must be repeated everytime the test restart.
12. The water level is neglected.
13. The depth of footingss (*Df*) is zero (0).
14. There are nine partially skirted footings models which are conducted they have a skirt thickness of 2 mm for 75, 100, and 150 mm of footings diameter and 75, 100, 150 mm of skirt length. Three partially un-skirted footings models with 75, 100, 150 mm diameter and 10 mm of thickness

are also conducted to make data comparison for the partially skirted footings. Two open holes are drilled at the surface of every footings models.

15. The L/D ratios are :

L/D	D 75 mm	D 100 mm	D 150 mm
L 75 mm	1.00	1.33	2.00
L 100 mm	0.75	1.00	1.50
L 150 mm	0.50	0.66	1.00

E. Research Authenticity

The research of modification circular footings with title "Bearing Capacity of Partially Skirted Footings on Sand" has not been previously conducted in Universitas Muhammadiyah Surakarta. But, in several countries, the journals or researches that could be as references for this study has been conducted with several ways and methods.

Amr Z. EL Wakil (2013) from Alexandria University, Egypt, has already published his research on Alexandria Engineering Journal about "Bearing Capacity of Skirt Circular Footings on Sand". He discussed about the effect of skirt length to the bearing capacity with various type of relative density such as 35%, 65%, and 90%. So, it means there are six difference skirted footings models with difference diameters and lengths with three types of different relative density.

Table I.1 The differences between this study and Amr. Z EL Wakil's.

No	Variable(s)	This Study	Amr. Z EL Wakil
1	Sand (Aggregate)	Use the same formation of sand and the same of water content in every test	Use different formation of sand in every test with different relative density (*Dr*) 35%, 65%, 90%.
2	Skirted Footingss	Nine models of partially skirted	Five models × 3 kinds of *Dr*. Three models have,

		footings. T_s = 2 mm; D = 75, 100, 150 mm; L = 75, 100, 150 mm; T_f = 10 mm; L/D = 0.50, 0.67, 0.75, 1.00 (75/75), 1.00 (100/100), 1.00 (150/150), 1.33, 1.50, and 2.00.	D = 100 mm, T_f = 20 mm, L/D = 0.5, 1, and 1.5, respectively T_s = 1.5, 2.5, and 3.5 mm. Two other have, D = 75 mm and 150 mm, L/D = 1.0.
3	Unskirted Footingss	Three models of partially skirted footings. D = 75, 100, 150 mm; T_f = 10 mm.	One model × 3 kinds of *Dr*. D = 100 mm, T_f = 20 mm.
4	Soil Bin	Made from cylinder with 500 mm height and 600 mm diameter.	Made from two steel rings with total height is 600 mm and 750 diameter.
5	Loading Mechine	Frame Load Testing Machine with maximum load is 250 kN.	Motorized loading machine, proving ring calibration is 28 kN maximum capacity.

With :

D : footings diameter;

L : skirt length;

T_s : thickness of skirt;

T_f : thickness of footings;

L/D : the ratio between L and D.