CHAPTER I INTRODUCTIONS

1.1 Background

All structures need a solid foundation in order to stand. The most important function of a foundation is its ability to support the weight of the structure above no matter the size. There are two major types of foundations: shallow foundation and deep foundations. Shallow foundations, particularly rectangular spread footings, are used mostly for small buildings such as a house with no more than three stories high and on good soil such as rock. Deep foundations are used when the load it bears (the structure load above) is great and the soil is poor like soft clay.

Both types require accurate calculations of dimensions, stability, and strength in order to serve their purpose based on the standards already set. There are several methods to calculate and analyze the essentials of a foundation. Specifically there are two major design aspects: geotechnical and structural. The geotechnical aspect of the design is concentrated on the parameters and behaviors of soil; while the structural aspect is concentrated on the characteristics of the design's structure and whether or not it meets the safety standards applied. Because in general, concrete is used as the material for constructing a foundation, the structural design of it would be based on the characteristics of concrete and the codes that govern them.

Computations in designing a rectangular spread footing foundation can be somewhat complex and sometimes requires the use of trial and error and repetitions. Therefore, it would be most convenient if the foundation of a structure were calculated and analyzed in a program that would display the result in an organized way and safe keep it for future developments. Therefore, an information system for doing such things is much needed for a faster and more efficient way to build a solid and strong foundation.

1.2 Problems Formulated

1. What calculations are needed to design a rectangular spread footing foundation?
2. What controls are used for the design of a rectangular spread footing foundation?
3. What materials are used in constructing a foundation and what kind of structural failures need to be anticipated and with what?
4. How does a foundation designer design a foundation, requested by a building owner, in a more efficient and effective way?
5. Does putting calculations concerning the design of a foundation in a program help speed up the process of designing it? How does it help speed up the process?
6. If an information system were able to calculate a foundation's design, how will it present it as a report to the owner?
7. What information will the information system keep regarding a foundation's design?
8. What is the use of keeping a database of foundations?

1.3 Purpose

1. The main function of the program is to calculate both the geotechnical factors and structural reinforcements of the foundations.
2. The controls used to ensure the safety of a foundation will be determined by the standard codes that are currently being used.
3. A foundation is generally made of concrete with reinforcements of steel to anticipate flexural and shrinkage failure of the concrete itself as well as steel dowels to transfer the load from the column to the footing.
4. An information system will be made to effectively and efficiently design a foundation by acting as an application in one part to

calculate a foundation's essentials. It will also keep data that will help future designs and analysis of foundations.

5. Calculating using a computer application will certainly speed up the process of any calculation work including calculating the details and measurements of a foundation by automatically computing input data from the user, processing it according to the steps required, and finally giving output that is easy to read and understand.
6. The final result of a foundation design should be represented as a carefully drawn detail of the foundation with its measurements to scale and important calculation results for considerations in field constructions.
7. The information system will keep information regarding a foundation such as the owner requesting the design, the building which will stand upon it, the soil on which it will rest, the dimensions of its reinforcements, and the location and address where it will be built.
8. Keeping records of past designs is very useful in future developments and those records can also be used as a guarantee or proof of the correct design of the foundation.

1.4 Scope of Research

Topics to be discussed:

1. Definition of foundation
2. Theories on shallow foundation structures. More specifically, concrete rectangular spread footing foundations
3. Theories of calculation of foundations methods using data from laboratory experiment
4. Formulas and equations for analyzing foundations (Terzaghi Method)
5. Structural behavior of the foundation, as well as its calculations, formulas, and equations
6. Load transfer from the top structure to the foundation
7. Shrinkage and flexure reinforcements of the foundation

8. Excluding settlement analysis of foundation
9. Excluding calculations for top structure
10. Excluding calculations of bearing capacity with water tables
11. Using the information system
12. Creating, editing, deleting, and saving data (client, soil project, reinforcement)
13. Calculating and designing the dimensions, flexural and shrinkage reinforcements, and dowels of the foundation
14. Making a report and displaying it as a portable document file.
15. Drawing a diagram with Java2D

The case that will be modeled after for this research is based on what a consultant would do when an owner presents him/her with a project. Foundations designed for the project is strictly limited to the rectangular spread footing model which will be designed for a range of loads for economical purposes as is the case in a normal project situation. The structure on top is limited to a 3 (three) story building with loads that will not exceed the capacity of a shallow foundation. Soil data from laboratory tests is given by the owner to the consultant for further analysis and designs. As a result of the design, a report in the form of a detailed drawing of the finished foundation will be shown to the owner.

1.5 Data Source

1. Structural data is from a previous concrete lab report.
2. ACI-318-05M (American Concrete Institute standard code).
3. Theory on designing a foundation is from books and e-books recommended by the supervising Civil Engineer lecturers.
4. Theory on developing an information system is from books and e-books recommended by the supervising IT lecturers.

1.6 Presentation System

This report is divided into three parts: the beginning, content, and ending. The beginning consists of the following:

a. Title page

b. Legalization page

c. Preface

d. Publication Agreement page

e. Statement of Originality

f. Abstract

g. Table of Contents

h. Appendixes

The content of this report consists of 5 chapters:

Chapter 1 INTRODUCTION

Chapter 1 covers the introduction of the manuscript, purpose and reasoning, scope of research, and the arrangement of the writing.

Chapter 2 THEORIES

Chapter 2 explains the basic theories of Foundation, soil bearing capacity according to Terzaghi, and computations based on the American Concrete Institute (ACI) code. It also explains the theory of structural behavior found in concrete foundations. This chapter will also explain what an information system is and other basic theories to support this project.

Chapter 3 ANALYSIS AND DESIGN

Chapter 3 is where the information system is analyzed and designed; and it is where the flowchart used in the design is tested.

Chapter 4 IMPLEMENTATION

Chapter 4 will describe the implementation of the user interface

Chapter 5 EVALUATION

This chapter will present the testing results of the information system and results of a questionnaire made to evaluate the user interface.

The last part of this report is:

Chapter 6 CONCLUSION

Finally, chapter 6 consists of conclusions and any critics useful for possible future development of the information system.