CHAPTER 1
INTRODUCTION

1.1 Research context

It can be said that every single structure has to transmit its own weight as well as any other loads acting upon it into the ground. As a geotechnical engineer, one must consider as many options as possible when selecting types of foundation for a particular structure. Nevertheless, the shallow foundation should always be considered first. This is because it is the cheapest in terms of construction cost. In addition, it is easier to build thereby reducing both construction time and overall cost. It should be noted that the shallow foundation comprises several forms and types, including raft foundations, combined foundations, and compensated foundations.

In the case it has been found that the shallow foundation is not suitable. For example, loads are so high that the shallow foundation could not carry. In some case, if a water table is very near soil surface the shallow foundation may be prone to the buoyant force. In such cases, other methods are considered, for example using the deep foundation. When a pile foundation is to be constructed, there are several factors that a designer must take into consideration. First and foremost is the material for the pile foundation. These include concrete, steel, and timber. Recently, other materials are being investigated in order to be employed as pile foundation.

Eventually, when a pile has been chosen and installed there are other problems a designer is concerned. For example, if the pile tip is shorter than the design what further steps should be carried out. In the case of the pile tip is longer there may also be a problem. One might have a question whether the design is correct. If the case of the pile tip level is in accord with the design, other bigger problem needs to be addressed: does the pile have the integrity of 100%?
To answer that question engineers have been trying to develop tools and instruments because defects are within the ground that of course cannot be observed from the surface. It may be concluded that devices being employed recently are robust enough in terms of evaluating the integrity of a pile. It should be noted that there are several devices and methods available, depending on the technology chosen to develop. It also should be noted that a device for pile integrity testing is quite expensive. In addition, when there are two defects within a pile the lower one normally is very difficult to detect, owing to the nature of stress waves travelling through a rod-like material such as piles.

This research attempted to address the two problems of the cost of owning a pile integrity test and the pile integrity evaluation of a pile having two defects at different locations. The former one was solved by experimenting with a conventional accelerometer to be used in the pile integrity test. For the latter, it was achieved by performing the pile integrity test on modelled piles having been intentionally defected with known defecting sizes and locations. Please be noted that the experiment for the latter was carried out using a commercial pile integrity test manufactured by Pile Test Co (Amir, 2009).

1.2 Research objectives

The following objectives were set to achieve the aims of this research project:

1) Investigate conventional accelerometer for being used in the pile integrity test.
2) Study and investigate the make of a nylon hammer to be used in the pile integrity test.
3) Study and develop a computer program for being used in the pile integrity test.
4) Experiment with the system developed for testing the integrity of model piles having been intentionally defected.
5) Analyse all of the signals obtained.
6) Compare the results and signals obtained from the experiments with the commercial one.
7) Propose a table for evaluating the integrity of a pile in terms of signal interpretation.
1.3 Research methods

To achieve the aims of the research the first task was to obtain as much information related to this project as possible, especially a technique for simulating a tsunami. The methods for this research project were divided into steps as following:

1) Study and search the literature related to this project for the purpose of gathering information as much as possible. For example, a popular techniques for testing the integrity of a pile. In addition, techniques for the interpretation of seismic signals are also summarised.

2) Prepare materials, tools, and devices that are essential for this research.

3) Construct model piles having defects with known sizes and locations.

4) Conduct the integrity test of the model piles by both commercial instrument and in-house developed instrument.

5) Analyse the signals and results obtained. These also are compared with standards commonly available.

6) Propose a table that to be used for technicians, engineers, and scientists who are interested in the application of this technique for evaluating the pile integrity.

7) Write up a research report.

1.4 Expected outcome

After this research project done, the most expected outcome was to obtain a table for being used as a tool for evaluating the integrity of a pile based on the signals obtained from the seismic test. It should be emphasised herein that the table may only be valid for the system employed. Nonetheless, the difference should not be large because even tested with different devices, but they all are based on the similar principles.

1.5 Layout of the report

This report begins with chapter 1 that provides some introductory remarks with respect to the importance for conducting this research project, especially the pile integrity test. It also includes the brief methods employed to carry out the experiment and objectives of the research. All of the essential work and research related to this research were reviewed and summarised in our own understanding in chapter 2. This chapter also
paves ways for conducting the experiments in terms of providing the methods that other investigators had done.

Chapter 3 simply provides readers concerning materials, methods, and test programmes to be carried out. The main aim of this chapter is to provide the information as accurate as possible so that others would be able to follow suite. After all of the test programmes done, their results are summarised in chapter 4. Also included in the chapter is discussion at which is one of the most important aspect of conducting research. This is because it would provide some insight knowledge why something happens. Then, it would be further enhanced by others to form a group of new knowledge. Chapter 5 traditionally concludes what this project has done and got. Also, some recommendations are also included so that one might be interested in doing similar work.