CHAPTER I

INTRODUCTION

1.1 Research Motivation

Challenging in soil exploration tasks in Civil Engineering has led to the search for advanced technologies that can offer a better understanding of soil property. The different kinds of tests are used to characterize the soil for different purposes. Among these, the seismic techniques link with the characterization of subsoil's shear wave velocity, which is considered as an important soil parameter for dynamic analysis. However, some traditional seismic testing methods such as downhole, uphole, and crosshole require an invasive performance that is not convenient for particular condition. For example, it is not a good idea to bore the hole when the test is conducted on the stiff top surface like pavement. Moreover, the real application of these techniques for soil exploration frequently encountered with the underlying bedrock which the drilling machine is unable to penetrate. Therefore, the shear wave velocity parameter below that depth can not be obtained. Seeing the difficulty, the surface methods have been proposed such that the field measurement is performed only on the free surface. The conventional surface methods such as reflection and refraction surveys use body wave to determine the soil profile and consider the surface waves as useless noises. In contrast, a recent development by analysing the surface waves, such as the Rayleigh or Love waves generated from impact sources, has gained popularity among geotechnical and environmental engineers. The field survey of surface wave methods are easier than that of body wave methods since the strong nature of surface wave energy can be generated by a simple impact source and easily detected on free surface. These methods provide a good resolution at shallow depth as required in geotechnical characterization. The Multichannel Analysis of Surface Wave Method (MASWM) is an advance technology of surface wave test to identify the fundamental mode of Rayleigh waves, which is the main component for analysis, from various types of waves. The MASWM has been successfully applied to investigate the shallow subsoil profiles in many projects by the University of Kansas

and Politecnico di Torino. It has been proved the most effective testing technique which offers reliable determination of soil parameters with time-efficiency and cost effectiveness. These conveniences motivate the author to apply it on subsoil in Thailand, evaluating for appropriate inversion algorithm that is applicable for that kind of soil condition.

1.2 Research Objectives

The objectives of the thesis are:

1. To investigate the shear wave velocity profiles of subsoil in Thailand within 30m depth by using MASWM technique
2. To verify the validity of MASWM by comparing its shear wave velocity profiles from seven sites with those of downhole test, boring reports, and Seismic Cone Penetration Test (SCPT).
3. To evaluate a proper inversion process (between $\lambda/2$ and $\lambda/3$ techniques) for soil exploration in Thailand.
4. To search for the best practice for MASWM

1.3 Scope of Study

The scope of study is covered as outline below:

1. To perform the MASW active approach at seven locations that have similar or different profiles
2. The equipment used in the experiment are:
    a. Source: a 10 lb hammer and a plate steel
    b. Receiver: sixteen 2Hz geophones with 9cm spikes
    c. Seismograph: Data logger NR-2000
3. The data analysis is done by a simplified method in MASWM, i.e., only $\lambda/2$ and $\lambda/3$ approaches are adopted. The author does not go into the advanced approach.
4. The expected depth of investigation is around 30m due to limitation of energy source and geophones.

1.4 Research Outcome

From this work, the author expects some benefits as following:

- The application of MASWM is introduced to civil engineering community in Thailand.
- The soil parameter investigated from MASWM can be confidentially used and kept as a research document for dynamic analysis in Thailand.