CHAPTER I
INTRODUCTION

1.1 Introduction

The vacuum preloading consolidation method furthermore has become the popular effective method to improve soft soil introduced by Kjellman in early 1952 and enhanced in recent years with the merging of new materials and technologies. The prediction behavior of improved soft soil should be concerned significantly not only in the laboratory but also at the field to predict and avoid the instability of embankment during performance of vacuum consolidation.

The new method is proposed using tri-axial apparatus to simulate the comprehensive behavior of soft soil improved by vacuum preloading method in the laboratory, to support the engineering task quickly, and to make this method become familiar in the future. Stability of embankment during vacuum preloading consolidation should be concerned to ensure that the project can be performed well and safety. A case study of vacuum consolidation at Nakhorn Sri Thammarat Airport is proposed.

The project is at serving airport in Nakhorn Sri Thammarat, a town in the south of Thailand. It is located in Muang District, about 14 km from city. Capacity of passenger building arrival is 300 people and departure 300 people per hour. The Chevron Co,Ltd planned to settle their hub. The transportation to the oil platform from the sea is required and should be located together with the airport. The separated airport terminal is fixed about 0.5 km away from the existing way. The taxiway links from the new terminal to the existing runway as shown in Figure 1.1.

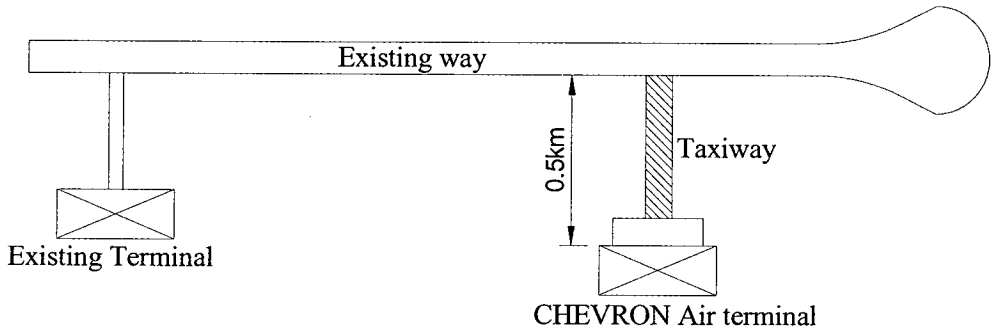

Figure 1.1. Layout of the Chevron Air Terminal

The construction area is located on the low land and marshy area. The high embankment from 4.00m to 4.50 m is designed for Apron and Taxiway construction area approximately 30,000 m^2.

The layout of the project is shown as the **Figure 1.2.**

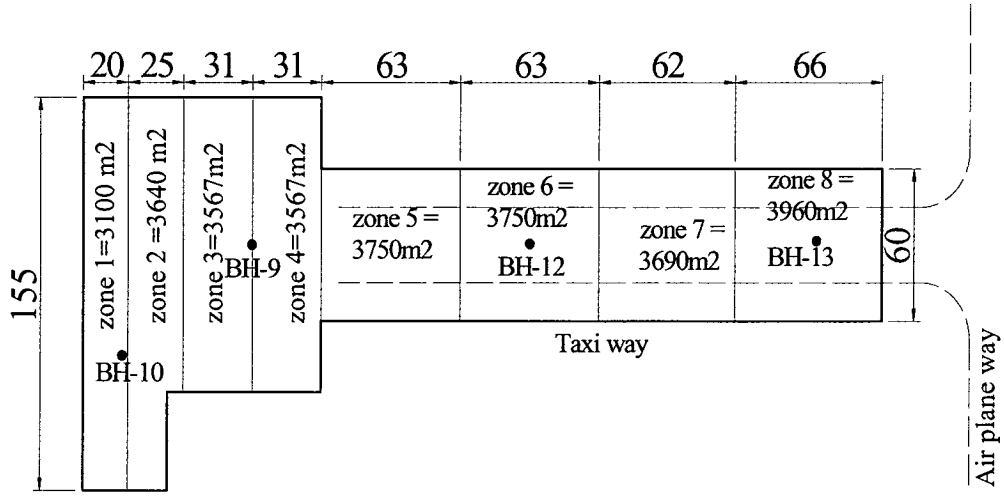

Figure 1.2. Layout of the project

The soil condition consists of 6.0 m thick of very soft dark gray clay in the swamp area, having water content over 100%, with low shear strength from 15.6 to 23kPa with depth. Due to very poor engineering properties of soft to very soft clay, low shear strength and high compressibility, the soil improvement techniques would be become major consideration for this project. In point of views of construction management, geotechnical engineering, and economic issues, vacuum method has been applied to be a method of soft ground treatment works to fulfill the construction's requirements.

The soil improvement by vacuum consolidation method (CVM), which has so many advantages; is selected to improve the very soft clay with required shorten time construction.

The most advantage of CVM is the time of construction of embankment shorter than that of conventional method. The surcharge can be applied immediately without any stability issues; therefore, it can save time and money. However, the technique should be performed gradually and has to research more to make it more perfectly and effectively in soft clay improvement.

1.2 Statement of Research

Vacuum preloading method was used in Survanabhumi Airport by cap drain technique method. The first time; the Vacuum Consolidation technique from Maruyama Co,Ltd has been used in Thailand. Research behaviors of soft clay before and after improvement by vacuum preloading method have to conduct to estimate the effectiveness of this method, applying in the future in Thailand and the lowland areas.

The modeling vacuum method to improve soft soil in the laboratory has been performed by Indaratna 2008 by the large-scale apparatus and follows one-dimensional consolidation theory (Terzaghi). The results obtained from this modeling get somewhat evaluated the behavior of soft soil reinforced by vacuum preloading method in the laboratory. However using the large specimen 45cm x 90cm in diameter and height respectively in the large-scale apparatus, the testing time was more than one month. In addition, the horizontal deformation (ε_r) during test time, which is the typical deformation of soft soil improvement by vacuum, and the increasing of undrained shear strength of soil specimen, could not be measured; so far, the controlling surcharge processing during vacuum construction has not been discussed sufficiently.

1.3 Purpose of Research Works

By using Vacuum Consolidation Method (CVM) to improve the soft clay at the taxiway of the Nakhorn Sri Thammarat Airport, the time of construction will be reduced remarkable by increasing of the rate of consolidation. The specific objectives of this research are follows:

(1) Assessment the behaviors and performance of soil ground during improvement by CVM;

(2) Assessment the effectiveness of the CVM ;

(3) Assessment the behavior of ground after completion of CVM and embankment loading;

(4) Performance the laboratory test to simulate the soil improvement behavior under vacuum preloading;

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(5) Back analysis the performance of CVC with embankment loading compare with field measurement.

1.4 The Scope of the Research Works

(1) Measure the data during soil improvement to control the step of construction of embankment by CVC. To estimate the behavior of this method by analysis the data measured at the site.

(2) Carry out the test in the laboratory to simulate the behavior of soft clay improvement by Tri-axial apparatus.

(3) Numerical to back analysis by FEM.