

## CHAPTER 1

### INTRODUCTION

#### 1.1. Background

Liquefaction is phenomenon where partially or fully saturated soil suddenly behave like liquid, loss all its strength and stiffness due to monotonic or cyclic loading. Liquefaction is an ordinary phenomenon until it occurs and causing severe losses or damages to the livings, then liquefaction can be counted or categorized as disaster.

From the past few decades, liquefaction become one of disasters that caused great losses. Most great liquefaction disasters that happened for the past few decades around the world caused by great earthquakes, like destruction of San Francisco's Marina District in 1989 Loma Prieta earthquake, in Port of Kobe in 1995 Great Hanshin earthquake, and the most recent in Palu, Central Sulawesi during the 2018 Palu's earthquake that also followed by tsunami.

Until now, it is very difficult to overcome liquefaction. In fact, until now only prevention that we can done to overcome liquefaction. It is even harder because most of liquefaction disasters caused by earthquakes, as we know earthquake can come on any place at any time.

#### 1.2. Problem Statement

1. Until now, the only way to overcome liquefaction is to use liquefaction prevention method, either by soil improvement, liquefaction resistance structure, etc.
2. Difficult and high cost to obtain high quality undisturbed soil sample to perform liquefaction potential test.
3. When liquefaction occurred in soil where there were a lot of building and structure, liquefaction can cause building and structure to sink, collapse and fail, and can caused huge losses, both in the form of fatalities or damages.

### 1.3. Objective

To perform prediction of liquefaction potential of soil with help of Deepsoil v7 software.

### 1.4. Limitation

1. Soil sample used based on Boulanger, R.W., Mejia. L.H., and Idriss. I.M. (1997). "Liquefaction at Moss Landing during Loma Prieta Earthquake". Journal of Geotechnical and Geoenvironmental Engineering, pp. 453-467.
2. Earthquake used in this analysis based on 1989 Loma Prieta Earthquake.
3. This method only applied to Deepsoil v7 program, other FEM analysis software might have different workflow.
4. Soil specific weight is assumed based on typical soil unit weight in natural state.
5. Soil material only categorized into 2 types, sand soil and clay soil.

### 1.5. Research Benefit

Expected to help develop method of software aided prediction of soil liquefaction potential.

### 1.6. Originality of Final Project

Refer from [1], several method of liquefaction potential predictions in Moss Landing area on the Monterey Bay, California, U.S.A. is done, started from prediction of liquefaction potential based on CPT data, SPT data, and shear wave velocity. None of them discussed about the prediction of liquefaction potential using help of numerical analysis program, in this case Deepsoil v7.