

## **CHAPTER I**

### **PRELIMINARY**

#### **A. Background**

Soil is an important part of civil engineering works. Soil is a contains of minerals, organic matter and relatively loose deposits, which are located on bedrock. the relation between relatively weak granules can be caused by carbonates, organic substances, or oxides that settle between particles can contain water, air or both. Determination of the properties of the soil are mostly encountered in technical problems relating to the soil. In many technical issues (such as road pavement planning, foundations, dams in the reservoir, etc.), the selection of land into groups or subgroups that exhibit the same characteristics will greatly help this selection called classification.

By the various types of soil in Indonesia, soils with high plasticity clay characteristics are often found. That soil has the characteristics of clay with high plasticity. High plasticity clays have low strength, high shrinkage and high compressibility. According to the AASHTO (American Association of State Highway and Transport Official Classification) classification, soils are classified as clay if the fraction that passes the sieve no. 200 is more than 35%. Meanwhile, according to the USCS (Unified Soil Classification System) classification, soil is classified as clay if the fraction that passes the sieve no. 200 is more than 50%.

Soil stabilization is important and must be carried out before build a construction. One way to stabilize soils that is mostly done is by mixing additives that are able to change the nature of the soil chemically. One of them is by using lime. The stabilization of clay with lime can increase its strength by accelerating the chemical reaction between clay and lime. To speed up the reaction it is necessary to add sodium salt such as Na-silicate, Na-carbonate, Na-sulfate. However, this time the material will be tried with sea water.

Different papers suggest the results of a testing program on soils treated with lime. In addition, the effect of using seawater instead of potable water as mixing water for the lime-treated soil and its effect on the swelling behavior, engineering properties, and the consolidation parameters. Also, the environmental and economic impact benefits gained from using the sea water and the existing materials from the site location. Adding lime to soil stabilization materials can reduce soil plasticity, increase strength and durability, reduce water absorption and swelling caused by water. In this situation the stabilization effect is due to a certain chemical process and is not a reinforcement due to mechanical treatment. This chemical process changes the structure of the soil by forming larger grain aggregates (flocculation), and this is very beneficial for a construction. The addition of lime affects the compaction characteristics, namely the optimum water content ( $w_{opt}$ ) rises, the maximum dry volume weight ( $\gamma_d_{max}$ ) decreases and the compaction curve is flatter. Strength increase due to the stabilization of clay with lime is caused by 3 reactions, namely: absorption of water (hydration of soil), flocculation / ion exchange, and cementation (hardening) / pozzolanic reaction. Another mechanism is carbonization (carbonation), this reaction causes a slight increase in strength, so it can be ignored. Rapid reaction (short term reaction) includes hydration for live chalk and flocculation. The slow reaction (long term reaction) includes cementation and carbonation.

This paper reports the results of a linear regression testing program for lime treated soils. In addition, the effect of using seawater as a substitute for drinking water as mixing water for treated soils with time and its influence on soil properties behavior and unconfined compressive strength parameters. To find out the effect of sea water on lime stabilization of clay soil.

## **B. Problem Formulation**

From the background above, there are several formulations of the problem:

1. What is the different of sea water on the stabilization of lime on clay soils by pure water comparison with conceptuality of literature.

2. What is the effect of sea water on the lime stabilization of clay soil by the unconfined compressive data?

### **C. Purpose of Research**

Depends on the background above, the objectives of research are :

1. To identify the comparison data collection of the sea water and pure water on the lime stabilization of clay soil
2. To identify effect of sea water on the lime stabilization of clay soil from the UCS data in soil improvement .

### **D. Benefits of Research**

Depends on the purpose of research above, the benefits of research are :

1. Know the benefits of soil stabilization with lime that is compressed with sea water against the high plasticity of clay.
2. Adding concept and skills regard of application from soil mechanics theories that have been done in the class.
3. Can be used as referenced for students in the civil engineering department, Universitas Muhammadiyah Surakarta, especially in geotechnics course as a center of learning resources in libraries, especially as a media to facilitate thesis writing.

### **E. Limitation of Problem**

Scope of problem of this research are :

1. Clay Soil that used in this research
2. Research carried with literature study .
3. Data that used in this literature research are Unconfined Compression Data
4. For sea water and Lime Stabilization material following literacy.

## **F. Authenticity of Research**

This research is used Literature Study. Title of this research is “Effect of Sea Water on Lime Stabilization of Clay Soil” that never do in Civil Engineering Department, Engineering Faculty. Universitas Muhammadiyah Surakarta

This research was inspired by the journal titled " Swelling soils treatment using lime and sea water for roads construction" by Dina A. Emarah, Safwat A. Seleem. (2017).