CHAPTER I

INTRODUCTION

1.1 Background

Concrete is a construction material for building, real estate, bridge, road, dam and etc. The increasing of the human population made the industrial construction was also increasing, therefore the concrete demand was also increasing. Concrete composes from various kinds of material such as fine aggregate, coarse aggregate, cement and water. Concrete is widely used in construction because it has several advantages, such as high compressive strength, easy to make, high durability and resistant to high temperature.

However, due to the high demand of concrete, it causes the material mining on a large scale, like sand mining and gravel mining. That activities can destroy the nature. Therefore, need a solution that can reduce the use of materials of sand and gravel. One of the ways to solve that problem is utilization of recycle aggregate from construction waste.

One of waste material that can be used to substitute sand and gravel is red tile waste. Usually, red tile waste just discarded and not be used. In fact, red tile waste can be recycle and utilized became material that useful and has economic value. According to As'ad and Agustina (2012) red tile waste that can be used as aggregate in the concrete production is made from clay and combusted on the temperature more than 1000ºC. The clay that is used to make red tile is clay that has fine grain so it is easily formed and not easy to crack during the process of

combustion and drying. Red tile waste can be used to substitute the normal aggregate, including fine aggregate, coarse aggregate or both.

Red tile waste fragment has low density, if red tile waste is used as aggregate to make a concrete so the density of concrete itself will be lower. Morever, the production cost to make concrete will be cheaper if red tile waste is use as the aggregate. Furthermore, concrete with red tile waste aggregate has low thermal conductivity. At the same time, concrete with red tile waste aggregate also has several disadvantages such as the compressive strength is not high as concrete that used normal aggregate and has high rate water absorption. The hardeners of red tile waste aggregate depend on the quality of the combustion.

The research about red tile waste already done by Herbudiman and Dewi (2012). Red tile waste was used as substitute of fine and coarse aggregate with proportion 20% of weight of cement. The result of compressive strength were high but the result of modulus of elasticity under the theories.

One of the concrete type that is usually used in the construction is ‘Self Compacting Concrete’ (SCC). The application of ‘Self Compacting Concrete’ is considered more practical and faster than normal concrete. Because of red tiles waste have high rate of water absorption, it result the concrete quick hardening in just a few minutes after mixing. So, to make the Self Compacting Concrete using red tile waste as aggregate must be under Saturated Surface Dry (SSD) condition.

The aim of this experiment is to study about the effect of red tile waste to substitute the fine aggregate in self-compacting concrete. The tests that conduct are compressive strength, modulus of elasticity and modulus of rupture.

1.2 Problem Statement

According to the background, the problem statements that will be discussed in this experiment are:

1. How does the effect of red tile waste as fine aggregate substitution with proportion 10%, 20%, 30%, 40% and 50% of sand in compressive strength test when the concrete at the age 7, 14 and 28 days compare with normal concrete?
2. How does the effect of red tile waste as fine aggregate substitution with proportion 10%, 20%, 30%, 40% and 50% of sand in modulus of elasticity test when the concrete at the age 28 days compare with normal concrete?
3. How does the effect of red tile waste as fine aggregate substitution with proportion 10%, 20%, 30%, 40% and 50% of sand in modulus of rupture test when the concrete at the age 28 days compare with normal concrete?

1.3 Problem Limitations

In order to make this research focuses in the main problem, author set several limitations:

1. This experiment only does compressive strength, modulus of elasticity and modulus of rupture of self-compacting concrete using red tile waste.

2. The compressive strength test will be conduct when the concrete at the age 7, 14 and 28 days, while for modulus of elasticity and modulus of rupture only do when the concrete at the age 28 days.
3. The water cement ratio plan is 0.45.
4. Superplasticizer use Sika Viscocrete-10 with percentage 1.25%.
5. The specified concrete stress is fc' = 25 MPa.
6. Red tile waste that use as fine aggregate to substitute the sand with proportion 10%, 20%, 30%, 40% and 50%.
7. Red tile waste as fine aggregate must pass the sieve no. 4 and still retrained in sieve no. 200.
8. Coarse aggregate from Kali Clereng, Kulon Progo, Yogyakarta, with minimum size aggregate 10 mm.
9. Cement type I with Gersik brand.
10. The cylinder specimen for compressive strength test and modulus of elasticity has diameter 150 mm and height 300 mm.
11. The beam specimen for modulus of rupture test has dimension (100x100x500) mm.
12. Compressive strength test use Compression Testing Machine (CTM) with brand ELE.
13. Modulus of rupture and modulus of elasticity test use Universal Testing Machine (UTM) with brand Shimadzu UMH-30.

1.4 Genuineness of Final Project

Based on the observation that have already have done, the author finds some title of final project that support and has the connection, such as “Pengaruh Penambahan Fiber Lokal Terhadap Kuat Geser Balok Beton Memadat Mandiri”, “Pengaruh Penambahan Foaming Agent ADT Terhadap Beton dengan Genting Merah sebagai Agregat Halus”, “Pengaruh Penambahan Serat Baja Lokal (Kawat Bendrat) pada Beton Memadat Mandiri (Self-Compacting Concrete)”, “Pengaruh Penggunaan Kalsium Karbonat sebagai Substitusi Semen pada Beton dengan Pecahan Genteng”. “Pengaruh Penggunaan Serat Kawat Galvanis pada Sifat Mekanik Beton Memadat Mandiri (Self-Compacting Concrete SCC) dan Beton Non-SCC”, “Pengaruh Penggunaan Silica Fume, Fly Ash dan Superplasticizer pada Beton Mutu Tinggi Memadat Mandiri”, “Pengaruh Variasi Penambahan Filler Zeolit pada Kuat Lentur Balok Beton Memadat Mandiri (Self-Compacting Concrete”. For the research with title “Self-Compacting Concrete using Red Tile Waste as Fine Aggregate” has never been used on any other final project before.

1.5 Aim of the Research

The aim of this research is to know the composition effect of self-compacting concrete with red tile waste as the substitution of the fine aggregate towards compressive strength, modulus of elasticity and modulus of rupture.

1.6 Benefit of the Research

The benefits of this research are:

1. The result of this research can become the base of the next research, especially the proportion of red tile waste as the substitution of fine aggregate.
2. To know the compressive strength, modulus of elasticity and modulus of rupture of self-compacting concrete using red tile waste as fine aggregate.
3. To provide a new discourse in the field of civil engineering especially regarding the effects of the use of red tile waste as fine aggregate to make Self Compacting Concrete. Otherwise, it can be used as an additional reference in similar research further.