CHAPTER I
INTRODUCTION

1.1 Background

Concrete is a building material that is often used in building structures. SNI 2847-2013 defines concrete as a mixture of portland or other hydraulic cement, fine aggregate, coarse aggregate, and water with the presence of additional admixtures or without additional admixtures. The provision of materials to fulfil development/construction needs makes people who are far from the mining area a dilemma. The farther the desired material provider is, the more costs are required (Rochmah, 2016). Some researchers try to make strength comparisons by adding certain materials other than these raw materials. The increasing need for concrete materials can trigger mining on a large scale, this condition can cause problems including a decrease in the amount of material available for the purposes of making concrete which is directly proportional to price and material increases, one of the alternative materials that can be used is dead coral reef fragments.

Non-structural concrete is a category of concrete for non-structural or non-reinforced buildings. To produce normal non-structural concrete, generally uses a mix by volume weight, with a proportion ratio of 1 cement : 2 sand : 3 crushed gravel/gravel. Generally, this concrete is used to make the ground floor, work floor, carport floor, and others.

The act of carefully considering the ways to obtain a good fresh concrete mix and also produce a good hard concrete, is needed to produce good concrete and fulfil the requirements (Witjaksana, 2016). There are a number of concrete mix planning methods (mix design). Of the several mixed planning methods, it cannot be said which method is the best because each method has its own advantages depending on the material used and the purpose of the structure and the purpose of the concrete structure. There are several kinds of mix designs that can be used, including: DOE (British Department of Environment), ACI (American Concrete Institute), Nisco Master (Japan). LJ Murdock (UK), According to Nugraha & Antoni (2007) of the four methods, the DOE method is the simplest while Murdock is the most complicated. Complexity does not always mean the most accurate results, the basic principles are the same, the difference is only in the use of formulas and graphs.

Coarse aggregate is gravel produced from the natural disintegration of rock or in the form of crushed gravel originating from the stone-breaking industry. Coarse aggregate having a grain size between 4.75 mm (sieve No.4) to 40 mm (sieve No.1½ inches) (SNI 1970-2008). Currently, natural gravel-producing sources are dwindling,

requiring the use of alternative materials to replace concrete mix aggregate with other materials that have not been widely used and meet the specified standards.

Coral reefs are a group of coral animals that form underwater ecosystems. Dead coral reefs will be carried by the wave currents to several locations on the beach and over time will form piles of coral fragments. According to Yamin (2011) aggregates originating from coral have the largest chemical content in the form of CaO, in order that, they are included in the limestone rock group.

Kampung Lobuk is a hamlet on Madura Island, East Java Province, Indonesia. which geographically covers two districts. The western Lobuk area is included in the Bumianyar Village area, Tanjung Bumi District, Bangkalan Regency. And to the east is Trapang Village, Banyuates District, Sampang Regency (liputan6.com/Kampung Lobuk, accessed in 2024). Kampung Lobuk has a wealth of dead coral reefs in several locations on the edge of the sea. The large availability of dead coral reefs makes the coastal community of Kampung Lobuk use the coral for various purposes such as decoration. Some locals of Kampung Lobuk use materials from the beach such as sand and dead coral to build simple buildings.

Figure 1.1 Piles of dead coral reefs in Lobuk beach
(*Source: Author, 2024*)

Coral has several weaknesses, namely high porosity, high water absorption, and low crushing strength (Wang et al., 2023). In a study conducted by Putra & Sefrus (2022) regarding the use of 60% percentage of dead coral as a substitute for coarse aggregate, the results of the study showed that concrete was 60% better than other concrete. Based on research conducted by Wesli et al. (2023) in Simeulue Regency, the use of coral as a coarse aggregate can be used in normal concrete mixes because it produces a compressive strength of more than 17 MPa. Based on research conducted by Sina et al. (2003) on the island of Timor. the use of coral as coarse aggregate is recommended for concrete with a compressive strength of less than 25 MPa.

With the above background, researchers want to use the coastal coral reefs of Kampung Lobuk to be used as a substitute for coarse aggregate in the concrete mix. In order that, the use of coarse aggregate does not completely use crushed gravel, but utilizes coral as a concrete mixture, in order that it can reduce the use of crushed gravel or gravel, the cost of making concrete because free coral is taken from nature. The research was carried out using a design concrete quality of 14.5 MPa (K 175) and the percentage of coral replacement as coarse aggregate was 0%, 25%, 50%, 60%, 75%. The research was conducted to find out at what percentage between 0%, 25%, 50%, 60%, 75% coarse aggregate using coral produces the best concrete. The study used the proportions of 0%, 25%, 50%, 60%, 75% coral to determine the effect of coral as a coarse aggregate on the strength of concrete.

1.2 Problem Formula

Due to the large availability of coral in Kampung Lobuk, the use of coral as a substitute for coarse aggregate in the concrete mix will be very beneficial. The formulation of the problem in this study is as follows:

1) How does the variation in the composition of dead coral reefs as coarse aggregate material affect the slump value in the concrete mix?
2) How does the use of coarse aggregate use dead coral reefs with a percentage of 0%, 25%, 50%, 60%, and 75% affect the unit weight of the concrete?
3) How does the use of coarse aggregate use dead coral reefs with a percentage of 0%, 25%, 50%, 60%, and 75% affect the absorption of water in concrete?
4) What are the characteristics of the compressive strength of concrete with a percentage of dead coral reefs 0%, 25%, 50%, 60%, and 75% as a substitute for coarse aggregate in the concrete mix?

1.3 Research Objective

Meaning and purpose of carrying out this research is as follows:

1) To find out the variation in the composition of dead coral reefs as a coarse aggregate material to the slump value.
2) To determine the effect of using dead coral reefs as coarse aggregate with a percentage of 0%, 25%, 50%, 60%, and 75% on the unit weight of the concrete.
3) To determine the effect of replacing dead coral reefs as coarse aggregate with percentages of 0%, 25%, 50%, 60%, and 75% on water absorption in concrete.

4) To determine the characteristics of the compressive strength of concrete with a percentage of dead coral reefs 0%, 25%, 50%, 60%, and 75% as a substitute for coarse aggregate in concrete mixtures.

1.4 Research Benefit

The benefits of this research are as follows:

1) This research produces a knowledge of concrete technology development.
2) The large of coral in Kampung Lobuk can be used as coarse aggregate material for the community.
3) Providing information and knowledge to the public about the utilization or use of dead coral reefs as a substitute for coarse aggregate in concrete mixes.

1.5 Problem Limitation

The following are the limitations of the problem in this study:

1) The test was carried out in the concrete test laboratory at the Civil Engineering Universitas of 17 Agustus 1945 Surabaya.
2) Mix design using the DOE (Department of Environment) method
3) Target concrete quality f 'c = 14.5 MPa (K175)
4) Addition of dead coral reefs with a mixture percentage of 0%, 25%, 50%, 60%, and 75% of the weight of coarse aggregate in the form of gravel for 3 samples each.
5) The specimens were made in the form of cylinders measuring 20 cm in diameter and 10 cm for testing concrete absorption.
6) The specimens were made in the form of cylinders measuring 30 cm in diameter and 15 cm for testing the compressive strength of concrete.
7) The tests to be carried out are slump test, unit weight, absorption and compressive strength of concrete.
8) The concrete to be compressed is 14 and 28 days old.
9) The concrete to be tested for absorption is 28 days old.
10) The coral samples were dead coral taken from the beach of Kampung Lobuk and then brought to Surabaya.
11) The chemical content of coral aggregates not researched.
12) Coral reef is used in its original condition, this is in accordance with the customs of the people of Kampung Lobuk.
13) The coral aggregate used is that which passes the 37.5 mm sieve.