

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The highly demand for light and durable concrete has increased in the recent years because of its inbuilt economies and advantages compared with conventional concrete in many structural application. Lightweight concrete is the concrete that have density between 1400 kg/m^3 to 1950 kg/m^3 for structural concrete and 600 kg/m^3 to 1200 kg/m^3 for non-structural concrete. This type of concrete is mainly used for non-load bearing wall in domestic building as well as being used as panels in framed structures. Is also being used for structural applications such as bridges, high rise building , floating structures and building where the soil conditions for the construction of the building is poor and cannot withstand higher load bearing capacity.

When the density of concrete is reduced this in turn leads to reduction of dead load acting in the structure consequently reduced load in the foundation, leading to greater economy in construction. Thus making it possible to construct high rise building in soft soil. This also gives a greater reduction in the weight of precast elements and thus reducing the handling load, which it turn ensure the safety of construction Lightweight concrete has major effect on the improvement of the properties of the concrete especially in term of tensile-compressive ratio, the behavior towards earthquake forces and resistance to fracture toughness and cracking. This chapter will be discussing about the problem statement of the study that explain the reason of lightweight concrete to be used in structural element. The objective of this study will also be stated to clarify the aim of this study, the scope of study, and the expected outcome of this study.

1.2 PROBLEM STATEMENT

Nowadays, a large volume of construction and demolition waste has been the main causes for the environmental problems that have to be faced by construction industry in almost all country in the world. Concrete is the most essential need for any construction industry. Concrete is used nearly about three tonnes per year for each person in the world which then made it to become the second largest consumable material in the world after water consumption. The vast development of construction activities indicate the widely use natural resources such natural aggregate such as sand , gravel , granite , basalt and many more. In concrete production, aggregate occupy about 70 to 80 % of the concrete volume. Coarse aggregate occupy the concrete about 2/3 of the total volumes of aggregate and the rest of it is filled with fine aggregate.

Many of the natural coarse aggregate are formed by crushing the rock that extracted from pits and quarries which come from different geological sources. Due to the vast growth in the construction industry, the demand for coarse and fine aggregate is increase rapidly. For fine aggregate, river sand is commonly used as natural sand. The demand of river sand is escalating rapidly in developing country in order to satisfy the growth of construction industry.

Hence, as an alternative to replace natural sand, offshore sand is considered to be used due to its fineness, price fluctuations throughout the year, and ease of mining operation. For the replacement of natural coarse aggregate, synthetic lightweight coarse aggregate (SYLCAG) is used in concrete. The SYLCAG will be used as partial replacement of natural coarse aggregate as it produced concrete with lighter density than the normal concrete.

1.3 RESEARCH OBJECTIVES

- i. To determine the ultimate flexural load and the deflection of reinforced SYLCAG beam
- ii. To identify the mode of failure of reinforced SYLCAG beam.
- iii. To determine the mechanical properties of lightweight aggregate concrete in term of compressive strength
- iv. To make comparison of result from experiment and theoretical based on Eurocode 2 and ACI 318-05 code provision.

1.4 SCOPE OF STUDY

Synthetic lightweight coarse aggregate (SYLCAG) is used to replace partially function of natural coarse aggregate in the concrete. This SYLCAG concrete is considered as foam concrete as its production consist only fine aggregate which used offshore sand in this study with addition of foaming agent. The offshore sand were obtain from the reclamation project located at Pantai Klebang, Melaka. The cube specimen of SYLCAG concrete with size of 150 mm that have been produced will be crushed in order to obtain the synthetic lightweight coarse aggregate.

The synthetic lightweight coarse aggregate with 4 different sizes will be used to produced lightweight aggregate concrete beam . The 4 sizes are 5 mm, 10 mm , 14 mm and 20 mm. 50 % of this SYLCAG is used as a replacement of natural coarse aggregate in the concrete beam. The beam specimen size will be 150 mm x 200 mm x 1500 mm. The tests that will be carried out are compression test and beam flexural test. Compression test will be tested on cube samples at age of 7 days and 28 days. 3 cubes will be tested on each day. For the beam flexural test, the method used for the test is four-point loading The test is conducted to identify the behavior of the beam in term of cracking pattern, deflection at failure, and the ultimate load. All of these parameters will be compared with the control concrete beam.