

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter will be discussing about the method and procedure in the production of reinforced lightweight concrete beam using synthetic lightweight coarse aggregate (SYLCAG) , the material and equipment used, and the testing take place in this study. The tests involved in this research is compression test, and beam flexural test. The objectives of this tests as mentioned in the previous chapter is to determine the ultimate flexural load, deflection, the compressive strength, and the mode of failure in the beam samples.

The test will take place at Heavy Laboratory, Faculty of Civil Engineering, UMP. The main purpose of this experiment is to achieve the objective that have been mentioned in Chapter 1 which is to determine to determine the ultimate flexural load and the deflection of reinforced beam samples, to identify the mode of failure of reinforced beam samples and to determine the mechanical properties of lightweight aggregate concrete in term of compressive strength and flexural strength. The topic covered in this chapter will involve the sample planning, sample preparation, laboratory test , and data reporting.

3.2 CONCRETE PREPARATION

The process for sample preparations will be takes place in Heavy Structure Laboratory , Faculty Of Civil Engineering and Earth Resources , UMP. All the material, equipment , testing machine are available there. As for the synthetic lightweight coarse aggregate (SYLCAG) , the concrete cube of SYLCAG was already produced by the previous experiment. This section will discuss the raw materials to be used and the procedure in the lightweight concrete production process.

3.2.1 Materials

3.2.1.1 Ordinary Portland Cement

Cement is one of the crucial materials in the production of concrete which act as hydraulic binders. Cement will react with water by the hydration process and create cement paste that will be harden and set by this process. In this study, cement type of Ordinary Portland Cement is to be used in the production of LWAC. The OPC used complied with Type 1 Portland Cement in accordance with ASTM C150 (2005)

3.2.1.2 Natural Coarse Aggregate

Natural Coarse aggregate is made from crushed rock or gravel obtained from the natural deposits without any changes occur in their nature during production such as grinding and washing . The natural coarse aggregate is used for the control concrete sample, and partially used for production of LWAC using SYLCAG.

3.2.1.3 Synthetic Lightweight Coarse Aggregate (SYLCAG)

Synthetic Lightweight Coarse Aggregate (SYLCAG) is made from the crushed foam concrete which consist of offshore sand as the fine aggregate. The SYLCAG will be sieve to obtain the size of 5 mm , 10 mm , 14 mm ,and 20 mm of coarse aggregate. This SYLCAG will be used as partial replacement of natural coarse aggregate in the production of LWAC.

3.2.1.4 Natural Fine Aggregate

Fine aggregate is the aggregate that passing the No.4 (4.75 mm sieve) and predominately retained in the on the No.200 (75-micrometer sieve). River sand is used in the production of LWAC as fine aggregate. It act as a filler to fill all void in the concrete mix. The sand is assume to be well-graded , thus , it does not have to be sieve.

3.2.1.5 Water

Water is essential on concrete mixing work to promote the chemical reaction with cement with a process of hydration contribute to setting, hardening and curing process. It is also functioned to lubricate the mixture of sand, gravel, and cement to facilitate placing of concrete. in this study , water from the pipe is used as source of water.

3.2.2 Concrete Casting and Compacting

The grade of concrete mixture that will be produced is at the range of 30 N/mm^2 to 35 N/mm^2 for lightweight concrete. As for the control concrete, the grade is at the range of 35 N/mm^2 to 40 N/mm^2 . All the raw materials will be mix together with the correct proportions in the concrete mixer machine. The mixing process will be takes place about few minutes until all the ingredients are mixed well. After the mixing work is done, the fresh concrete mix will be poured into the formwork of beam. It is then compacted using poker vibrator to remove air voids.

3.2.3 Concrete Curing

For the beam samples, the formwork of the beam will be removed 7 days after concrete is being casted. The hardened concrete must be solid and hard enough before removing the formwork so that there is no cracking occur during the removal process. Then, the hardened concrete beam will undergo curing process which takes place about 28 days. The beam samples will be cured by covering wet sack around the beam. For