The Effect of Reinforcement, Expanded Polystyrene (EPS) and Fly Ash On The Strength of Foam Concrete

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Abstract **-** Foam concrete is a type of lightweight concrete. The main characteristics of foam concrete are its low density and thermal conductivity. Its advantages are that there is a reduction of dead load, faster building rates in construction and lower haulage and handling costs. This research was conducted to investigate the compressive strength and flexural strength of reinforced foam concrete. The use of fly ash and Expanded Polystyrene (EPS) as cement and sand replacement were also included in the production of reinforced foam concrete. There were two types of reinforcements used to reinforce the foam concrete namely plastic and wire mesh. Physical failure mode, compressive strength and flexural strength of samples were compared and analyzed. The replacement percentages for both fly ash and EPS were varied between 0-50% and 0-40% respectively. The study showed that it is feasible to reinforce the foam concrete and the best result was obtained from wire mesh reinforcement. The study also showed that the optimum replacement level for both fly ash and EPS was 30% based on compressive and flexural strength results.

Keywords**:** Foam Concrete, Wire Mesh, Fly Ash, Expanded Polystyrene (EPS), Strength

I. INTRODUCTION

Foam concrete is one of type lightweight concrete. It is composed of Portland cement, sand, water and air pores [1]. The air pores are produced by agitating air with a foaming agent diluted with water, creating mechanically manufactured foam [2]. This foam is then carefully blended with the cement slurry or base mix. Depending on the amount of foam introduced, foam concrete has low densities typically ranging from 400 – 1600 kg/m^3 which ensures economical use for walls of the lower floors and foundations [3][4][5]. Besides that, it possesses high flowability, minimal consumption of aggregate, controlled low strength and excellent thermal insulation properties [3]. Foam concrete is suitable for a number of applications like cladding panels, curtain walls, composite flooring systems, and load bearing concrete blocks [3].

However, the use of foam concrete in structural applications is quite limited due to its low compressive strength [6]. Therefore, this study is an attempt to attain reasonably high strength foam concrete by reinforcing the foam concrete with wire mesh. Another aspect of the study is to investigate the effect of fly ash and EPS as cement and sand replacement respectively in foam concrete[7][8][9][10].

II. MATERIALS AND MIX CONSTITUENT OF FOAM CONCRETE

Materials

Cement which is Ordinary Portland Cement and Class F fly ash are used as cementitious materials in the concrete mixes. River sand from Kuching area with specific gravity of 2.5 is used. In this work, the range sizes of EPS beads that are used are 600 micrometer to 3.35 millimeter. The reinforcements used are the plastic and wire mesh as shown in Figure 1.

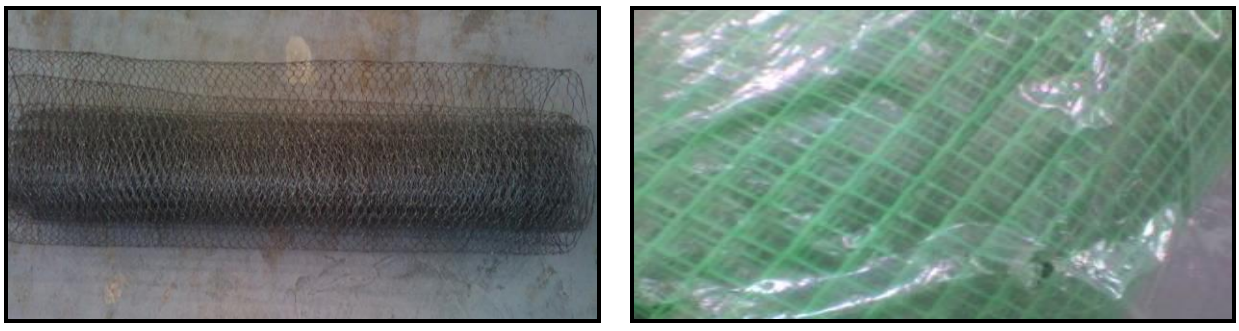

Figure 1: Photos showing wire and plastic mesh

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