CHAPTER 1

INTRODUCTION

1.1 Background of Research

In many countries, due to the increasing cost of raw materials and the continuous reduction of natural resources, the use of waste materials is a potential alternative in the construction industry. Waste materials, when properly processed, have shown to be effective as construction materials and readily meet the design specifications. The continued and expanding extraction of natural aggregate is accompanied by serious environmental problems. Often it leads to irremediable deterioration of rural areas, since quarrying of aggregates alters land topography and causes other potential problems, such as erosion. The artificial aggregates from industrial and post-consumer wastes are not only adding extra aggregate sources, but also reduce environmental pollution.

Therefore, polystyrene beads will be used in this study instead of course aggregates. As we know, polystyrene is a thermoplastic that is designed for applications requiring excellent electrical and mechanical properties together with good process ability. Polystyrenes have well-balanced physical properties and are generally transparent, but available in various colours. Moreover, Polystyrene is lightweight but
extremely strong once rendered and offers high insulation and thermal properties, termite resistance and fire retardant capabilities.

Expanded polystyrene (EPS) is a lightweight cellular plastics material consisting of fine spherical shaped particles which are comprised of about 98% air and 2% polystyrene. It has a closed cell structure and cannot absorb water. Therefore, it has a good sound and thermal insulation characteristics as well as impact resistance. Expanded polystyrene beads are often used as the basis for packaging material. This leads to a large amount of waste material which is not biodegradable. This material could be granulated and used as a lightweight aggregate for concrete.

![Polystyrene beads](image_url)

**Figure 1.1**: Polystyrene beads

Lightweight concrete (LWC) is one of the important materials in construction industry because of the practical and economic advantage of it. The essential characteristic of LWC is its porosity, which results in low apparent specific gravity. In concrete construction self-weight represent a very large portion of the load on the structure, and there are considerable advantages in reducing the density of concrete.

Furthermore, LWC reduces the cost of form work and steel and it also increases productivity. Concrete which has lower density also gives better thermal insulation than ordinary concrete. There are many advantages to be gained from the use of lightweight concrete. These include lighter loads during construction, reduced self-weight in structures, and increased thermal resistance. Lightweight concrete is generally accepted as concrete having a density of about 1800 kg/m3 or less.
1.2 Problem Statement

Nowadays, the raw materials such as aggregates cost are expensive due to lack of sources or hard to produce the aggregates, especially when the request from industries too much. So, this automatically can affect the whole cost of building and it will increase the problem towards owner.

As we know, slab is an important part in a building and it must be strong enough to resist loads from other parts of structures. If the slab is not strong and sturdy, the deflection will occur when loads are applied or landed on the slab. This will collapse the building and risk the others. Concrete is a form when cement, fine aggregate, coarse aggregate and water were mixed together. In addition, concrete commonly used in construction to construct beam, slab, column and other needs like tiling and finishing. Unfortunately, the normal concrete is heavy, rigid and hard to handle during installation and it can cause many problems during the construction.

Moreover, concrete is known as a brittle material with a low capacity for deformation under tensile stress. The development of these tensile stresses may be a result of mechanical loading, harmful reactions and environmental loading. Cracks that can adversely affect the performance of concrete result frequently from these stresses. Cracking is one of the most common defects observed in reinforced concrete structures.