CHAPTER 1

INTRODUCTION

1.1 GENERAL

In this modern technology cum civilized era, green technology has been implemented in our daily life. Construction industry as one of the greatest greenhouse gases producer definitely has the responsible upon this issue. In order to fulfil green technology index, slab can be modified from its structure so that to optimize resources used in the building.

Slab is a horizontal element and it is normally supported by beam and column in a building. Basically slab can be category as one-way slab, two-way slab. Two-way slab frequently used in construction industry because it’s cost effective characteristic. As thickness of slab increase when load or span increase at the same time, it is more economical to construct two-way slab compare to one-way slab. In previous time, slab can be divided into flat plate slab, flat slab, cantilever slab, and grid slab or known as waffle slab. As technology getting advanced, slab structure being modified into hollow slab, sandwich slab and so on. This innovation able to reduce cost of construction, cost effectiveness, weight of building and thermal insulation.

Honeycomb sandwich slab panel (HSSP) is honeycomb core layer cover with reinforced concrete both top and bottom layer. Sandwich slab panel is one of the green building method that has been implement long time ago. HSSP not only light in weight, strong, lower in cost of construction, fire resistance, thermal insulation and the list goes on. In order to fulfil green building index, HSSP characteristic which is thermal insulation has play an important role. It reduces the rate of thermal transfer from one side to the
other (Telangana, 2015). In conjunction with this, electrical energy can be save for air conditioning propose. The building is sustaining for longer service period and less greenhouse gases emit to the environment.

HSSP consist of 3 layers which is honeycomb core layer covered up with 2 layers of reinforced concrete both top and bottom parts. Honeycomb core layer made up of fibre reinforced plastic which has very high in term of strength. Fibre reinforced plastic is made of polymer matrix reinforced with fibre which is usually glass, aramid or carbon. Main focus of honeycomb core layer is to reduce the thermal transfer by using its unique air void between each other. Therefore, honeycomb core layer has high in strength and at the same time able to reduce heat transfer from the environment.

1.2 PROBLEM STATEMENT

Nowadays global warming, greenhouse effect, melting glaciers, ozone layer depletion and increase of global temperature getting serious as time goes. As a result, government start to implement green technology concept in daily life. Construction industry proposed green building technology or innovate building structure to fulfil green building index. Nevertheless, energy consumption in building become the key factor in green building index. According to Research on Overview of Building Energy Consumption in Malaysia, building consumed up to 48 % of electricity which generated in our country and expected energy demand increase up to 116 Million tons of oil equivalent by the year 2020. Meanwhile, Carbon Dioxide emission increased dramatically to 221 %. Malaysia will rank on 26 among of top 30 greenhouse gases emitters in the global (Hassan et al, 2014).

Green building is a building which can fully utilized the resources used and efficiency of the building. Sandwich panel is getting frequently used in building due to its light weight, energy efficiency, attractive aesthetic, easily to handle and erect characteristic (Bajracharya et al, 2013). Therefore, honeycomb sandwich slab panel is one of the method in optimize energy efficient and achieve green building index at the same time.
Depth and internal angle of honeycomb sandwich core layer will affect the structural performance such as deflection and failure of the honeycomb sandwich slab. Thus, test should be carry out in order to prevent structural failure happen in construction industry.

1.3 OBJECTIVES

The main purpose of conducting this study is to discover the effect of change in internal angle and depth honeycomb structure core layer:

i. To determine the deflection of honeycomb sandwich slab panel with different depth of honeycomb core layer and internal angle of honeycomb in sandwich slab panel under lateral load.

ii. To observe the failure mode when load is applied on the honeycomb sandwich slab panel with various depth of honeycomb core layer and internal angle of honeycomb in sandwich slab panel.

1.4 SCOPE OF STUDY

In this study, the simulation of honeycomb sandwich slab panel (HSSP) varies in depth and internal angle of honeycomb core layer slab was conducted by using ABAQUS v6.14 Finite Element Analysis software. The thickness of core layer of sandwich slab panel increase, the strength of the slab increase at the same time.

Seven models of HSSP namely HSSP 1, HSSP 2, HSSP 3, HSSP 4, HSSP 5, HSSP 6, and HSSP 7 shared the same dimension of 1500 mm x 1500 mm x 120 mm. Four different angles 15°, 30°, 45° and 60° designated as HSSP 1, HSSP 2, HSSP 3 and HSSP 4 respectively whereas three different depth of honeycomb core layer (120 mm, 130 mm and 140 mm) designated as HSSP 5, HSSP 6 and HSSP 7 respectively. Top and bottom of honeycomb structure core layer covered by 40 mm of Grade 30 concrete. Figure 1.1 shows the overview of honeycomb sandwich slab panel.