

## CHAPTER I

### INTRODUCTION

#### 1.1. Background

There are two types of pavement in highway constructions, namely flexible and rigid pavement. Flexible pavement structure consists of sub-base course, base course, and surface course. Those three layers are laid over sub-grade on road bed soil as shown in Figure 1.1. This pavement is called flexible because it will be deformed if the subgrade deform without crack. Different with rigid pavement which the surface layer is plate of cement concrete will be crack if subgrade deform.

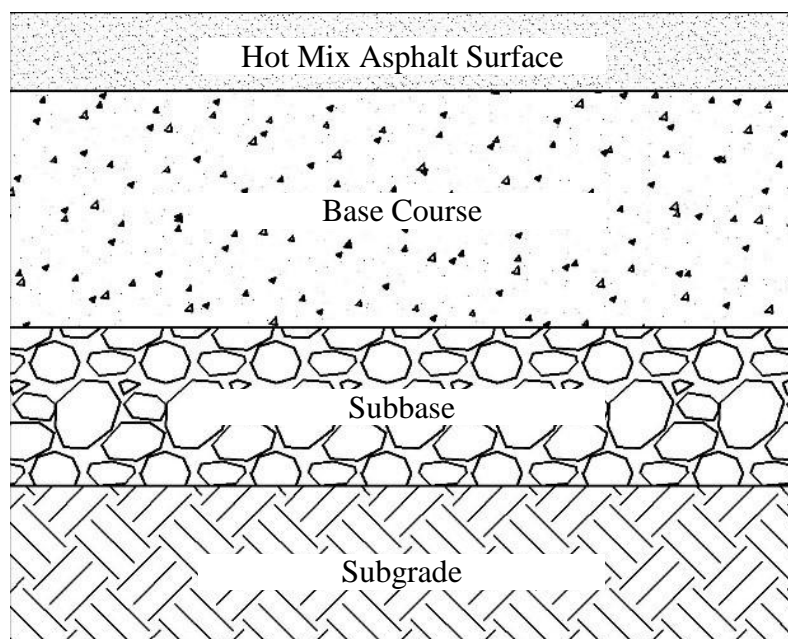


Figure 1.1 Flexible Pavement Structure

Surface layer of flexible pavement use asphalt to bind particles of aggregate. Therefore, asphalt or bitumen is also called binder. To be used the hot mix asphalt (HMA) mixtures, aggregate must be heated at temperature up to 200°C in order have zero percent of water content. Meanwhile, asphalt heated till becomes liquid to be able to pour in the aggregate. Nevertheless, asphalt is mixed into the aggregate in temperature 180°C to be able properly mixed. Reaching a temperatures of 200°C require a lot of energy to heat it.

However, currently one of the problems faced by humans today is the problem of global warming which has quite an impact on human life and the environment around the asphalt work. The type of asphalt mixing with HMA contradicts the spirit of mankind to protect the environment from the dangers of global warming, therefore the demand arises to make asphalt mix with good quality but with a lower temperature than the HMA to reduce disposal existing energy and still support the movement to save the earth from global warming. One method used is Warm Mix Asphalt (WMA).

According to Hurley and Prowell (2006) [1] as well as of Gandhi and Amirkhainan (2007) [2], WMA refers to technology that allows a significant reduction in mixing temperature and compaction temperature of the asphalt mixture by adding additives.

The process that can be applied to reduce the need for high temperatures is introduced by using a water releasing agent such as zeolite. Many ingredients have been tested to be used as reducing temperatures for Ashpa-Min®, WAM- Foam®, Sasobit®, Evotherm® asphalt and Asphaltan B® asphalt [3].

In this Final Assignment will be studied WMA mixtures using zeolite as additive of this bitumen by comparing HMA which acts as a control variable.

## **1.2. Problem Limitations**

In this Final Assignment, some limitations are taken as follows :

1. Type of asphalt cut back asphalt penetration grade 60/70.
2. Type of the mixtures is Dense Graded asphalt mixtures.

## **1.3. Objectives of the Study**

The objectives of the study are:

1. To make and study Warm Mix Asphalt (WMA) mixture.
2. To compare the quality between Hot Mix Asphalt (HMA) and Warm Mix Asphalt (WMA).

## **1.4. Scope of the study**

To achieve this goal, this study begins with a literature review of information relating to the characteristics of HMA and characteristics of WMA and also tests that must be done to compare the strength between HMA and WMA. Based on the results of the literature review, the research design is a research development of the characteristics of the Asphalt mixture, namely WMA which uses an additive mixture in the form of natural Zeolite. HMA is used as a fixed variable or control from the research that is used as a comparison material with the quality of WMA with both using Dense Graded Asphalt Mixture. Several tests on the mixture of Dense Graded to evaluate its performance were carried out using the Marshall Stability test. Data obtained from tests are analyzed and conclusions and recommendations are made.