CHAPTER 1

INTRODUCTION

1.1 GENERAL

Road transportation is an important mode of transport in Malaysia that ensures both mobility of people and delivery of goods. Transportation in Malaysia has been dominated by road transportation ever since the introduction of road network at the end of the 19th century. Malaysia’s road is divided into three main categories namely toll expressway, federal roads and state roads and the life spans are between 10 to 15 years. Lembaga Lebuhraya Malaysia (MHA), Jabatan Kerja Raya (PWD) and local authorities (example: Majlis Perbandaran Kuantan) can generally be claimed as the agencies or departments that are responsible for building and maintenance of roads in Malaysia. Jabatan Kerja Raya (JKR) plays a vital role in researching, developing, designing, constructing and maintaining roads in our country. The current JKR Manual on Pavement Design (Arahan Teknik Jalan 5/85) is loosely based on 1981 Asphalt Institute (MS-1) and AAHTO design procedures. Later, several revisions and publications are made on the AASHTO Guide and JKR is granting its own teams to insert new techniques and technologies in pavement design procedures which is, by international standards outdated by several technical generations. Two main types of pavement in our country are flexible pavement and rigid pavement whereby, flexible pavement covers
three quarters of total local roads. Flexible pavement and rigid pavement can be distinguished into structure or cross section, content of aggregates, method and duration of paving. Over the last decades, there was also a new technology of pavement introduced into Malaysian Pavement Design which is manufactured to be porous and it’s called porous asphalt. The first application of porous asphalt in Malaysia was in 1991 when the Public Work Department (JKR) undertook a project to resurface Federal Route 1 between Cheras and Beranang. Subsequently, several other types of porous asphalt were laid at various locations such as Route 1, Seremban-Mantin, 1995 and Route 2, Kuantan, 2003 (Fazleen Hanim Ahmad Kamar, 2005). Equal considerations should be given for the maintenance of our local roads as much as what were given earlier for constructing them, concerning the amount of hazards which our local roads are exposed to so far. Weather, in the form of snow, rain, storm, strong wind, excessive heat and fog is one environmental factor that is known to affect the performance of the surface transportation system and road safety.

Malaysia has an equatorial climate which has 3 general attributes and they are uniform temperature, high humidity and copious rainfall. The climate is influenced by the Northeast and Southwest Monsoons. The Northeast Monsoon brings in more rainfall compared to the Southwest Monsoon. The annual average rainfall is 2,420 mm for Peninsular Malaysia, 2,630 mm for Sabah and 3,830 mm for Sarawak, with heavier precipitation recorded in the east coast of Peninsular Malaysia and the coastal regions of Sabah and Sarawak. Jabatan Meteorologi Malaysia (formerly abbreviated as MMD and now MetMalaysia) is the department responsible for conducting all local weather-related activities and researches. Narrowly, some of its main duties are maintaining a technically advanced observation station network to support monitoring of weather conditions and seismic activities in the country, issuing timely meteorological information and forecasts for civil and military aviation, marine activities and general public and compiling quality climatological, atmospheric composition and seismological data and prepare climatological statistics. Climate always has important issues to deal with traffic and roadways. When it comes to traffic or transportation, the three foremost components which are facing serious impacts are driver, vehicle and road surface.
Secondly, low quality of materials used in road construction in Malaysia. Materials used in either layers of pavement which are low in quality and may not have passed certain performance testing may possess many defects such as low permeability and low moisture-susceptibility. These defects in materials will promote to the roads’ minimum amount of strength and resistance against those detrimental factors. The third blame falls on works to be conducted during the pre-construction stage of road building. Preparation of soil and compaction of subgrade and subbase have major impacts on sustainability and serviceability of roads. Soil which is poorly investigated and prepared and insufficient compaction of base layers will reduce road’s load bearing capacity, weakens its strength parameters which consequently will lead to structural failure as well as misalignments of the road constructed as it experiences regular imposition of load from vehicles. Talking about load from vehicles, the issue of overloading solely also causes roads in Malaysia to have their mending period earlier than the expected lifespan. Vehicle overloading has been identified as one of the major contributors to road pavement damage in Malaysia (N. I. I. Mohamed Rehan Karim, Ahmad Abdullah Saifizul, Hideo Yamanaka, 2013). Overloaded vehicles produce higher kinetic energy, resulting in greater impact forces and damages to other vehicles or to the infrastructure. Number of vehicles with 3 axles or more or simply known as trucks either bonded or trailer are witnessed to be increasing on roads nowadays. Trucks which are transporting tons of good such as sand, packed materials and containers impose greater load to the surface of roads while they are static or in motion. Too much load, when in contact with the surface results in settlement of the underneath layers which make the roads uneven and unsuitable for travelling because where as time passes by, it forms cracks and potholes on roads.

Traffic is the most important factor in pavement design (Dr. Professor Christopher Barnes Eneja M.Sc., Pavement Analysis and Management 2013). When designing a road, one should consider the loading that will be imposed on it. Three issues of load that should be considered are load magnitude, configuration of load and load repetitions. Load magnitude simply refers to how much of load, amount or its size when it is supposed to be in contact with a surface. Load configuration refers to arrangement of load in a particular form on a particular surface. Lastly, load repetitions may be defined as how frequency or the number of times a surface is being exposed to