CENTER OF STUDIES IN BUILDING SURVEYING

DEPARTMENT OF BUILT ENVIRONMENT STUDIES & TECHNOLOGY

FACULTY OF ARCHITECTURE, PLANNING & SURVEYING

UNIVERSITI TEKNOLOGI MARA

PERAK

METHOD ROAD CONSTRUCTION PROCESS USE BITUMINOUS PREMIX

HAFIZAH FITRAH BT ABD NASIR

(2019672464)

BACHELOR OF BUILDING SURVEYING (HONS)

PRACTICAL TRAINING REPORT

OCTOBER 2021

CENTER OF STUDIES IN BUILDING SURVEYING

DEPARTMENT OF BUILT ENVIROMENT STUDIES & TECHNOLOGY

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

PERAK

METHOD ROAD CONSTRUCTION PROCESS USE BITUMINOUS PREMIX

OCTOBER 2021

This practical training report is fulfilment of the practical training course.

PREPARED BY

NAME : HAFIZAH FITRAH BT ABD NASIR

SIGNATURE

SUPERVISING LECTURER

NAME : SR DR MOHAMAD HASZIRUL BIN MOHD HASHIM

SIGNATURE :

DATE : 28 JANUARY 2022

ACKNOWLEDGEMENT

I would like to take these opportunities to acknowledge SK JUARA ENTERPRISE SDN BHD who give me a great knowledge and experience during the internship programme from October 2021 until January 2022. I learnt a new experience in building construction, road construction and maintained work during the time. It gives me a knowledge how a real construction industry work in and I manage to differentiate it between practical and theory during the class.

Also, a special thank you to my supervisor Suhaila Bt Abdullah who always guide and share knowledge about the construction during in the site construction. The knowledge I have gain will be use in the future and apply in my life if I can be a site supervisor as her. The knowledge is very useful because I cannot learn it myself in the other place because the knowledge needs many experiences in the site.

A special gratitude to my supervisor lecturer Sr Dr Mohamad Haszirul Bin Mohd Hashim who give me guidance during the process of making this report. Without the guidance this report would not be complete and cannot be submitted on time. Finally, a huge thanks to all my family and my friends who always give me their full support and always checking on my condition during this internship programme.

TABLE OF CONTENT

ACKNOWLEDGEMENT iii
TABLE OF CONTENT iv
LIST OF TABLES vi
LIST OF FIGURES vii

CHAPTER ONE
1.0 Introduction 1
1.1 Company Background 2
1.2 Company Objective 3
1.3 Company Mission and Vision 4
1.4 Company Organization Chart 5
1.5 Scope of Work 6

CHAPTER TWO: LITERATURE REVIEW
2.1 Definition of Road Premix 7
2.2 Type of Pavement 9
2.2.1 Flexible Pavement 10
2.2.2 Rigid Pavement 14
2.3 Specification of Prime Coat and Tack Coat 18
2.3.1 Prime Coat 18
2.3.2 Tack Coat 20
2.4 Types of Machinery 22
2.4.1 Paver Machine 22
2.4.2 Tandem Roller 24
2.4.3 Multi Tyred Roller 25

CHAPTER THREE: CASE STUDY

3.1 Introduction 26

3.2 Project Information 28

3.3 Scope of Work 30

3.4 Method Statement of Road Construction and Maintenance 31

3.4.1 Preparation for Sub-base 31

3.4.2 Application of Tack Coat 33

3.4.3 Lay Wearing Course 35

3.5 Material Testing 37

3.5.1 Coring Test 37

3.6 Conclusion 40

CHAPTER FOUR

Problem Identify 41

CHAPTER FIVE

Conclusion and recommendations 42

REFERENCES 44

LIST OF APPENDICES 46

LIST OF TABLES

Table 3.1	Project Information	31
Table 3.2	Coring Sample Reading for Point 1 and Point 2	39
Table 4.1	Problems Identification on Site	41

LIST OF FIGURES

Figure 1.1	SK Juara Enterprise Sdn Bhd Building	3
Figure 1.2	SK Juara Enterprise Sdn Bhd Location	3
Figure 2.1	The Layer of Flexible Pavement and Rigid Pavement	9
Figure 2.2	Load Distribution in Flexible Pavement	10
Figure 2.3	Typical Cross Section for Flexible Pavement	11
Figure 2.4	Cross Section of Joint Plain Concrete Pavement (JPCP)	15
Figure 2.5	Cross Section of Joint Reinforced Concrete Pavement (JRCP)	15
Figure 2.6	Cross section of Continuously Reinforced Concrete Pavement (CRCP)	15
Figure 2.7	Application of Prime Coat	18
Figure 2.8	Application of Tack Coat	20
Figure 2.9	Asphalt Paver or Paver Machine	22
Figure 2.10	Tandem Roller Compaction	24
Figure 2.11	Pneumatic Tyre Roller	25
Figure 3.1	Location plan of Kampung Raja Bashah Road	28
Figure 3.2	Existing Road at Kampung Raja Bashah, Kuala Kurau	31
Figure 3.3	The stockpile of crusher run	32
Figure 3.4	Back Pusher Grading the Crusher Run	32
Figure 3.5	Tandem Roller Compact the Crusher Run	33
Figure 3.6	Tack Coat during Spraying Process	34
Figure 3.7	Tack Coat after Spraying Process	34
Figure 3.8	Lay Wearing Course using Paver Machine	35
Figure 3.9	Compaction Premix Using Tandem Roller 6tonnes	36
Figure 3.10	Result of the Pavement at Kampung Raja Bashah	36
Figure 3.11	Coring Test	37
Figure 2.12	Point of Coring Test	38
Figure 3.13	Coring Sample for Point 1	39
Figure 3.14	Coring Sample for Point 2	39

CHAPTER ONE

1.0 INTRODUCTION

The art and science of forming items, systems, or organisations is referred to as construction. Construction is the installation, maintenance, and repair of buildings and other stationary structures, as well as the construction of roadways and service facilities that form fundamental components of structures and are required for their operation. Construction, in its most common sense, refers to the processes involved in constructing buildings, infrastructure, and industrial facilities, as well as related operations, from start to finish. Construction comprises structural additions and changes, but it does not cover the construction of transportable constructions like trailers and ships. It usually begins with planning, finance, design, execution, and construction, as well as repairs, maintenance, and improvements.

Road construction also in the categories of construction. it is also needing a proper planning and scheduling to develop a good road pavement facility to public. The basic purpose of roads is to provide access and mobility. Now, developing countries all over the world are focusing on improving and connecting their road networks. Given that a solid road network helps to the development of the economy and national growth, road projects are being prioritised in their national budget. All road features, including pavements, bridges, tunnels, signs, lighting, information systems, and others, must be supervised to preserve quality. During operation, as roads and buildings deteriorate, their demand for maintenance grows, and they become more vulnerable to increased traffic, freight quantities, and climatic change.

The asphalt surface on highways and streets quickly deteriorates if they are not maintained on a regular basis. Poorly maintained roads restrict vehicle mobility and significantly raise vehicle operating expenses, as well as the number of accidents and their associated human and property losses. The delay in doing road maintenance raises both direct and indirect costs. The expense of repairing road problems is usually cheap if they are addressed quickly. If the faults and distresses have been present for a long time and are severe, rebuilding is required, which can cost up to three times as much as normal technical maintenance.

1.1 COMPANY BACKGROUND

SK JUARA ENTERPRISE SDN BHD is a private business managed by a Bumiputera that was established on 3 October 2007 under the Company Act 1965. This company's industry is classified as construction and services. This organization provides infrastructure, building, restoration, and maintenance services that are needed by both the government and the commercial sector. They always carry out all strategies completely and make use of all latest technologies to ensure that the job runs smoothly and efficiently.

This business can be found at No. 32, Tingkat Bawah, Jalan Bestari, Pusat Bandar Fasa 2, Parit Buntar, Perak. The firm is named SK juara after the proprietor, who was born and raised in Sungai Kota, Bagan Tiang Tanjong Piandang, Perak. Sungai Kota is a tiny settlement in Tanjong Piandang, Malaysia, that leads to Kuala Bagan Tiang. Bagan Tiang is crossed by the Sungai Kota. The town is essentially a collection of village cottages and stores.

Construction activities and general commerce are the mainstays of SK Juara Enterprise Sdn. Bhd's operations. MS Mega Jaya Sdn.Bhd and Anggerik Global Sdn.Bhd are two of the subsidiaries of SK Juara Enterprise Sdn. Bhd. CIDB Malaysia, KWSP, and EPF have all been registered with this business. This firm employs 32 people and has five teams working on ongoing projects. This firm held licences ranging from G1 to G7. SK Juara Enterprise Sdn Bhd own the G6 license.

Figure 1.1: SK Juara Enterprise Sdn Bhd Building

Figure 1.2: SK Juara Enterprise Sdn Bhd Location

1.2 COMPANY OBJECTIVE

- Carry out the business of general merchants, general importers and exporters, manufacturers, commission agents, wholesale or retail dealers of commodities and products of all kinds, and to purchase, sell, barter swap, or otherwise deal with them.

- To carry on the business of a property developer and building contractor by erecting and constructing houses, buildings, or work of all kinds on the company's land or others' land or property, as well as breaking, rebuilding, enlarging, altering, and improving existing houses, buildings, or work, and converting and appropriate any such land into roads, streets. Square, gardens, and other conveniences, as well as dealing with and improving the Company's property in general.

- To enter into any arrangement with any governments or authorities, municipal, local individual, group, companies, or otherwise, and to invest money in any way deemed fit by the Company with the goal of improving the value of any business or property of the company or otherwise directly or indirectly advancing its interest, that may seem conducive to the Company's object or any of them, and to obtain any rights, privileges, or concessions from any of the above mentioned.

1.3 COMPANY MISSION AND VISSION

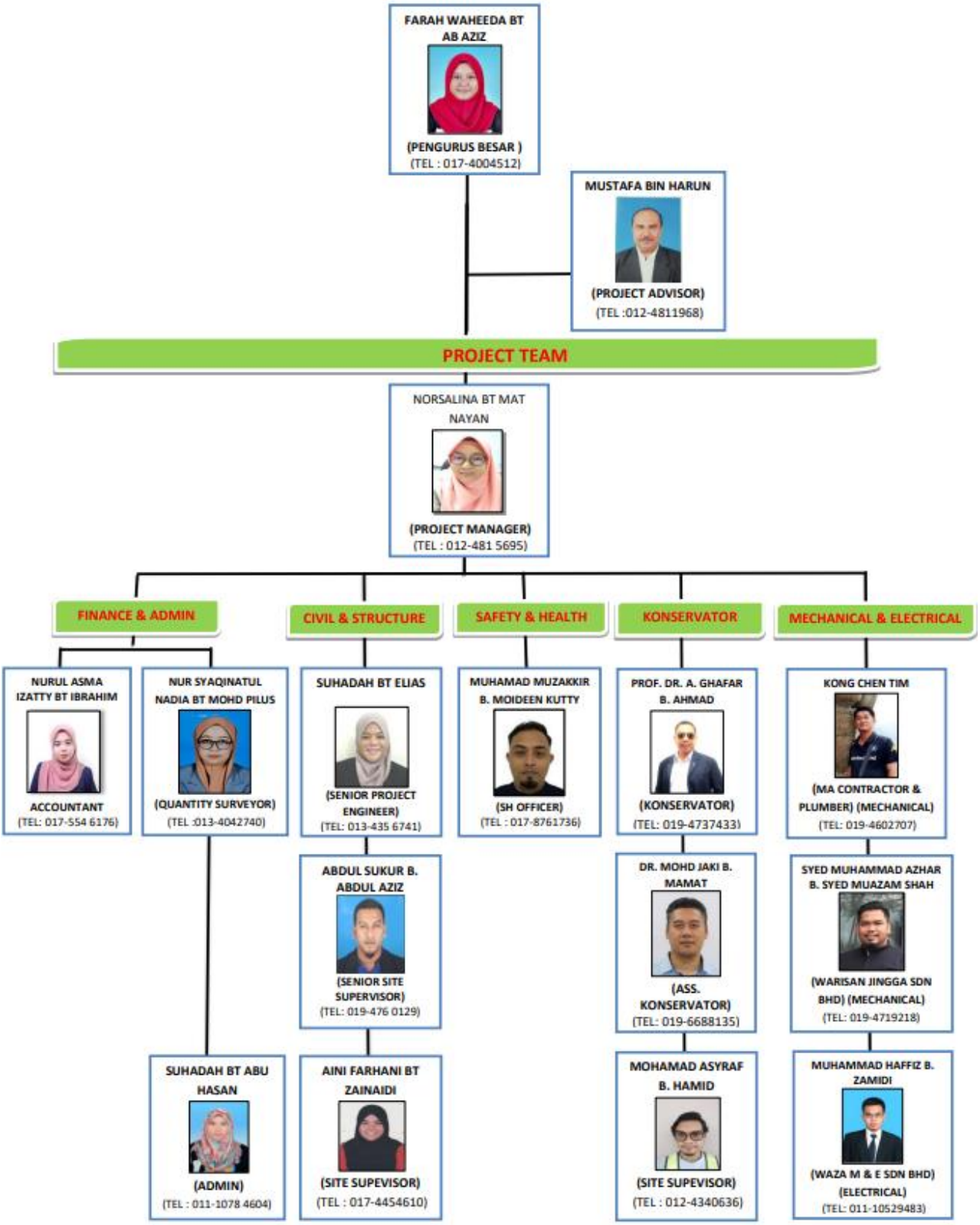
MISSION

- To become a major and authoritative company in this country
- To supply a wide range of quality services and product accordingly to modern technology and materials
- To support local citizen and support Malaysia economy

VISSION

- To be client choice by providing good services through modern and efficient equipment and machinery
- We innovated, to grow and diversity our business

1.4 COMPANY ORGANIZATION CHART



1.5 SCOPE OF WORK

SK Juara Enterprise SDN BHD as a main contractor give a site supervisor scope of work to being carried out during the internship program under this company. In the construction sector, site supervision is a necessary feature, as safety is a major concern that requires a lot of attention. It is a responsibility as the site supervisor to analyse and handle workplace safety issues (Vermeulen, 2017). Managing and teaching site employees, defining team goals, and seeing projects through to completion are all possible responsibilities.

As a site supervisor on site, it must be responsible for analysing numerous safety concerns and calculating the chance of an accident. This entails conducting frequent inspections to ensure that everything is in working order, including checking for and correcting any dangers. Even if are unable to eliminate a hazard, it is still the responsibility to address the matter. It's also crucial to know how big of a disturbance any prospective accidents may cause, as well as how much it would cost to fix them.

Hence, as a site supervisor need to manage the site worker. Site supervisor should constantly be aware of who is on the job, and it is obligation to ensure that everyone is aware of any possible safety dangers. Site supervisor should also make oneself as reachable as possible, ensuring that the appropriate individuals have the contact information.

Also, SK Juara Enterprise SDN BHD give a special task for me to handle a small-scale road construction at Kampung Raja Bashah, Kuala Kurau, Perak. Then, another scope of works doing the office task such as buying the tender, fill in the tender and make bill of quantity for some project. It gives a great experience for the internship programme to experience a real life of working features in this construction industry.

CHAPTER TWO

LITERATURE REVIEW

2.1 DEFINITION OF ROAD PREMIX

Road premix is a sort of hard surface comprised of durable surface material that is placed down on an area to carry automotive or pedestrian activity. A good quality premix is needed because Its primary role is to spread applied vehicle loads across many levels of the sub-grade. The road surface should have enough skid resistance, good ride quality, good light reflecting properties, and low noise pollution. Its purpose is to lower the vehicle transmitted load to a level that does not exceed the sub-bearing grade's capability (Mahajan, 2020). In the development of any building, the road paving plays an essential function.

The premix's strength must be capable of resisting the contact pressure from the wheel loads, and its thickness must be sufficient to distribute this pressure to a broader area of the foundation soil below to avoid severe soil deformation or shear failure. This will guarantee that the premix structure remains robust and stable throughout the design process to meet traffic demands.

Road premix has it own history in this world, it is started with United Kingdom introduced the road pavement for their citizen to upgrade their facilities. Prior to the Romans, there appears to be no evidence of "traditional" roadways in the United Kingdom. The principal Roman roads in the United Kingdom (a total of around 4100 km) were mostly used for military purposes, connecting camps that were about 30 kilometres apart (Collins & Hart, 1958). Because the major function of these roads was to transport foot soldiers, they were straight and nearly gradeless. They made a lot of noise, were difficult to work with, and took a lot of time. The Romans used four layers in their principal U.K. roads: the first is Summa Crusta (surfacing), which has a smooth texture and polygonal stones bedded in the underlying layer. Nucleus was the second layer, which was a form of base layer made of gravel and sand mixed with lime cement. Rudus was the next layer, and the third layer was made from rubble masonry and smaller stones put in lime mortar. Statumen is the last layer, which consists of two or three courses of flat stones laid in lime mortar.

For the early bituminous pavement, the have been introduced the Tar Macadam as a new road pavement to be use according to the new technology and new era in the world. The first tarmacadam premix believed to have been laid outside of Nottingham (Lincoln Road) in 1848. Such premix were only considered adequate for mild traffic at the time, not for metropolitan streets. The binder, coal tar, had been available in the United Kingdom since around 1800 as a by-product of coal-gas lighting. This might have been one of the first attempts to recycle waste materials into a pavement (Almeida, 1993).

Tar macadam projects were completed in Paris (1854) and Knoxville, Tennessee, not long after the Nottingham project (1866). A "tar concrete" was widely utilised in Washington, D.C. in 1871. Sulfuric acid was utilised as a hardening agent, and the combination also included sawdust, ashes, and other elements. 630,000 m2 were planted during a seven-year span (Hassani, 2002). Most of these roadways collapsed within a few years of construction, in part owing to a lack of care in defining the tar. As a result, tar was demonised, which boosted the asphalt business.

From the 1800s through the 1900s, pavement structural design was accomplished via standards or catalogues. The focus of this analysis has been on the pavement types that contributed to the development of asphalt pavements. It's worth noting that, until 1909, Portland cement concrete (PCC) was mostly utilised as a base or "foundation" layer for surface course materials like bricks, wood blocks, sheet asphalt, and so forth (Barber, 2010). The year 1909 is significant in the United States because it is the year that PCC was first utilised as a structural wearing course. In summary, up until the 1950s, the structural design of asphalt and PCC pavements was a result of an evolutionary process that began with the Romans and continued with Telford and Macadam. As the preceding material, hopefully, illustrates, this change increased dramatically in the 1930s and 1940s.

2.2 TYPE OF PAVEMENT

Flexible and rigid pavements are the two types of pavements that may be classed based on their structural performance. A flexible pavement is a pavement layer made up of aggregates and bitumen that has been heated and mixed appropriately before being poured and compacted on a granular layer substrate. Rigid pavements, on the other hand, are built of cement concrete or reinforced concrete slabs that are set over a low-strength concrete layer (Dry lean concrete, DLC) or a poorly compacted aggregate layer, or both.

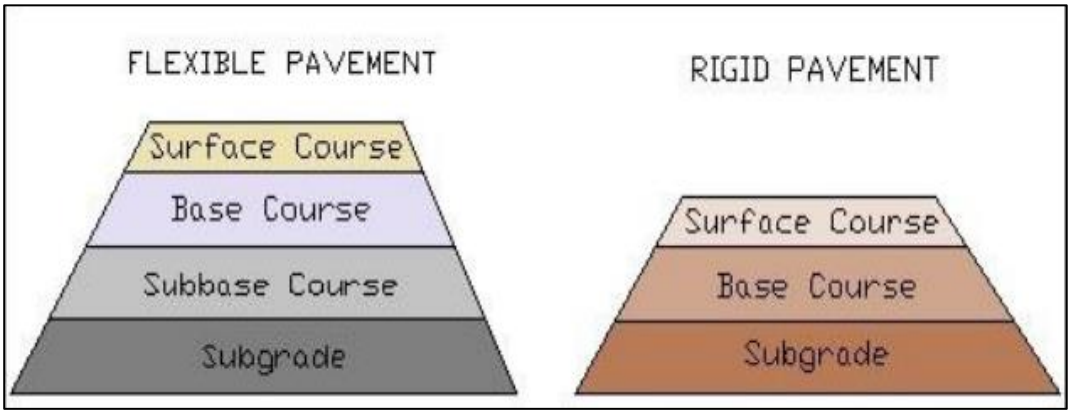


Figure 2.1: the layer of flexible pavement and rigid pavement

Vehicle stress is conveyed to the subgrade through gain-to-gain contact of the aggregate through the granular structure in flexible pavements. These roads have a lower flexural strength and behave like a flexible sheet, like a bituminous road. Vehicle loads are conveyed to sub-grade soil via the pavement's flexural strength, and the pavement functions as a rigid plate in the case of rigid pavement, such as cement concrete highways. A mixed pavement, sometimes known as semi-rigid pavement (Mahajan, Pavement Layers, 2020), is also utilized. In this case, a hard pavement is covered with a thin layer of flexible pavement, resulting in an ideal pavement with the best properties. However, due of the high cost and complicated study necessary, these sorts of pavement mixes are rarely employed in new construction.

2.2.1 Flexible pavement

The stress is conveyed to the sub-grade by the lateral distribution of the applied load with depth in flexible pavements made of bituminous or unbound material. A bituminous material surface course, as well as underlying base and subbase courses, make up flexible pavement. Asphalt is the most common bituminous substance, and its viscous nature allows for great plastic deformation. Although some 'full depth' asphalt surfaces are laid directly on the subgrade, most asphalt surfaces are built over a gravel basis. Asphalt is classified as hot mix asphalt (HMA), warm mix asphalt, or cold mix asphalt depending on the temperature at which it is applied.

The name "flexible pavement" comes from the fact that the pavement surface reflects the entire deflection of all succeeding layers caused by the traffic load. The load-distribution properties of a layered system are used to construct the flexible pavement. It uses a mixture of layers to transmit load to the subgrade. The load is distributed across a smaller area of the subgrade under flexible pavement. Flexible pavements have a low initial installation cost, which is why they are more widely found across the world. The flexible pavement, on the other hand, requires periodic maintenance and repairs every few years. Furthermore, owing to inadequate drainage and frequent vehicular traffic, flexible pavement deteriorates quickly, resulting in cracks and potholes.

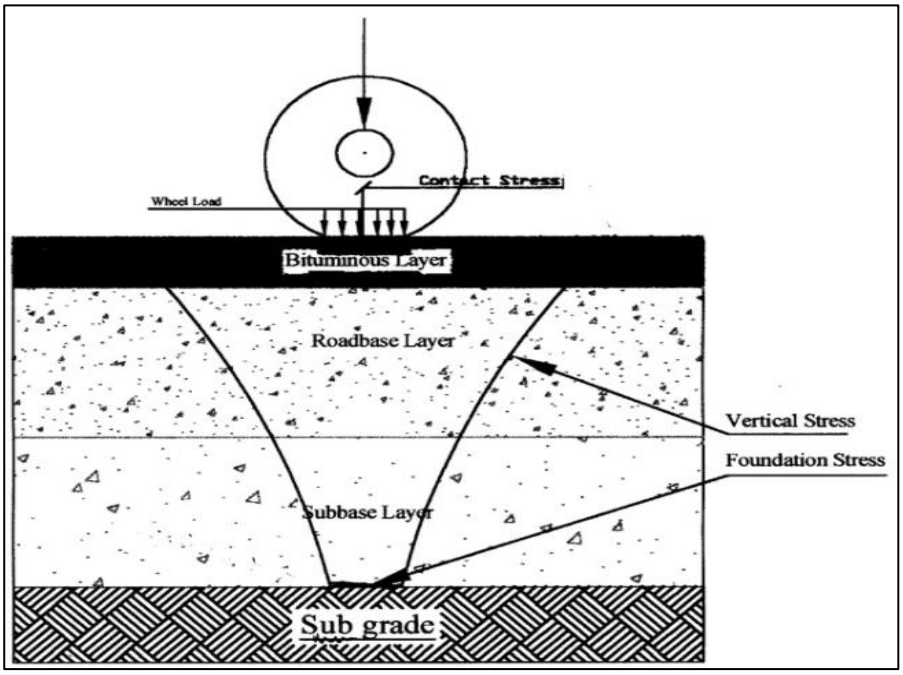


Figure 2.2: load distribution in flexible pavement, source: (Jamal, 2017)

Flexible pavement has three types which is conventional layered flexible pavement, full depth asphalt pavement and lastly contained rock asphalt pavement. Conventional flexible pavements are layered systems with high-quality, costly materials at the top where stresses are greatest, and low-quality, inexpensive materials at the bottom. Bituminous layers are laid directly on the soil sub-grade to create full-depth asphalt pavements. When there is a lot of traffic and local materials aren't accessible, this is a better option. Contained rock asphalt mats are made up of dense/open graded aggregate layers sandwiched between two layers of asphalt. When modified thick graded asphalt concrete is laid above the sub-grade, the vertical compressive strain on the soil sub-grade is greatly reduced, and surface water is protected.

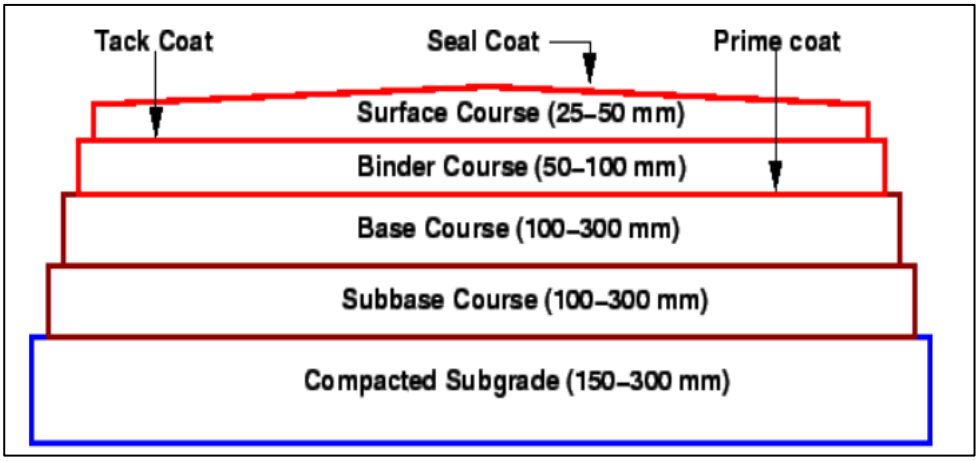


Figure 2.3: Typical cross section for flexible pavement

A flexible pavement's asphalt surface layer can be separated into sub-layers. Sub-layers in order of appearance, starting at the top and working down. First, compacted (150–300 mm) Sub-grade All pavement layers are built on top of a compacted subgrade. The tension is transferred to this layer from all the pavement layers above. As a result, it's critical to avoid overstressing the soil subgrade. As a result, it must be appropriately compacted to the necessary density and moisture content.

Second, sub-base course (100mm – 300mm) it's a material layer beneath the base course. It has an important function in providing structural support, improving drainage, and reducing particles infiltration into the pavement structure from the sub-grade (khan, 2020). When the base course is open graded, a sub-base course with finer material might be used as a filler between the subgrade and the base course. The principal purposes of the sub-base course, which lies beneath the base course, are to provide structural support, enhance drainage, and prevent particles from entering the pavement structure from the sub-grade. If the base course is open graded, a finer sub-base course can fill in the gaps between the sub-grade and the base course. It is not always necessary or appropriate to take a sub-base course. A pavement built over a high-quality, strong sub-grade, for example, may not require the sub-base course's extra qualities. Sub-base courses may not be available in certain circumstances.

Next, the base course 100mm – 300mm thickness. It's a layer of materials that sits just beneath the binder course's surface, providing extra load distribution and aiding in sub-surface drainage. Crushed stone, crushed slag, and other untreated or stabilised materials are among the materials used for base courses. After the base course layers, it is containing a layer of prime coat before start to lay the binder course. Prime coat function is low viscosity cutback bitumen is applied to an absorbent surface, such as granular bases, before the binder layer is applied. It is mostly used to join two layers together. A primary coat can penetrate the layers behind it, filling gaps and forming a waterproof surface.

The bulk of the asphalt concrete structure is in the Binder coat. Its primary purpose is to transfer weight to the base course. The binder course is mostly made of aggregate mixed with low asphalt, and it does not have the same high-quality requirements as the surface course. The use of the binder course to replace portions of the surface course resulted in a more cost-effective design. In between it is having the tack coat layer. A little quantity of asphalt is placed to the surface in the tack coat. It's usually asphalt emulsion that's been diluted with water. Its primary purpose is to provide adequate bonding between two layers of binder course, and it must be thin, uniformly cover the whole surface, and set quickly.

The last layer which is surface course or as known as wearing course 25mm – 50mm thickness. It is the primary layer, which bears the brunt of direct traffic and often comprises high-quality materials. In most cases, the surface course is made of graded asphalt concrete (AC). The functions and needs of this layer, which is this course, include features like as friction, smoothness, and drainage. It also prevents excess water from entering the underlying base, subbase, and subgrade. It should have a firm surface to prevent deformation from traffic and to give a smooth, skid-resistant riding surface. The uppermost layer's job is to generate a smooth, robust, abrasion-resistant, and relatively impermeable surface. It must resist the imposed wheel loads and securely transmit them to the layer below since it is in close contact with the car tyres. Depending on the nature of the structure, the material may be granular, bituminous, or cement concrete.

Fatigue cracking, rutting, and heat cracking are the most common flexible pavement failures. The horizontal tensile strain at the bottom of the asphaltic concrete causes fatigue cracking in flexible pavement (Mathew, 2009). The permissible number of load repetitions is related to tensile strain in the failure criteria, which may be measured in a laboratory fatigue test on asphaltic concrete specimens. Only flexible pavements rust, as evidenced by persistent deformation or rut depth along the wheel load path. To manage rutting, two design strategies were used: one to restrict vertical compressive strain on the top of the subgrade, and the other to limit rutting to a bearable quantity (12 mm normally). Low-temperature cracking and thermal fatigue cracking are both types of thermal cracking.

2.2.2 Rigid Pavement

The flexural strength of a rigid pavement, as opposed to a flexible one, determines its load-bearing capability. The pavement's flexural strength allows it to bridge over slight irregularities or weak points in the subgrade or other courses beneath it, such as the base or sub-base. As a result, the intrinsic strength of the pavement slab plays a significant part in resisting wheel loads; nonetheless, the importance of a robust subgrade cannot be overstated. It simply implies that, if the subgrade provides a specific level of support, the rigid pavement's performance is determined by the strength of the pavement slab rather than the subgrade. Rigid pavements are made of ordinary Portland cement concrete (OPC), which can be plain, reinforced, or pre-stressed.

Rigid pavements have strong flexural strength and can distribute wheel weight to a larger surface. There aren't as many layers of materials in stiff pavement as there are in flexible pavement. The automobile traffic load is transferred by slab action in stiff, and the road takes on the appearance of an elastic plate lying on a viscous liquid. Plain cement concrete is used to build it. Plate theory, rather than layer theory, is used to examine its design, which assumes an elastic plate sitting on a viscous basis. The plate theory assumes that the road pavement slab is a medium–thick plate that is plane before and after loading. Due to wheel load and temperature variations, the pavement slab bends, causing tensile and flexural stress.

Rigid pavements are divided into four categories which is jointed plain concrete pavement (JPCP), jointed reinforced concrete pavement (JRCP), both joints and reinforcement are included in JRCP designs such example welded wire fabric, deformed steel bars. Dowel bars and tie bars are utilised at all transverse and longitudinal connections, and joint spacings are normally around 9 to 12 m. The reinforcement, which is dispersed throughout the slab and accounts is meant to keep any transverse fractures in the slab securely together. Where the reinforcing has been removed, it is difficult to guarantee that joints are cut. This pavement type is not as widespread on state roads as it once was, although it is still employed by municipalities to some extent. Continuous reinforce concrete pavement (CRCP) There are no transverse joints in CRCP designs, but they do include a lot of longitudinal reinforcement, usually 0.6 to 0.8 percent of the cross-sectional area. The high reinforcing content effects both the growth of transverse cracks within an acceptable spacing and the tightening of cracks. Because of its adaptability for high-traffic loads, several agencies utilise CRCP designs for high-traffic, metropolitan roads.

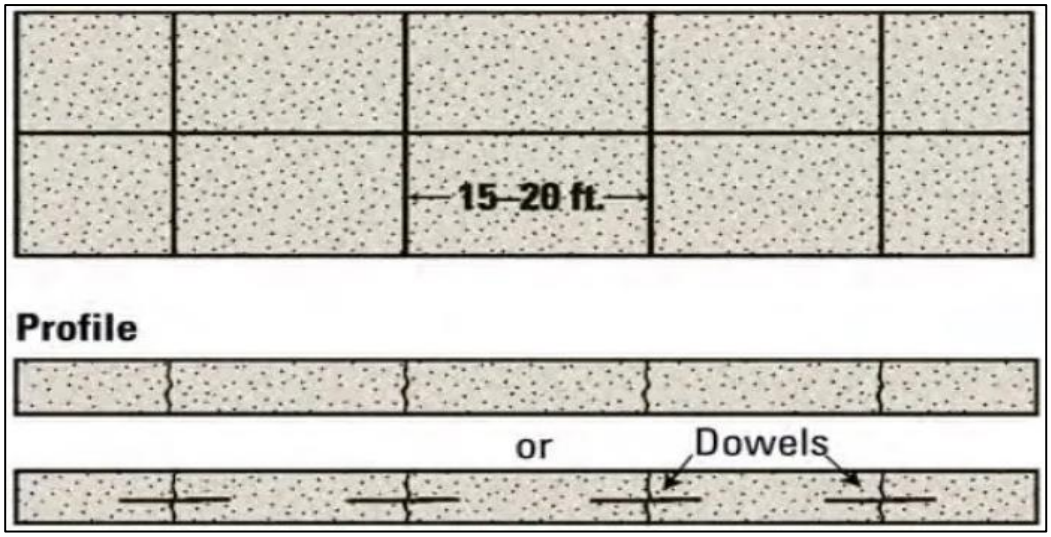


Figure 2.4: cross section of Joint Plain Concrete Pavement (JPCP)

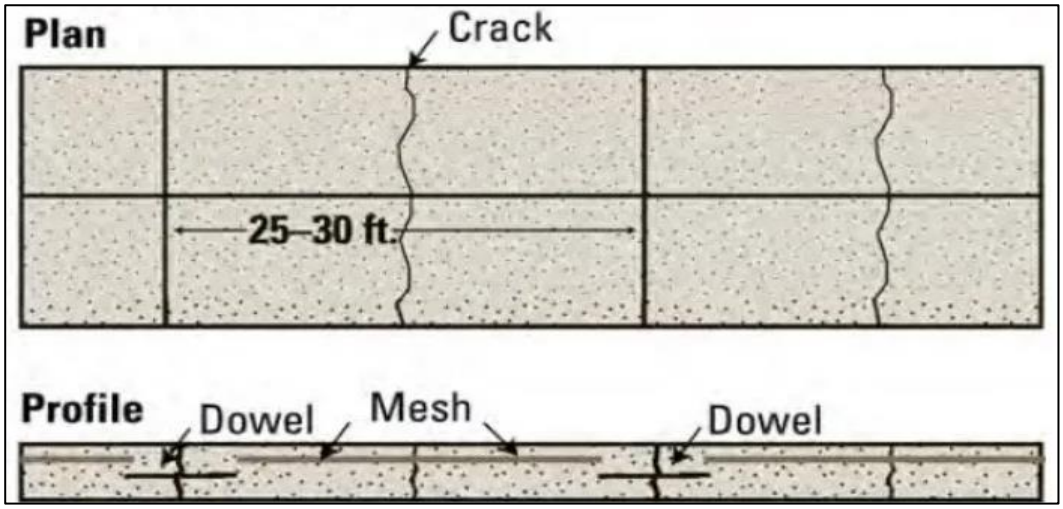


Figure 2.5: cross section of Joint Reinforced Concrete Pavement (JRCP)

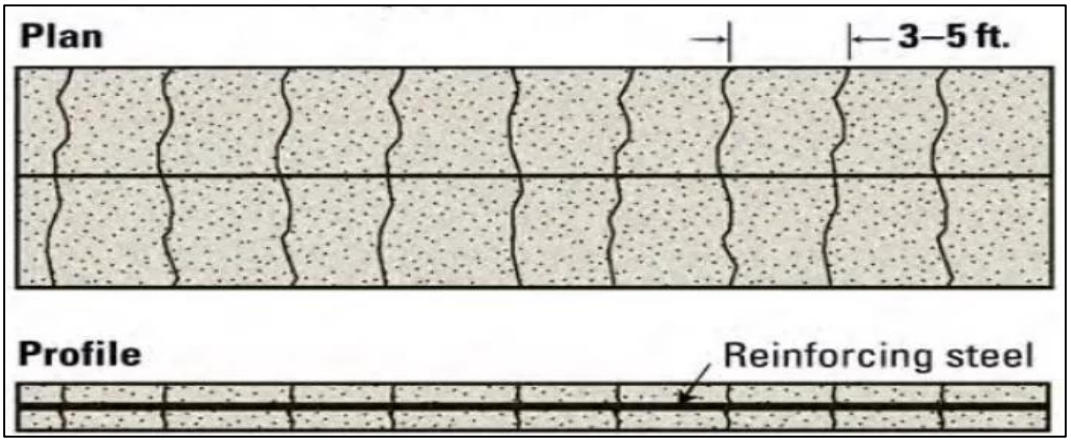


Figure 2.6: Cross section of Continuously Reinforced Concrete Pavement (CRCP)

First, Jointed Plain Concrete Pavement is a firm pavement made of plain cement concrete with contraction joints that are closely spaced. Joined Plain Concrete Pavements are the most popular form of cast-in-place concrete pavements in the world. The phenomenon of cracking occurs in all concrete pavements when the concrete is subjected to multiple thermal and mechanical activities because of early-age shrinkage or expansion, temperature gradients, traffic pressures, or probable soil movements. Steel bars are commonly utilised for weight transmission across joints in this design. It has a joint spacing of 5 to 10 metres.

It is made up of transverse joints, which are necessary to keep the pavement from splitting at random. The concept of JPCP is to regulate the placement and breadth of fractures at these joints by purposely locating them. Motorways, highways, main and minor roads, agricultural roads, urban roads, squares, tunnels, bus lanes, industrial areas, and car parks are just a few of the applications for JPCP. The following elements, transverse joints spacing, width of the JPCP, thickness of the JPCP, presence or absence of dowels in the transverse joints, presence, or absence of reinforcement bars, bearing capacity of the base layer and subbase, strongly influence the behaviour of JPCP under traffic load and weather conditions (Ghafari, 2020).

There are four types of joints that applied in the method of JPCP which is transverse contraction bending joints. A contraction-bending joint's job is to restrict the effects of both contraction which is hygrometric shrinkage and thermal contraction, and bending owing to deformations caused by temperature gradients, among other things. Transverse joints are generated by beginning cracks at precise locations, such example with the spacing defined in the preceding section, to avoid any random crack pattern at the surface. This crack initiator may be used in both new and old concrete. If the concrete is still fresh, a plastic strip with a vibrating mechanism designed for this purpose is installed.

Second, Transverse construction joints. During concreting, transverse construction joints are positioned at any interruption sites in JPCP, such as at the conclusion of each day production or in the event of a greater than 2-hour interruption. They are also known as "end-of-the-day joints" and "cold joints," respectively. The contact surface between the old and new concrete must be level and parallel to the base layer's surface. There is no requirement for a joint profile when casting fresh concrete against hardened concrete. To avoid sawing exactly adjacent to the joint, the joint should not be sawn here. At this point, concrete contraction will naturally produce a junction. Once the fracture is evident, milling a groove and sealing it is suggested to avoid edge erosion (Sutherland, 2010).

Next, transverse expansion joints. As detailed in the preceding section, these joints have been changed to become just contraction-bending joints. This modification has not only enhanced driving comfort, but it has also helped JPCP save money on maintenance. The number of expansion joints has decreased dramatically in recent years. However, they are still important in some specific instances when compressive pressures absorption is needed to minimise damage to surrounding structures (Suryakanta, 2016). Furthermore, expansion joints are recommended in certain concreting situations, such as at one end of a repaired slab or series of slabs when the temperature during concreting is low, on bicycle paths, given the increased risk of blow-ups due to the higher length / width ratio, approximately every 150 m in a straight line when the temperature during concreting is low, secondary roads and bicycle paths before and after tight turns to avoid lateral displacement when the temperature during concreting is low, and on secondary roads and bicycle paths before and after tight.

Lastly, isolation joints. An isolation joint is a full-height longitudinal (or sometimes transverse) junction that prevents all existing joints from breaking in newly poured concrete adjacent to it (Ghafari, 2020). The isolation joint in this situation prevents the concrete from expanding too much. It is then sufficient to place a thin membrane into the joint. Also, it acts as a break between two hard pavements or buildings, limiting the amount of compressive force that might cause random cracking, splitting, or elevation. This form of joint can be used against neighbouring structures, as well as around manhole covers, drains, water nets, and other built-in features. In this situation, the isolation joints may allow for some concrete expansion. The same filler material (high density polyethylene foam) used for the expansion joint should be used, but at a lower thickness.

2.3 SPECIFICATION OF PRIME COAT AND TACK COAT

Flexible Pavements are made up of four layers: sub-grade, sub-base, base course, and asphalt. Prime Coat and Tack Coat are also applied to flexible pavements' construction. Flexible Pavements are made up of four layers: sub-grade, sub-base, base course, and asphalt. Prime Coat and Tack Coat are also applied to flexible pavements' construction. Since road building procedures vary over time, it is essential for Jabatan Kerja Raya (JKR) to update and enhance their standard specifications on a regular basis. These new criteria are intended to assist improve the quality of produced products as well as stay up with current technology.

The building of road infrastructure necessitates the use of standard specifications for road works. Based on current best practises, this standard provides better advice in material selection and the manufacture of high-quality work and products. The goal of this standard specification is to provide consistency in road construction for road designers, road authorities, manufacturers, and suppliers of road-related materials.

2.3.1 Prime Coat

Prime Coat is the layer that sits between the Asphalt Course and the Crushed Aggregate Base Course (CABC). Its objective is to bind loose CABC aggregates to prepare them for the upcoming construction activity of laying Asphalt layer. Prime Coat also acts as a capillary blocker in CABC, preventing water from rising to the Asphalt layer (Shirazi, 2017). It's important to remember that asphalt and water do not mix, therefore any pavement should be designed to drain away any water that could come into touch with it. The goal of the prime coat is to prevent the passage of water rising from the embankment according to capillary action.

Figure 2.7: Application of prime coat

Prime coat also works as a binder for Asphalt and CABC. Excess Prime Coat, especially if it has created a pond, can cause inefficient bonding between CABC and Asphalt Course, as well as change the characteristics of Asphalt, such as reducing air spaces. Effective asphalt-CABC bonding is critical because it aids in decreasing longitudinal shear stress gradients caused by accelerating and breaking vehicles, especially if the asphalt layer is thin below 4 inches.

The unbound aggregate road base must be shaped and compacted in accordance with the rules of this Specification before applying the bituminous prime coat. Any damage to or degradation of the road base must be repaired to the satisfaction of the S.O. before the bituminous prime coat is applied, regardless of any prior approval of the finished road base. The full width of the surface to be treated shall be swept with a power broom followed by a compressed air blower and, if necessary, scraped with hand tools to remove all dirt, dust, and other objectionable materials, all to the satisfaction of the site supervisor, immediately prior to applying the bituminous prime coat.

The bituminous primary coat must be sprayed on to the cleaned road base surface by means of a pressure distributor. Any locations inaccessible to the distributor spray bar should be sprayed utilising the distributor's hand spraying technique. The rate or rates of application will be determined by the S.O. depending on the results of test applications but will typically be in the range of 0.5 to 1.0 litre/sq.m. During spraying operations, the temperature of cut-back bitumen MC-70 must be kept between 50 and 70 degrees Celsius (Othman, 2008). When the surface to be treated is generally dry, bituminous prime coat treatment should only be done in dry and warm conditions.

The spraying temperature for the bitumen emulsion SS-1K should be between 25 and 45 degrees Celsius. After the bitumen emulsion "breaks," softly apply sand or quarry dust over the prepped surface. The coated surface must be allowed undisturbed for 24 hours to cure (Othman, 2008), following which it can be swept clean of sand or quarry dust before the overlaying pavement course is constructed. The required prime coat should be applied in two separate spraying operations if necessary to prevent the bituminous prime coat from running over the sprayed surface. Where the condition of the treated surface shows that it is essential, bituminous prime coat extra to that prescribed should be applied as the site supervisor shall order. Bituminous prime coats should be kept undisturbed for at least 24 hours after application and not opened to traffic until they have permeated the road base and dried sufficiently to prevent being picked up by vehicle wheels.

2.3.2 Tack Coat

Tack Coat is the layer that sits between the Asphalt Base Course (ABC) and the Asphalt Wearing Course (AWC). Tack Coat is also put between the concrete deck slab of bridges and the AWC that will be installed on top of it, or between the concrete slab of Rigid Pavement and the AWC that will be laid on top of it. Tack Coat's goal is to create a relationship between AWC and ABC (or concrete slab). AWC will prone slip under traffic load if Tack Coat is not placed, and the pavement will collapse owing to AWC spalling (Shirazi, 2017). When AWC is applied directly over ABC, the bitumen in AWC is insufficient to produce a long-lasting effective connection between the two layers.

Figure 2.8: Application of tack coat

As a result, following rainfall and water penetration beneath the AWC layer, the relationship between AWC and ABC will break down. AWC will begin to slip at this point, and slippage fractures will appear, eventually leading to spalling. It's important to remember that too much Tack Coat might cause AWC to slip, therefore the pace at which it's applied should be regulated according to site conditions.

The bituminous tack coat material must be a grade RS-1K rapid-setting cationic bitumen emulsion that meets MS 161 standards. Only a clean and dry surface of bituminous or bitumen primed pavement course shall be treated with bituminous tack coat. Only apply the bituminous tack coat as far ahead of the construction of the underlying bituminous pavement course as is required to ensure a sufficient degree of tackiness before the overlaying material is put.

Only a clean and dry surface of bituminous or bitumen primed pavement course shall be treated with bituminous tack coat. Only apply the bituminous tack coat as far ahead of the construction of the underlying bituminous pavement course as is required to ensure a sufficient degree of tackiness before the overlaying material is put. The surface to be treated must have been prepared in accordance with the applicable sections of the Specification prior to applying bituminous tack coat.

Any damage or degradation to this surface, regardless of previous approval, must be repaired before bituminous tack coat is placed. To remove any dirt, dust, and other unpleasant elements, sweep the whole width of the surface to be treated with a power broom, followed by a compressed air blower, and if required, scrape with hand tools, just before to applying bituminous tack coat.

By using a pressure distributor, the bituminous tack coat is sprayed on to the clean and dry surface of the bituminous or bitumen prepared pavement course. The distributor's hand spraying method will be used to treat any places that are unreachable to the distributor's spray bar. The rate or rates of application will be determined by the S.O. based on the results of test applications but will typically be in the range of 0.25 to 0.55 litres/sq.m. During spraying operations, the temperature of the bituminous tack coat must be kept between 25 and 45 degrees Celsius.

Bituminous tack coat must be applied evenly and without streaks across the surface to be treated; amounts applied must not differ by more than 10% from those specified. Areas having excess bituminous tack coat must have it removed at the Contractor's expense, and areas with inadequate bituminous tack coat must be resprayed as needed to make up the difference. The surfaces of structures, road furniture, and trees close to the areas being sprayed must be covered to prevent bituminous tack coat from being spattered or disfigured. Bituminous tack coat must not be poured down drains or into gutters. Until the underlying pavement course is created, traffic must be always kept off the bituminous tack coat, and the Contractor must maintain the bituminous tack coat.

2.4 TYPES OF MACHINERY

Road construction may need the utilisation of a large amount of machinery. However, on certain projects, they only employ related gear to save money, time, and space. Every piece of machinery is highly expensive to hire, and the size is larger. Depending on whether a project entail creating a new road, re-carpeting an existing road, or merely minor road repairs, the equipment utilised in road construction varies. There is compulsory machinery will be use in road pavement construction such as paver machine, tandem roller and multi tyre roller.

2.4.1 Paver Machine

The asphalt paver is a formless laydown equipment with a floating screed that is self-propelled. Hot Mix Asphalt is loaded at the front, transported to the back by flight feeders, spread out by augers, and finally levelled and compacted by a screed. Tractor and screed are two basic systems that may be used to separate this collection of duties. The material feed system on the tractor collects asphalt from the front of the paver, transports it to the back, and spreads it out to the necessary width in preparation for screed levelling and compaction.

The self-levelling screed unit, which determines the profile of the asphalt being laid, is the most important aspect of the paver. The screed takes the head from the material delivery system, strikes it off at the proper thickness, and compacts the mat for the first time. The screed assists in the regulation of the amount of material extruded onto the foundation course, as well as the flattening of the asphalt on the ground. It also promotes compaction by providing a flat surface, regardless of the state of the base course. To avoid future cracking, the base course should be sufficiently level.

Figure 2.9: Asphalt paver or paver machine

According to Jabatan Kerja Raya standard specification the paver must be self-propelled and capable of both forward and backward motion. It must have a hopper in the front intended to receive paving mix from tip trucks, as well as a mechanical distribution system in front of a screeding and compacting machine with a sufficient heating mechanism for distributing the mix uniformly and without segregation across the surface to be paved.

The screeding and compacting mechanism must be capable of confining the edges of the material being laid without the use of stationary side forms, be adjustable to strike off the mixture to the required thickness and cross-section shape and be controlled by an automatic levelling device to produce an even carpet of bituminous mixture with a uniform surface texture free of indentations, ridges, tear marks, and other irregularities. The paver must be able to lay the bituminous mixture in paving widths ranging from 2.5 to 3.75 metres and finish the pavement layer according to the prescribed lines, grades, levels, dimensions, and cross-sections, subject to rolling compaction.

2.4.2 Tandem Roller

Tandem vibratory rollers compact paving materials like asphalt mixtures and roller-compacted concrete. Two steel drums vibrate using an internal eccentric mechanism, which may be modified to change the frequency and amplitude of the vibratory action (Bazz, 2020). Some tandem vibratory rollers, which are equipped with satellite navigation and proprietary software, may continuously record the degree of compaction, and map the jobsite's compaction values for future reference.

Figure 2.10: Tandem roller compaction

Steel-wheeled tandem rollers must be self-propelled and able to reverse without backlash; they must also have power steering and dual controls that allow operation from either the left or right side. Water tanks, sprinkler systems, and scraper blades must be installed on the roller to keep all wheels uniformly moist and clean during operation. Each steel-wheeled tandem roller must be ballasted to a total working weight of 8 to 10 tonnes, with the driving roll (or rolls) exerting a rolling force of at least 3.5 tonnes per metre of roll width. The Contractor must give a calibration chart for each roller to the S.O. that shows the connections between the quantity or depth of ballast, total weight, and rolling force.

2.4.3 Multi Tyre Roller / Pneumatic Tyre Roller

Pneumatic Rollers are consequently essential in the construction of roads to obtain maximum density and great road smoothness that will last for years. Its main aim is to 'maneuverer' the material to efficiently eliminate air holes caused by carelessly placed material until a certain degree of compaction is reached. It's suitable for both dirt and asphalt. Subgrades, bases, and bituminous mixtures are also commonly compacted with them. Soft foundation materials, loose soil layers, and tightly grained sands are suited for this sort of compaction machinery. For solid paving applications, manufacturers are focused on maximum compaction technology.

Pneumatic rollers now have traction control as an option, which increases productivity in difficult terrain. Productivity is ensured by the established hydrodynamic propulsion technology. For job sites, the rollers produce a kneading and sealing effect, enhancing efficiency on difficult terrain (Pneumatic Tyred Rollers for quality compaction, 2021). The air pressure adjustment features allow the tyred rollers to work on both aggregates and asphalt. Ballast packets may be simply added or withdrawn to ensure that the equipment and process are as efficient as possible.

It's suitable for a variety of applications, including subdivision roadways, huge parking lots, and roads. The equipment is incredibly user-friendly and easy to run, and it comes with a large cab, making it easy to control for operators. A control operation station allows the operator to simply handle everything. Pneumatic rollers have grown in popularity as stiffer mixtures have become increasingly difficult to condense. These rollers have tyres on them that allow for better static penetration into the materials. The weight of the machines and the air pressure in the tyres may both be changed to reach the exact pressure required for a given work.

Figure 2.11: Pneumatic Tyre Roller

CHAPTER THREE

CASE STUDY

3.1 INTRODUCTION

Roads are a matter of national asset in Malaysia. They lay the groundwork for our economic activity and, on a lesser scale, guarantee that our day-to-day operations go off without a hitch. Without roads, our society would not experience economic progress, and most of us would be unable to access work, social, health, or education services. As a result, maintaining the safety and functionality of roadways is critical. This is when road maintenance enters the picture.

Road maintenance is engaging in activities on roadways of all types, from highways to unclassified roads, to keep them robust, safe, and efficient. The goal of road maintenance, which can range from pothole repair to resurfacing highways, is to keep road users safe, control traffic, and sustain upkeep. Pothole repair, road resurfacing, and pavement resurfacing are all examples of road maintenance (Stankevich, 2005). Repairing and unblocking gutters or drains in a road, replacing grid and manhole covers, replacing and repairing road signs or street names, and maintaining green areas are all examples of road maintenance (such as hedge cutting and weeding).

That maintaining road infrastructure is important to preserving and enhancing those advantages. However, the road network has irreversibly deteriorated due to a backlog of uncompleted repair. Roads might require replacement or extensive repairs after only a few years if they are not properly maintained. The rapid spread of degradation over a road system leads in skyrocketing expenses and a significant financial impact on the economy and residents.

If anything, terrible occurs that has an immediate and noticeable impact on the flow of traffic or the safety of road users, emergency road maintenance is necessary. Heavy rains, for example, might produce flooding, which disrupts the entire road network and puts road users and pedestrians at danger of injury or death. To avoid harm or inconvenience, emergency maintenance must be addressed right away. Road maintenance services and municipal governments nearly always have contingency plans in place to help them cope with emergency road repair as quickly as possible.

As a result of a situation, reactive road maintenance is required. Pothole repair is the most prevalent type of reactive road maintenance. Potholes, as we all know, emerge over time as the road surface cracks and erodes, leaving a depression or hollow in the road. Reactive road repair may be costly, especially if a minor issue is allowed to grow into a much larger (and potentially deadly) one. As a result, those in charge of the road attempt to reduce reactive road maintenance to a minimum and, where feasible, perform proactive road maintenance.

When possible, preventative road maintenance entails planning to avoid reactive road work. It implies that roads are evaluated for deterioration on a regular basis, and preventative repairs are made to avoid future accidents or more costly work. Preventative road maintenance is essential for keeping roads running smoothly, traffic moving, and road users safe (BituChem, 2021). Surface treatments, highway preservation, and road emulsions are some of the alternatives.

Road Asset Management programmes or systems can be used in many nations to benefit various road stakeholders by preserving assets via preventative maintenance and balancing long-term needs. The use of engineering, financial, and management approaches to optimise the level-of-service outcome in exchange for the most cost-effective financial input is what road asset management entails. Indeed, the primary goal is to apply the appropriate treatment at the appropriate moment to achieve the required level of service, demonstrating that road infrastructure is a financial asset for society and the economy.

3.2 PROJECT INFORMATION

For this practical training report, which was my project for my last semester, I covered the building and maintenance process of the road pavement. Before beginning to write the final report, it is necessary to conduct some research and obtain a large amount of relevant data from reputable journals, articles, the Public Works Department (JKR DAERAH KERIAN), and the site engineer as part of the literature review and data for this report.

Kampung Raja Bashah, Kuala Kurau, Perak Darul Ridzuan is the location of the case study. The primary goal of this project is to improve and repair the current road. The community of Kampung Raja Bashah is in a rural location near the estuary and has 64 residences. Most of the people who live in this area are Malay fishermen. Because of the heavy traffic in this neighbourhood in the mornings and evenings owing to fishermen activities, Pembangunan Luar Bandar (PLB) has decided to upgrade and maintain the road for villager usage.

"CADANGAN MENAIKTARAF DAN MEMBAIKI JALAN DI KAMPUNG RAJA BASHAH, KUALA KURAU, PERAK" is the title of this project. Pembangunan Luar Bandar was our client (PLB). This project began on January 11, 2022 and will conclude on January 12, 2022. All tasks and labour can be completed in a timely manner. The total cost of this project was RM20,000.

Figure 3.1: Location plan of Kampung Raja Bashah Road

PROJECT INFORMATION	
TITLE	CADANGAN MENAIKTARAF DAN MEMBAIKI JALAN DI KAMPUNG RAJA BASHAH, KUALA KURAU, PERAK
CLIENT	PEMBANGUNAN LUAR BANDAR (PLB)
START DATE **FINISH DATE**	11 JANUARY 2022 12 JANUARY 2022
DEFECT LIABAILITY PERIOD (DLP)	12 MONTHS
COST	RM20,000.

Table 3.1: Project information

3.3 SCOPE OF WORK

The scope of work list:

- Collect and analyses all data, record, proposal, and drawings and cause any further study, survey, or investigation to be carried out for all additional information required for the design and construction of the whole works.
- Do field survey before starting the construction. Field survey to pick up the ground data such as type of soil, the strength of soil and existing structure.
- Carrying out the soil investigation such as probe mackintosh and field density test.
- Prepare and present the report progress work to clients
- Monitoring the road construction on pre-construction, during construction and post-construction
- Participate in meeting with clients
- Involve in project problems and suggestion for clients
- Performing special test and investigation of road construction such as coring test.

3.4 METHOD STATEMENT OF ROAD CONSTRUCTION AND MAINTAINANCE

Bituminous has several different steps. All steps must adhere to the specifications of the Public Work Department (JABATAN KERJA RAYA). However, because the road is in a rural location, the project client is Pembangunan Luar Bandar (PLB), and all specifications must adhere to the standards. The Ministry of Rural Development (abbreviated as KPLB) is Malaysia's ministry in charge of rural development, regional development, community development, Bumiputera, Orang Asli, rubber sector smallholders, land consolidation, and land rehabilitation. The prerequisites for Jabatan Kerja Raya and Pembangunan Luar Bandar are nearly identical, as are the processes.

Figure 3.2: Existing Road at Kampung Raja Bashah, Kuala Kurau

The purpose of this project is to maintain and improve the existing road pavement in Kampung Raja Bashah Kuala Kurau. There are a few processes in the construction of a bitumen pavement road, such as preparing the base course, applying the tack coat and prime coat, placing the asphaltic mix, rolling, and checking for quality, such as testing the premix.

3.4.1 Preparation for Sub-Base

Before laying crusher run, grade the soil to create a slope on the road to prevent water ponding. A grader machine will be used in this operation. The grader machine's function is to alter the slope with the blade according to the specifications. Place crusher run on the soil after it has been graded according to the specifications. Crusher run is a mixture of rock and quarry dust with a size range of 40mm to 10mm. It varies by project; some projects employ solely quarry dust, while others use both crusher run and quarry dust. Both qualities were used in this project to ensure that the pavement was more stable. In addition, the proportions of crusher run, and quarry dust must be equivalent.

The function of rock is to support weight. Dust was also used as a binder to keep the rock and dust together. As in this project, only crusher run will be use since the road are already in good condition according to the field density test.

Figure 3.3: The stockpile of crusher run

After that, lay the crusher run 300mm on the ground with a back pusher machine. The back pusher's job is to level the crusher run according to the soil's slope. The bucket will be used to level the crusher run. Before the final layer of crusher run is compressed, shape it. The road's surface should have a crown that forces water to drain off the edges, preventing it from ponding on the road. Make the road's middle a few inches taller than the sides.

Figure 3.4: back pusher grading the crusher run

Compact the crusher run after it has been laid to ensure that the rock and quarry dust stay together. It's also to make the process of laying asphaltic bitumen go smoothly; larger rocks cause the premix to split, so asphaltic bitumen can't be laid. We employ an 8-ton tandem roller machine to condense the crusher run.

Figure 3.5: Tandem roller compact the crusher run

3.4.2 Application of Tack Coat

To facilitate bonding, a tack coat is a thin layer of bituminous liquid asphalt, emulsion, or cutback used between binder course pavement lifts. For the completed pavement structure to operate as a single unit and provide enough strength, effective bonding between construction lifts, particularly between the current road surface and an overlay, is necessary. If neighbouring layers do not connect to one another, they act as separate thin layers, none of which are designed to withstand the bending pressures that will be produced by traffic.

Delamination (deboning) can occur because of poor layer bonding, which can lead to longitudinal wheel path cracking, fatigue cracking, potholes, and other distresses including rutting, all of which diminish pavement life. Since tack coat must be quick to set to the road, RS-1K and RS-2K must be used. Tack coatings do not need to be applied for 12 hours like prime coats because they are lighter and quicker to dry. A total of three boxes of bitumen prime coat were sprayed at a rate of two (2) litres per box.

Figure 3.6: Tack coat during spraying process

Figure 3.7: Tack coat after spraying process

3.4.3 Lay Wearing Course

The approach for a lay wearing course is the same as for a binder course. The same machine and equipment are also used. When laying the wearing course, check the temperature of the premix on the lorry, paver machine, and continue to lay the premix until it is completely compacted. The temperature, for example:

- On lorry: 180 until 170 degrees Celsius
- On paver machine: 160 until 140 degrees Celsius
- Lay premix: 130 until 80 degrees Celsius
- Compaction: 70 until 60 degrees Celsius

Use the Sumitomo paver machine from Japan to lay the wearing course. The premix for the paver machine must be between 160 and 140 degrees. To begin, the premix must be thrown on top of the paver hopper by the lorry carrying it. The driver will then carefully advance the paver machine after it is ready; the premix will lay automatically with the slope and thickness according to our demand, which is 40mm.

Figure 3.8: Lay wearing course using paver machine

After the premix has been laid out according to the specifications, condense it with the tandem roller machine. Tandem roller machines have a few unique features, such as the ability to vibrate. Use a tandem roller machine that weighs eight (6) tonnes and can shuttle four (4) times. Two (2) times with vibrator and the rest of the time without. After using the tandem roller, use a twelve (8) tonne multi-tyre roller to compact the premix and lower the temperature. The back of the multi-tyre roller has a few pipes that can splash water as the multi-tyre roller shuttles for 8 times.

Figure 3.9: compaction premix using tandem roller 6tonnes

At Kampung Raja Bashah in Kuala Kurau, the pavement layers include a 40mm wearing course and a 60mm crusher run road base. By using a tandem roller, all this layer must be compacted. After being deposited on the base course, the mix is compressed thoroughly by rolling at a speed of no more than 5 km per hour. The first or break down rolling is done with a 6 to 8 tonne roller, and the intermediate rolling is done with a 10 to 15 tonne fixed wheel pneumatic roller with a 5kg per sq.cm tyre pressure. The roller's wheels are kept moist with water.

Figure 3.10: Result of the pavement at Kampung Raja Bashah

3.5 MATERIAL TESTING

Last but not least, the final stage for road construction is doing the coring test. the coring test purpose to check the thickness of the pavement layers according to the road specifications. The coring test will get the pavement cross section, using digital calliper the specialist will conduct a procedures to the sample and take the reading and collect the data according to the point.

3.5.1 Coring Test

Finally, we must conduct a pavement coring test on the road pavement. The goal of doing a coring test is to determine the pavement's strength and thickness. This test is commonly used to gather asphalt samples. For construction quality control testing, quality assurance testing, and product acceptance testing, samples of asphalt collected using the coring method can be used to evaluate various characteristics of an asphalt concrete pavement. The apparatus and material used in the coring test are as follows:

- Portable Drilling Equipment.
- Core barrels
- Core retrieval tools. To extricate cores from the pavement when coring is completed, without causing damage to the cores.
- Marshall handheld compaction hammer
- Gloves

Figure 3.11: Coring test

Before setting the coring apparatus, mark the core sample location. From a total area of 462m/2 in Kampung Raja Bashah, Kuala Kurau, the approx. utilise 50m/2 for each point. Coring tests should be performed three to six days after the road pavement has been completed and compacted. Then, at the selected sampling site, position the core drill with the core barrel perpendicular to the asphalt concrete surface. Start cutting the pavement by turning on the core barrel cooling equipment and gradually lowering the revolving barrel with just enough pressure to start cutting the pavement. Stop the barrel rotation and turn off the cooling equipment once the core barrel has pierced the asphalt concrete. Raise the core barrel and use core retrieval equipment to retrieve the core from the hole.

Figure 3.12: point of coring test

Water is included with the core drilling machine. So that the water stain may be removed after removing the core barrel, wipe the cores with a sponge or a dry cloth as soon as possible to prevent water absorption into the core. After that, locate the core sample and measure the thickness of the cores with a digital calliper. Gather all of the information from the two places. After the cores have been extracted from the road surface and the sample number has been recorded, the sample will be stored in an insulated container that can retain the cores' temperature. Backfilling the holes with hot asphalt mix and compacting it with a manual compaction hammer is required. Prior to backfilling, the core holes must be dry and clean.

Figure 3.13: coring sample for point 1

Figure 3.14: coring sample for point 2

Point	Coring sample reading
Point 1	52.02mm
Point 2	54.47mm

Table 3.2: coring sample reading for point 1 and point 2

3.6 CONCLUSION

In conclusion, the process of maintaining the road pavement at Kampung Raja Bashah, Kuala Kurau need one day to finish. The process started with preparing the sub-based, lay crusher run, compact the crusher run, spray tack coat, and lastly lay the wearing course. The process is different with Jabatan Kerja Raya specifications, which is need prime coat and binder course at the road. Pembangunan Luar Bandar specification only required to have tack coat and wearing course at their road because the rural area such as in this village does not have heavy transport across only small vehicle such as motorcycle, bicycle, and car only.

Also, village road and federal road are two different things. In Jabatan Kerja Raya specifications, federal road must have field density test and road marking procedures. Since the federal road are open to all people use and many heavy transports to use the road. At village road, Kementerian Pembangunan Luar Bandar do not have the field density test and road marking since it is in the village. Finally, the time spend to finish the work also different, at village road it is require one weeks after the release date and federal road takes until 3 weeks to complete the task.

CHAPTER FOUR

PROBLEM IDENTIFY

The process during this road maintenance at Kampung Raja Bashah, Kuala Kurau develops lot of problems. There are only minor problems and can be settle down with in one until two hours only by the contractors. The problems such below:

NO.	PROBLEMS
1.	**WORK DELAY** The delay is from Kamunting Premix Plant (KPP). The premix cannot arrive at the site on time because of the limited driver lorry and at the plant they do not have enough manpower to process the premix.
2.	**NO TECHNOLOGIES** Lack of using modern technology to detect underground piping system then during the process of preparing the sub-base, one pipe on the ground have been found broken. More water spreading over the area. It is because lack of awareness to the surroundings during the process.
3.	**NO QUALITY CHECKING** During the process of laying the premix, Kementerian Pembangunan Luar Bandar staff do not attend to check the quality of the premix and the quality of the workmanship.
4.	**LACK OF TEST** Only coring test will be do in this project, the other test such as field density test and California bearing test do not apply since it is only for the village road. It is also because the cost for the two tests is very high and need professional person to develop the test.
5.	**PAVEMENT CRACKING** The pavement cracking after doing the process. It is because the sub-base is not strong and durable according to the existing soil condition. It is also settlement due to the soil near with sea water. The wave erodes the soil.

Table 4.1: problems identification on site

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

In conclusion, Kementerian Pembangunan Luar Bandar and Jabatan Kerja Raya have different specifications for the road pavement process. Jabatan Kerja Raya manage federal road and Kementerian Pembangunan Luar Bandar manage the village road. The federal road requires more procedures and specification to develop the road construction and road maintenance such as need to do the Field Density Test and California Bearing Test before starting the project. This type of test needs more money since the cost are very high and need proper professional workmanship to do the test.

The purpose to maintaining the village road is because to make the society at the place use the facilities and to bridge the gap between village and town. Society at village deserve to use the same facilities as the town people since the road are the main usage to do any work. If the road is not in proper condition, it can make the work process complicated. The process of maintaining the village road is easier to handle because it is required basic method if the road is safe to use. There is no special test such as field density test and California bearing test before starting the road construction or maintaining. It is only required coring test after the road construction finished. The coring test is to make sure the condition of the premix follows the specification according to Kementerian Pembangunan Luar Bandar.

The specification for the tack coat between Jabatan Kerja Raya and Pembangunan Luar Bandar is same. The type of tack coat and the amount of usage are same which is use RS-1K (rapid setting) and spray at rate 2litre. On this project, prime coat SSK-1K is not use because the village road does not require binder course and it is only use wearing course because village road do not have heavy transport, it is only for motorcycle, car and bicycle usage only.

Lastly, there are five problems occur during this process of maintaining the road pavement at Kampung Raja Bashah, Kuala Kurau such as the work delay because of not enough manpower to supply the premix at site. Second, broken pipe on the ground due to lack of awareness of the worker. Third, no quality checking from Pembangunan Luar Bandar engineer to the procedures of road maintenance. Next, lack of test and lastly the pavement has been found cracking.

For the recommendations, Kementerian Pembangunan Luar Bandar must develop new act and standard regulations for their road construction procedures such as Jabatan Kerja Raya. It is because to make all contractors apply the same method and can be standardize according to the standard specification. The work delays are always happened in all construction industry not only in road construction, but the delay also always happen because of workmanship or the transportation schedule on the site. To avoid these problems, site supervisor must ensure the schedule always on time and make a confirmation with clients or workers.

Also, all construction works need quality checking in all aspect not only in special test or special works. Road constructions are compulsory to have quality checking from the client and the contractor to make sure the road pavement finishing end up with good condition and safe to people use in their daily life without any major problems. Finally, the road construction must hire professional clients to make a field density test or California bearing test before start doing the road constructions. It is because to make research about the soil in the site.

References

Almeida, J. C. (1993). Analytical techniques for the structural evaluation of pavements.

Barber, S. D. (2010). Pavement design for port areas.

Bazz, N. (2020, 10 14). *Tandem Roller: What Is It & Some Questions May You Concern*. Retrieved from machinesl: https://www.machinesl.com/what-is-tandem-roller/

BituChem. (2021, 9 26). *What is road maintenance?* Retrieved from BituChem: https://www.bituchem.com/knowledge-hub/what-is-road-maintenance/

Collins, H. J., & Hart, C. A. (1958). *Principles of road engineering.* Britain: London, E. Arnold & Co. [1958], [1936].

Ghafari, S. (2020). Guide for design of "Jointed Plain Concrete Pavements". 4-6.

Hassani, A. (2002). Bitumin laminated reinforced concrete pavements.

Jamal, H. (2017, april 30). *Flexible Pavement Definition and Explanation*. Retrieved from about civil: https://www.aboutcivil.org/flexible-pavement-road.html

khan, S. (2020, 10 1). *FLEXIBLE PAVEMENT*. Retrieved from Civil click: https://www.civilclick.com/flexible-pavement/

Mahajan, B. (2020, 2 26). *Pavement Layers*. Retrieved from Civiconcepts: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers

Mahajan, B. (2020, 2 26). *What Is Pavement | Types of Pavement | Road Pavement | Pavement Layers | Flexible Pavement | Rigid Pavement*. Retrieved from Civiconcepts: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers

Mathew, P. T. (2009, 8 3). *Introduction to pavement design*. Retrieved from civil.iitb: https://www.civil.iitb.ac.in/tvm/1100_LnTse/401_lnTse/plain/plain.html

Othman, I. A. (2008). *s Standard Specification For Road Works Section 4: Flexible Pavement.* Kuala Lumpur: Jabatan Kerja Raya (JKR).

Pneumatic Tyred Rollers for quality compaction. (2021, 9 8). Retrieved from Constro Facilitator: https://www.constrofacilitator.com/pneumatic-tyred-rollers-for-quality-compaction/

Shirazi, H. (2017, 9 25). *PRIME COAT AND TACK COAT AND THEIR PURPOSE IN ROAD CONSTRUCTION.* Retrieved from linkedin: https://www.linkedin.com/pulse/prime-coat-tack-purpose-road-construction-hasan-shirazi-pe-bsc-ceng

Stankevich, N. (2005). Why Road Maintenance is Important and How to Get it Done. *Transport Notes Series; No. TRN 4*.

Suryakanta. (2016, 2 18). *3 BASIC TYPES OF CONCRETE PAVEMENT*. Retrieved from civil blog: https://civilblog.org/2016/02/18/3-basic-types-of-concrete-pavement/

Sutherland, S. (2010). Why All Roads Lead To Concrete: Paving for economy and the environment.

Vermeulen, J. (2017, 9 6). *What are your responsibilities as a site supervisor?* Retrieved from SAMS: https://www.samsltd.co.uk/responsibilities-site-supervisor/

LIST OF APPENDICES

PREMIX QUANTITY CALCULATION

volume of premix = L x W x T

= 260m x 3.2m x 0.05m

= 41.60m^3

Density of premix as 2330kg/m^3

Therefore, Quantity of ~~dst~~ premix =
volume of road section x density

41.60 m^3 x 2330kg/m^3 = 96928

96928 ÷ 1000 = 96.93tons

SK JUARA ENTERPRISE SDN. BHD.
No. 32, Jalan Bestari,
Pusat Bandar Fasa II,
34200 Parit Buntar,
Perak.
Tel: 05-717 5726
019-5770440
744369-A