



**DEPARTMENT OF BUILDING**  
**UNIVERSITI TEKNOLOGI MARA**  
**(PERAK)**

**UPGRADING OF ROAD SAFETY INFRASTRUCTURE (DIVIDER)**

**Prepared by:**

**NUR LIELY SYAFIQAH BINTI KHAIRUDDIN**

**2017207052**

**DEPARTMENT OF BUILDING  
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING  
UNIVERSITI TEKNOLOGI MARA  
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**It is recommended that this practical training report provided  
by**

**NUR LIELY SYAFIQAH BINTI KHAIRUDDIN  
2017207052**

**entitled**

**UPGRADING OF ROAD SAFETY INFRASTRUCTURE (DIVIDER)**

be accepted in partial fulfillment of the requirements for obtaining the Diploma in Building.

Report Supervisor	:	<u>En. Zulkifli Bin Ab Halim</u>
Practical Training Coordinator	:	<u>En. Muhammad Naim Bin Mahyuddin</u>
Programme Coordinator	:	<u>Dr. Dzulkarnaen Bin Ismail.</u>

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## ABSTRACT

Malaysia has earned equitable international reputation for having extensive and good road infrastructure as a result of economic development and industrialization needs. The road network must be provided with adequate facilities and provide comfortable good riding quality for the road users. Therefore, a good road construction will provide high quality and safe road for users. This report discusses about the construction of the road divider at Jalan Raya Persekutuan FT008 KM33 Jalan Machang Kelantan. The objectives of this report are to determine the type of road divider and the factors of choosing the type of road dividers. Next, this report will also explain the method and procedure of upgrading the road safety infrastructure mainly divider. In addition, to determine problems occurred and the solutions taken to solve during the construction. Furthermore, to complete this report, observations and interviews were conducted with people involved in the construction process. This report will also provide some specification in practical information about road divider and the construction machines required.



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## CHAPTER 1.0

### INTRODUCTION

Every country in the world is in dire need of roads as it plays an important role in connecting one area with another and it is also a catalyst for the local economy. Besides, roads are also commonly used for travel and do other specialized functions. Meanwhile, road construction is the act or result of putting different things together to form a long, hard surface built for vehicles to travel along. In Malaysia, road construction has begun since before independence. Before, 1957 there has been a road system linking Johor Bahru in the south with Kangar in the north and Kota Bharu in the east coast, connecting main cities between the other cities . (JKR,2010) The number of roads and the intensity of traffic has increased dramatically over the past 30 years . (Ch. Hendriks,2001) Additionally, construction of road is on the rise because there are more vehicles and people traveling and doing their daily activities. Roads in Malaysia classified into two broad categories which are federal roads and state roads. Therefore, the Public Work Department (PWD) was established in Malaysia to construct and maintain existing roads to a better and more satisfactory level. In addition, it is also to provide needed utilities and transportation during emergencies to the consumers. (JKR,2008)

There are several types of roads that are used in Malaysia accordance with the conditions of the land such as earth roads, gravel roads, bitumen paved roads, concrete roads and paved block pavement roads. For the earth road it uses natural soil. Next, rock road is a layer of gravel that is exposed to the compacted soil forming a better and stronger surface than the pavement. While bitumen paved roads are used to carry higher traffic than dirt roads or gravel roads. Concrete road (concrete pavement) has a structure similar to bitumen paved road but the surface layer uses reinforced concrete. However, paving block pavement roads are not widely used. The road construction plays a vital role in the utilization of road and constructed for different use as the route increasingly takes an important role in society. (F.G. Bell,2004) Nevertheless, the road safety infrastructure is the important element in road management. The road safety

infrastructure management refers to a set of procedures that support a road authority in decision making related to the improvement of safety on a road network. (Luca Persia,2016)

In improving the road safety infrastructure, Public Work Department(PWD) should be responsible for ensuring that all road safety infrastructure is in good condition. If the road safety infrastructure is damaged or can cause accidents, it must be repaired or upgraded to produce satisfactory results for road users. In Malaysia, bitumen paved roads and black top roads is the popular. Thus, bitumen roads have been constructed and are in use now across the world. (Prithvi Singh,2006) The paved road pavement material consists of aggregates, fasteners (bitumen) and fillers. Malaysia is one of the countries that use bitumen paved roads as it is strong and suitable for traffic in Malaysia compared to earth road. When it mixed and laid properly, a durable and long lasting structure are produced. (Dr Robert,2000)

Additionally, to improve the safety, the road needs to be equipped with a road safety infrastructure such as the road divider. Road divider is a separator of road for vehicle moving from opposite direction in order to avoid any collision with traffics of lanes separated by divider. It is very much essential in the busiest zone of city. (Mimi das saikia,2010) There are a few types of road divider such as Guardrail Median, New Jersey Barrier(NJB), Median Curb and Wire Rope. Most popular road safety infrastructure of divider use in Malaysia is Median curb. Median curb is a protective concrete barrier used as a highway divider and means of preventing access to a prohibited area. (A. Loeb,2008) However, road failure can occur due to various factors such as traffic, environment, materials and construction factors (Noor Hafiz,1992) Corresponding with this, transportation lies at the core of society as it links people together. Now people routinely use vehicles on roads for transportation to their destinations. (Daniel Sperling,2003) This may cause and increase the road failure factor. So that all road failures need to be resolved immediately to prevent incidents to the road users and to provide comfort to the road users.

The emphasis on road safety infrastructure is important for everyone to facilitate daily activities. As road construction practice change over time, it is imperative for PWD to

ensure that all relevant matters go smoothly and in accordance with the prescribed terms from time to time.

Moreover, the new specifications are not only aimed at keeping abreast with current technologies but also to help in improving the quality of constructed product. (JKR,2008) Road construction provides a wide variety of road services including traffic and safety systems. But this report focuses only on specifications, operations, problems and solutions related to the construction of upgrading road safety infrastructure. The aim of this report to study the construction of the road divider at Jalan Persekutuan FT008 KM33,Jalan Kota Bharu-Kuala Krai, Machang Kelantan.



## **1.1 Scope of Study**

The study was located at Jalan Raya Persekutuan FT008 KM33, Jalan Kota Bharu, Kuala Krai, Machang Kelantan. The research will be focus on the road divider construction. There are lots of information included in this report such as the factor of choosing type of road divider, the method and procedure of upgrading the road safety infrastructure (Divider), problems occurred and the solutions taken to solve during the construction. This report is mainly to understand the construction of road divider work and the specification that need to be followed in order to achieve the standard of upgrading the infrastructure according to the type and the condition of the road. However, this study does not include the detail cost about the project because the data related to it are confidential.

## **1.2 Objectives**

The objectives of this study are:

- 1) To discover the type of road divider and the factors of choosing type of road divider at Jalan Raya Persekutuan FT008 KM33, Jalan Kota Bharu, Kuala Krai, Machang Kelantan.
- 2) To study the method and procedure of upgrading the road safety infrastructure (Divider).
- 3) To identify problems occurred and the solutions taken to solve during the road construction.

### **1.3 Research Methods**

The site visit is on a task of title road divider construction. This research method consists of observation, interview and document analysis.

#### **a) Observation**

This report will discuss and overview about all the data collected from the site visit which is including the factors of choosing type of road divider, the process of road divider construction, the problem usually occurring at the place and also the solution of the problems. The observation was conducted on Sunday 15 Sept. It is located at Jalan Persekutuan FT008, KM 33 Jalan Kota Bharu-Kuala Krai, Machang Kelantan. The data to be collected during the observation of the construction are collected in the form of written notes, capture a pictures and also recording a short video of certain main process in the road divider construction.

#### **b) Interviews**

In this site visit, the interview was used two kind of methods such as semi-structured and unstructured interviews. Semi-structured interviews mean questions are prepared before the interview. The question was already prepared before the site visits was conducted. While the unstructured interviews mean questions are questioned during the site visit or during the works. The questions are answered by the contractor in charge and the supervisor that responsible for the project. Other than that, questions also addressed to the labor at the site about the road divider construction. The interview is conducted in Malay language. After the interview, the site visit followed by surround the area of the site and take a look for the road divider construction process. During the interview, the video was recorded

from the beginning to end of the site visit. Other than that, the pictures of the site also were captured.

c) **Document reviews**

Data collected are also obtained from the responsible party. The documents collected were bill quantities of the road divider construction, drawing plan of the construction safety infrastructure, and others documents that are related. However, not all of the document can be referred as reference because some of it was confidential.

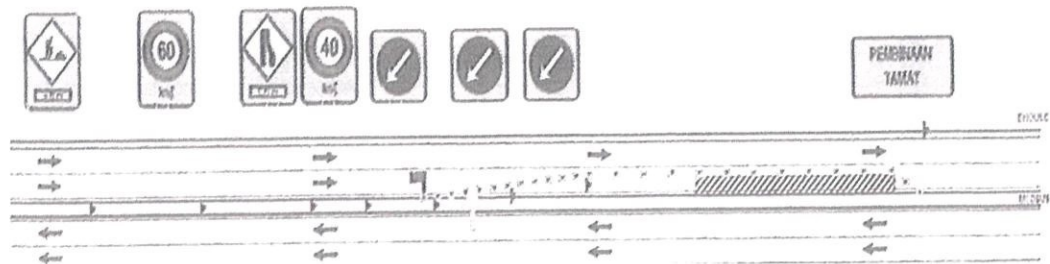


Figure 1.1: The construction of safety infrastructure plan.

## CHAPTER 2.0

### COMPANY BACKGROUND

#### 2.1 Introduction of Company

At the beginning of the Public Work Department (PWD) Kelantan was divided into three areas namely PWD North Kelantan, PWD Kelantan Tengah and PWD West Kelantan. Each area is governed by an Executive Engineer. PWD Machang is managed by PWD Kelantan Tengah under Executive Engineer, P.C Sakaran. From 1963, PWD Machang was formed and administered by the Colonial Engineer. Its office building is located on Jalan Bahagia, in Machang city. The old offices that have being built in 1963 have been upgraded into new buildings presently occupied. PWD Machang was set up to provide state-of-the-art infrastructure and facilities. Part of this Department's work related to drainage and drainage work was set aside for the establishment of the Department of Irrigation and Drainage (DID) now known as the Department of Irrigation and Drainage (DID) in 1956. The objectives are to submit the project in a good quality, time and costs that have being approved and provided facilities (roads and buildings) for the government to safely and comfortably use.

The achievement of the country's aspiration in providing the best service to the people, PWD Machang expressed it through the vision and mission of the department. The vision state that PWD Machang will be a world-class service provider and center of excellence in asset management, project management and engineering services for the country's infrastructure development through creative and innovative human capital and the latest technology. The mission of PWD Machang is to contribute to the development of the country through assisting clients in delivering policy and service outcomes through the cooperation of strategic partners, standardization of processes and systems for consistent delivery of results, provide effective and innovative asset and project



management also strengthen existing engineering competencies. Furthermore, PWD Machang also will develop human capital and preserve the environment in service delivery.

## **2.2 Company Profile**

### **1. Engineer**

Nazamira Bin Razali is the Engineer at PWD Machang. He has many duties such as, responsible for all policies relating to the administration of the PWD Machang. Engineer also serves as the highest hierarchy of occupation at PWD Machang.

### **2. Building Department**

The building department is led by building engineer Tengku Munirah Binti Tuan Mahmood and assisted by electricity, quantity surveyor, architecture, and others. The function of the building department is to plan, organize, supervise PWD road and bridge projects, Kelantan. Next, to ensures management and preparation of construction projects government buildings such as offices and residential houses governments are prepared according to schedule, specifications and requirements contract.

### **3. Road Department**

The road department is led by road engineer Norhafiza Binti Halim. The main function of road department is planning, organizing, monitoring and supervising projects and road works and bridges of PWD Machang, Kelantan. Administer and manage the procurement of supplies, services, and work of PWD Tanah Merah, Kelantan.

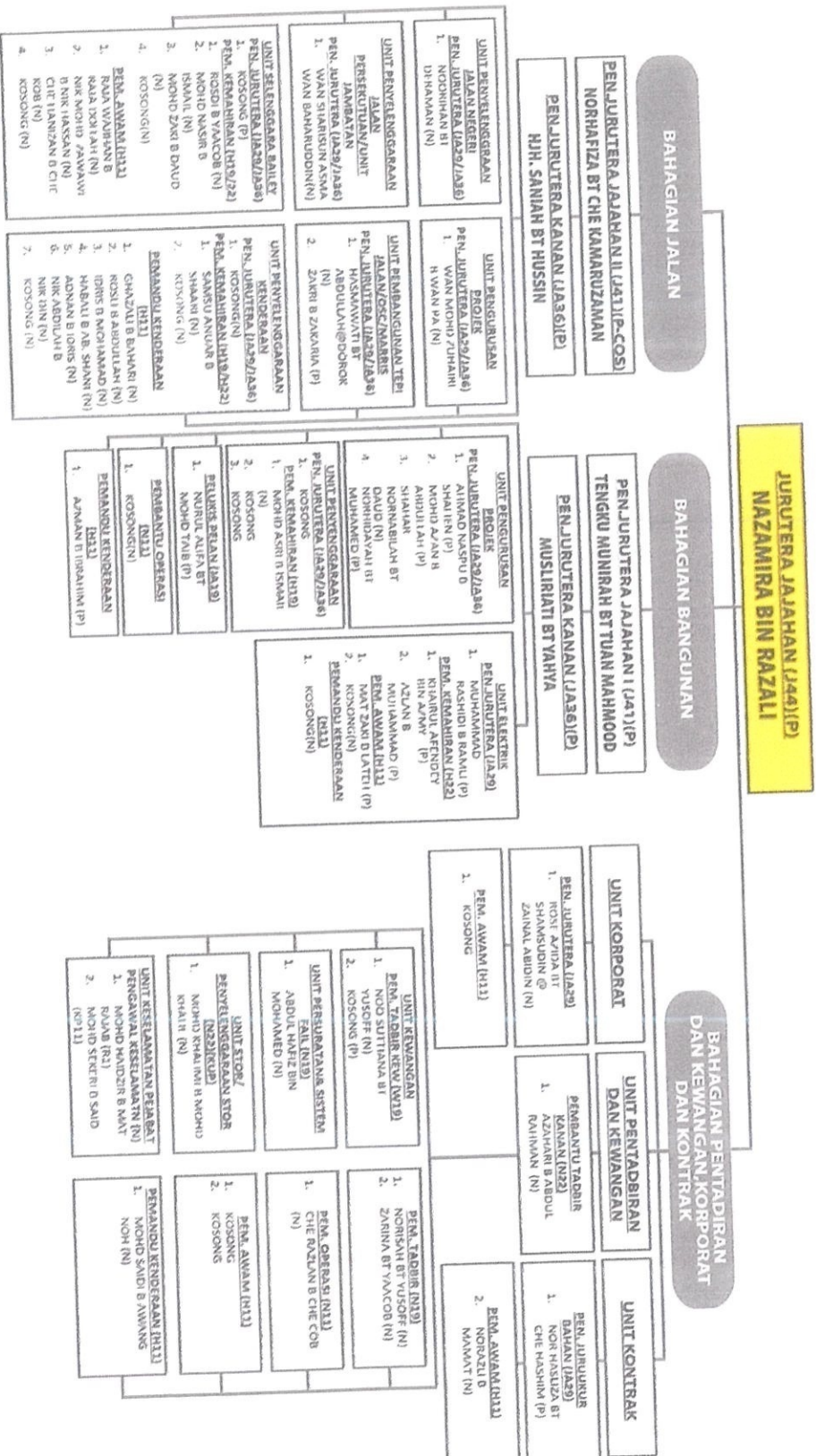
### **4. Electric Department**

Among the scope of the electrical unit tasks are to operate and maintain electricity services at state and federal government premises.

Perform maintenance works on street lights, traffic lights, schools, federal buildings. To carry out electrical work in conjunction with the government premises or buildings to operate in a safe manner.



## 2.3 Organization Chart



## 2.4 List of Projects

### 2.4.1 Completed Projects

PWD Machang has been monitoring several government projects of road safety infrastructure as shown in the table below:

Projects	Quotation cost	Date	Contractor
Kerja-kerja Menggantikan Komponen Perabut FT008 Jalan Kota Bharu – Kuala Krai	RM 17,132.49	31/10/2017	Bintang Idaman Enterprise
Kerja-kerja Menggantikan Komponen Perabut FT004 Jalan Machang – Pasir Puteh	RM7,861.29	8/11/2017	Amir Enterprise
Membina Dan Menyiapkan Jajaran 10KM Lebuhraya Rakyat Dari Machang Ke Kuala Krai	RM417,100.00	20/11/2017	Keys Resources
Projek Baiki Laluan Berbahaya FT004 Jalan Tanah Merah-Pasir Puteh	RM270,609.52	7/5/2018	Al Hakim Maju Enterprise
Kerja Pembinaan Infrastruktur keselamatan Jalan FT008 Jalan Kota Bharu-Kuala Krai Machang Kelantan	RM336,670,00	31/7/2019	Mohd Supian Bin Saud

Table 2.1: Completed projects

#### 2.4.2 Projects in Progress

PWD Machang has been monitoring several government projects of building construction and maintenance as shown in the table below:

Projects	Quotation cost	Date	Contractor
Kerja-Kerja Penyelenggaraan Kuarters Di JKR – Machang Kelantan	1,301,000.00	7/8/2018	Husain Enterprise
Kerja-Kerja Penyiasatan Tanah Dan Ujian Makmal Bagi Projek Klinik Kelantan	100,000.00	20/9/2018	TQ Construction
Kerja-Kerja Penyiasatan Tanah Projek Klinik Kesihatan Jenis 7 Dan Ujian Makmal Bagi 7 Joh, Machang	115,007..50	15/7/2019	FRG Resources
Kerja-Kerja Penyiasatan Tanah Dan Ujian Makmal Bagi Projek Klinik Kesihatan Jenis 7 Tekilla, Machang	RM67,857.00	15/9/2019	Salam Wibawa Construction
Kerja-Kerja Penyediaan Infrestruktur Telekomunikasi TM di Kompleks Perpaduan Daerah Machang	RM29,487.30	06/07/2019	Telekom Malaysia Berhad

Table 2.2: Projects in Progress

## CHAPTER 3

### ROAD CONSTRUCTION AT JALAN RAYA PERSEKUTUAN FT008 KM33, JALAN KOTA BHARU, KUALA KRAI, MACHANG KELANTAN

#### 3.1 Introduction Case Study

This is a case study that incorporates the objectives of road construction, introductions and technical observations made including learning outcomes organized from case studies. The tasks involved in road construction mainly focus on the installation and operation process and the site visit was organized on September 15, 2019 (Sunday) by Wan Sarisun who is in charge of the project. This project has been selected among the construction projects under developer Mohd Supian bin Saud Enterprise which is located at Jalan Raya Persekutuan FT008 KM33, Jalan Kota Bharu, Kuala Krai, Machang Kelantan. Furthermore, this project is to upgrade the road safety infrastructure along the federal route FT008 which is located opposite the Sekolah Kebangsaan Tok Bok. This upgrading is to construct a new road divider for road renovation work that has many problems such as accidents, uneven roads and holes. The construction of this project is to reduce the risk of harm to road users and nearby villagers. The total cost for this road construction is Rm 336,670,00. The time period of this project is about 10 weeks. This construction project uses the suitable machine especially road construction machine for easy handling to give a better result.

In this case study the focus will be on the road construction to upgrading the road safety infrastructure as it is suitable topic due to process of construction is not very difficult and complex. As the figure 3.1 shows the red circle is the location of the road construction project.





Figure 3.1: Location of road construction

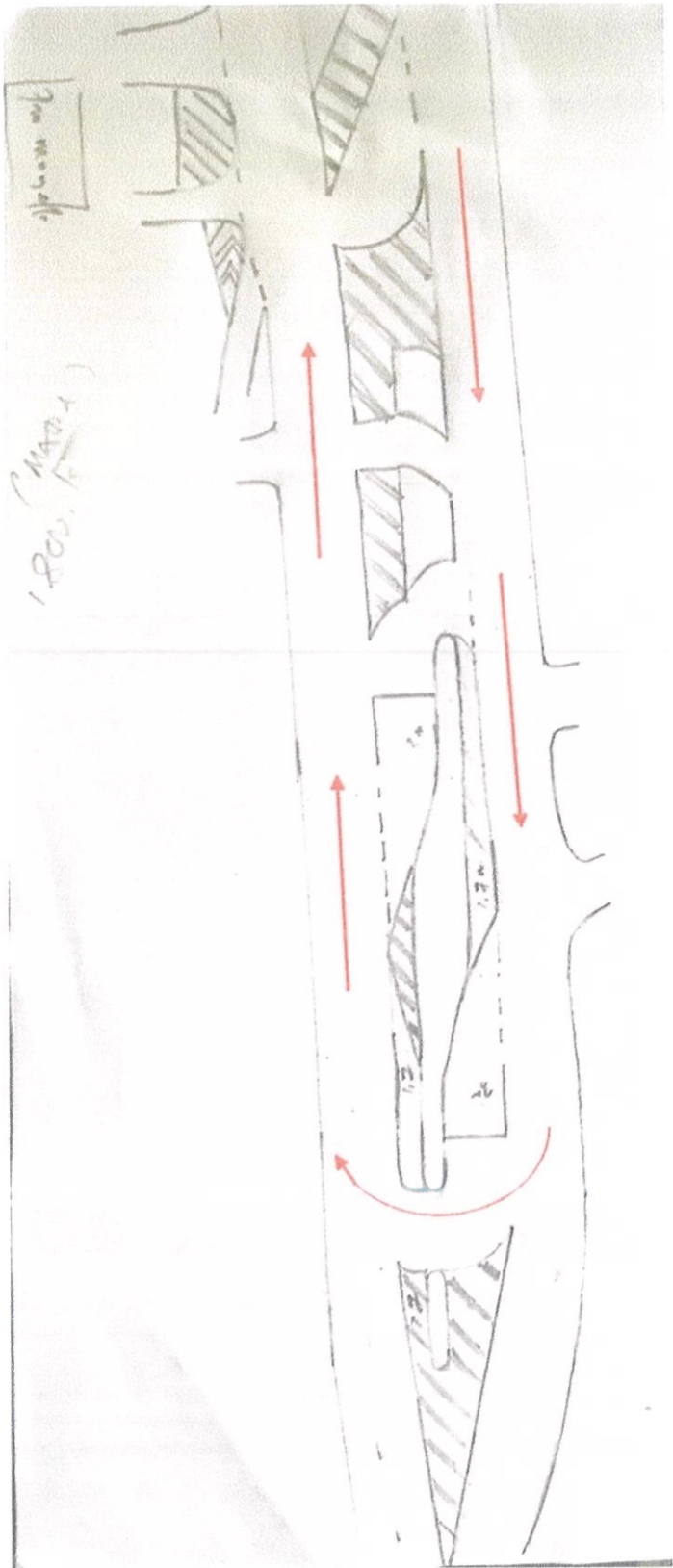


Figure 3.2: The construction plan



**3.1.1 Parties involved in the road construction at Jalan Raya Persekutuan FT008  
KM33, Jalan Kota Bharu, Kuala Krai, Machang Kelantan**

Table 3.1: List of parties involved

<b>Owner</b>	Mohd Supian Bin Saud Enterprise	Lot 362,Kg Sat Hilir 17500,Tanah Merah Kelantan
<b>Project manager</b>	JKR Machang	Jabatan Kerja Raya Daerah Machang,18500 Machang Kelantan
<b>Civil engineering</b>	WN Electrical	Lot 7608, Jalan Melawi- Semerak,Tok Bali,16700 Pasir Puteh,Kelantan
<b>Quantity surveyor</b>	Nor Hasliza Binti Che Hashim	Jabatan Kerja Raya Daerah Machang,18500 Machang Kelantan
<b>Contractor</b>	Mohd Supian Bin Saud Enterprise	Lot 362,Kg Sat Hilir 17500,Tanah Merah Kelantan

### 3.2 Types of Road dividers.

Road divider is a very common road safety feature and it is a horizontal structural component with width surfaces parallel. Concrete curb is used in divider construction due to various properties and advantages it has over other materials. Moreover, concrete curb placed between the lanes of a highway to divide the traffic moving in opposite directions on the same road. Additionally, it is also placed to enhance safety in the event of an emergency for student and parents of Sekolah Kebangsaan Tok Bok on the road and offer protection in cases where a vehicle loses control and breach the street limits at high speed. The road divider construction may take about 12 weeks from the beginning until the end of the construction which is painting a road line. However, there are four types of road divider. Each type has a specific characteristic and function on the road. Furthermore, there are four factor of choosing median curb as road divider in front of the school in this project.

Type of road divider: -

- I) Guardrail Median
- II) New Jersey Barrier(NJB)
- III) Median Curb
- IV) Wire Rope

### 3.2.1 Type of road divider

#### I) Guardrail Median

One type of guardrail that is defined by its function is a median barrier. These are designed to prevent a vehicle from crossing into oncoming traffic and striking another vehicle head-on. Furthermore, these kinds of guardrails also were placed outside of public places such as industrial and commercial buildings. In addition, guardrail median is made of galvanized guardrails that are constructed from high-strength 12-gauge (Class A) and 10-gauge (Class B) galvanized steel for effective impact absorption. The most common highway guardrail is the galvanized W-Beam, which are longitudinal highway barriers designed to reduce the severity of run-off-road (ROR) collisions.



Figure 3.3: Example of Guardrail Median

## II) New Jersey Barrier (NJB)

A Jersey barrier, or Jersey wall, is a modular concrete or plastic barrier employed to separate lanes of traffic. It is designed to minimize vehicle damage in cases of incidental contact while still preventing vehicle crossovers resulting in a likely head-on collision. Jersey barriers are also used to reroute traffic and protect pedestrians and workers during highway construction, as well as temporary and semi-permanent protections between lanes of a highway. Over time, they grew taller (as their effectiveness was demonstrated) and became more modular (as their usefulness as temporary barriers became apparent). Taller barriers have the added advantage of blocking most oncoming headlights. Now, plastic water-filled barriers of the same general shape are commonly called Jersey barriers, as well.



Figure 3.4: New Jersey Barrier



### III) Median Curb

Median Curb is the edge where a raised sidewalk or road central reservation meets a street or other roadway. Curbs may fulfill any or several of a number of functions such as delineating the edge of the pavement, it is to separate the road from the roadside and discourage drivers from parking or driving on sidewalks and lawns. It is also provides structural support to the pavement edge. Curbs can be used to channel runoff water from rain or melted snow and ice into drains. It is also an aesthetic aspect, in that curbs look formal and "finished". Since curbs add to the cost of a road, it are generally limited to urban and suburban areas, and are rarely found in rural areas except where certain drainage conditions (such as mountains or culverts) make them necessary. Curbs are not universally used, however, even in urban settings (see living street).



Figure 3.5: Median Curb

#### IV) Wire Rope

A cable barrier, sometimes referred to wire rope safety barrier is a type of roadside or median safety traffic barrier. It consists of steel wire ropes mounted on strong posts. As is the case with any roadside barrier, its primary purpose is to prevent a vehicle from leaving the traveled way. Also similar to most roadside barriers, cable barriers function by capturing and redirecting the errant vehicle. There are two types of cable barrier systems in use today, low-tension and high-tension. Each system has its advantages and disadvantages, but in general, a high-tension system has a higher initial cost with lower long-term maintenance costs. Low tension simply means the cables themselves are tensed only enough to eliminate sag between posts. High-tension cable consists of three or four pre-stretched cables supported by weak posts. When a vehicle impacts the high-tension system under normal conditions, the cable deflects as little as 2.4 meters from its original location.



Figure 3.6: Wire Rope





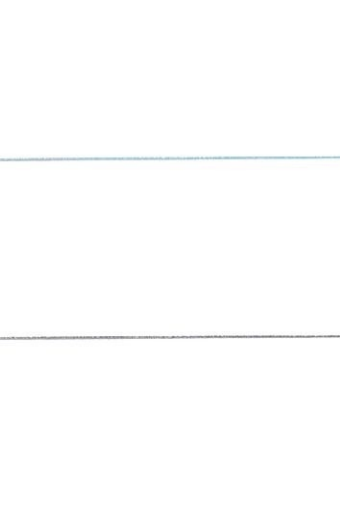

**3.2.2 Factors for choosing Median curb as Road divider for Project at Jalan Raya Persekutuan FT008 KM33, Jalan Kota Bharu, Kuala Krai, Machang Kelantan.**

**Table 3.2: Factors for Choosing Median Curb**



<b>Factor</b>	<b>Description</b>
Long term durability	<ul style="list-style-type: none"> <li>• Median curb made of concrete is more durable than other road divider as wire rope and steel divider. The durability of this concrete divider may last more than 10 years.</li> </ul>
Structural design	<ul style="list-style-type: none"> <li>• As it is known, that choosing this type of road divider is not on the power of contractor, it has been reviewed and calculated by engineer. Engineer is experts need to know the condition of the road so that they can determine the type of road divider to be used. Moreover, it is does not have an adverse effect on the road. The engineer has decided to use median curb concrete divider in this project.</li> </ul>
Construction process	<ul style="list-style-type: none"> <li>• The construction process of the road divider is not so difficult. It is easier than other road divider as in this project it.</li> <li>• just use a simple construction process.</li> </ul>

<b>Factor</b>	<b>Description</b>
The weather resistance	<ul style="list-style-type: none"> <li data-bbox="778 472 1434 817">• The concrete divider is more weather resistance than other road divider as it is made up from concrete that did not easily rust such as wire rope and steel divider. This give an advantage to the concrete divider more than other divider. That is because Malaysia is subjected to humid equatorial weather.</li> </ul>



NO	OPERATION	SEQUENTIAL DIAGRAM	MACHINERY & PLANT	LABOUR	EQUIPMENT	PERIOD
1.	Measure, mark the length and the width of the divider base on the bill of quantities. The length is 653m and the width is 5m	 <p>Figure 3.7: Red mark on the road</p>		-2 unskilled labor	-measuring tape -red paint spray -pen -book	1 Day
2.	Mixing the cement with ratio 1:1:2 to build a good and strong concrete divider along the road. The concrete divider was produce on site to form fresh and quality mix concrete. The construction of the divider is using the special machine.	 <p>Figure 3.8: The construction process of concrete divider</p>	-cement lorry -cement mixer machine	- 1 skilled labor - 3 unskilled labor	-rope -cement shovel -boots -glove	4 Days
NO	OPERATION	SEQUENTIAL DIAGRAM 25	MACHINERIES & PLANT	LABOR	EQUIPMENT	PERIOD



3.	<p>During the construction of the divider, the spilled cement is collected and cleaned. Other workers will make sure the rope is in a straight line during the construction to prevent the divider being crooked.</p>	 <p>Figure 3.9: The process of cleaning the spilled cement</p>	-lorry	- 4 unskilled labor	-cement shovel -basket -hoe	3 Days	
No	OPERATION	 <p>Figure 3.10: The workers cleaning the spilled cement on the road</p>	SEQUENTIAL DIAGRAM	MACHINERIES & PLANT	LABOR	EQUIPMENT	PERIOD







4.	<p>After the construction of the divider has finished, sand is added into the divider and compacted to fill the empty space. The level of the sand from the bottom are 1/3 to the surface of the divider. Ratio 1.3:1 consist of sand, aggregate and sand.</p>	 <p>Figure 3.11: The divider</p>  <p>Figure 3.12: The process of filling the sand into the divider</p>	-lorry	-5 unskilled labor	-hoe -cement shovel -sand flattening tool	-5 Days
NO	OPERATION	SEQUENTIAL DIAGRAM	MACHINERIS & PLANT	LABOR	EQUIPMENT	PERIOD



<p>5.</p> <p>Coarse aggregate and fine aggregate are mixed together and filled into the mid space in the divider. The aggregate is the second layer after the sand.</p>	 <p>Figure 3.13: Aggregate filled into the divider</p>	<p>-backhoe</p>	<p>-1 skilled labor -5 unskilled labor</p>	<p>-hoe -cement shovel</p>	<p>-5 Days</p>
<p>6.</p> <p>Laying concrete into the divider for the last layer after sand and the aggregate. After that, the process of flattening the cement on the divider to form a smooth and flat surface of the divider. Measure the thickness of the cement with that corresponding to bill of quantities.</p>	 <p>Figure 3.14: Process of pouring a concrete</p>	<p>-mixing cement lorry</p>	<p>-2 skilled labor -5 unskilled labor</p>	<p>-cement shovel -hoe -long flat wood -rode -square Load -measuring tape</p>	<p>-7 Days</p>

NO	OPERATION	SEQUENTIAL DIGRAM	MACHINERIES & PLANT	LABOR	EQUIPMENT	PERIOD
		 <p data-bbox="970 633 1002 1193">Figure 3.15: Process of flattening the concrete</p>				
		 <p data-bbox="539 633 571 1193">Figure 3.16: Measure the thickness of cement</p>				




7.	<p>After the cement has set and dry, the surface of the divider will be painted by using white emulsion paint for the first coat.</p>  <p>Figure 3.17: the first layer of paint</p>		-5 unskilled labor	<ul style="list-style-type: none"> <li>-white emulsion paint</li> <li>-brush</li> <li>-red paint</li> <li>-basket</li> </ul>	4 Days
8.	<p>After the white paint has dried continue drawing a line beside the concrete divider to form a square shape that will be painted with black and white paint intermittently. After that, the whole surface of the divider will be painted with red paint as the second coat.</p>  <p>Figure 3.18: Workers draw and paint the side of divider</p>		-4 unskilled labor	<ul style="list-style-type: none"> <li>-pencil</li> <li>-measuring tape</li> <li>-red, white and black paint</li> <li>-brush</li> </ul>	5Days

	 <p>Figure 3.19: Red surface of divider</p>				
<p>9. Put up the signage on the road divider at the right place. Example of the signage installed are a warning sign and other signage that are suitable to be used for the road user.</p>	 <p>Figure 3.20: The installation of signage</p>	<p>-Equipment lorry</p>	<p>-3 unskilled labor</p>	<p>-Signage -Tools</p>	<p>1 Days</p>



<p>10.</p> <p>Next, drill a hole to screw the flexible plastic bollards into the road. The installation of flexible plastic bollards is to improve the traffic safety in locations where hazards exist. There were 40 plastic bollards installed.</p>	 <p>Figure 3.21: Installation of plastic bollards</p>		<p>-3 unskilled labor</p>	<p>-Plastic bollards -Drill -screw</p>	<p>-3 Days</p>
<p>11.</p> <p>Installation of stud light reflector lighting by using a hand drill to drill a hole. A hammer to hammer the nut into the stud light reflector lighting to fix into the road. There are about 200 stud light reflector lighting need to be install along the road divider.</p>	 <p>Figure 3.22: Process of drilling a hole</p>		<p>-3 unskilled labor</p>	<p>-stud light reflector lighting -hammer -nuts -hand drill -Cone</p>	<p>-4 Days</p>



	 <p>Figure 3.23: installation of road stud</p>				
<p>12. After install all the road accessory, the next step is paint the road line on the road by using suitable paint to create a good and long lasting paint.</p>	 <p>Figure 3.24: Stud light reflector lighting</p>	<p>-Equipment lorry</p>	<p>-2 unskilled labor</p>	<p>-brush -paint -rope -paint machine</p>	
 <p>Figure 3.25: Draw a road line</p>					

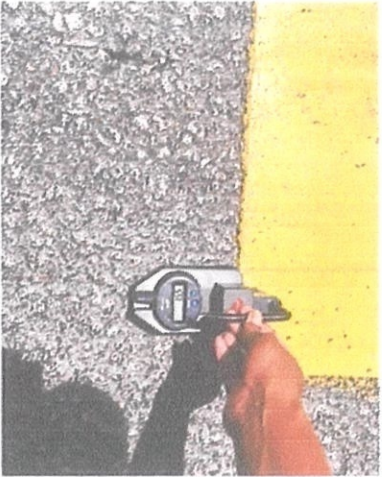

<p>13.</p> <p>Lastly, make a test on the thickness of the roadline.. The thickness of the yellow roadline is 7.55mm</p>	 <p>Figure 3.26: Testing the thickness of the road line</p>		<p>-1unskilled labour</p>	<p>-Road line test machine</p>	
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Table 3.3:Method Statement of upgrading road safety infrastructure

**3.4 To determine problems occurred and the solutions taken to solve during the road construction.**

**Table 3.4: Problem and the solution**

<b>PROBLEM</b>	<b>SOLUTION</b>
<p>The contractor found the existing structure at site.</p> <ul style="list-style-type: none"> <li>• Old concrete block</li> </ul>  <p>Figure3.27:Demolish work</p>	<ul style="list-style-type: none"> <li>• The contractor gives the instruction to demolish existing structure by excavation work.</li> </ul>
<p>Congested road causing slow traffic</p>	<ul style="list-style-type: none"> <li>• The road is busy during the construction and traffic slowed down. Temporary roads are provided to facilitate traffic</li> </ul>
<p>Noisy (machineries and plant)</p> <ul style="list-style-type: none"> <li>• Cement lorry and sand lorry</li> <li>• Backhoe</li> </ul>	<ul style="list-style-type: none"> <li>• Control incoming and outgoing flows of the lorries to avoid interference with students at Sekolah Kebangsaan Tok Bok,</li> </ul>

PROBLEM	SOLUTION
<p>Weather (rainy)</p> <ul style="list-style-type: none"> <li>• construction work need to stop when its raining for safety reasons.</li> <li>• construction work not effective when it rains .</li> </ul>	<ul style="list-style-type: none"> <li>• Wait until the rain stop to continue the construction work.</li> <li>• Wait until the rain stop to prevent an accidents happening during construction.</li> </ul>

## CHAPTER 4.0

### CONCLUSION

#### 4.1 Conclusion

The 20 weeks spent time in PWD Machang (JKR) has been a unique experience and it was an eye opener to how real world tasks are deal with and the exposure to both on –field and office work was a welcoming practice. From the discovery on site,the investigation located at Jalan Persekutuan FT008 KM33 Jalan Kota Bharu-Kuala Krai,Machang Kelantan. The investigation was to determine the type of road divider and the factors of choosing type of road divider that suitable to suit the road conditions at Jalan Persekutuan FT008 KM 33 Jalan Kota Bharu-Kuala Krai,Machang Kelantan. The median curb was the type of road divider that used in this project as it was suitable to use according to the condition of the place at Jalan Persekutuan FT008 that located infront of the Sekolah Kebangsaan Tok Bok.

The investigation also to identify the method and procedure of upgrading the road safety infrastructure (Divider). This method was very similar with other type of road divider. But in this process, median curb was using asphalt and masonry blocks. However, most often the divider is made of Portland cement concrete. While in this project of median curb the method more focus on using the asphalt and the masonry blocks.

Finally, the investigation also to determine problems occurred and the solutions taken to solve during the construction. There are a few problems occurred during the construction. One of the problem found existing structure on site, congested road, noisy and weather. But all this problem has been cleverly resolved by the respondent to avoid any ongoing problems. So that the construction project will be finish on time.



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