PERPUSTAKAAN UMP
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SITE INVESTIGATION ON SG. BELAT BRIDGE AND ROAD APPROACHING KM1 FEDERAL ROAD FR012 JALAN GAMBANG-MUADZAM SHAH, PAHANG

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A thesis submitted in partial fulfillment of the
requirements for the award of the degree of
Bachelor of Civil Engineering

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15 JUNE 2012

ABSTRACT

Road accident is one of an attractive issue to be focused seriously. The reason is because road accident is the main cause of the death in Malaysia. According to statistic from the Malaysia Road Safety Council the death toll were 5672 in 2007, 5952 in 2008, 6218 in 2009 and 6260 in 2010 and 6350 peoples in 2011. The total death of the past 5 years is 30 342 peoples. The number of accident still very high in Malaysia despite various intervention programmed is handle by the authority in reducing the number of accident. The purpose of this case study are to find out the visibility defect from point of view of geometric design that contributes to the accidents occurrences and to propose an innovative road design and infrastructure solution to improve the safety standard for road design. This study was carried out by site investigation to detect all the road and infrastructures deficiencies alaong the study location. The location of this study is on KM 1, Federal Road FR012 Jalan Gambang- Muadzam Shah, in Pahang. The result of this study indicates that the road design and infrastructures deficiencies are one of the major factors that can bring hazard to road users and contributes road accidents.

ABSTRAK

Kemalangna jalan raya adalah satu isu yang menarik untuk di ketengahkan. Penyebab utamanya adalah kerana ia merupakan punca utama kematian di Malaysia. Mengikut statistic dari Kesatuan Keselamatan Jalan Raya, kadar kematian adalah 5672 pada 2007, 5952 pada 2008, 6218 pada 2009 dan 6260 pada 2010 and 6350 orang pada 2011. Jumlah kematian pada lima tahun lepas ialah 30 342 orang. Jumlah kemalangan masih tinggi di Malaysia walaupin pelbagai program telah dijalankan oleh pihak berkusa dalam mengurangkan kadar kemalangan. Tujuan kajian ini dijalankan untuk mengenalpasti kecacatan yang kelihatan dari segi rekaan geometri jalan yang boleh membawa kepada kemalangan jalan raya dan untuk mencadangakan innovasi dalam penyelesaian rekaan jalan dan infrastruktur untuk meningkatkan standard keselamatan. Kajian ini dijalankan dengan penyiasatan tapak untuk mengenalpasti semua kekurangan jalan raya dan infrastruktur di sepanjang kawasan kajian. Kawasan kajian terletak di Jambatan Sg. Belat dan jalan berhampiran KM 1 Jalan Persekutuan FR012 Jalan Gambang-Muadzam Shah, Pahang. Hasil kajian mendapati yang kelemahan rekaan jalan raya dan infrastuktur merupakan factor major yang boleh membawa bahaya kepada pengguna jalan raya sekaligus membawa kepada kemalangan jalan raya.

FIGURE NO	TITLE	PAGE

CHAPTER 1

INTRODUCTION

1.1 Introduction

Traffic accidents in Malaysia have been increasing at the average rate of 9.7% per annum over the last three decades (see Figure 1). Compared to the earlier days, total number of road accidents had increased from 24,581 cases in 1974 to 328,264 cases in 2005, reaching more than 135% increase of accident cases over 30 years. The number of fatalities (death within 30 days after accident) also increased but at slower rate compared to total road accident from 2,303 in 1974 to 6,200 in 2005. However the upward trend of fatalities dropped in 1997 after Malaysia Government established a 5- year national road safety target to reduce road accident deaths by 30% by the year 2000. The increase of road accidents is in link with the rapid growth in population, economic in development, industrialization and motorization encountered by the country. . Since 1970's, Malaysia had experienced a remarkable growth in these sectors. In facts, there is an increase in Malaysian population from 10.4 million in 1974 to 26.1 million in 2005 at an average growth rate of about 2.1% per year2.

Furthermore, the total length of road had also increased from 11,161 km in 1974 to 71,814 km in 2005 to accommodate an increase in numbers of vehicles in Malaysia. This also led to an increase of ownership from 9.6 persons per vehicle in

1974 to 1.7 persons per vehicle in 2005. The total numbers of registered vehicles also increased from 1,090,279 to 15,026,660 vehicles in 2005. (Refer **Table 1.1**)

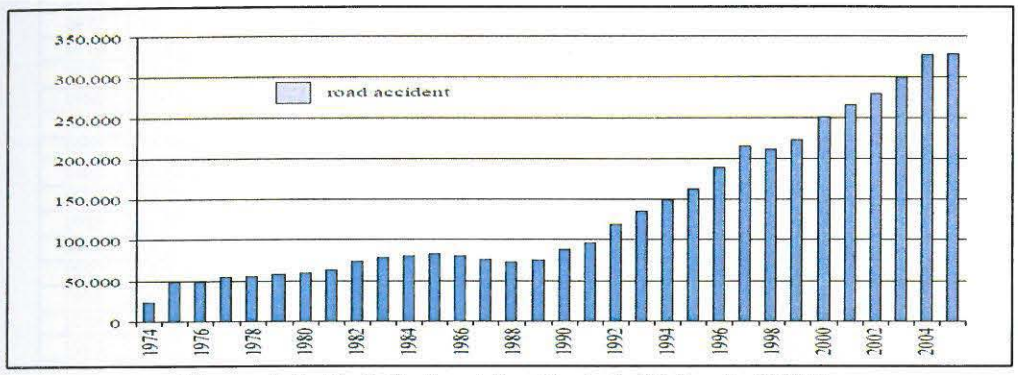

Figure 1.1: Statistic Road Accidents in Malaysia (2005)

Despite an increased in traffic accident and road fatalities, there is a drop in death rate (value of death per 10,000 registered vehicles). By further comparing the death rate over the last five (5) years, it shows that the death rate value has dropped from 5.17 in 2001 to 4.13 in 2005. Similarly during the same period, accident death rate per 100,000 peoples has also dropped from 24.35 in 2001 to 23.73 in 2005.

Table 1.1: General Road Accident Data in Malaysia (1982-2005)

Year	Population	Vehicles Registered	Vehicles Involved	Road Length (km)	Road Accidents	Road Casualties	Road Deaths	Vehicle Ownership
1974	10,434,592	1,090,279	39,056	11,161	24,581	13,332*	2,303	9.6
1975	10,438,137	1,267,119	75,653	12,043	48,233	19,440	2,317	8.2
1976	10,472,544	1,429,845	80,995	12,340	48,291	19,327	2,405	7.3
1977	10,716,642	1,621,271	86,688	12,637	54,222	20,305	2,512	6.6
1978	10,944,500	1,829,958	91,122	13,399	56,021	21,659	2,561	6.0
1979	11,188,630	1,989,391	94,788	13,772	57,931	22,611	2,607	5.6
1980	11,442,086	2,357,386	99,485	14,446	59,084	22,404	2,568	4.9
1981	14,128,354	2,901,182	107,552	31,568	63,192	22,303	2,769	4.9
1982	14,506,589	3,246,790	126,474	36,238	74,096	22,820	3,266	4.5
1983	14,886,759	3,594,943	139,006	40,664	79,150	26,557	3,550	4.1
1984	15,437,683	3,941,036	140,042	42,254	80,526	25,552	3,637	3.9
1985	15,866,592	4,243,142	142,653	43,994	82,059	24,824	3,603	3.7
1986	16,278,001	3,523,674	137,175	44,700	79,804	23,257	3,522	4.6
1987	16,527,973	3,674,482	131,609	44,239	76,882	21,467	3,320	4.5
1988	16,521,300	3,865,711	124,922	44,428	73,250	22,538	3,335	4.3
1989	17,376,800	4,155,197	127,279	44,592	75,626	30,037	3,773	4.2
1990	17,812,000	4,547,417	146,747	50,835	87,999	29,805	4,048	3.9
1991	18,178,100	4,942,040	161,823	55,367	96,513	30,107	4,331	3.7
1992	18,606,000	5,259,836	185,805	59,796	118,554	36,262	4,557	3.5
1993	19,050,000	5,656,037	220,939	59,796	135,995	41,686	4,666	3.4
1994	19,494,000	6,166,432	251,686	60,734	148,801	48,503	5,159	3.2
1995	20,096,700	6,802,375	275,430	62,221	162,491	52,152	5,712	3.0
1996	21,169,000	7,686,684	325,915	64,511	189,109	53,475	6,304	2.8
1997	21,665,600	8,550,469	373,526	66,108	215,632	56,574	6,302	2.5
1998	22,179,500	9,141,357	366,932	66,741	211,037	55,704	5,740	2.4
1999	22,711,900	9,929,951	390,674	67,069	223,166	52,937	5,794	2.3
2000	23,263,600	10,598,804	441,386	68,770	250,429	50,200	6,035	2.2
2001	23,795,300	11,302,545	483,351	74,217	265,175	50,473	5,849	2.1
2002	24,526,500	12,068,144	507,995	74,641	279,711	49,552	5,891	2.0
2003	25,048,300	12,819,248	555,634	79,667	298,653	52,741	6,286	2.0
2004**	25,580,000	13,828,889	-	71,814	326,815	54,091	6,228	1.8
2005**	26,130,000	15,026,660	-	71,814	328,264	47,012	6,200	1.7

Source: Royal Malaysian Police 2005.

1.2 Current National Government Policy for Road Safety

Currently Malaysian's strategies to reduce disabilities from injuries and accident are accident reduction and prevention; and injury reduction. Accident reduction and prevention involves the application of "Three Es": education, engineering and enforcement whereas injury reduction involves the application of appropriate safety policies, vehicle and road engineering approaches, and medical and trauma management. Government has provided nationwide road safety targets by 2010 as follows:

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1. 10 deaths per 100,000 population
2. 2 deaths per 10,000 registered vehicles
3. 10 deaths per billion vehicle kilometers travelled

Furthermore, under Ministry of Transportation of Malaysia, a 'Road Safety Plan 2006-2010'have been drafted and agreed by the Government to provide guidelines and initiatives for road safety in Malaysia by providing 9 road safety strategies.

1.3 National Road Safety Indicators

In order to reduce road and traffic accident in Malaysia, the government has taken some safety road indicator to overcome this problem in national level. Seven orders of National road safety indicators are:

1. Road users
    i. Motorcycle Daytime Head Lights Campaign
    (Radin Umar Radin Suhadi. (1998) *Critical Review of Road Safety in Malaysia.* Volume 7, No 1, the Proceeding of the Chartered Institute of Transportation in the UK). It was launched nationwide on July1992 to study the impact of running daytime headlight for motorcyclist to improve the conspicuity of motorcycles. September1992, regulation of compulsory use of headlight was imposed on all motorcyclists. Radin revealed that running daytime headlight reduced conspicuity related motorcycle accident by 29%.

ii. Road Safety Education in Schools

Under Initiative Programmes 2004/2005 (*National Road Safety Council, National Road Safety Council Report 2004/2005, 45th Annual General Meeting, Kota Kinabalu, Sabah. Disember 2005*) by Road Safety Council, Ministry of Transport, pilot study on Road Safety Education has undergone in 2005 in Pasir Mas, Kelantan. The purpose of this study is to increase awareness of road safety for school children (mainly in primary school 1, 2 and 3) by providing road safety curriculum (in Malay and English language). Because of positive reaction received, the program may be extended to all primary school of 1, 2 and 3 in 2006.

iii. Usage of Helmet, Seat Belt, Child Restraints

Usage of helmet and seatbelts (front and back) is mandatory in Malaysian Law while the usage for child seatbelt is currently is not a mandatory. Usage of helmet for every motorcycle users (rider & pillion) is a mandatory and provided as a regulation in Road Traffic Act 1987. Whereas for usage of frontal seatbelt written in the same act. Violation of the seat belt law is a compoundable offence with a maximum confine of RM300 (1US$= RM3.80). One study done by Road Safety Research Centre, University Putra Malaysia (*Kulanthayan S., Raha A.R., Law T.H. And Radin Umar R.S. Seat Belt Use Among Car Users In Malaysia. Road Safety Research Centre, University Putra Malaysia. 2003*) shows that the seating position, driving location, education level, enforcement activity, attitude to speeding and night-time driving are the contributing factors that influence the compliance behavior to seat belt use in Malaysia. When the compulsory helmet law was earlier enforced, 30% reduction in motorcycle fatalities was reported Supramaniam (Supramaniam, V, Belle, V, and Sung, J. (1984) Fatal Motorcycle Accidents and Helmet Laws in Peninsular Malaysia, Accident Analysis and Prevention, Vol. 16, No. 3.

2. Road

The Road Planning Division represents Ministry of Works (MOW) on the Executive Board of the Road Safety Council. This division is responsible for construction and maintenance of roads and associated facilities, such as motorcycle lanes, pedestrian crossings, and others, through its three main agencies are Highway Planning Unit, Malaysia Highway Authority, and Public Works Department as list below :

i. Highway Planning Unit.
MOW's Highway Planning Unit assists in identifying the country's black spot locations. This information is then used by PWD to carry out black spot treatment.

ii. Malaysia Highway Authority.
The Malaysia Highway Authority is an agency under MOW that deals only with toll road highways. Its main contribution is monitoring highway safety.

iii. Public Works Department.
PWD, which is also under MOW, is represented on the Executive Board by its Unit of Road Design (Road Safety). PWD carries out black spot treatment and road safety audits in the country.

3. Planning/design of roads (especially Federal Road) is under provision of Ministry of Works, Malaysia. A numbers of road safety programs were initiated under the MOW to include road safety audit program, motorcycle lane program, hazardous locations improvement and road safety program and low cost countermeasure.

4. Road safety program was initiated by Public Works Department involving auditing works on unsafe road safety elements and then try to improve and elevate the safety by removing the elements as earliest as road planning stage. During earlier stage, priority of road safety program only to Federal Road. In review of the increase of road accident on other type of road (namely State road and Municipal Road) in 2004, Cabinet Committee on Road Safety has agreed that scope of road safety program should be widened to all road types.

5. Motorcycle lane program was earlier initiated by Highway Planning Unit because of close to 57% of road accident involved motorcycle. In review of the current accident condition, then in 2000, the Government has agreed to construct 15 motorcycle lanes in Peninsular Malaysia. Until now, this program still undergoing and being monitored and implemented by PWD.

6. Hazardous locations improvement implemented to raised the safety of Malaysian road especially Federal Roads. The remedial measured was carried out by PWD and in the year of 2010 expenditure to MYR15 was spent to treat 30 black spot areas.

7. Low cost countermeasure was introduced because of the need of urgency in improving localized accident location especially during festive season whereby during these times, a drastic increase of road accident have occurred. Engineering approaches taken are as follows:

    i. Accident prevention (pro-active action)
    ii. Accident reduction (re-active action)
    iii. Road maintenance

1.4 Problem Statement

Road design and defects are often partially or primarily responsible for a large majority of road accidents. It is a fact that improved roadway design, the elimination of road defects and proper road maintenance can have a huge and positive impact in reducing road accidents. Many roads fail to live up to the standards of predictability, consistent signage, proper hazard warnings and numerous injuries and fatalities occur as a result.

1.5 Goal and Objectives of the Study

Goal of the research is to propose an innovative road design and infrastructure solutions to improve the safety standard for road design. Objectives of this research are to investigate the visibility defect from point of view of geometric design that influence to an accident occurrences and to identify road infrastructures deficiencies that contribute to road accident.

1.6 Scope of Study

A proper planning should be made to ensure that the goal and objectives of the study were achieved. Thus the study by focusing on a study location at Sg.Belat Bridge and road approaching at Km1 Federal Road FR012 Jalan Gambang-Muadzam Shah, Pahang and analyzing the study location will be made. All relevant information will be collected. Scope of the study is divided into three levels which are early studies, detailed study and recommendations.

1.6.1 Early Study

This stage involves the process of data collection and information related to road accidents. This is to facilitate the identification of causes of road and traffic accidents occur frequently. Collections of statistical information are obtained from the records of the Royal Malaysian Police (PDRM), Public Work Department (PWD). In addition information also obtained from newspapers, books, internet articles and journals.

1.6.2 Detailed Study

This stage involves the process of identifying the causes of accidents in the area of study. The study is focused on visibility defect from point of view of geometric design of area of study.

1.6.3 Recommendations

At this stage, a number of recommendations were suggested based on the outcome of the study conducted to improve the road design and safety reduce the accident rate at the study location.

1.7 Significant of the study

Results of studies obtained are important to know the actual causes of road and traffic accident in the location of the study. In addition, the results also can be use by the government such Royal Malaysian Police (PDRM), Public Work Department (PWD) and Road Transportation Department (JPJ) to improve the safety of road design so that it is safe to use. Other than that, the result of this research also can be use by some parties to commit safety programs to provide an education regarding to road safety to road users.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, road accident problems will be discussed more detail. Three major factors that related with highway and transportation engineering are road accident, road geometry design and road infrastructures. The main issue to be addressed in this chapter is visibility defect and infrastructures deficiencies of road along the bridge that can contribute to road accident. Besides that, factors, categories and types of road accident also will be discussed in this chapter. All information and data are obtained from previous researcher who had made the research studies about road and traffic accident.

In road geometry design, some aspects that contribute to features safety of road design will be focused. This is to measure the elements of road geometry that can contribute to road accident such horizontal alignment, vertical alignment and cross section alignment. Furthermore, elements of road infrastructure deficiencies that can contribute to road accident also will be discussed in this chapter. The elements to be studied are lighting, traffic signals and road marking and delineation.

2.2 Road and Traffic Accidents

A road accident or traffic accident occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole. Traffic collisions may result in injury, death and property damage.

Malaysia is reputed to possess one of the best road systems in the world. But unfortunately, it is also believed that it also has one of the highest rates of accidents. China, followed very closely by India, holds the top 2 positions for accidents. Malaysia, with a population of only some 25 – 30 million people, including Sabah and Sarawak, has a "death" rate, which averages 7,500 people per year. Surprisingly, the United States of America, with a population of some 50 million, is reported to have only a death rate only 300 per year.

2.2.1 Factors of Road and Traffic Accident

A number of factors contribute to the risk of collision including vehicle factors, environmental factors and human factors. Worldwide motor vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved.

There is consensus forming among the general public due in part to emphatic reinforcement of the accident statistics by traffic authorities that the human element is the key causal factor of road accidents occurrence. Drivers and other road users basically determine their movements on the road due to a sense of obligation to adapt their behavior to existing traffic regulations and rules, to road surfaces, to traffic and weather conditions in accordance with their driving skills and health status.