



**UNIVERSITI PUTRA MALAYSIA**

**MOTORCYCLE CRASH PATTERNS ALONG  
EXCLUSIVE MOTORCYCLE LANES IN MALAYSIA**

**TUNG SOW HOONG**

**FK 2007 50**



**MOTORCYCLE CRASH PATTERNS ALONG  
EXCLUSIVE MOTORCYCLE LANES IN MALAYSIA**

**TUNG SOW HOONG**

**MASTER OF SCIENCE  
UNIVERSITI PUTRA MALAYSIA**

**2007**



**TUNG SOW HOONG**

**MASTER OF SCIENCE**

**2007**

**MOTORCYCLE CRASH PATTERNS ALONG EXCLUSIVE  
MOTORCYCLE LANES IN MALAYSIA**

**By**

**TUNG SOW HOONG**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfilment of the Requirement for the Degree of Master of Science**

**June 2007**



**This work is specially dedicated to**

*My beloved family, friends and teachers...*



Abstract of thesis presented to the Senate of Universiti Putra of Malaysia in  
fulfilment of the requirement for the degree of Master Science

**MOTORCYCLE CRASH PATTERNS ALONG EXCLUSIVE  
MOTORCYCLE LANES IN MALAYSIA**

By

**TUNG SOW HOONG**

**June 2007**

**Chairman: Associate Professor Wong Shaw Voon, PhD**

**Faculty: Engineering**

Motorcycle crashes are being notified as the main contributor to road fatality in our country. Motorcyclists, as the vulnerable road user, are not protected while traveling along the traffic. The exclusive motorcycle lanes have been introduced to tackle the problem by segregating the motorcycle from the main traffic. However, motorcycle accident are still occurring on the exclusive motorcycle lanes. In this study, motorcycle crashes occurred along the exclusive motorcycle lanes in Malaysia was investigated. This study has been focusing on crashes which are roadside object related. The motorcyclists are exposed to roadside hazards while travelling along the pathways. The study has been focused to determine possible risk factors causing fatalities in motorcycle crashes along exclusive motorcycle lanes, to identify the harmful roadside objects to motorcyclist along exclusive motorcycle lanes and to determine the multivariate relationships between the injury severity and other factors of motorcycle crashes along the exclusive motorcycle lanes. The study unveiled that the fatality risk factors for overall motorcycle crashes along exclusive motorcycle lanes in Malaysia are the road geometry of the crash location, the brightness



condition during the crash and finally, the roadside object involvement in the crashes. Fatality risk is found to be higher while colliding with roadside objects, at straight section on the lanes, and crashing during night-time. Furthermore, roadside object is approximately 2.0 times more likely to cause fatality in motorcycle crashes along the exclusive motorcycle lanes. Guardrail has recorded as the most being struck object which represented 20.6% of all roadside object related crashes and 23.5% of all fatal cases were guardrail related. However, narrow surface objects, (e.g. tree trunks, traffic sign posts, streetlighting poles) were determined 2.3 times more likely to cause severe injury compared to non-narrow surface objects (e.g. guardrails, tunnel walls). Therefore, guardrail should be provided to protect the motorcyclist from colliding narrow surface object as initial impact. The study further established that guardrail as one of the factors to cause fatality. Thus, a new guardrail design should be introduced to the exclusive motorcycle lane. Lateral offsets of the collided objects were found to be correlated to injury severity ( $p < 0.10$ ). From the overall roadside object related motorcycle crashes, 85% involved object planted at an offset distance 155 cm or less from the roadside. Furthermore, multivariate analysis has verified that a higher injury severity if motorcycle crashes involved narrow surface object occurred at location where the lane width is more than 300 cm and the narrow object is planted at the offset distance 151.3 cm or less from roadside. Another multivariate analysis performed on wide surface object crashes has shown that higher injury severity to motorcyclist if crashes involved guardrail, crashes during night-time, involved wide surface object that planted at offset distance 75 cm or less from roadside and it is a single motorcycle crash.

Therefore, the existing design criteria of roadside object needed to be reviewed and improved in order to achieve a safer exclusive motorcycle lane in Malaysia.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**BENTUK PELANGGARAN KEMALANGAN MOTOSIKAL YANG BERLAKU DI SEPANJANG LORONG MOTOSIKAL DI MALAYSIA**

Oleh

**TUNG SOW HOONG**

**Jun 2007**

**Pengerusi: Profesor Madya Wong Shaw Voon, PhD**

**Fakulti: Kejuruteraan**

Di dalam negara kita, kemalangan motosikal memang terkenal sebagai penyumbang utama dalam kadar kematian di atas jalanraya. Penunggang motosikal memang mudah dilukai kerana seolah-olah tidak dilindungi apa-apa pun semasa berada di atas jalanraya. Kaedah penggunaan lorong motosikal telah diperkenalkan untuk menangani masalah ini dengan mengasingkan para penunggang motosikal daripada laluan trafik utama. Walaupun begitu, kemalangan motosikal masih berlaku di atas lorong motosikal. Di dalam kajian ini, kemalangan motosikal yang berlaku di atas lorong motosikal di Malaysia telah disiasat. Kajian ini memberi perhatian ke atas kemalangan-kemalangan motosikal yang melibatkan objek di tepi jalan. Penunggang-penunggang motosikal adalah terdedah kepada bahaya atau risiko pelanggaran dengan objek di tepi jalan semasa bergerak di sepanjang lorong motosikal. Kajian ini dijalankan untuk mengenalpasti faktor-faktor kematian kemalangan motosikal yang berlaku di atas lorong motosikal, mengenalpasti objek-objek tepi jalan yang memudaratkan para penunggang di atas lorong motosikal dan menentukan hubungan multi-variasi di antara tahap kecederaan dengan faktor-faktor

yang terlibat dalam kemalangan motosikal yang berlaku di atas lorong motosikal. Secara keseluruhan, kajian ini telah membuktikan bahawa risiko kematian penunggang motosikal adalah bergantung kepada faktor-faktor seperti bentuk geometri jalan di mana kemalangan berlaku, keadaan cahaya semasa kemalangan dan penglibatan objek tepi jalan. Kecenderungan berlakunya kematian adalah bagi kemalangan motosikal melibatkan objek tepi jalan, di kawasan lurus sepanjang lorong motosikal dan dalam keadaan gelap. Kemalangan yang melibatkan objek di tepi jalan adalah 2.0 kali lebih cenderung menyebabkan kematian jika dibandingkan dengan kemalangan motosikal yang tidak melibatkan objek di tepi jalan. Oleh itu, satu panduan rekabentuk perkakas tepi jalan yang lebih selamat adalah diperlukan bagi menjamin keselamatan penggunaan lorong motosikal di Malaysia. Kajian ini mendapati bahawa, penghadang jalan merupakan objek yang mencatatkan jumlah kemalangan tertinggi (20.6%). Sementara itu, 23.5% daripada jumlah kemalangan maut merupakan kemalangan yang menglibatkan penghadang jalan. Walaupun begitu, objek-objek berpermukaan sempit (cth. pohon pokok, tiang besi isyarat jalan, tiang lampu jalan) didapati 2.3 kali lebih cenderung menyebabkan kecederaan parah (termasuk kematian) jika dibandingkan dengan jenis objek-objek berpermukaan luas (cth. penghadang jalan, dinding terowong). Oleh itu, penghadang jalan adalah sesuai disediakan untuk melindungi penunggang motosikal daripada melanggar objek-objek berpermukaan sempit yang berada di sepanjang tepi lorong motosikal. Walaupun begitu, penghadang jalan masih merupakan salah satu faktor utama menyebabkan kematian penunggang motosikal. Oleh itu, rekabentuk baru khas penghadang jalan adalah penting diperkenalkan ke dalam rekabentuk lorong motosikal di Malaysia. Offset sisi bagi objek-objek yang dilanggar didapati

berkorelasi dengan tahap kecederaan ( $p < 0.10$ ). Secara keseluruhan daripada kemalangan-kemalangan motosikal yang melibatkan objek tepi jalan, 85% daripada jumlah kes didapati melibatkan objek-objek yang diletakkan pada ofset 155 cm atau kurang dari tepi jalan. Analisa multivariansi menunjukkan bahawa kemalangan-kemalangan motosikal yang melibatkan objek-objek berpermukaan sempit adalah cenderung melibatkan kecederaan parah apabila berlaku di lokasi jalan yang berkelebaran 300 cm atau lebih dan objek-objek tersebut diletakkan pada ofset sejauh 152 cm daripada tepi lorong. Satu lagi analisa multivariansi telah menunjukkan tahap kecederaan adalah lebih tinggi bagi kemalangan-kemalangan motosikal yang melibatkan objek-objek berpermukaan luas dan melibatkan penghadang jalan, dalam keadaan kurang bercahaya, kemalangan motosikal tunggal dan objek-objek yang dilanggar diletakkan pada jarak ofset 75 cm atau kurang dari tepi lorong. Oleh itu, reka bentuk perkakas tepi jalan bagi lorong motosikal sekarang perlulah diimbas kembali dan diperbaharui bagi menjamin keselamatan lorong motosikal di Malaysia.

## ACKNOWLEDGEMENTS

My sincere gratitude goes to my supervisory committee chairman, Associate Professor Dr. Wong Shaw Voon, Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia (UPM), for his patient supports in guiding and providing constructive advices in completing my study. Besides that, I would like to express my appreciation for the chances given by him for me to attend valuable seminars, workshops, and conferences throughout the study.

Great thanks to my supervisory committee members; Professor Ir. Dr. Radin Umar Radin Sohadi and Mr. Law Teik Hua, Department of Civil Engineering, Faculty of Engineering, UPM and Dr. Abdul Ali Raja Mohamad, University Malaya Medical Centre, University Malaya (UM) for their valuable suggestions and advices contributed to the completion of my study.

This multidisciplinary study could not be accomplished without the financial support from Intensification of Research in Priority Area (IRPA) programme, provided by the Ministry of Science Technology and Innovation (MOSTI). Not to forget here to thank the Department of Traffic Police, Royal Malaysia Police and KESAS Highway Sdn. Bhd. in providing the accident data needed throughout this study; especially to En. Isa (PPUM), Sergeant Ahmad Shah (RMP), and Pn. Rozanna (KESAS Highway).



Special thanks to my colleagues and friends, who provided supports, assistance and encouragement to me along the study. I would like to show my appreciation to Ms. Lim Lay Sean for her morale support through out the study. Last but not least, my deepest thanks to my family members, especially my parents Tung Won Wah and Tong Mei Lin, for their continuous supports and understanding.



I certify that an Examination Committee met on **14<sup>th</sup> June 2007** to conduct the final examination of Tung Sow Hoong on his Master of Science thesis entitled “Motorcycle Crash Patterns Along Exclusive Motorcycle Lanes in Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree.

Members of the Examination Committee are as follows:

**Shahnor Basri, PhD**

Professor  
Faculty of Engineering  
Universiti Putra Malaysia  
(Chairman)

**Hussain Hamid, PhD**

Lecturer  
Faculty of Engineering  
Universiti Putra Malaysia  
(Internal Examiner)

**Mohd. Sapuan Salit, PhD**

Associate Professor  
Faculty of Engineering  
Universiti Putra Malaysia  
(Internal Examiner)

**Ahmad Kamal Ariffin Mohd. Ihsan, PhD**

Associate Professor  
Faculty of Engineering  
Universiti Kebangsaan Malaysia  
(External Examiner)

---

**HASANAH MOHD. GHAZALI, PhD**

Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date : 27 September 2007



This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Wong Shaw Voon, PhD**

Associate Professor  
Faculty of Engineering  
Universiti Putra Malaysia  
(Chairman)

**Radin Umar Radin Sohadi, PhD**

Professor  
Faculty of Engineering  
Universiti Putra Malaysia  
(Member)

**Law Teik Hua, M.Sc**

Lecturer  
Faculty of Engineering  
Universiti Putra Malaysia  
(Member)

**Abdul Ali Raja Mohamad**

Lecturer  
Trauma and Emergency  
University Malaya Medical Centre  
Universiti Malaya  
(Member)

---

**AINI IDERIS, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date : 15 November 2007



## **DECLARATION**

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

**TUNG SOW HOONG**

Date : 20 August 2007





## TABLE OF CONTENTS

<b>DEDICATION</b>	<b>Page</b>
<b>ABSTRACT</b>	ii
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGMENTS</b>	vi
<b>APPROVAL SHEET</b>	ix
<b>DECLARATION FORM</b>	xi
<b>LIST OF TABLES</b>	xiii
<b>LIST OF FIGURES</b>	

### CHAPTER

1	<b>INTRODUCTION</b>	1
	1.1 Introduction	1
	1.2 Problem Statements	3
	1.3 The Needs of the Study	5
	1.4 Objectives of the Study	6
	1.5 Research Hypotheses	7
2	<b>LITERATURE REVIEW</b>	8
	2.1 Motorcycle Crashes	8
	2.2 The Segregation of the Vulnerable Road Users	11
	2.3 Exclusive Motorcycle Lanes	13
	2.4 Existing Design Guide	14
	2.5 Roadside Hazards	17
	2.6 Injury Severity Due to Roadside Hazards	20
	2.7 Clear Zones and Lateral Offsets	23
	2.8 Other Risk Factors in Object Crashes	27
	2.8.1 The Rigidity and the Shape of the Object	28
	2.8.2 Geometric Characteristics of the Roadway	29
	2.9 Recommendations of Roadside Safety Improvement	32
	2.10 Statistical Analysis Method	33
	2.11 Chi – Square Test of Independence	33
	2.12 Odds Ratio Analysis	34
	2.13 Binary Logistic Regression Modeling	34
	2.14 Summary of the Chapter	35



3	<b>METHODOLOGY</b>	36
	3.1 Overall Methodology	36
	3.2 Selection of Exclusive Motorcycle Lanes	40
	3.2.1 Exclusive Motorcycle Lane along F0002	41
	3.2.2 Exclusive Motorcycle Lane along Shah Alam Expressway	45
	3.3 Criteria In Data Selection	48
	3.4 Data Sets	50
	3.5 Injury Classification	48
	3.6 Data Collection Forms	51
	3.6.1 Crash Data Form	51
	3.6.2 Injury Data Form	52
	3.6.3 Casualty Interview Form	53
	3.6.4 Site Investigation Form	54
	3.7 Site Data Collection and Investigation	54
	3.8 Roadside Object Categorisation	57
	3.9 Data Compilations	57
	3.10 Statistical Analysis	58
	3.10.1 Univariate Analysis	58
	3.10.2 Multivariate Analysis	59
	3.10.3 The Needs of Univariate and Multivariate Analysis	62
	3.11 Resource Limitations	62
4	<b>RESULTS AND DISCUSSION I: MOTORCYCLE CRASHES ALONG EXCLUSIVE MOTORCYCLE LANES</b>	64
	4.1 Injury Severity of Motorcycle Crashes along Exclusive Motorcycle Lanes	64
	4.2 Crash Patterns of Motorcycle Crashes along Exclusive Motorcycle Lanes	65
	4.3 Crash Patterns as Risk Factors in Motorcycle Crashes along Exclusive Motorcycle Lanes	68
	4.4 Road Geometry as Risk Factors in Motorcycle Crashes along Exclusive Motorcycle Lanes	70
	4.5 Brightness Condition Risk Factors in Motorcycle Crashes along Exclusive Motorcycle Lanes	71
	4.6 Roadside Object Involvement in Motorcycle Crashes	73
	4.7 Multivariate Analysis	74
	4.7.1 Model I: Fatality Logistic Model	74



5	<b>RESULTS AND DISCUSSION II: ROADSIDE OBJECT RELATED MOTORCYCLE CRASHES ALONG EXCLUSIVE MOTORCYCLE LANES</b>	76
5.1	Injury Severity in Roadside Object Related Cases	76
5.2	Crash Type in Roadside Object Related Motorcycle Crashes	78
5.3	Road Geometry in Roadside Object Related Motorcycle Crashes	80
5.4	Brightness Condition while Motorcycle Crashes	81
5.5	Lane Width of the Location	83
5.6	Object Related in Motorcycle Crashes	84
5.7	Lateral Offset and Injury Severity	86
5.8	Comparison of Different Object Type	88
5.8.1	Narrow Surface Object vs. Wide Surface Object	89
5.8.2	Guardrails in the Motorcycle Crashes	90
5.8.3	Narrow Surface Object vs. Guardrail	91
5.8.4	Guardrail and Lateral Offset	92
5.8.5	Narrow Surface Object and Lateral Offset	93
5.9	Multivariate Analysis	95
5.9.1	Model II: Narrow Surface Object Logistic Model	95
5.9.2	Model III: Wide Surface Object Logistic Model	96
6	<b>CONCLUSIONS</b>	98
6.1	Conclusions	98
6.2	Recommendations	100
6.3	Limitation of the Study	101
	<b>REFERENCES</b>	102
	<b>APPENDICES</b>	109
	<b>BIODATA OF THE AUTHOR</b>	160



## LIST OF TABLES

<b>Table</b>		<b>Page</b>
2.1	Non – Intersection and Intersection Accident Rate (accident/10 <sup>4</sup> Vehicle KM) 1969, Denmark	12
2.2	Summary of information examining roadside furniture involved in motorcycle crashes	19
2.3	Motorcyclist collisions with fixed objects in Ontario	20
2.4	Type of Roadside Hazards Causing Car Occupant Fatalities in South Australia 1985 – 1996	23
2.5	1998 – 1993 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> Event Collision Involving Rock Faces on Existing Alignment	25
2.6	Relationship between Size of Clear Zone and Accident Reduction	26
3.1	The collected data from the respective sources	40
3.2	Basic features of exclusive motorcycle lane along Federal Highway F0002	41
3.3	The seven levels of Abbreviated Injury Scale (AIS)	51
3.4	Description of Variables Included in the Multivariate Analysis	60
4.1	Crash types in non – single motorcycle crashes along exclusive motorcycle lanes	66
4.2	Comparison of single motorcycle crashes and non- single motorcycle crashes in terms of injury severity	69
4.3	Road geometry and fatality in motorcycle crashes along exclusive motorcycle lane in Malaysia	71
4.4	Brightness condition and fatality in motorcycle crashes along exclusive motorcycle lanes in Malaysia	72
4.5	Roadside object involvement and injury severity of motorcycle crashes along the exclusive motorcycle lanes	74
4.6	Logistic Regression on Fatality Risk Resulting from Motorcycle Crashes along Exclusive Motorcycle Lanes in Malaysia	75
5.1	The distribution of injury severity for roadside object related and non – roadside object related motorcycle crashes along exclusive motorcycle lanes	77



5.2	The first collision type reported in motorcycle crashes along both exclusive motorcycle lanes	78
5.3	The crash types and the injury severity outcome in roadside object related motorcycle crashes along both exclusive motorcycle lanes	79
5.4	The road geometry and injury severity for roadside object related motorcycle crashes along the exclusive motorcycle lanes	81
5.5	The brightness condition and injury severity of roadside object related motorcycle crashes along the exclusive motorcycle lanes	82
5.6	The lane width and injury severity of roadside object related motorcycle crashes along the exclusive motorcycle lane	83
5.7	The involved object types and injury outcome	86
5.8	The lateral offsets of the object involved and the injury outcome	87
5.9	Comparison: Narrow Surface Object and Wide Surface Object	90
5.10	The Comparison of Guardrails and Non-Object Related Motorcycle Crashes along Exclusive Motorcycle Lanes	91
5.11	Comparison: Narrow Surface Object and Guardrail	92
5.12	Logistic Regression on Severe Injury Risk Resulting from Motorcycle Crashes with Narrow Surface Object along Exclusive Motorcycle Lanes in Malaysia	95
5.13	Logistic Regression on Severe Injury Risk Resulting from Motorcycle Crashes with Wide Surface Object along Exclusive Motorcycle Lanes in Malaysia	96



## LIST OF FIGURES

<b>Figure</b>		<b>Page</b>
1.1	The fatality rate per 10,000 registered vehicle in Malaysia from 1997 to 2001	1
2.1	The fatalities of motorcyclists comparing with other vehicle users from 1992 to 2002	8
2.2	Type of vehicle involved in motorcycle road accident in Malaysia in 2002	9
2.3	Restricted Cycle Track	16
2.4	Exclusive Cycle Track	16
2.5	Roadway Cross Section	24
2.6	The relationship between relative risk and lateral offsets of poles from road	26
2.7	Roadside 'Clear Zone' Requirements	27
3.1	Flow Chart on Data Collection	39
3.2	Photographs taken along exclusive motorcycle lane along F0002	43-44
3.3	Photographs taken at exclusive motorcycle lane along Shah Alam Expressway	46-47
3.4	Lane width capturing during the site visit	55
3.5	Lateral offsets capturing during the site visit	56
3.6	Lateral offset capturing for a guardrail related motorcycle crashes	56
4.1	Detailed comparison of single and non-single motorcycle crashes for crashes occurring along exclusive motorcycle lanes	66
4.2	Crash pattern and injury severity related in the motorcycle crashes along the exclusive motorcycle lanes	69



5.1	Types of roadside object related in motorcycle crashes along both exclusive motorcycle lanes	85
5.2	The cumulative percentage vs. lateral offset of the involved object in roadside object related motorcycle crashes along exclusive motorcycle lanes	87
5.3	The cumulative percentage vs. lateral offset of the guardrail in roadside object related motorcycle crashes along exclusive motorcycle lanes	93
5.4	The cumulative percentage vs. lateral offset of the involved object in narrow surface object related motorcycle crashes along exclusive motorcycle lanes	94

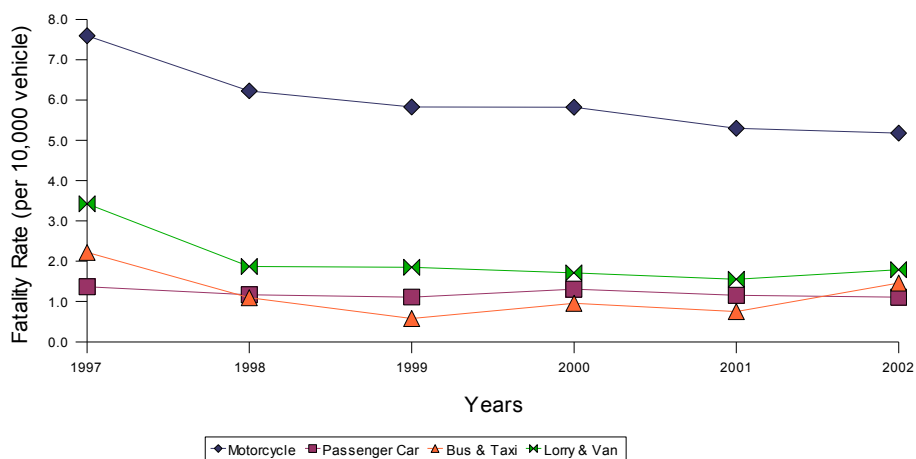


# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Motorcycles have been the most registered type of vehicle in Malaysia for the past 10 years. There are 5,842,617 registered motorcycles, which represents 48.5% of all registered vehicles in Malaysia in year 2002. This shows that the motorcycle is a very popular mode of transportation in Malaysia. Its popularity may be due to the affordable prices of the motorcycle. The popularity also resulted in the highest fatality rate among all modes of transport. From 1997 to 2002, motorcyclists had the highest fatality rate (per 10,000 vehicle) as shown in Figure 1.1 (PDRM, 2003). The high rate of motorcyclist fatalities seems to be a major concern in our country.



**Figure 1.1: The fatality rate per 10,000 registered vehicle in Malaysia from 1997 to 2002 (Source: Royal Malaysia Police (PDRM), 2003)**



Many measures have been carried out to reduce the number of fatalities every year. One of the most effective measures is the introduction of the exclusive motorcycle lane for motorcyclists. The exclusive motorcycle lane segregates the motorcycle traffic from the main traffic stream. The segregation reduces the high number of motorcycle crashes with other vehicles. A short-term reduction of 39% of motorcycle crashes was found after the introduction of the exclusive motorcycle lane along Federal Highway F0002 in Malaysia (Radin et. al, 1995). However, there are still motorcycle crashes occurring along exclusive motorcycle lanes. Fatality is due to multiple motorcycle crashes, single motorcycle crashes and even due to motorcycles colliding into objects at the roadside. Clear zones are a feature of modern highways that have great impact on roadside safety (M. H. Ray, 1998). Thus, allocating proper clear zones along the exclusive motorcycle lanes can reduce the collisions of the motorcycles with roadside objects planted along the exclusive motorcycle lane.

The existing exclusive motorcycle lanes in the country were designed according to a design guide, Arahan Teknik (Jalan) 10/86: A Guide to the Design of Cycle Track. However, some of the design parameters in the existing design guide are combinations of highway and cycle track design. These might not be suitable because of high volume of motorcycle traffic in our country. Unfortunately, the guide does not include any design for clear zones. Therefore, a better design guide is needed to produce safer exclusive motorcycle lanes for present and future usage of the motorcyclist.