UNIVERSITI PUTRA MALAYSIA

DETERMINATION OF IDEAL WIDTH FOR EXCLUSIVE MOTORCYCLE LANE ALONG THE STRAIGHT SECTION OF FEDERAL HIGHWAY, SELANGOR, MALAYSIA

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BY

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

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

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Supervisor: HUSSAIN B HAMID, PhD

Faculty: Engineering

In the design of roadway, factors such as lane width, lateral clearance, vertical and horizontal alignment affects the capacity and Level-Of-Service (LOS). Ideal lane width is the upper limit range of width in which optimum capacity is achieved. There are numerous studies and literature available on the design of bicycle facilities. However, there are limited literature and studies about design of motorcycle facilities.

The main issue pertaining to the provision of motorcycle facility is the width of its lane. If the width of the motorcycle lane is too wide, it may incur unnecessary construction costs and also leads to speeding problems. On the other hand, if the width of the lane is too narrow, the riding convenience and safety of motorcyclists may be affected particularly when overtaking is not possible. It is necessary to understand the basic sciences of motorcycles

traffic so that a more scientific and professional judgment can be made with regard to the design and operation of motorcycle facilities.

As such, this research aims to determine the effective factors affected by the motorcycle lane width, to establish relationship between these factors and finally determine the ideal width of motorcycle lane.

Study sites which met the research criteria were selected along the existing exclusive motorcycle lane along the Federal Highway, Selangor, Malaysia. To observe motorcyclists riding and passing another motorcyclist within the motorcycle lane, the segments under study are at least 100 m long and covered lane widths ranging from 1.8 m to 3.3 m.

Motorcycle flow was recorded using a digital video recorder and motorcycle count is obtained by transcribing the pre-recordings in the laboratory. Individual motorcycle spot speeds were measured using a laser speed detector. To observe motorcyclists riding comfort, transcription was done on the pre-recordings video in the laboratory where classification of comfortable or not comfortable used riding interruptions as a surrogate in the field.

Aggregated motorcycle flow, speed and comfort data collected at 16 different motorcycle lane widths were plotted. Quadratic regression analysis was employed for the motorcycle flow-width relationship, Analysis of Variance (ANOVA) test for the motorcycle speed-width relationship, and logistic regression analysis for comfortable width.

Results revealed that maximum motorcycle flow (mc/hr/m) occurs at 2.7 m wide lane, comfort is observed at 2.7 m lane or wider, and motorcycle speeds stabilized along 2.5 m lane or wider.

Hence, 2.7 m is an ideal lane width for motorcycle lanes which encompassed the optimum of motorcyclist riding comfort, speed and flow. The findings of this study not only contribute new knowledge to the field of transportation engineering but would also be useful input in the design guidelines of motorcycle lanes for highly motorcycled countries.

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

PENENTUAN LEBAR YANG UNGGUL UNTUK LORONG MOTOSIKAL EKSKLUSIF SEPANJANG SEKSYEN LEBUH RAYA PERSEKUTUON, SELANGOR, MALAYSIA

Oleh

MOHAMMAD RASOOL AHMAD RAJABI

Mei 2012

Pengerusi: Hussain B Hamid, PhD

Fakulti: Kejuruteraan

Dalam reka bentuk jalan, faktor-faktor seperti lebar lorong, kelegaan sisi, penjajaran mendatar dan tegak mempengaruhi muatan dan tahap perkhidmatan (LOS). Lebar lorong unggul ialah julat batas kelebaran di mana muatan optima dicapai. Terdapat banyak kajian dan penulisan yang boleh didapati tentang reka bentuk kemudahan-kemudahan basikal. Bagaimanapun, penulisan dan kajian-kajian tentang reka bentuk kemudahan-kemudahan motosikal adalah terhad.

Isu utama berkaitan dengan penyediaan kemudahan motosikal ialah kelebaran lorongnya. Jika kelebaran lorong motosikal adalah terlalu luas, ia boleh menyebabkan peningkatan kos pembinaan yang tidak perlu dan juga masalah-masalah operasi. Sebaliknya, jika kelebaran lorong terlalu sempit, keselesaan menunggang dan keselamatan penunggang motosikal boleh terjejas terutamanya jika penunggang tidak dapat memotong motosikal yang

lain. Adalah perlu untuk memahami sains asas kenderaan motosikal supaya keputusan yang lebih profesional dan saintifik dapat dibuat berhubung dengan reka bentuk dan operasi kemudahan-kemudahan motosikal.

Oleh itu, penyelidikan ini bertujuan untuk menentukan faktor-faktor berkesan yang mempengaruhi kelebaran lorong motosikal, mewujudkan hubungan antara faktor-faktor ini dan akhirnya menentukan kelebaran lorong motosikal unggul.

Tapak kajian yang memenuhi kriteria penyelidikan dipilih sepanjang lorong motosikal eksklusif di sepanjang Lebuhraya Persekutuan, Selangor, Malaysia. Untuk pemerhatian penunggang motosikal dan pemotongan penunggang motosikal yang lain di dalam ruang lorong motosikal, segmen-segmen di bawah kajian adalah sekurang-kurangnya 100 m panjang dan meliputi lebar lorong dari 1.8 m ke 3.3 m.

Aliran motosikal direkodkan menggunakan perakam video digital dan bilangan motosikal diperolehi dengan mentranskripsi pra-rakaman di makmal. Kelajuan setempat motosikal masing-masing diukur menggunakan pengesan kelajuan laser. Untuk pemerhatian keselesaan menunggang motosikal, transkripsi dilakukan dari pra-rakaman video di makmal itu di mana pengelasan selesa atau tidak selesa bagi penunggang motosikal menggunakan gangguan menunggang motosikal sebagai pemerhatian pengganti di tapak kajian.

Data aggregasi aliran motosikal, kelajuan dan keselesaan yang dikutip di 16 kelebaran lorong motosikal yang berbeza telah diplotkan. Analisis regresi kuadratik digunakan untuk hubungan kelebaran-aliran motosikal, analisis regresi fungsi bersyarat eksponen (ECFR) digunakan untuk hubungan kelebaran-kelajuan motosikal, dan analisis regresi logistik untuk kelebaran selesa.

Keputusan mendedahkan bahawa aliran motosikal maksimum (motosikal/jam/m) berlaku pada lorong selebar 2.7 m, keselesaan diperhatikan pada lorong selebar 2.7 m atau lebih, dan kelajuan motosikal stabil di sepanjang lorong selebar 2.5 lorong m atau lebih.

Oleh itu, nilai 2.7 m ialah lebar lorong unggul untuk lorong motosikal yang merangkumi keselesaan menunggang motosikal, kelajuan dan aliran motosikal yang optima. Penemuan-penemuan kajian ini bukan sahaja menyumbang ilmu baru bagi bidang kejuruteraan pengangkutan tetapi juga dapat menjadi maklumat berguna sebagai garis panduan reka bentuk lorong motosikal untuk negara-negara yang mempunyai bilangan motosikal yang tinggi.

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I certify that an Examination Committee has met on 23 May 2012 to conduct the final examination of Mohammad Rasool Ahmad Rajabi on his Master of Science thesis entitled "DETERMINATION OF IDEAL WIDTH FOR EXCLUSIVE MOTORCYCLE LANE ALONG THE STRAIGHT SECTION OF FEDERAL HIGHWAY, SELANGOR, MALAYSIA" in accordance with Unversiti Pertanian Malaysia (HIGHER Degree) Act 1980 and Universiti Pertanian Malaysia (High Degree) Regulation 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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

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Date:

DECLARATION

I declare that the thesis is my original work as per program given to me, except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or other institutions.

MOHAMMAD RASOOL AHMAD RAJABI

Date: 23 May 2012

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