EFFECTIVENESS OF VEHICLE ACTUATED SIGNALS FOR AT GRADE FOUR LEGGED INTERSECTIONS IN SRI LANKA: A COMPARISON STUDY AGAINST FIXED TIME TRAFFIC SIGNALS

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Degree of Master of Engineering

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DECLARATION OF THE CANDIDATE

'I declare that, this is my own work and this thesis/dissertation does not incorporate without acknowledgement of any material previously submitted for a Degree or Diploma in any University or other institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text'

Signature: ..... Date: / /2011

A.Kamalrajh

DECLARATION OF THE SUPERVISOR

'I have supervised and accepted this thesis for the submission of the degree'

Signature of the supervisor: ..... Date: / /2011

Prof. J.M.S.J. Bandara

This thesis is dedicated to my ever-loving family

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"Reading makes perfect", one of the main sources of my reference is the University library. In fact, I was attracted towards traffic signals zone due to a nice book found in the university library, which is the *Australian Road Research Board (ARR) Report No 123 'Traffic Signals: Capacity and Timing Analysis'* by R.Akcelik. I am dedicated to thank the Librarian and staff of library, University of Moratuwa for their extended cooperation and strategic organisation in exploring such a magnificent knowledge.

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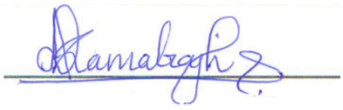
Finally, I would like to thank everyone who was important to the successful realisation of this thesis, as well as expressing my apology that I could not mention personally one by one.



A.Kamalrajh

ABSTRACT

The goal of traffic engineers in recent years is trying their best to get the most out of the systems that they develop. By designing efficient systems, using the advancement of electronics and Information Technology (IT) the overall costs of transportation should be easier to manage.

Road Development Authority under the Ministry of Ports and Highways administrates over fifty traffic signals in the Western Province of Sri Lanka. All these fixed-time traffic signals are primarily located at major routes of the city of Colombo and other townships linked with Colombo in the Western Province.

In Sri Lanka, it is anticipated that the prevailing fixed-time traffic signals would be replaced by modern Vehicle Actuated signals, which would be the next generation of traffic signals possibly be introduced in near future. This study has been carried out to evaluate the efficiency of vehicle-actuated signals against prevailing fixed-time traffic signals, prior to their implementation in Sri Lanka.

This study was carried out to compare the efficiency of Vehicle Actuated Signals against prevailing fixed-time traffic signals in an urban area. Several signalised intersections were carefully studied with their geometric and traffic turning movements especially in Colombo (the capital of Sri Lanka) region and a simulation was programmed in Microsoft Excel in such a way to represent traffic turning movements of typical intersection in urban area. Various traffic volume combinations were selected among North-South and East-West through traffic and other turning movements (Left-turns, Right-turns & Heavy vehicles) were randomised within their permissible limits (found from the analysis of existing junctions) to characterise a real dynamic situation at an urban intersection. Numerous calculations for Cycle time, Vehicle-delay, Pedestrian-delay and Critical movements of different traffic combinations were computed with the help of a well-known Australian Software called ***SIDRA*** **[S**ignalised (and unsignalised) **I**ntersection **D**esign and **R**esearch **A**id, developed by Akcelik & Associates Pty Ltd].

The outcomes of analysis were tabulated against each different traffic combinations produced by Excel simulation and were compared in graphical and tabular forms for the efficiency of *fully-Actuated Signals* against *fixed-time Signals*.

It is found that the replacement of fixed-time traffic signals with fully actuated signals for stand-alone intersections shall not produce any major enhancement (reduction in delay) to the existing at grade four-legged intersections, which have three standard-approach lanes including right turn-bays with optimum length and two standard-exit lanes.

Moreover, it is sensible that semi-actuated signals would be a better alternative for signalised intersections, where major roads (continuous high demand) meet with minor roads (very stochastic or very low traffic demand).

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List of Abbreviations or Acronyms

AG – Articulated Goods vehicles

AR – All red

CAR – Cars

CD – Compact disk

E-W – East West direction

GOSL – Government of Sri Lanka

HCM – Highway Capacity Manual

HG – Heavy Goods vehicles

HV – Heavy Vehicles

LBU – Large Buses

LGV – Light Goods vehicles

LOS – Level of Service

LT – Left turn traffic

LV – Light Vehicles

MBU – Medium Buses

MCL – Motor Cycles

MG – Medium Goods vehicle

N-S – North South direction

pdf – Portable document format

Ped – Pedestrians

Pers – Persons

PFF - Peak Flow Factor

RA – Red_Amber

RT – Right turn traffic

SIDRA – **S**ignalised (and unsignalised) **I**ntersection **D**esign and **R**esearch **A**id

Sum - Summation

TH – Through Traffic

TWL – Three Wheelers

VAN - Vans

Veh – Vehicles

List of Annexure

A CD contains electronic version of the followings:

(i) SIDRA INTERSECTION software – 30 days trial version

(ii) SIDRA user manuals

(iii) Sample SIDRA INTERSECTION out puts in portable document format (pdf)

(iv) Classified traffic turning movement data – collected from Planning Division

(v) Microsoft Excel Tables of detailed analysis for random traffic generation and signal timing and performance measures

(vi) Thesis references and bibliography