

**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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(08/8861H)

Degree of Master of Engineering

Department of Civil Engineering

University of Moratuwa

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**Thesis submitted in partial fulfilment of the requirements for the
degree 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'

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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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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** [Signalised (and unsignalised) Intersection Design and Research Aid, 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).

Table of Contents

DECLARATION OF THE CANDIDATE.....	i
DECLARATION OF THE SUPERVISOR.....	ii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	vi
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	3
2.1. Introduction to Traffic Signal	3
2.2. Signal Control Strategies	3
2.2.1 <i>Vehicle Actuated Controllers</i>	4
2.2.2 <i>Semi-Actuated Controllers</i>	9
2.2.3 <i>Fully-Actuated Controllers</i>	10
2.2.4 <i>Volume-Density Controllers</i>	10
2.3. Detectors	12
2.4. Overview of Traffic Signal Design.....	13
2.4.1 <i>Definitions and notations</i>	13
2.4.2 <i>Cycle</i>	13
2.4.3 <i>Phase (P or Ø)</i>	13
2.4.4 <i>Cycle length/time (C)</i>	14
2.4.5 <i>Interval</i>	14
2.4.6 <i>Amber time (A)</i>	14
2.4.7 <i>All red time (AR)</i>	14
2.4.8 <i>Red_Amber (RA)</i>	14
2.4.9 <i>Green interval or Display Green (G_i)</i>	15
2.4.10 <i>Effective Green time (g_i)</i>	15
2.4.11 <i>Red interval (r_i)</i>	15
2.4.12 <i>Lost time (l)</i>	15
2.4.13 <i>Inter Green Period (I)</i>	15
2.4.14 <i>Signal design procedure</i>	16
2.5. Introduction to <i>SIDRA</i> software.....	18
2.5.1 <i>Traffic signal timing concept in SIDRA</i>	18
2.5.2 <i>Signal model features available in SIDRA</i>	19
2.5.3 <i>Cycle Time and Green Split Options</i>	19

2.5.4	<i>What can SIDRA INTERSECTION Do?</i>	20
2.5.5	<i>How Does SIDRA Intersection Work</i>	21
2.5.6	<i>Actuated signals-method used in SIDRA</i>	21
2.5.7	<i>Actuated Signal Timing Method</i>	27
2.5.8	<i>Delay</i>	30
2.5.9	<i>Delay Measurement</i>	32
2.5.10	<i>Delay definitions</i>	33
2.5.11	<i>PEDESTRIANS</i>	37
3.	DATA COLLECTION	49
3.1.	Selected At Grade Intersections in Colombo District.....	49
4.	METHODOLOGY	50
4.1.	Selection of Intersection Geometry	50
4.2.	Selection of Signal Phase Arrangement.....	51
4.3.	Generation of Random Traffic.....	52
4.4.	Preparation for Data entering and analysis	56
4.5.	Other Important Parameters	58
5.	ANALYSIS AND RESULTS.....	61
6.	CONCLUSIONS.....	71
7.	RECOMMENDATIONS	73
8.	LIST OF REFERENCES	75
9.	BIBLIOGRAPHY	77
10.	APPENDICES	79
10.1.	Traffic and Signal analysis tables	79
10.2.	Contents of attached CD	83
11.	GLOSSARY OF ROAD TRAFFIC ANALYSIS TERMS	84

List of Figures

Figure 2-1: Vehicle-actuated control by vehicle interval	6
Figure 2-2: Extension sequence in a basic vehicle-actuated controller	7
Figure 2-3: Vehicle interval with average traffic flow per phase	8
Figure 2-4: Average delay with vehicle interval.....	9
Figure 2-5: Vehicles stoppage with vehicle interval.....	9
Figure 2-6: Gap reduction process	11
Figure 2-7: Variable initial timing process	11
Figure 2-8: Operation of the <i>SIDRA INTERSECTION system</i>	21
Figure 2-9: Basic parameters in actuated signal operation	24
Figure 2-10: Degrees of saturation at vehicle-actuated signals	28
Figure 2-11: Delay definition, experienced by vehicles at traffic signals	31
Figure 2-12: Delays experienced by vehicles in oversaturated conditions.....	33
Figure 2-13: Graphical representation of various delays used in SIDRA	34
Figure 2-14: Walk and clearance times for pedestrian movements.....	41
Figure 2-15: Pedestrian crossing speeds at signalised intersections and midblock crossings.....	43
Figure 2-16: Probabilities of no pedestrian arrivals during the signal cycle	46
Figure 2-17: Effective green and red times for pedestrian movements.....	47
Figure 4-1: Typical four-legged intersection with right-turn bay	50
Figure 4-2: Typical four-legged intersection with selected dimensions for detailed analysis.....	50
Figure 4-3: Signal Phasing arrangement Type-A for detailed analysis	51
Figure 4-4: Signal Phasing arrangement Type-B for detailed analysis	51
Figure 4-5: Four-legged intersection with different traffic demand-flow lines.....	52
Figure 4-6: Four-legged intersection with traffic-turning movements' numbers	57
Figure 4-7: SIDRA typical four-legged intersection with turning movements' numbers	57
Figure 5-1: Fully actuated signals' Cycle time vs. Total through-traffic	62
Figure 5-2: Intersection Control Delay of fully actuated signals vs. Total through-traffic.....	64
Figure 5-3: Intersection Control delay of actuated & fixed-time signals vs. Total through-traffic	66

Figure 5-4: Pedestrian delay vs. Total through-traffic.....68
Figure 5-5: Vehicle Control delay vs. Total intersection demand.....70

List of Tables

Table 2-1: Default values of actuated signal settings in SIDRA	25
Table 2-2: Default parameter values for calculating pedestrian timing data	41
Table 4-1: Conditions for turning movements to generate random traffic	54
Table 4-2: Conditions for LV & HV maximum and minimum values and ratios	54
Table 4-3: Conditions used in Microsoft Excel to generate random HV	54
Table 4-4: Selection of Through-traffic combinations for E-W direction.....	55
Table 4-5: Selection of Through-traffic combinations for N-S direction	55
Table 10-1: Sample traffic turning movements with seperated HV and LV during a weekday	80
Table 10-2: Comparison of traffic turning movements of selected intersections in Colombo District.....	81
Table 10-3: Detailed comparison of traffic turning movements of selected intersections in Colombo District	82

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	–	Signalised (and unsignalised) Intersection Design and Research Aid
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