GUIDELINE FOR ROAD SAFETYIMPROVEMENT AT IDENTIFIED ACCIDENT BLACKSPOTS

K.A.G. Jayawardena

06/8866

Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree

Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

March 2010

University of Moratuwa

ABSTRACT

This thesis provides a procedure for road safety improvement at identified accident black spots. Accident rates in Sri Lanka are very high considering the population and the number of vehicles on the road. Simple safety measures will lead to a significant reduction of accidents at identified accident black spots. Black spots treatments are likely to be the most effective and straight forward. Having identified an accident black spot along a route, it is needed to identify nature of the problems leading to poor safety.

Moreover, there is no guideline at present to identify the reasons for the problems in identified accident locations. The process developed here is further analysis than a safety audit because in a safety audit, it is expected to treat all identified problems. In this research it has been identified five major issues and their sub issues which caused to accidents in Sri Lankan road network. The five issues are Road markings, Signing and lightening, Layout geometric details and road surface, Pedestrians, Overtaking and Land use.

The five safety issues were finalized after following number of check lists which are used in safety audits to enhance road safety. Moreover road expatriate experience in Sri Lankan Road Agencies were in cooperated to expand and develop in a local context when concluding the main issues. Method has been proposed to priotrize the major issue, as most of our organizations are not in a position to rectify all identified issues due to restricted funds. When priotrizing the major issue a sensitivity analysis was done to get the suitable weightings in decision making criteria depending on location. Then it could be implemented the most relevant safety measures for that particular location with reference to the given safety measures in this document. An important conclusion of this study is that implementing the given method it will enhance the road safety in identified accident black spots with low cost but still very effective safety measures. Moreover resulting more economic benefits to the society.

"I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement 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 here the acknowledgement is made in the text"

Signature:

小

Date: 30 - 63 - 10



University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations www.lib.mrt.ac.lk

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

Signature of the supervisor:

Date



ACKNOWLEDGEMENT

I am heartily thankful to Prof JMSJ Bandara project supervisor of my research project whose encouragement, guidance and support from the initial to the final level enabled me to complete my thesis. I wish to express my warm and sincere thanks to Dr W K Mampearachchi for his important support and advice throughout the project.

I would like to thank my family for the support they provided throughout my entire life and in particular my husband. Shiram Jayawardena without whose encouragement it would not possible to finish this thesis.

Lastly I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.





Table of Contents

Declaration Of The Candidate	i	
Declaration Of The Supervisor I	ii	
Acknowledgements I	iii	
Abstract	iv	
Table Of Content	V	
List Of Figures	vii	
List Of Tables	viii	
Chapter (1)		1
INTRODUCTION	1	
1.1 Road Safety Problem	1	
1.2 Severity Of Road Safety Problem In Sri Lanka	4	
Chapter (2) Electronic Theses & Dissertations Www.iib.mrt.ac.ik		7
LITERATURE REVIEW		
2.1 Road Safety Audit	7	
2.2 Current Checklists Overview In Different Countries		
Chapter (3)	1	l
ACCIDENT PREVENTION STRATEGIES	11	
3.1 Problems	11	
3.1.1 Road Markings / Signing (Lighting)	11	
3.1.2 Pedestrians	14	
3.1.3 Layout geometric details and road surface	17	
3.1.4 Land use	18	
3.1.5 Overtaking	20	
3.2 Possible Solutions	22	
3.2.1 Road markings/ signing/ lighting	22	
3.2.2 Pedestrians	29	
3.2.3 Layout geometric details and road surface	33	

3.2.4 Overtaking	36
3.2.5 Land use	39
Chapter (4)	42
Methodology	42
4.1 Survey Process and Application Method	42
4.2 Questionnaire	46
4.3 Weight Distribution	47
4.4 Normalizing the Issues	49
4.5 Problem Identification	52
4.6 Solution	52
Chapter (5)	53
COUNTER MEASSURES AT ACCIDENT BLACK SPOTS	
5.1 Road Marking. Signing And Lightening	53
5.2 Layout Geometric Details And Road Surface	
5.3 Pedestrians	56
5.4 Overtaking	58
Chapter (6)	59
CASE STUDY	59
6.1 Problem Identification	59
6.2 Questionnaire Results	60
6.3 Proposal	67
Chapter (7)	70
7.1 Conclusion	70
7.2 List of References	72

List of Figures

Figure 3.1	Type of Road users killed nationwide	14
Figure 3.2	Road Delineators	23
Figure 3.3	Cat eyes lighten up road at night	23
Figure 3.4	Benching on inside of horizontal curve	25
Figure 3.5	Rules related to meaning of lines	27
Figure 3.6	Zebra Crossing	31
Figure 3.7	Divided Zebra Crossing	31
Figure 3.8	Pelican Crossing	32
Figure 3.9	Median Barrier	36
Figure 6.1	Malabe - Kottawa Road wersity of Moratuwa, Sri Lanka	59
Figure 6.2	Black spot at Malambe Kottawa Road	60
	Road Warning Signs	69
Figure 6.4	Differentiate the carriageway	

List of Tables

Table 1.1 Number of Reported Accidents in Sri Lanka (Unit=cases)4
Table 1.2 Number of Reported Accidents in Sri Lanka (Unit=cases)5
Table 3.1 Recommended delineator spacing on curves
Table 4.1 RSA Checklist - Existing Roads (Road Links)
Table 4.2 Questionnaire results
Table 4.3 Weight distribution
Table 4.4 Normalizing the issues
Table 6.1 Marks obtained for individual questionnaires
Table 6.2 Pair wise Comparison matrix for different road safety issues
Table 6.3 Pair wise Comparison matrix for different road safety issues
Table 6.4 Consistency check for the matrix of Moratuwa Sri Lanka 62
Table 6.5 Squaring the pair wise comparison matrix for different road safety issues63
Table 6.6 Squaring the pair wise comparison matrix for different road safety issues64
Table 6.7 Calculated weights for the criteria – different road safety issues
Table 6.8 Marks obtained for individual questionnaires
Table 6.9 Weight distribution among individual issues
Table 6.10 Weight distribution among individual issues
Table 6.11 Normalizing the issues
Table 6.12 Marks obtained for individual issue67