

Traffic Standards and Guidelines
1995/96 Survey

**Treatment of Slip Lanes
at Traffic Signals**



June 1997

Survey of Traffic Standards and Guidelines

The Land Transport Safety Authority is a stand-alone authority responsible for promoting safety in Land Transport at reasonable cost. Part of its function defined in statute is to “monitor adherence to safety standards within the land transport system”.

For a number of years the regional engineering sections of the Land Transport Safety Authority have had a programme to survey the implementation of various safety standards by road-controlling authorities.

The purpose of the surveys is to:

- assist and advise road controlling authorities on the implementation of selected traffic standards and guidelines that affect traffic safety;
- measure the uptake of standards and guidelines by road controlling authorities;
- provide a national summary of the uptake and compliance with standards and guidelines and report findings to road controlling authorities and other interested parties; and
- identify changes to improve standards, guidelines or traffic rules.

The surveys are usually carried out in two parts:

- Part 1 uses a questionnaire to look at the systems and procedures a road controlling authority has in place to deliver on the standard.
- Part 2 uses a field survey to measure where possible the actual delivery from the users viewpoint. It essentially provides a snapshot of delivery at the date of the survey.

This report presents the national results of one of those surveys. They have previously been presented to the Traffic Management Workshop. I hope you find the information of value and can use it to further the interests of road safety in New Zealand.

Please contact the Regional Engineer at the LTSA’s Auckland, Wellington or Christchurch Office if you would like further information or assistance with implementing traffic standards or guidelines.

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Executive Summary

Introduction

- Interview surveys were conducted in mid-1996 at a sample of 30 road controlling authorities (RCA's) to investigate procedures and programmes for three safety areas - traffic signal light output, street lighting, and signing and layout of slip lanes.
- Field surveys were also done at a sample of sites to obtain a "snapshot" of the on-road situation relative to the standards, verify responses to the interview and to discuss problems/successes on-site with RCA staff.
- This report details the results of the survey of signing and layout of slip lanes. Companion reports detail the results of the other two safety areas.

Results

- 59% of authorities reported using RTS9 *Guidelines for Signing and Layout of Slip Lanes* requirements and a further 9% partially used RTS9.
- Only two authorities had a systematic programme in place to upgrade to RTS9.
- 43 of the 302 slip lanes surveyed were Free Flow Slip Lanes and the remainder High Entry Angle Slip Lanes.
- Only 37% of Free Flow Slip Lanes and 19% of High Entry Angle Slip Lanes complied fully with RTS9 requirements.
- A small number of sites were found where signs and markings had been incorrectly installed in a way that would confuse drivers.

Discussion

- Upgrading all remaining slip lanes in New Zealand to RTS9 requirements would cost an estimated \$141,000.
- A saving of one injury crash from this upgrading would cover this cost.

Recommendation

- Road controlling authorities should be installing or upgrading slip lanes to comply with RTS9 and have programmes in place to achieve compliance.

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1. Introduction

In mid-1996 the Regional Offices of the Land Transport Safety Authority (LTSA) conducted surveys of three standards and guidelines in 30 road controlling authorities (RCA's).

The standards and guidelines surveyed are:

- traffic signal light output (Australian Standard AS 2144)
- street lighting (New Zealand Standard NZS 6701:1983)
- treatment of slip lanes at traffic signals (RTS9 - Guidelines for Signing and Layout of Slip Lanes)

This report describes the procedures for the survey of the signing and layout of slip lanes and presents the results.

2. Purpose of the Survey

The purpose of the survey of the signing and layout of slip lanes was to:

- review procedures used by RCA's for their installation;
- measure the installation against RTS9;
- assist and advise RCA's on the use of RTS9;
- recommend any justifiable changes to the standards and policies for the signing and layout of slip lanes.

3. Methodology

3.1 Sample Selection

A sample of 30 RCA's was chosen for inclusion in the survey. The sample was biased towards authorities not included in the LTSA surveys the previous year.

3.2 Interview Surveys

Interview surveys were conducted with representatives in each authority. Survey forms were sent in advance to allow time to research answers if necessary. Questions centred on programmes, procedures and criteria used for the installation of slip lanes.

3.3 Field Surveys

Field surveys were carried out on slip lane treatments to:

- obtain a “snapshot” of slip lanes treatments against the standard;
- verify responses to the interview questionnaire, and
- discuss problems or successes on-site with RCA staff.

The specific features recorded for slip lane treatments were:

- type of slip lane - high entry angle or free-flow;
- type and position of traffic control.
- type and position of signs - "FREE TURN", "TURN LEFT AT ANY TIME WITH CARE" ("TLAATWC") or "Diverge".
- provision of continuity lines.

4. Results

4.1 Interview Surveys

Results from interview surveys on slip lane treatments were available from 22 RCA's. Two additional authorities (Palmerston North City and Hutt City) had results available from field surveys but did not take part in the interview survey.

4.1.1 Standards Used For Signing/Marking Slip Lanes

Reported standards used for installing signs and markings at slip lanes were:

- 13 authorities (59%) used RTS9
- 2 authorities (9%) partially used RTS9
- 6 authorities (27%) used other standards
- 1 authority did not know what standard, if any, had been used.

Those which used other standards did so because slip lane treatments were installed before RTS9 was published and had not been upgraded since.

4.1.2 Modification of Slip Lanes to Meet RTS9 Standards

Only four authorities had to make modifications to the geometrics of any slip lanes to meet RTS9 standards. Only six slip lanes had to be so modified.

4.1.3 Programmes for Upgrading to RTS9 Standards

Eleven authorities (50%) had no programme to upgrade their slip lanes

Only 9 authorities had programmes for upgrading slip lanes to meet RTS9:

- 3 authorities (14%) were upgrading as part of marking maintenance.
- 3 authorities (14%) were planning to have a programme.
- 2 authorities (9%) had budgeted for an upgrading programme.
- 1 had already upgraded.

Of the two authorities which had budgeted for an upgrading programme, Christchurch City was planning to upgrade using their existing signs budget and Transit NZ Christchurch had specifically set money aside. Both authorities had an inventory of work needed.

4.2 Field Surveys

4.2.1 Types of Slip Lanes Installed

Slip lanes were classified as Free Flow only if there was sufficient merge taper length on the departure. All others were classified as High Entry Angle.

The types of slip lane in each authority are shown in Table 1 in the Appendix. Forty-three (14%) of the sample of 302 surveyed were classified as Free Flow.

4.2.2 Slip Lane Compliance With RTS9

Table 2 in the Appendix summarises the number of slip lanes in each authority complying fully with RTS9. Table 2 shows:

- 16 out of 43 Free Flow Slip Lanes (37%) complied fully with RTS9
- 48 out of 259 High Entry Angle Slip Lanes (19%) complied fully with RTS9

4.2.3 Signs and Layout of Free Flow Slip Lanes

Table 3 in the Appendix shows the features at Free Flow Slip Lanes. In summary:

- only 16 out of 43 (37%) had a "TLAATWC" sign
- 24 (56%) had a "Diverge" sign on the island
- only 14 (33%) had continuity lines marked on the approach
- only 17 (40%) had continuity lines marked on the departure.

Compared with the number of authorities which said they used RTS9 as their standard for slip lanes (59%) there is a low proportion of Free Flow Slip Lanes complying with the particular requirements in RTS9.

4.2.4 Signing and Layout of High Entry Angle Slip Lanes

Table 4 in the Appendix shows the features at High Entry Angle Slip Lanes. In summary:

- 209 out of 259 (81%) had the controls correctly installed
- only 128 (49%) had “Diverge” signs erected on the island
- only 72 (28%) had continuity lines marked on the approach
- only 38 (15%) had continuity lines marked on the departure

35 High Entry Angle Slip Lanes (14%) had no “Diverge” sign and no control

Of more concern were the sites where changes had been made incorrectly:

- 3 High Entry Angle Slip Lanes had a "TLAATWC" sign installed
- 4 sites had a traffic control and a “FREE TURN” sign in place
- 1 site had a traffic control and a "TLAATWC" sign in place

These are all situations RTS9 was specifically trying to overcome as drivers are presented with conflicting messages.

Again, compared with the number of authorities which said they used RTS9 as their standard for slip lanes (59%) there is a low proportion of High Entry Angle Slip Lanes complying with these particular requirements in RTS9.

5. Discussion

A majority of road controlling authorities claimed they were using RTS9 for the design and layout of their slip lanes however a majority of slip lanes did not comply with RTS9.

Only a small number of authorities had any systematic programme in place to upgrade their slip lanes to RTS9 standards.

No comprehensive crash analysis has been carried out as part of this study to determine possible savings from upgrading all slip lanes to RTS9 standards. There were around 600 slip lanes in New Zealand in total at the time of the survey. Extrapolating from the survey results it is likely about 470 of them did not comply with RTS9 in 1996. At a cost of \$300 each to upgrade it would cost about \$141,000 to upgrade them all. A resulting saving of one injury crash would recover this cost.

6. Recommendation

- All road controlling authorities should be installing or upgrading slip lanes to comply with RTS9 and should have programmes in place to achieve compliance with RTS9.

Appendix

TABLE 1: NUMBERS OF EACH TYPE OF SLIP LANE

ROAD CONTROLLING AUTHORITY	TOTAL SAMPLE	FREE FLOW SLIP LANES	% FREE FLOW	HIGH ENTRY SLIP LANES
AUCKLAND	34	7	21%	27
CHRISTCHURCH	25	3	12%	22
DUNEDIN	3	1	33%	2
HAMILTON	24	1	4%	23
HASTINGS	3	0	0%	3
HUTT CITY	6	0	0%	6
MANUKAU	30	3	10%	27
NELSON	4	0	0%	4
NEW PLYMOUTH	3	1	33%	2
NORTH SHORE	26	0	0%	26
PALMERSTON NORTH	14	2	14%	12
ROTORUA	1	0	0%	1
TAURANGA	1	0	0%	1
TIMARU	2	0	0%	2
TMZ HAMILTON	15	5	33%	10
TNZ AUCKLAND	31	4	13%	27
TNZ CHRISTCHURCH	14	2	14%	12
TNZ DUNEDIN	4	2	50%	2
TNZ WELLINGTON	14	7	50%	6
UPPER HUTT	2	1	50%	1
WAITAKERE	30	0	0%	30
WANGANUI	4	1	25%	3
WELLINGTON	16	3	19%	13
WHANGAREI	6	0	0%	6
TOTALS	302	43	14%	259

TABLE 2 SLIP LANE INSTALLATIONS COMPLIANCE WITH RTS9

ROAD CONTROLLING AUTHORITY	TOTAL SITES	SAMPLE	COMPLYING SITES		SITES LIKELY TO COMPLY
			NUMBER	%AGE	
AUCKLAND	120	34	2	6%	8
CHRISTCHURCH	39	25	7	28%	11
DUNEDIN	3	3	1	33%	1
HAMILTON	24	24	4	17%	4
HASTINGS	3	3	2	67%	2
HUTT CITY	6	6	4	67%	4
MANUKAU	72	30	1	3%	2
NELSON	4	4	0	0%	0
NEW PLYMOUTH	3	3	0	0%	0
NORTH SHORE	92	26	4	15%	14
PALMERSTON NORTH	14	14	0	0%	0
ROTORUA	1	1	0	0%	0
TAURANGA	2	1	0	0%	0
TIMARU	66	31	4	13%	8
TNZ AUCKLAND	27	14	3	21%	6
TNZ CHRISTCHURCH	35	15	2	13%	5
TNZ DUNEDIN	4	4	2	50%	2
TNZ HAMILTON	20	16	1	6%	1
TNZ WELLINGTON	2	2	1	50%	1
UPPER HUTT	2	2	2	100%	2
WAITAKERE	30	30	13	43%	13
WANGANUI	4	4	4	100%	4
WELLINGTON	19	14	10	71%	14
WHANGAREI	8	6	0	0%	0
TOTAL		302	67	22%	

TABLE 3: FEATURES OF THE FREE FLOW SLIP LANES

ROAD CONTROLLING AUTHORITY	No of SLIP LANES	WITH SIGN TYPE		WITH CONTINUITY ON	
		TLAATWC	DIVERGE	APPROACH	DEPARTUR
AUCKLAND	7	3	1	4	5
CHRISTCHURCH	3	1	2	1	2
DUNEDIN	1	0	1	0	0
HAMILTON	1	1	0	1	1
HASTINGS	0				
HUTT CITY	0				
MANUKAU	3	3	2	2	2
NELSON	0				
NEW PLYMOUTH	1	0	0	0	0
NORTH SHORE	0				
PALMERSTON NORTH	2	1	0	1	0
ROTORUA	0				
TAURANGA	0				
TIMARU	0				
TNZ AUCKLAND	4	0	4	2	1
TNZ CHRISTCHURCH	2	1	1	0	0
TNZ DUNEDIN	2	0	0	0	0
TNZ HAMILTON	5	0	5	2	2
TNZ WELLINGTON	7	5	6	0	2
UPPER HUTT	1	0	1	0	0
WAITAKERE	0				
WANGANUI	1	1	0	0	0
WELLINGTON	3	0	1	1	2
WHANGAREI	0				
TOTALS	43	16	24	14	17

TABLE 4: FEATURES OF HIGH ENTRY ANGLE SLIP LANES

ROAD CONTROLLING AUTHORITY	No of HIGH ENTRY SLIP LANES	No WITH TRAFFIC CONTROL	No WITH DIVERGE SIGN	WITH CONTINUITY ON	
				APPROACH	DEPARTURE
AUCKLAND	27	27	12	16	0
TNZ AUCKLAND	27	18	16	7	3
CHRISTCHURCH	22	9	10	4	0
TNZ CHRISTCHURCH	12	7	9	4	2
DUNEDIN	2	2	1	0	0
TNZ DUNEDIN	2	0	0	1	1
HAMILTON	23	22	14	10	13
TNZ HAMILTON	10	9	8	4	1
HASTINGS	3	3	2	1	0
HUTT CITY	6	6	4	0	0
MANUKAU	27	27	10	5	2
NELSON	4	4	0	3	0
NEW PLYMOUTH	2	2	0	0	0
NORTH SHORE	26	18	11	3	7
PALMERSTON NORTH	12	9	0	2	2
ROTORUA	1	0	1	0	1
TAURANGA	1	1	1	1	0
TIMARU	2	2	0	0	0
UPPER HUTT	1	1	1	0	0
WAITAKERE	30	30	15	2	1
WANGANUI	3	3	3	1	0
WELLINGTON	13	1	2	2	3
TNZ WELLINGTON	6	5	5	4	1
WHANGAREI	6	3	3	2	1
TOTALS	259	209	128	72	38