Guidelines for the implementation of traffic control at crossroads

RTS 1

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Contents

Preface

The Land Transport Division has adopted as a road safety measure, the policy that all crossroad intersections should be provided with suitable forms of traffic control.

The Division's objective is that there will be no uncontrolled crossroads remaining in New Zealand by 1 January 1993. This policy has been published as Road and Traffic Standards Information No. 9 (see Appendix 1).

Expected savings are more than 800 injury and fatal accidents over a five year period, when implementation of the policy is completed.

The purpose of these Guidelines is to provide practical information about the traffic management methods available for the assessment of road networks with respect to installation of appropriate crossroad controls.

Road Controlling Authorities are now requested to arrange the implementation of the policy stated above and assist the monitoring of results by annual completion of the reporting form included in Appendix 1.

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Manager, Safety Standards

1. Introduction

Land Transport Division policy is that every crossroad junction has an appropriate form of traffic control. This policy is promulgated in Road and Traffic Standards Information No. 9. Appendix 1 is a copy of this document.

These guidelines are for road controlling authorities requiring technical guidance and further information when installing traffic control devices in accordance with the above policy. They focus on traffic control by signs, since most uncontrolled crossroads remaining in New Zealand will not justify traffic signals or more extensive treatment. Appropriate reference material is already available if more extensive treatment is indicated by these guidelines.

They have been prepared with the help of many members of the traffic engineering profession in New Zealand and are derived from a paper endorsed by the New Zealand Traffic Management Workshop (1).

2. Summary

The use of these guidelines will result in the selection of the most appropriate crossroad controls for urban and rural intersections, and ensure compliance with legal requirements.

Main features of the guidelines are:

- All crossroads will have traffic control;
- The choice of which approach legs the control should be placed on, and the need for reinforcement by additional measures, depends on the road hierarchy and driver prior expectation about the intersection;
- The criterion for control by Stop signs is the maximum *safe approach speed;*
- Measures which physically achieve speed reduction, e.g. roundabouts, have additional benefits but cost more than signs and markings;
- Control by signs and markings have such a short pay-back period that they should be considered as an interim measure even if better longer term solutions are pending;
- Traffic Regulation requirements for signs and markings must be met.

It is intended to monitor and evaluate the results of this policy.

3. Crossroads in urban areas

3.1 Road hierarchy

The relative importance of each route and traffic flows, will generally be the main factor governing intersection priority.

Urban roading systems usually consist of a network of roads arranged according to the type of function fulfilled by each road or route. Any road will usually be either a local street, a collector route which local streets lead into, or an arterial route fed by the collector routes. This ranking of road function is called a *road hierarchy* and forms the basis of a properly organised network.

This enables roads and intersections to be designed and constructed according to their intended function.

The intersection control should be consistent with the status of the approach roads in the hierarchy.

As a general rule at intersections, collector roads should have priority over local streets, and arterials should have priority over collectors. Streets with the same hierarchical status should preferably have equal priority.

The latter case is usually dealt with by roundabouts or traffic signals, although in the case of local streets four-way Stop control or physical speed reduction devices have been used successfully. On local streets the control of vehicle speeds at intersections is more important than maintaining traffic flow efficiency by minimising delays.

3.2 Driver expectation

A driver's prior expectations about the traffic control at the next intersection is a major factor in compliance with the traffic control.

Driver expectation of traffic control at intersections ahead should not be violated

This can happen when the preceding driving environment, such as a succession of intersections where priority has been given, has established this expectation.

It is therefore best to avoid giving consistent priority to the same local street. In a grid network of local streets is may be possible to alternate the controlled roads at successive intersections.

When a lower status street meets a higher status street, such as a collector route meeting an arterial, violation of driver expectation may be unavoidable. This can also occur on arterial where traffic signals are encountered after a long section of priority intersections.

Where there is any risk of violation of drivers' expectation of traffic control priority, which cannot be removed by other means, then the presence of the control should be reinforced by additional measures. These measures can include duplicating signs or signals on central islands or overhead mast arms, and shifting signs out onto kerb extensions to a position closer to the centre of a driver's focus of attention.

To ensure that these devices are clearly visible at night, additional lighting at delineation should be provided if necessary.

3.3 Choice of priority control at crossroads

(a) The use of signs

All crossroads must have Stop or Give Way signs unless some other form of priority traffic control is used.

Safe approach speed is the criterion used to decide between the installation of Stop or Give Way signs at intersections.

(i) Stop signs

Stop signs should be installed on a crossroad approach if lack of visibility makes it unsafe to approach the intersection at speeds greater than 10 km/h.

It is unsafe to approach an intersection at more than 10 km/h if, from a point 9 metres from the intersection on a controlled approach, a driver could not see a vehicle on an uncontrolled approach at a distance (in metres) of 1.2 times the speed (in km/h) of vehicles approaching on the priority route. The speed of priority route traffic is taken as the speed exceeded by 15% of vehicles on that route, i.e. the 85th percentile speed measured in km/h.

(ii) Give Way signs

Give Way signs should be installed at all crossroads that do not have visibility constraints which require the installation of Stop signs, or are not controlled by other methods.

Stop signs should not be used instead of Give Way signs for reasons such as the violation of driver expectation (see Section 3.2), to establish or reinforce a road hierarchy (see Section 3.1), or as a routine response to an actual or expected accident problem. This use of Stop signs is generally ineffective, and can reduce their effectiveness when used correctly in other locations. Where the above problems do occur then additional devices such as central islands with duplicated signs, kerb extensions or threshold treatments as mentioned in Section 3.2 will be required.

(iii) Different signs on opposite approaches

Stop signs and Give Way signs will occasionally be justified on opposite approaches of the same crossroad intersection, according to the safe approach speeds. This situation can cause confusion because it results in some priorities which are the reverse of the more common situation, i.e. where the controls on opposite approaches are the same. This occurs because the giving way rules state that traffic at a Stop sign must always give way to traffic at a Give Way sign. Therefore, the use of different controls on opposite approaches should be avoided if possible by considering the use of Give Way signs on both approaches, with a physical speed control device, threshold treatment or visibility improvements on the more restricted approach.

If no alternative methods exist the use of differing controls can be acceptable when a Stop sign is obviously needed on one approach, and the opposite approach has a safe approach speed of more than 30 km/h, i.e. excellent visibility.

(b) Reduction of approach speeds

The speed of traffic approaching intersections can be reduced by making physical changes to the intersection or the approach roads.

Some methods can be used solely in isolation, e.g. roundabouts, while other speed reducing methods such as chicanes and speed control humps must be part of a complete Local Area Traffic Management Scheme to avoid the creation of safety hazards.

If an intersection is programmed for treatment with speed restraint devices in the next year, control by Give Way or Stop signs should be installed in the interim period. The latter are low cost measures which repay costs through accident saving in only a few months.

It is recommended that intersections with speed restraint devices should also have Stop or Give Way sign control to define or to reinforce priorities. This is because not all drivers can be relied on to apply the right hand rule, a situation which is not expected to improve as the number of uncontrolled intersections is reduced in future.

Aesthetic reasons are not justification for the omission of sign-posted controls, even in landscaped areas.

(c) Roundabouts

Well-designed roundabouts have the advantages of slowing traffic.

This has traffic management benefits which extend beyond the intersection, and prevent the formation of a priority route with higher speeds.

On local streets a roundabout does not generally need approach islands, and can be mountable by heavy vehicles.

As a guide, if a roundabout can be installed at low cost (less than $10,000) then the safety improvement will provide a favourable benefit cost ratio, assuming an accident rate of one injury accident in five years for an uncontrolled intersection. This accident rate should, however, not be regarded as a warrant as it is too low for a warrant and subject to statistical variations.

A suggested warrant (based on Kitto's results (2)) for the installation of a roundabout on safety grounds is a total inflow exceeding 2,000 vehicles per day, and that the flows are not grossly unbalanced.

Any roundabout installation should be designed and constructed to high standards (NAASRA *Roundabouts: A Design Guide* provides information. Appendix 2, ref 2). Badly installed roundabouts will lead to an increase in accidents, and can be particularly confusing for elderly road users.

The changing of existing priorities at controlled intersections causes greatly increased accident risks because driver expectations are seriously violated. If possible such changes should be avoided, but if they must be made then physical works will be required to alert all road users to the changes to help maintain acceptable safety. Clearly, the correct initial choice of control is a paramount consideration.

4. Crossroads in rural areas

The principles which apply to the control of traffic at crossroads in urban areas are relevant to rural crossroads, but with some important differences. Road traffic volumes are usually lower, intersections are much further apart and there is usually no need to discourage unwanted through traffic or to reduce speeds.

4.1 Road hierarchy

The importance of the routes and the traffic flow are the main factors which determine intersection priority in rural areas. However, flexibility may be required if there is a regular pattern of intersections, e.g. a grid network, to achieve a consistent pattern of control, e.g. all north/south roads have priority over all east/west roads.

4.2 Driver expectation

Where the control at a series of consecutive intersections all favour one route, a driver may come to expect priority at the next junction. Where the control is contrary to this expectation, or where there are strong linear elements in the landscape, such as rows of trees or poles and fences which line up through the intersection disguising its presence, a single control sign may not be sufficient.

The duplication of control signs on offset central islands has been successful in such situations and should be considered for implementation if the above conditions apply. This usually involves the widening of the seal on the left side of each approach to accommodate each island. Consequent reorganisation of drainage is often involved.

As an interim measure such sites should at least have the Stop or Give Way sign duplicated on the right hand side of each controlled approach.

4.3 Lighting

Considerable care is required to ensure that traffic islands in rural areas are clearly visible at night. These should generally have street lighting and reflective delineation.

4.4 Choice of control

For most rural crossroads the only cost effective option will be Give Way or Stop sign controls. The choice between Stop or Give Way signs should be based solely on the safe approach speed. *The same visibility criteria as for urban intersection apply. See 3.3 (a).*

Note that there are a few crossroads where the safe approach speeds can be lower than 10 km/h, thus needing Stop sign control, even though good visibility is available. This occurs when drivers experience unusual difficulty in judging the speed, distance or lane position of approaching traffic. This is most likely to occur when approaching traffic speeds are very high, traffic flows are high, and carriageways are wide. Control devices other than signs are likely to be preferred. However, if other forms of control are not acceptable, then Stop signs may be safer than Give Way signs if these other factors reduce the safe approach speed to below 10 km/h.

5. Implementation

5.1 Legal aspects

Road controlling authorities are given the authority to erect regulatory signs which include Give Way and Stop signs, by clause 122 of the *Traffic Regulations 1976 (3)*. A resolution of the authority is necessary.

Associated roadmarkings are required by the *Traffic Regulations 1976,* regulations 105 and 106. Both signs and markings must be present to have legal effect, except where the surface type makes it impractical to provide markings, e.g. unsealed roads. The required markings are detailed in *Guide to Urban Road Marking (4)*.

It should be noted that the current edition of the *Manual of Traffic Signs and Markings* (5) shows the "Stop" or "Way" letters starting a maximum of 10 metres from the limit line. To make sure the Traffic Regulations are complied with the whole of the word should be within 10 metres from the limit line as shown in the *Guide to Urban Road Marking*.

The location of the signs is specified in the *Traffic Regulations 1976* with further guidance given in the Signs Manual. Duplication of signs may be desirable as outlined in these guidelines.

Roundabouts are required to have symbolic a "Rotary Junction" (W-54) sign in advance of the junction on each approach. This is specified in the definition of 'Intersection' in the interpretation clause of the *Traffic Regulations 1976*. While Give Way signs and markings are not required at roundabouts by law, they are necessary to ensure uniform national standards and to avoid confusion.

Legal aspects of speed reduction devices are discussed in *Guidelines for Use and Construction of Speed Control Humps* (6).

5.2 Suggested practical procedure

(a) Identify sites: Carefully work through a map of the area to identify all the crossroads without control. It is very easy to overlook some intersections.

(b) Use the guidelines contained herein to select the appropriate controls and the approaches to which they should apply. It is important that the decisions made at this stage are correct, because later changes are difficult to implement safely (see Section 3).

(c) Arrange for the necessary resolution of the road controlling authority.

(d) Publicise the reasons for the controls, and where they will be installed.

(e) Co-ordinate the signs and markings so they are installed together.

For example, Ashburton Borough controlled 48 intersections. The poles (pre-drilled to take the signs), were erected and 30 metres of centreline were marked on each approach. This coincided with publicity. The limit lines and messages on the road surface were then marked. Then the signs van followed the roadmarker erecting the signs as the roadmarker finished each site. Each area was completed before moving on. It was reported that the preparation and erection of the signs were the most time consuming tasks.

A larger centre will probably need to complete the exercise as a series of smaller areas.

6. Monitoring

The Land Transport Division wishes to monitor progress of the implementation of the policy to control every crossroad junction in New Zealand, and to evaluate its effect in reducing accidents.

For this purpose please return to one of the addresses below, completed, the form which is attached to Appendix 1.

Regional Engineers
Land Transport Safety Authority
Auckland Regional Office
Private Bag 106 602
Auckland *or*

Wellington Regional Office
PO Box 27 249
Wellington *or*

Christchurch Regional Office
PO Box 13 364
Christchurch

It is suggested that this is done at the end of each financial year until the programme is completed.

7. Acknowledgement

The preparation of the technical material for this document was by Tim Hughes at the Christchurch Office of the Road and Traffic Standards Section. Contributions by Christchurch members of the Traffic and Transportation Group of the Institution of Engineers of New Zealand, and the 1988 Traffic Management Workshop are gratefully acknowledged. John Edgar undertook the technical editing, Denise Hamilton draft typing, and Chrisine Prebble arranged final production.

8. References

(1) Hughes T, 1988 *Policy and Guidelines for the Control of Crossroads* New Zealand Traffic Management Workshop

(2) Kitto H J, 1980 *Accident Rate at Urban Right Angle Intersection* National Roads Board Bulletin No. 48

(3) *Traffic Regulations 1976* New Zealand Government

(4) Traffic and Transportation Group of the Institution of Professional Engineers New Zealand, 1984 *Guide to Urban Road Marking* National Roads Board NZ

(5) 1975 *Manual of Traffic Signs and Markings* National Roads Board NZ

(6) *Guidelines for the Use and Construction of Speed Control Humps* 1987, Ministry of Transport

Appendix 1: Road and traffic standards information

No. 9, November 1990

Policy on traffic control at crossroads

1. Introduction

As a result of safety studies and extensive consultation with interested parties, the Ministry has determined that there should be no crossroad type intersections without some form of positive traffic control on any public road in New Zealand.

The Ministry has an objective to ensure that all remaining uncontrolled crossroads are progressively eliminated by road controlling authorities within the next two years.

The completion of this programme has been estimated to prevent more than 800 injury and fatal accidents over a five year period, and will be highly cost effective. Benefit/cost ratios for signposting uncontrolled crossroads in urban areas have been estimated to range from 26 to 38 depending on whether sites have an accident history. A study of sites in several rural areas indicated a ratio of 4:1.

2. Background

Analysis of the outcome of studies completed by Accident Investigation Teams in a number of local authority areas revealed that disproportionate numbers of accidents occur at uncontrolled cross road intersections. Although few such crossroads remain in most areas, they account for a relatively large number of accidents because they create an unexpected and unfamiliar road environment for most drivers.

Large savings in accident numbers and associated accident costs could be achieved with the application of appropriate low cost traffic control methods at these locations.

This policy was received with unanimous support when proposed at a joint Ministry of Transport/ Transportation and Traffic Engineering Group Workshop at which a wide range of central and local government organisations were represented.

3. Action

All road controlling authorities are requested to identify all their uncontrolled crossroads and to adopt procedures to implement suitable forms of traffic control. This would most often only require the installation of Give Way or Stop signs. At a few locations more major changes such as roundabouts, traffic islands, traffic signals, turning restrictions or street closures may need consideration.

4. Monitoring

To enable monitoring of the implementation and results of this policy, road controlling authorities are requested to fill in and submit the form attached to this policy to the District Controller, Road and Traffic Standards at one of the addresses below.

5. Implementation

Procedures for the choice of traffic control at a particular uncontrolled crossroad are discussed in a new Ministry publication *Guidelines for the Implementation of Traffic Control at Crossroads* (1). It provides a convenient reference to matters such as visibility distance, approaching vehicle speeds, type of road, e.g. local, arterial etc., appropriate legal matters and practical aspects. In particular it contains new criteria for the installation of Stop signs based on the safe approaching speed.

Copies of the guidelines are available from the offices of the Land Transport Division listed below.

Relevant information can also be found in the *Manual of Traffic Signs and Markings (2)*. It has been agreed that the section of the Manual dealing with Give Way and Stop signs will be amended to give effect to this policy and be consistent with the guidelines.

The District Controllers, Road and Traffic Standards, located at the Land Transport District Offices in Auckland, Wellington and Christchurch, are available to provide further technical and policy advice. However, the implementation of this policy should be undertaken by road controlling authorities using their own staff or consultants.

6. Attachment

Monitoring report form.

7. References

(1) *Guidelines for the Implementation of Traffic Control at Crossroads* Road and Traffic Standards, Land Transport Division, Ministry of Transport

(2) *Manual of Traffic Signs and Markings,* National Roads Board NZ, 1975

For further information, please contact:

Regional Engineers
Land Transport Safety Authority
Auckland Regional Office
Private Bag 106 602
Auckland, *or*

Wellington Regional Office
PO Box 27 249
Wellington, *or*

Christchurch Regional Office
PO Box 13 364
Christchurch.

Monitoring report form

Priority street	Controlled street	Control	Date installed
e.g. Johns	Harewood	Stop	21.05.89

Note: Where opposite approaches are not identically controlled, list each approach separately.

Please return this form completed to the District Controller of Road and Traffic Standards at the end of each financial year.

Appendix 2: Accidents and economic analysis

1. Introduction

Accident studies by the Accident Investigation Units of the Ministry of Transport identified uncontrolled crossroads as a black feature of road networks. Studies in Ashburton and Invercargill quantified the problem, and considered the reasons.

Analysis of accident reports suggested that drivers thought they were slowing to safe speeds to negotiate the crossroads, but their reported speeds were frequently too fast for them to have given way.

Speed surveys were performed at a number of intersections in Ashburton that had severe visibility restrictions. This confirmed that excessive speed through the intersections was a major driving factor.

Another problem related to the consistency of intersection controls. Many local authorities have already controlled all or most of their crossroads. Motorists from an area with no uncontrolled crossroads are easily deceived because they have learned to expect that if an intersection is not controlled on their approach it will have a Give Way or Stop control on the intersecting street. This was identified as a contributing factor to accidents in Ashburton and Invercargill involving drivers from other places.

Some accident investigation team study reports have recommended that all the crossroads in a district be controlled. Other districts had already implemented such a policy and there is concern that the remaining uncontrolled crossroads will become more dangerous as a result.

2. The size of the problem

During the five year period 1983 – 87 there were 701 collisions in New Zealand at uncontrolled crossroads involving traffic driving straight through. These are referred to by the traffic accident coding system as HA accidents. Over 80% of accidents as uncontrolled crossroads are of this type. It is the only accident type that clearly distinguishes between crossroads with or without control. The 701 accidents occurred at 529 sites. Twenty-four of these accidents were at rural sites and the others were urban.

An inventory of intersections and traffic control type was available for Christchurch, Ashburton and Invercargill.

This information was used to infer the approximate size of the problem nationally, and to estimate costs and likely benefits.

Table 1 estimates the number of sites with no accidents, and the underlying accident rate at such sites.

Table 1: Urban uncontrolled crossroad sites

	Chch	Ashbtn	Invgll	Total
Total Sites	50	48	121	219
No. of sites with no accidents in before period (1980 – 84)	31	27	79	137
No. of injury accidents in after period (1985 – mid 88) at the above sites	9	13	15	37
Accidents per site	0.29	0.48	0.19	0.27
Scaled to five years	0.41	0.69	0.27	0.39

The best estimate of the average number of accidents in next five years per uncontrolled crossroad, with no accidents recorded in the previous five years, is 0.39.

The above data includes only sites that were uncontrolled over the whole period 1980 – 88.

Table 2: New Zealand distribution of HA accidents at uncontrolled crossroads 1983 – 87

No of HA Ax. per site	No. of sites	No. of accidents
0	884 (calculated)*	0
1	411	170
2	75	150
3	36	108
4	4	16
5	2	10
6	1	6
Total	**1413**	**701**

** Assumes the proportion of sites with no accidents as in Table 1. This is probably an underestimate because the proportion of sites with no accidents is higher in rural areas.*

3. Proven remedies

There are two low cost remedies:

- Give Way or Stop signs have been demonstrated to reduce all accidents at urban crossroads by 70% and right angle collisions by 80% (1).
- Local street roundabouts are one of a number of speed reduction devices that can be used as part of a Local Area Traffic Management Scheme. They work by slowing traffic to a safe speed through the local network in general and at intersections in particular. Roundabouts have been demonstrated to reduce accidents at urban local street crossroads in Victoria by 95% (confidence limits 80% - 99%) (2).

Both the above controls also reduce accident severity (1, 3).

4. Costs and benefits

This analysis of costs and benefits assumes urban conditions. It is confined to the universal application of Stop or Give Way sign control. Other control devices cannot reasonably be considered for universal application and would normally be assessed for each case in comparison with control by traffic signs.

4.1 Sites with an accident history

The cost of installing two Give Way or Stop signs and associated road markings at a crossroads junction is not likely to exceed $1,200 including an allowance for maintenance over 10 years.

Treating the 529 sites with an accident history could be expected to cost $634,800 (present value over 10 years).

Estimated annual accident savings:

0.8 x 701/5	= 112 ax.

Present value of benefits:

Uniform series present worth factor for 10 years	= 6.447
Costs of each "HA" urban accident	= $78,472
PV benefits	= 112 x 6.447 x $78,472
	= $56.7 million
Benefit costs	= 56.7/0.634
	= 89.

With allowance for regression to the mean, the benefit/cost reduces to 38. This represents a first year rate of return of 580%.

4.2 Sites with no accident history

There are many sites that had no right angle collisions in the last five years but which could have them during the next five years.

To estimate the number of those sites, the uncontrolled crossroads in Christchurch, Ashburton and Invercargill were counted and found to number 219. Of these, 137 had no accidents in 1980 – 84. A total of 36 accidents occurred at these sites from 1985 to mid 1988. The underlying accident rate per site without accidents in the past five years is 0.39 ax. per five years (see Table 1).

If the proportion of sites without accidents in all New Zealand is the same as for Christchurch, Ashburton and Invercargill combined, then there would be 884 such sites in all New Zealand (see Table 2). They could be expected to have 345 accidents during the next five years.

Costs = 884 x $1,200	= $1,060,800
Benefits = 0.8 x 345 x $78,472 x 6.447/5	= $27,907,000
Benefit/cost	= 26.3
First year rate of return	= 408%

4.3 Rural sites

Analysis of accidents at rural crossroads in Ellesmere, Ashburton and Southland Counties was performed to indicate an approximate Benefit Cost Ratio for rural sites. There were six injury accidents in five years and an estimated total of 116 uncontrolled crossroads. It assumed that four out of six accidents would be preventable by assigning priority.

Present value of benefits:

Cost of each "HA" rural accident	= $107,848 (1988 dollars)
PV benefits: 4 x $107,848 x 6.447/5	= $556,236
PV costs: $1,200 x 116	= $139,200
Benefit cost:	= 4

Note: On this analysis some crossroads with very low traffic flows, e.g. unsealed roads in rural areas, may not justify control. However, it is desirable to control such intersections to achieve uniformity.

There is no national inventory of intersections, but it is roughly estimated that the total number of uncontrolled crossroads is between 1,200 and 2,000.

The costs in the first year for each intersection are estimated to be:

Sign and post $140 x 2 approaches	= $280
Roadmarkings (reflective) $90 x 2	= $180
Total	= $460

Signs and posts receive currently 75% Transit NZ subsidy. The roadmarkings receive base subsidy. The Transit NZ share is approximately $290 per intersection. The local authority share is approximately $170 per intersection.

The total costs therefore range from $552,000 to $920,000, depending on the number of intersections involved.

5. Conclusion

The control of all crossroads presently uncontrolled is highly cost-effective.

To achieve uniformity in the road network, all the remaining crossroads should be controlled.

References

(1) Frith W J and Harte D S *The Safety Implications of Some Control Changes at Urban Intersections* Accident Analysis and Prevention 18, 183 – 192, 1986

(2) National Association of Australian State Road Authorities *Roundabouts: A Design Guide* 1986 NAASRA 1986 pp 57 – 59

(3) Accident Investigation Team, *Invercargill City Accident Study* City Engineers Dept, City of Invercargill, 1986

Road and Traffic Guideline publications

The following Road and Traffic Guidelines are available:

RTS I	Guidelines for the implementation of traffic control at crossroads (1990)
RTS 2	Guidelines for street name signs (1990)
RTS 3	Guidelines for establishing rural selling places (1992)
RTS 4	Guidelines for flush medians (1991)
RTS 5	Guidelines for rural road marking and delineation (1992)
RTS 6	Guidelines for visibility at driveways (1993)
RTS 7	Advertising signs and road safety: design and location guidelines (1993)
RTS 8	Guidelines for safe kerbline protection (1993)
RTS 9	Guidelines for the signing and layout of slip lanes (1994)
RTS 11	Urban roadside barriers and alternative treatments (1995)
RTS 13	Guidelines for service stations (1995)
RTS 14	Guidelines for installing pedestrian facilities for people with visual impairment (1997)
RTS 17	Guidelines for setting speed limits (1995)

The Guidelines may be purchased from:

Land Transport Safety Authority, Head Office (PO Box 2840, Wellington) or Regional Offices in: Auckland, (Private Bag 106 602), Wellington (PO Box 27 249) and Christchurch (PO Box 13 364).