

Guidelines for visibility at driveways

RTS 6

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Definitions

For the purposes of these guidelines the following definitions apply:

Driveway

Any passage way providing vehicle access between the road carriageway and the adjoining property. The following classifications of driveways have also been defined for use in these guidelines:

Low volume: Up to 200 access manoeuvres per day.

High volume: More than 200 access manoeuvres per day. The 200 access manoeuvres per day is an arbitrary cut off to define the difference between low and high volume. This should be interpreted flexibly considering the type of activity being served by the driveway and the traffic flow on the frontage road.

Arterial roads

Routes with a dominant through traffic function either serving to link territorial authorities or major areas of activity within a territorial authority. Typically these roads carry more than 3,000 vpd but traffic volumes may be less particularly in rural areas and considerably higher in large urban areas.

Collector roads

Locally preferred routes forming a link between the arterial roads and residential, commercial, industrial and recreational areas. They have a main through traffic carrying function but often do also serve adjacent properties. Typically these roads carry traffic volumes in the 1,000 to 3,000 vpd range but this may be less in rural areas and higher in large urban areas.

Local roads

Roads with the main function of providing access to adjacent properties. Typically these roads have traffic volumes below 1,000 vpd.

Urban

Areas with speed limits of 70 km/h or less.

Rural

Areas with speed limits greater than 70 km/h.

Operating speed

The 85th percentile speed of vehicles on the frontage road. As a general guide when speed surveys are not available this can be taken as the speed limit plus 15%.

Sight distances (as defined in NAASRA, *Intersections at Grade* [1])

Sight distance: The distance, measured along the carriageway over which visibility occurs between a driver and an object or between two drivers at specific heights above the carriageway in their lane of travel.

Approach sight distance (ASD): Stopping sight distance on the approaches to an at-grade intersection.

Entering sight distance (ESD): The sight distance required for minor road drivers to enter a major road via a left or right turn, such that traffic on the major road is unimpeded.

Safe intersection sight distance (SISD): The sight distance required for a driver on the major road to observe a vehicle from a minor road moving into a collision situation and to decelerate to a stop before reaching the collision point.

1. Introduction

This document is intended to give guidelines which could be incorporated into district plans for the control of the location of vehicle driveways on the road network.

These guidelines are for all road controlling authorities covering rural, small urban and large urban areas. Some of the guidelines given, e.g. typical traffic volumes, low and high volume driveway definitions, may not be fully applicable to specific authorities. These can be amended locally for inclusion in district plans.

Analysis of injury accidents for all New Zealand shows approximately 10% of urban accidents and 6% of rural accidents occur at driveways. About half the accidents at driveways involve collisions between vehicles turning into a driveway, mainly right turning vehicles, and through traffic on the frontage road. Collisions between vehicles exiting from a driveway and through traffic represent about 20% of the accidents at driveways and collisions between vehicles manoeuvring (reversing) at a driveway and through traffic about 10%. One of the contributing factors to these accidents is inadequate visibility along the frontage road from and of the driveways. This document gives guidelines for visibility requirements for various driveway and frontage road classifications.

Driveways should be located, designed and constructed so that vehicles can enter or leave the driveway in a safe and convenient manner without causing undue adverse effect on the safe and efficient operation of the road network.

The potential for adverse effects depends on:

- the number of movements to or from the driveway;
- the traffic functions and traffic flow on the frontage road;
- the number and spacing of driveways along the road.

Generally the potential for adverse effects increases with increasing numbers of movements to or from driveways and higher traffic flows on the frontage road.

2. Summary

Driveways should be located, designed and constructed so that vehicles can enter or leave the driveway in a safe and convenient manner without causing any undue adverse effect on the safe and efficient operation of the road network.

The ideal visibility criteria would allow vehicles manoeuvring to or from a driveway to leave or enter the traffic flow on the frontage road without disrupting that flow. The minimum acceptable safety criteria is for vehicles on the frontage road to react to, and if necessary stop before colliding with, a vehicle manoeuvring at a driveway. This minimum criteria would allow sufficient distance for the frontage road traffic to avoid a collision if, for instance, a manoeuvring vehicle stalled on the roadway opposite a driveway. The minimum criteria do not imply the frontage road traffic should have to stop, only that it can if necessary. It is the obligation of traffic turning to or from a driveway to select gaps in the through traffic adequate for their manoeuvre.

The recommendations in this document are the minimum requirements for various combinations of driveway classifications, frontage road classifications and operating speeds. Design principles for these are given in Section 3.

The visibility requirement is for minimum lines of clear sight established from the sight distance and its measurement along the road.

Table 1, Section 2.1 lists the recommended minimum sight distances. These distances are measured along the centre of the appropriate lane to establish points C and D in Figures 1 and 2, Section 2.2. The resulting recommended minimum lines of clear sight are shown in Figure 2, Section 2.2.

Driveways with lines of clear sight greater than these minimum recommendations are desirable.

2.1 Sight distances

Table 1 lists the recommended minimum sight distances for various combinations of driveway classifications, frontage road classifications and operating speeds.

Section 3.2 outlines the design principles and logic for the sight distances recommended.

Table 1: Sight distances

These sight distances are the distances to be measured along the centre of the appropriate lane to establish points C and D in Figures 1 and 2, Section 2.2.

Driveway classifications	Operating speed (km/h)*	Minimum sight distance (metres)**		
		Frontage road classification		
		Local	Collector	Arterial
Low volume	40	30	35	70
Up to 200 vehicle manoeuvres per day	50	40	45	90
	60	55	65	115
	70	85	85	140
	80	105	105	175
	90	130	130	210
	100	160	160	250
	110	190	190	290
	120	230	230	330
High volume	40	30	70	70
More than 200 vehicle manoeuvres per day	50	40	90	90
	60	55	115	115
	70	85	140	140
	80	105	175	175
	90	130	210	210
	100	160	250	250
	110	190	290	290
	120	230	330	330

* Operating speed = 85th percentile speed on frontage road. This can be taken as the speed limit plus 15% if survey data are not available.

** Distances are based on the Approach Sight Distance and Safe Intersection Sight Distance tables in NAASRA, *Intersections at Grade* [1] assuming reaction times of 1.5 seconds on local roads with operating speeds up to 60 km/h and 2.0 seconds for all other speeds and all collector and arterial roads.

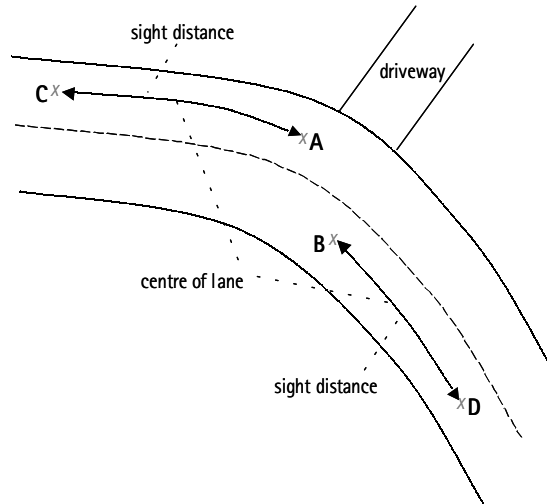
2.2 Visibility measurements

There are two aspects to visibility measurements. One is the sight distance measurement and the other is the lines of clear visibility. These are summarised below with the design logic for the recommendations in Section 3.3.

2.2.1 Sight distance measurement

The sight distances recommended in Table 1 are the stopping distances for vehicles on the frontage road. They should be measured along the centre of the appropriate lane as indicated by the lines AC and BD in Figure 1. For practical purposes, A and B can be taken as opposite the centre of the driveway.

Figure 1: Sight distance measurement



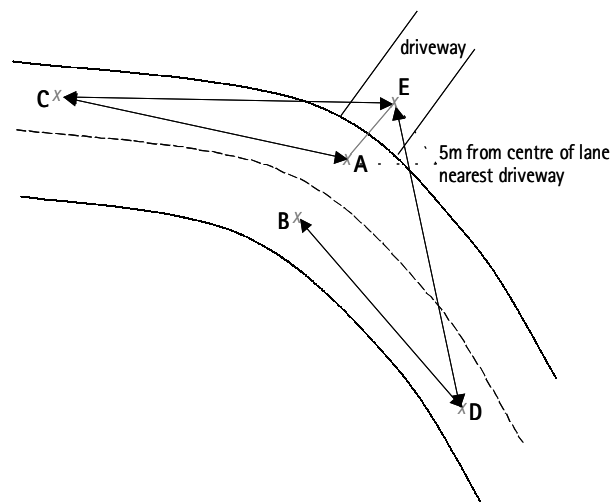
2.2.2 Lines of clear sight

There should be lines of clear sight from driver's eye height to driver's eye height, i.e. 1.15 metres above ground level, along the lines detailed below and shown in Figure 2.

- Lines AC and BD - All driveways, all roads.
- Lines EC and ED (no permanent obstructions, exclude parked vehicles which may obstruct these sight lines occasionally)
 - High volume driveway, collector road.
 - Low volume driveway, arterial road in urban area.
- Lines EC and ED (no obstructions, parked vehicles not excluded)
 - Low volume driveway, arterial road in rural area.
 - High volume driveway, arterial road.

Figure 2: Lines of clear sight

Points A, B, C and D are as shown in Figure 1, with points C and D established by measuring the sight distance from Table 1 along the centre of the appropriate lane from points A and B.



3. Design principles for visibility at driveways

3.1 General

Driveways provide the link between land use activity and the road network. Traffic manoeuvring to or from driveways can potentially conflict with the traffic flow on the frontage road and may therefore affect the safe and efficient operation of the road. Analysis of the 1987-91 Ministry of Transport accident records has shown approximately 10% of urban accidents and 6% of rural accidents occurred at driveways.

Driveways should be located, designed and constructed so that vehicles can enter or leave the driveway in a safe and convenient manner without causing any undue adverse effect on the safe and efficient operation of the road network.

The potential for adverse effects depends on:

- the number of movements to or from the driveway;
- the traffic functions and traffic flow on the frontage road;
- the number and spacing of driveways along the road.

Generally the potential for adverse effects increases with increasing numbers of movements to or from driveways and higher traffic flows on the frontage road.

In general the design of driveways should:

- (a) Achieve sufficient visibility between vehicles on the frontage road and vehicles using the driveway.
- (b) Cater for the types of vehicle using the driveway and in particular allow vehicles to turn left to or from the driveway without crossing the road centre-line.
- (c) Avoid confusion between vehicle manoeuvres at other driveways or intersections.
- (d) Provide adequate visibility between vehicles using the driveway and pedestrians.

3.2 Sight distances

3.2.1 General

The sight distance required at a driveway depends on the traffic speeds and function of the frontage road and on the expectancy of driveway manoeuvres.

Whatever sight distance is provided, it is the obligation of traffic turning to or from a driveway to select gaps in the through traffic adequate for their proposed manoeuvre. The minimum criteria for safety is that the through traffic on the frontage road can, if necessary, stop in time to avoid a collision with a vehicle turning to or from a driveway that may have misjudged gap selection or stalled during its manoeuvre.

The ideal criteria is for vehicles manoeuvring to or from the driveway to leave or enter the traffic flow on the frontage road without disrupting that flow. The minimum acceptable criteria is for vehicles on the frontage road to observe a vehicle manoeuvring at the driveway and react and if necessary stop before entering the conflict area.

These criteria are equivalent to the Approach Sight Distance (ASD) and the Entering Sight Distance (ESD) as defined in Clauses 5.2.2 and 5.2.3 of NAASRA, *Intersections at Grade* [1]. An intermediate

criteria is the Safe Intersection Sight Distance (SISD) defined in Clause 5.2.4 of the same publication. This is the ASD plus the distance a vehicle would travel in three seconds. The three seconds is the time allowed for a vehicle to observe a potential conflict developing. The NAASRA, *Intersections at Grade* [1] definitions for these sight distances are included in the Definitions in this document.

Initial project work for this guideline began by investigating the distances required on arterial routes that would allow vehicles to enter the traffic stream with no more than a 25% speed disruption to the traffic stream. Limited surveys were undertaken in Christchurch to find the in-service acceleration rates for single unit trucks and semi-trailers. Following these surveys entering sight distances for the vehicles were calculated. For heavy vehicles entering traffic streams travelling at 100 km/h a distance of 1,100 metres was calculated. These distances, though desirable, were considered impractical to impose as sight distance requirements for driveways. This project work recommended intersection sight distances from NAASRA, *Intersections at Grade* [1] be adopted for driveways. These were considered more practicable than the calculated distances noted above. It also recommended for driveways on arterials with operating speeds higher than 70 km/h that minimum roadway and shoulder widths be set.

Tables for intersection sight distances (ASD, ESD and SISD) in NAASRA, *Intersections at Grade* [1] assume driver reaction times from 1.5 seconds to 2.5 seconds. The lower value for restricted urban situations with high expectation of flow interruptions and the higher value for rural unaltered driving conditions. The ESD are based on the entering requirements for passenger cars.

3.2.2 Local roads

The main function of local roads is to serve the adjacent properties rather than to provide for through traffic. Drivers on these roads should be aware of the potential for conflicting manoeuvres at driveways, particularly in urban areas.

The minimum safe visibility requirement is therefore that drivers on the road seeing a vehicle in the conflict zone opposite a driveway can if necessary stop before reaching the conflict point. This is equivalent to the Approach Site Distance (ASD) in NAASRA, *Intersections at Grade* [1].

Reaction times of 1.5 seconds for drivers on local roads with operating speeds up to 60 km/h and 2.0 seconds for speeds over 60 km/h are considered appropriate (assuming the operating speed gives some indication of the driver's awareness of the potential for conflicting manoeuvres).

The minimum sight distances given in Table 1 for local roads is therefore the ASD from NAASRA, *Intersections at Grade* [1] with the above reaction times.

3.2.3 Collector roads

Although these roads often serve a significant number of adjacent properties, their main function is to distribute through traffic between local and arterial roads.

Users of most low volume driveways are probably regular users aware of the main traffic function of the road. It can be assumed that they take account of this and take extra care to indicate and observe the through traffic when they turn to or from the driveway. The safe visibility requirements for these low volume driveways can therefore be as for local roads except a driver reaction time of 2.0 seconds for all operating speeds is more appropriate. Drivers of the through traffic would not be as aware of potential conflicts as they would on local roads.

At high volume driveways on collector roads, the users may not be as aware of the main traffic function of the road. They may not therefore take as much care to indicate or observe the through traffic when turning to or from the driveway. Time for the through traffic to observe and react to potential conflicts developing is therefore required in addition to the sight distance requirements for local roads. The minimum visibility requirement is therefore equivalent to the Safe Intersection Sight Distance (SISD) in NAASRA, *Intersections at Grade* [1].

3.2.4 Arterial roads

The dominant function of arterial roads is to carry through traffic from one major area of activity to another. Drivers on these roads are therefore unlikely to expect many driveway manoeuvre type conflicts. The minimum visibility requirement at driveways therefore must allow time for these drivers to observe and react to potential conflicts and then if necessary stop before reaching the conflict point. This is equivalent to the Safe Intersection Sight Distance (SISD) from NAASRA, *Intersections at Grade* [1]. Driveways onto arterial roads will create conflicts between through traffic and driveway manoeuvres whatever visibility distance is provided. In particular right turn movements into a driveway will disrupt the through traffic. They are also the most common movement in accidents at driveways. High volume driveways on arterial roads should therefore be banned or strongly discouraged particularly on high volume rural arterials.

3.3 Visibility measurements

3.3.1 Sight distance measurement

The sight distances recommended (see Table 1, Section 2.1) are the stopping distances for vehicles on the frontage road to see, react to and stop before colliding with vehicles manoeuvring at driveways. They are therefore measured along the travel path (centre of lane) of the through traffic. This is shown by the lines AC and BD in Figure 1, Section 2.2.

3.3.2 Lines of clear sight

Visibility requirements at driveways are for clear lines of sight between vehicles on the frontage road and vehicles using the driveway. The lines of clear sight can therefore be measured from driver eye height to driver eye height, i.e. 1.15 metres above ground level. If the driveway is expected to be regularly used by heavy vehicles, then the lines of clear sight should also allow for the different driver's eye height between these and light vehicles.

Ideally lines of sight should be between vehicles waiting to leave a driveway and vehicles on the frontage road. This is impractical, however, on local roads and on many collector and arterial roads, that have a high parking demand near driveways. The ideal lines of clear sight would require unreasonable prohibition of parking. The majority of accidents at driveways involve vehicles turning into rather than from driveways. The minimum acceptable lines of clear sight are therefore between vehicles travelling on the frontage road and vehicles turning into a driveway.

The acceptable lines of sight for driveways are dependent on the functions of the driveway and the frontage road and the probability of conflicts. General discussion on the functions and operational aspects of driveways fronting local, collector and arterial roads are in Sections 3.2.1 to 3.2.4.

Based on these the following lines of sight are recommended:

Local roads

For all driveways on local roads there should be lines of clear sight between vehicles at or within the sight distance of the driveway and vehicles on the road opposite the driveway.

This is shown by the lines AC and BD in Figure 2, Section 2.2.

Collector roads

For low volume driveways the required lines of clear sight are as for driveways on local roads, i.e. lines AC and BD in Figure 2, Section 2.2.

For high volume driveways there should in addition to the above be clear visibility between vehicles waiting to leave the driveway and vehicles on the frontage road. That is between a point five metres into the driveway from the centre of the lane nearest the driveway to a vehicle at the sight distance along the road from the driveway. The five metre offset is the minimum recommended distance to allow intervisibility between drivers and allow adequate clearance from the front of the vehicle at the driveway and the edge of the traffic lane. The additional lines of clear sight are shown by the lines EC and ED in Figure 2, Section 2.2.

If parking is in demand near these driveways, then it may be impractical to fully insist on these lines of clear sight. It is accepted therefore that for these driveways parked vehicles may obstruct these lines of sight but there should be no permanent obstructions to these sight lines.

Arterial roads

For low volume driveways on arterial roads in urban areas the same conditions as for high volume driveways on collector roads are recommended.

For low volume driveways in rural areas and for all high volume driveways on arterial roads even parked vehicles should not obstruct the required lines of sight between vehicles at the driveway and vehicles on the frontage road. The recommended lines of clear sight are therefore as shown by lines EC and ED in Figure 2, Section 2.2 with no exemption for parked vehicles.

4. Associated safety aspect of driveway design/location

The visibility requirements detailed in these guidelines are aimed at reducing collisions due to conflicts between vehicles manoeuvring at driveways and vehicles on the frontage road.

Other safety aspects of driveway design and location aimed at reducing such conflicts are discussed below with reference to recommended standards in other Ministry of Transport and Transit New Zealand documents.

4.1 Frontage road seal widening

On rural roads without kerbs, additional seal widening near driveways allows more room for manoeuvring and through vehicles to avoid conflicts. The additional seal widening reduces the disruption to the through flow of traffic on the frontage road. Generally, this is only warranted on arterial roads with a speed limit of 70 km/h or more.

On these roads seal widening is not considered necessary, although it may be desirable, for low volume driveways unless they are frequently used by heavy vehicles, e.g. milk tankers, which need additional room and time to make manoeuvres compared with light vehicles.

Figures 3 and 4 show the recommended seal widening for low volume driveways frequently used by heavy vehicles and for high volume driveways fronting arterial roads without kerbs and with speed limits of 70 km/h or more. These figures are based on diagrams 3 and 4 from Transit New Zealand, *Planning for a safe and efficient highway network under the Resource Management Act* [2].

Figure 3: Seal widening on rural arterial roads for low volume driveways frequently used by heavy vehicles

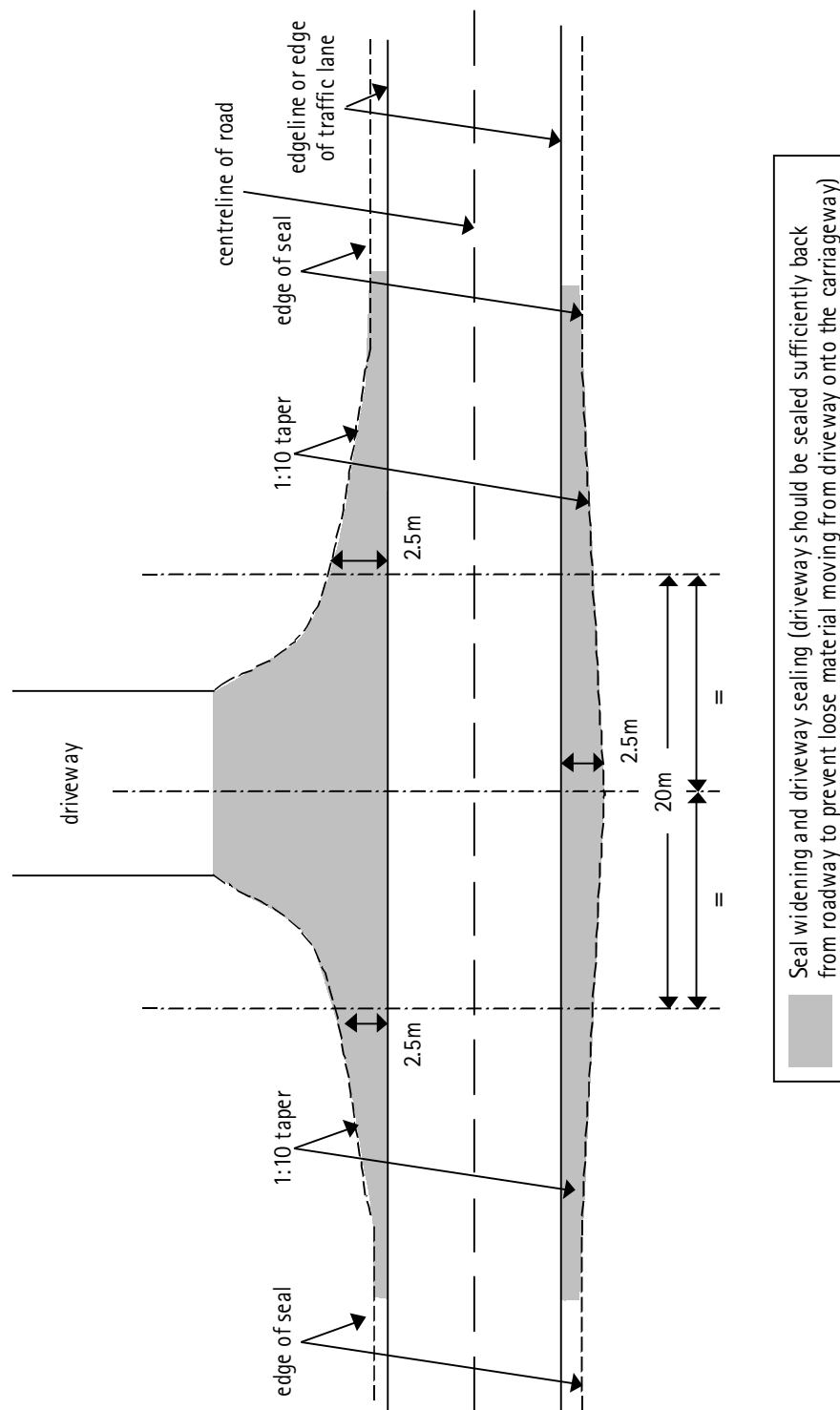
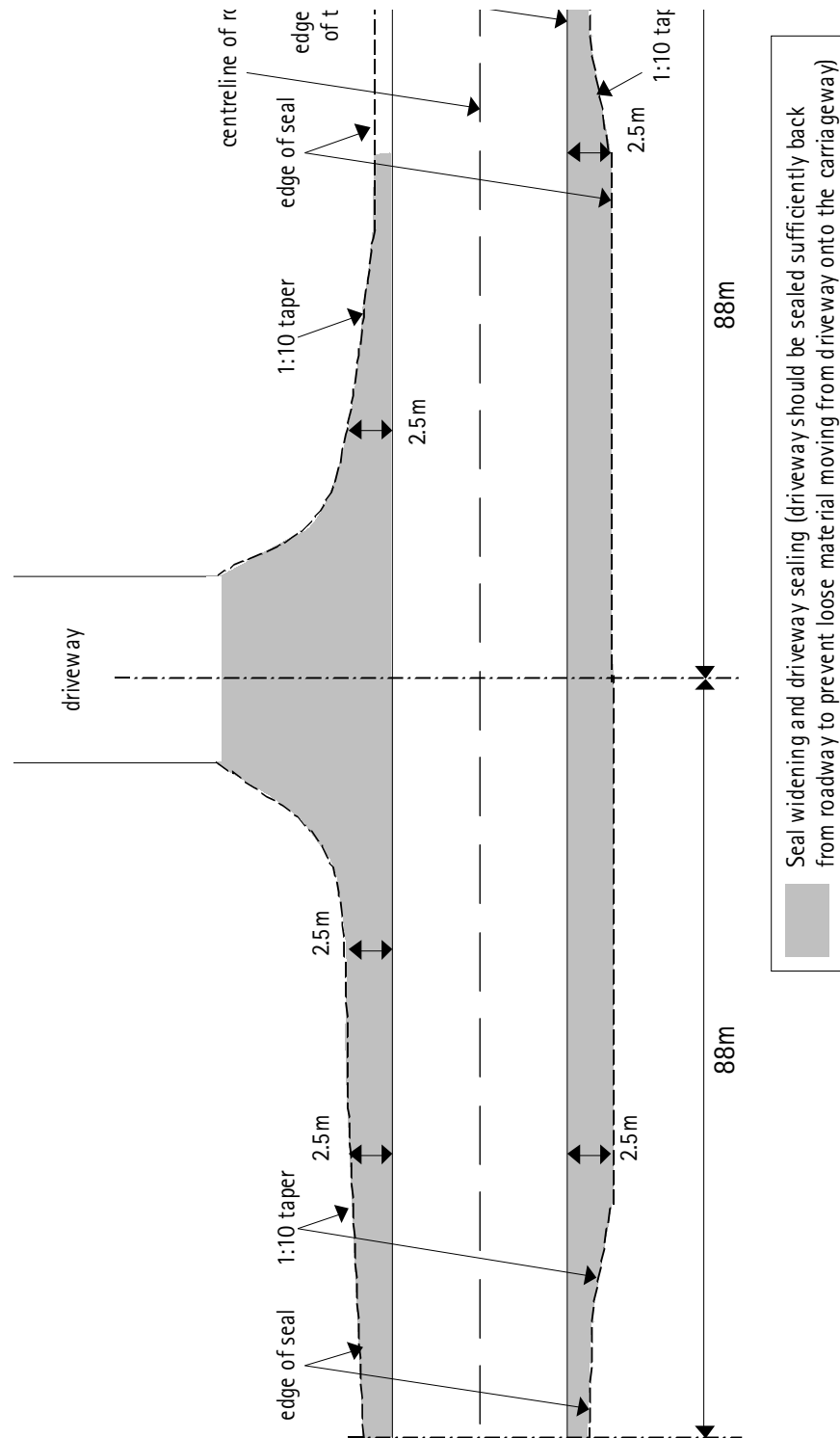


Figure 4: Seal widening on rural arterial roads for high volume driveways



4.2 Distance from intersections and between driveways

Driveways should be located sufficiently far from intersections so manoeuvres at the driveways do not conflict with, or get confused as, manoeuvres at the intersection.

The following distances from intersections are recommended by the given references:

	Distance
Ministry of Transport [3]	Service stations
	• Near intersections with traffic volumes > 1,000 vehicles per hour 30m
	• Near intersections with traffic volumes < 1,000 vehicles per hour 9m
Ministry of Transport [4]	Rural selling place
	• Arterial road 60m
	• Local/collector road 30m
Transit New Zealand [2]	Rural
	• On state highway 100m
	• On side road intersecting a state highway 30m
	Urban
	• One of intersecting roads a state highway 15m

Similarly, driveways should be spaced along the frontage road so it is clear at which driveway manoeuvres are taking place. This is particularly important for high volume driveways fronting arterial roads.

Transit New Zealand, *Planning for a safe and efficient highway network under the Resource Management Act* [2] recommends a minimum distance between driveways of 200 metres on rural state highways with a speed limit of 100 km/h. On urban state highways it recommends a minimum distance between driveways of 7.5 metres for residential land uses and 15 metres for other land uses.

4.3 Driveway width

Excessively wide driveways can create more unpredictable manoeuvres at driveways and increase the potential for conflicts with traffic on the frontage road.

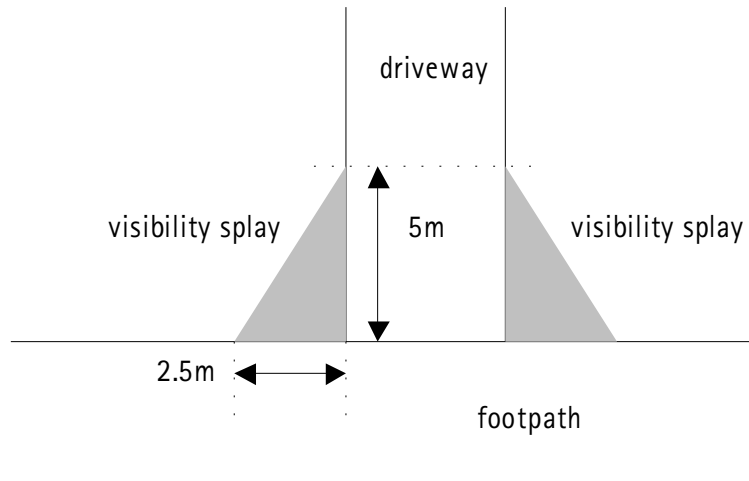
Both Ministry of Transport, *Standard for service stations* [3] and *Guidelines for establishing rural selling places* [4] and Transit New Zealand, *Planning for a safe and efficient highway network under the Resource Management Act* [2] recommend maximum driveway widths of 9.0 metres for two way operation. The latter also recommends a maximum 6.0 metres width for one way operation for activities with a high propensity to attract vehicles and a maximum of 3.5 metres for activities with a low propensity to attract vehicles. Ministry of Transport, *Standard for service stations* [3] recommends a maximum width of 6.0 metres for one way operation at service stations.

4.4 Pedestrian safety

For all driveways crossing a footpath there should be a line of clear sight between pedestrians on the footpath and vehicles using the driveway so that collisions are avoided. The area occupied by the driveway should also be well defined so that pedestrians can anticipate vehicle paths across the footpath.

This document has not developed any guidelines for this. However, Building Industry Authority DI Access Routes [5] recommends a 5.0 x 2.0 metre visibility splay for vehicle routes crossing a pedestrian route. This is indicated in the diagram below and should be considered for high volume driveways crossing footpaths in areas with high pedestrian activity.

Figure 5:



Ministry of Transport, *Standard for service stations* [3] states that “if the flow of pedestrians along the footpath is more than 1,000 per hour for several hours of the day, the site is not suitable for a service station.”

5. References

- [1] NAASRA (1988) *Guide to traffic engineering practice part 5 - intersections at grade.*
- [2] Transit New Zealand (June 1992) *Planning for a safe and efficient highway network under the Resource Management Act.*
- [3] Ministry of Transport (1983) *Standard for service stations.*
- [4] Ministry of Transport (August 1992) *Guidelines for establishing rural selling places.*
- [5] Building Industry Authority (Draft March 1992) Approved Document, *DI Access Routes.*

6. Acknowledgements

This document was compiled by Stephen Parry and Dean McCabe, Road and Traffic Standards Section, Christchurch with assistance from staff of Christchurch City Council and Transit New Zealand.

Comments on drafts were also received from:

- Auckland City Council
- Southland District Council
- Transit New Zealand
- All Ministry of Transport Road and Traffic Standards Sections.

A final draft was circulated to members of the Association of Local Government Engineers, New Zealand and comments from them incorporated into the final document.

Appendix: Accidents at driveways

1. Summary

Analysis of the 1987-91 injury accidents for all New Zealand shows 10.1% of urban and 6.1% of rural accidents occurred at driveways, i.e. are coded with junction type = D driveway in the Ministry of Transport accident database.

In urban areas nearly half of the accidents involved two vehicles on the frontage road, nearly one quarter vehicles from the driveway crossing or merging with the frontage road traffic and about one tenth vehicles manoeuvring (mainly reversing) at a driveway. Only 6% involved pedestrians. Of those involving two vehicles on the frontage road, two thirds were turning v same direction (G movement type) and one third right turn against (L movement type). Most involved right turn movements into driveways.

In rural areas over half involved two vehicles on the frontage road, 15% vehicles from the driveway crossing or merging with the frontage road traffic and 7% vehicles manoeuvring at a driveway. Less than 2% involved pedestrians. Of those involving two vehicles on the frontage road, most involved right turn movements into a driveway. As with the urban accidents, about two thirds of these were turning v same direction and one third right turn against movements.

Analysis of the injury accidents coded with special codes to indicate the development being served shows over half were at private house/farm driveways and about one quarter at non specified commercial activities.

2. Introduction

This appendix presents an analysis of the reported injury accidents for all New Zealand for the 1987-91 five year period. Accidents at driveways have been selected as those accidents coded with junction type = D (driveway).

In 1991 the Ministry of Transport introduced special codes to indicate the type of development vehicles were entering or leaving when accidents occurred at junction type = D. In the Ministry of Transport's southern region the accident data back to 1988 was reviewed to ensure accidents with junction type = D had the relevant special code added or, if the driveway was not relevant to the accident, the junction type = D removed. This checking and back coding has not been done in the central or northern regions. These codes have been analysed to show the developments served for 1991 national and 1988-91 southern region data.

3. Overall accident analysis

The following table shows an analysis of the national 1987-91 injury accidents with junction type = D. This gives a breakdown of the accidents by accident numbers, road type, vehicle type, movement type and natural light conditions.

Table 2: All New Zealand 1987-91 injury accidents with junction type = D (driveway)

		Urban		Rural	
		Number	%	Number	%
Accident numbers	All 1987-91 injury accidents	42,675		19,525	
	1987-91 injury accidents with junction = D	4,326	10.1	1,192	6.1
Road type	Accidents at driveways on state highways	479	11.1	685	57.5
	Accidents at driveways on local roads	3,847	88.9	507	42.5
Vehicle type	(As % of vehicles in driveway accidents)				
	Cars/vans/taxis		77.3		76.7
	Motorcycles		18.5		13.5
	Trucks		3.6		8.7
	Buses		0.4		0.2
	Other		0.2		1.0
Movement type	(Letters are first letter of movement code)				
	G turning v same direction	1,358	31.4	487	40.9
	L right turn against	661	15.3	202	17.0
	M manoeuvring (mainly MD driveway manoeuvres)	497	11.4	80	6.7
	H, J, K crossing or merging	969	22.4	182	15.3
	N, P pedestrian	267	6.2	17	1.4
	Other	576	13.3	223	18.7
Natural light conditions					
	Daylight	3,234	74.8	932	78.3
	Dark	1,086	25.2	258	21.7
Casualty type	(Types of road user killed or injured)				
	Driver (car/van/taxi)	1,916	35.7	844	44.7
	Passenger (car/van/taxi)	853	15.9	557	29.5
	Heavy vehicle	50	0.9	51	2.7
	Motorcyclist	1,491	27.8	349	18.5
	Pedestrian	283	5.3	28	1.5
	Cyclist	757	14.1	53	2.8

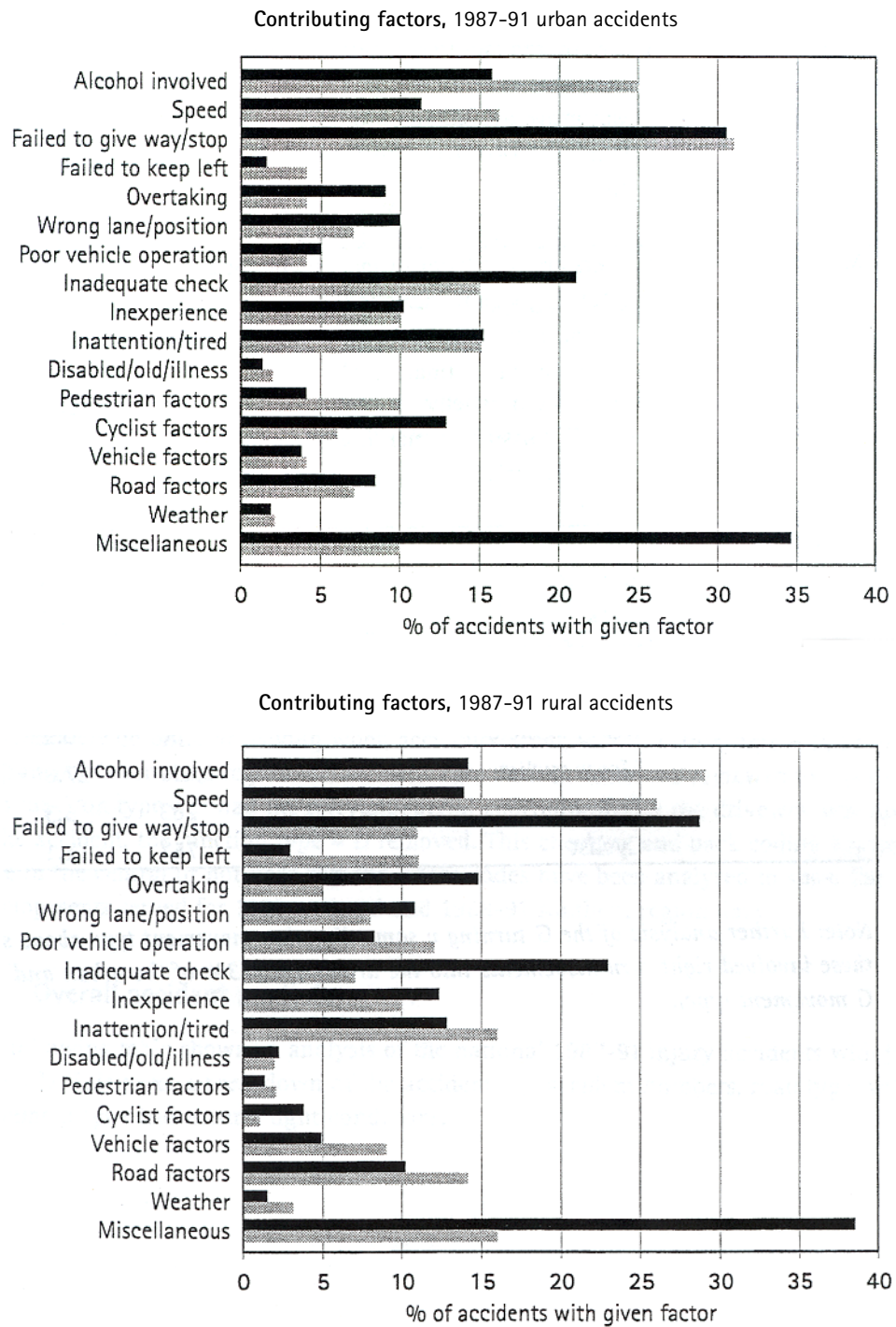
Note: Further analysis of the G turning v same direction movement type above shows most of these involved right turn movements into the driveways (73% of the urban and 90% of the rural G movement type).

4. Contributing factors

The following figures summarise the types of factors considered to have contributed to the 1987-91 injury accidents with junction type = D for urban and rural areas separately.

They also show the comparison with all injury accidents for New Zealand for the 1987-91 period.

Figure 6:



5. Developments served

Special codes in the accident database indicate the type of development vehicles were entering or leaving for accidents with junction type = D. These were revised and added to in 1991. As stated, these codes have been back entered for data back to 1988 for the Ministry of Transport's southern region.

The following table shows the development indicated by these codes for the national 1991 data and for the southern regions 1988-91 data.

The table shows over half of the accidents at driveways are at private house/farm driveways and about a quarter at other commercial activity, other than those specifically listed.

Table 3: Injury accidents with special codes

Code	Development vehicle entering or leaving	1991 national				1988-91 southern region			
		Urban Number	%	Rural Number	%	Urban Number	%	Rural Number	%
961	Roadside stall	7	1.1	21	11.2	3	0.5	12	10.0
962	Service station	50	7.7	16	8.6	54	8.9	2	1.7
963	Liquor outlet	20	3.1	3	1.6	24	3.9	4	3.3
964	Takeaway foods	9	1.4	0	0	3	0.5	0	0
971	Shopping complex	35	5.4	0	0	56	9.2	0	0
974	Car parking building	14	2.2	0	0	4	0.7	0	0
975	Other commercial activity	178	27.4	39	20.3	148	24.3	23	19.2
976	Industrial site	6	0.9	4	2.1	25	4.1	7	5.8
977	Private house/farm	331	50.9	105	56.1	292	48.0	72	60.0
	Total	650	100	187	100	609	100	120	100
	Number of accidents with junction = D	818		233		626		124	

Road and Traffic Guideline publications

The following Road and Traffic Guidelines are available:

- RTS 1 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 kerblines 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).