

# Part 4 Speed Controls

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## 2003 Edition

First Issue 1st August, 2003

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## PREFACE

This Part of the Manual sets out factors to be considered in determining an appropriate speed limit for a particular length of road and provides a uniform method of evaluating and signposting such a limit.

Control of speed is an important aspect in effective management of traffic and the involvement of speed related factors in road crashes is well established and understood by the general public.

It should not necessarily be assumed that imposition of a speed limit will solve all perceived safety problems on a road, nor will it necessarily alter travel speeds.

Experience and research in Australia and overseas has demonstrated that arbitrarily imposed limits that are too low attract poor levels of compliance. Actual speeds remain at the same levels as before unless massive and continued enforcement is undertaken. However, realistic and credible speed limits will be observed by the majority of road users and can be effective in regulating traffic flow, reducing crashes, maximising safety for vulnerable road users and controlling the environmental effects of traffic such as noise pollution.

The importance of having consistent, credible and largely self-enforcing speed limits is exemplified by the substantially increased levels of enforcement mainly brought about by the introduction of automated methods of infringement detection. Authorities therefore need to ensure that their methods of setting speed limits can be justified as being appropriate for both the environment and the road users.

Since 1 February 2003, the default speed limit in a built-up area in Queensland is 50 km/h. The default speed limit for rural areas is 100 km/h. These speed limits are generally not signposted. As well as the default limits of 50 km/h and 100 km/h the range of speed limits now in use includes 10 km/h in shared zones, 40 km/h in traffic calmed local residential areas and commercial shopping centres, 50 km/h in foreshore esplanades and strip shopping centres, 70 and 80 km/h on higher standard urban roads and 110 km/h on the highest quality rural highways.

This has highlighted the importance of the process used to assess and determine the appropriate speed limit according to the road function, prevailing traffic speed, roadside development and road and traffic characteristics.

It is important that imposed speed limits achieve a balance between safety, amenity and transport efficiency. The methods described in this Part of the Manual aim to achieve such a balance through signposting speed limits that are realistic and credible and consequently encourage voluntary compliance.

### **Principal variations:**

Principal variations from the First Issue 2003 Edition are as follows:

- (a) Introduction of a reduced speed limit for classes of vehicles.
- (b) Speed limit for Hospital zones.
- (c) Additional guidelines on signage of local streets.
- (d) Guidelines for determining the appropriate speed limit on roads in rural areas with substandard alignment to which the general rural speed limit would normally apply.
- (e) Introduction of the Speed Limit AHEAD sign (G9-79).
- (f) Change to buffer zone guidelines.
- (g) Revised signage guidelines in Figure 5.1.
- (h) Revised pavement markings guidelines.
- (i) Revisions to Tables B1 and B2.
- (j) Amendment to approval process for 110 km/h speed zones on undivided roads.

### **Attachments**

The following blank forms (master copies) are attached to Part 4:

- Speed Zone Plan and Data Sheet
- Speed Survey Field Sheet
- Speed Survey Calculation Sheet
- Frequency Distribution Curves Sheet
- Checklist for the Review of Existing Speed Limit

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## CONTENTS

SECTION 1. SCOPE AND INTRODUCTION.....	4-6
1.1 SCOPE .....	4-6
1.2 APPLICATION .....	4-6
1.3 OBJECTIVE.....	4-6
1.4 REFERENCED DOCUMENTS .....	4-6
1.5 DEFINITIONS .....	4-6
SECTION 2. SPEED MANAGEMENT .....	4-9
2.1 GENERAL.....	4-9
2.2 TYPES OF SPEED LIMIT .....	4-9
SECTION 3. APPLICATION OF CRITERIA BASED SPEED LIMITS .....	4-12
3.1 GENERAL.....	4-12
3.2 50 km/h LOCAL STREET SPEED LIMIT .....	4-12
3.3 110 km/h SPEED ZONES ON UNDIVIDED ROADS.....	4-12
3.4 SPEED LIMITS IN RURAL RESIDENTIAL AREAS .....	4-14
3.5 SPECIAL SPEED ZONES .....	4-16
SECTION 4. APPLICATION OF SPEED ZONING.....	4-17
4.1 GENERAL.....	4-17
4.2 CRITERIA FOR THE ESTABLISHMENT OF SPEED ZONES .....	4-17
4.3 PROCEDURE FOR DETERMINING APPROPRIATE SPEED LIMIT.....	4-19
4.4 REVIEWING SPEED LIMITS .....	4-22
4.5 LENGTH OF LINEAR SPEED ZONE.....	4-22
4.6 OFFSET SPEED ZONES .....	4-23
SECTION 5. SPEED LIMIT SIGNS.....	4-24
5.1 SPEED LIMIT SIGN DETAILS .....	4-24
5.2 SIGN APPLICATION.....	4-27
5.3 CONFLICT WITH ADVISORY SPEED SIGNS .....	4-30
SECTION 6. PAVEMENT MARKINGS .....	4-33
6.1 GENERAL.....	4-33
6.2 MARKING DETAILS.....	4-33
APPENDICES	
A FUNCTIONAL CLASSIFICATION OF ROADS IN URBAN ENVIRONMENTS .....	4-34
B TYPICAL SPEED LIMITS .....	4-35
C COLLECTION AND ANALYSIS OF SPEED DATA.....	4-38
D EVALUATION OF SPEED ENVIRONMENT UTILISING 'QLIMITS' .....	4-44
E CRASH DATA .....	4-52
F DETAILED PROCESS FOR THE DETERMINATION OF SPEED LIMITS.....	4-54
G GUIDELINES FOR CONDUCTING SPEED SURVEYS .....	4-63
H SPEED MANAGEMENT COMMITTEES .....	4-66
ATTACHMENTS .....	4-67

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DEPARTMENT OF TRANSPORT AND MAIN ROADS  
Queensland

**Manual of Uniform Traffic Control Devices**

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**PART 4 – SPEED CONTROLS**

**SECTION 1. SCOPE AND INTRODUCTION**

**1.1 SCOPE**

This Part of the Manual sets out traffic control devices to be used for the regulatory control of traffic speed and gives guidance on the way in which these devices should be applied in various situations. Guidance is also provided on the determination of appropriate speed limits.

This Part of the Manual does not cover the following:

*Advisory speed signing* - such as that used at substandard alignments - (see Part 2 of this Manual).

*Temporary speed limit zoning for roadworks* - (see Part 3 of this Manual).

*Speed limits on freeway ramps* - (see Part 8 of this Manual).

*Speed control in LATM areas* - (see Part 13 of this Manual).

*Shared zones and school zones* - (see Part 10 of this Manual).

**1.2 APPLICATION**

This Part of the Manual is applicable to all types of road under normal operating conditions.

**1.3 OBJECTIVE**

The objective of this Part of the Manual is to provide a set of uniform requirements and guidelines for the design and use of traffic control devices for the regulatory control of traffic speed on roads throughout Queensland.

**1.4 REFERENCED DOCUMENTS**

No Australian Standards are directly referenced in this Part of the Manual.

**1.5 DEFINITIONS**

For the purpose of this Manual the following definitions apply:

**1.5.1 AADT**

Annual Average Daily Traffic is the total yearly volume along a length of road divided by the number of days in the year, commonly abbreviated and referred to as AADT.

**1.5.2 Bin system**

A bin is a discrete range of values into which all measurements within that range are accumulated e.g. 41 to 45 km/h or 56 to 60 km/h etc.

**1.5.3 Buffer zone**

A speed zone, of minimal length, used as a transition between two speed limits that differ by more than 20 km/h. Buffer zones are being phased out in Queensland.

**1.5.4 Built-up area**

Built-up area, in relation to a length of road, means an area in which there are buildings on land next to the road, or there is street lighting, at intervals not over 100 metres for a distance of at least 500 metres or, if the road is shorter than 500 metres, for the whole road.

### 1.5.5 Design speed

Normally the 95th percentile speed of free-flowing traffic which is expected to occur as a function of the adopted design standard of a road.

### 1.5.6 Design standard (road)

The design standard relates to the level of service, mobility and safety provided by design elements such as:

- horizontal and vertical curvature
- sight distance
- superelevation
- pavement, shoulder and lane width
- gradients
- degree of access restriction

### 1.5.7 85th percentile speed ( $V_{85}$ km/h)

The speed at, or below, which 85 percent of vehicles are observed to travel under free flowing conditions past a nominated point. A vehicle is considered to be operating under free-flowing conditions when the preceding vehicle has at least 4 seconds headway and there is no apparent attempt to overtake the vehicle ahead.

NOTE: For the purpose of this Manual, it is normal to include all types of vehicle on the road and to aggregate the results of measurements unless specifically noted otherwise. Speed measurements are desirably made by unobtrusive means such as suitably hidden radar or timing devices.

Where this Manual indicates application of an 85th percentile speed to the approach to a hazard, intersection, etc, it should be measured well in advance of the point where the hazard, intersection, etc, itself begins to influence travel speeds, e.g. 200 m urban to 500 m rural in advance.

A guide to the determination of 85th percentile speed is set out in Appendix C and Appendix G.

### 1.5.8 Free speed

The travel speed chosen by a road user when unhindered by other traffic, often assumed to be a road user's desired speed of travel.

### 1.5.9 Local area

An urban area containing only local and collector roads which is bounded by arterial and sub-arterial roads or features such as rivers, railway lines or the limit of urban development. A number of local areas comprise a suburb.

### 1.5.10 Local street

A road or street that serves primarily to provide for direct property access and/or for limited neighbourhood movement. Local Streets are typically considered to be an Access Street or some minor Collector Streets, as described in Appendix A, Table A1 *Functional Classification of Roads in Urban Environments*.

### 1.5.11 Pace

A nominated speed range in which the greatest number of vehicles in traffic is observed to travel under free flowing conditions past a nominated point. For example, the 15 km/h Pace is the 15 km/h speed range in which the largest percentage of vehicles is observed to travel.

### 1.5.12 QLIMITS

A computer-based advisory system that provides a recommended speed limit based on an evaluation of the speed environment from information and data provided by the user. QLIMITS is available from the Department of Transport and Main Roads.

### 1.5.13 Speed distribution

The statistical distribution of a sample of vehicle speed measurements (refer Appendix C, Figure C4 *Frequency Distribution Curves Diagram*).

**1.5.14 Speed environment**

The elements of the road and traffic environment that collectively influence a road user's determination of an appropriate travel speed.

**1.5.15 Speed limit**

The maximum speed at which a motor vehicle is legally permitted to travel on a particular section of road.

**1.5.16 Speed zone**

A length of road or a network of roads (area) to which a single signposted speed limit applies.

**1.5.17 Traffic carrying road**

A road which carries traffic which primarily has trip origins and destinations outside a local area.

**1.5.18 Traffic control device**

Any sign, signal, pavement marking or other installation placed or erected under authority of the Transport Operations (Road Use Management) Act for the purpose of regulating, warning or guiding road users.

**1.5.19 Traffic route**

A road or street which serves primarily to enable travel between localities, typically arterial, sub-arterial and major collector roads.

**1.5.20 Typical speed limit**

The speed limit typically identified with particular road functions in urban environments.

## SECTION 2. SPEED MANAGEMENT

### 2.1 GENERAL

#### 2.1.1 Objective

The objective of speed management is to contribute to road safety, mobility and amenity on public roads by providing a credible system of speed limits that are compatible with the speed environment.

Note: The enforcement and educational components of speed management are outside the scope of this Manual.

#### 2.1.2 Principles

The following principles need to be observed when determining speed limits:

- (a) Speed limits should be capable of being practically and equitably enforced by use of speed zones of adequate length, by limiting speed limit changes, and by clarity and frequency of signposting.
- (b) The speed limit should not be so low that a significant number of road users ignore it.
- (c) Speed limits should not be applied specifically for the purpose of compensating for isolated geometric deficiencies.
- (d) Speed limits, other than general urban or general rural limits, should not be applied to unsealed roads or roads with narrow seals, i.e. seals of insufficient width for two vehicles to pass without use of the shoulder or verge. An exception to this requirement shall be the application of speed limits less than 50 km/h to roads which are not traffic routes.
- (e) All signposted speed limits shall be in multiples of 10 km/h.

#### 2.1.3 General requirements

Speed limits should be set to maintain a balance between a road user's reasonable perception of the speed environment and an acceptable level of environmental amenity for all road users and abutting land users.

Speed limits should be set to encourage, as far as practicable, a uniform speed of travel that will reduce the potential for conflicts due to speed differentials between vehicles. Excessive variation among vehicle speeds can indicate either an inappropriately set speed limit or that the road user's perception of the speed environment is open to confusion. If there is confusion, corrective action may be required rather than a reassessment of the speed limit.

Where the speed limit exceeds the maximum safe speed of travel at a particular location, advisory speed signs displayed in conjunction with the relevant warning signs (see Part 2 of this Manual) should be used to advise road users of the need to reduce speed.

The speed of vehicles along a section of road may be influenced by a range of factors that vary over time, including weather, lighting, road surface condition and the presence of animals within the road reserve. Such factors should not be taken into account in the determination of speed limits. The signposted speed limit represents the maximum speed limit under normal conditions and drivers are required by law to adjust their driving and vehicles' speeds to suit the prevailing road and traffic conditions.

### 2.2 TYPES OF SPEED LIMIT

#### 2.2.1 General speed limits

General speed limits throughout Queensland, or specific areas of Queensland, are applied by regulation to various classes of road according to their environment, in the absence of other more definitive means of setting speed limits.

The categories of general speed limit are as follows:

- (a) *General urban speed limit (50 km/h)* - applies in built-up areas in the absence of a speed zone.
- (b) *General rural speed limit (100 km/h)* - applies to other than built-up areas in the absence of a speed zone.

These speed limits are legally enforceable with or without posted signs, which avoids the need for extensive signing.

### 2.2.2 Criteria based speed limits

Criteria based speed limits are determined in accordance with specific criteria relevant only to that speed zone. Criteria based speed limits include:

- (a) *50 km/h local street speed limit* – this speed limit applies to streets whose primary function is to provide for direct property access and for limited neighbourhood movement.
- (b) *110 km/h speed limit for undivided rural roads* – this speed limit is applicable to the highest standard National and State Highways which form the intrastate routes. This speed limit may be applied to undivided roads which adequately meet the criteria listed in section 3.3 of this Part of the Manual.
- (c) *rural residential speed limits* – speed limits in rural residential areas are determined in accordance with the criteria listed in section 3.4. The speed limits are based on a risk management approach and are determined by the functional classification of the road and the average number of property accesses per 100 m.

### 2.2.3 Special speed limits

Special speed limits are either specified in the Transport Operations (Road Use Management – Road Rules) Regulation 1999 or indicated by signs, as appropriate to the particular type of limit. Special speed limits include:

- (a) *Temporary limit* - speed limits may be imposed during special events or at roadworks sites as a temporary measure to protect the road user from unexpected hazards, to safeguard workers and plant, or to protect works from damage caused by high-speed vehicles (see Part 3 of this Manual). They may also be imposed on a bridge if temporary or permanent structural deficiencies exist (see Part 2 of this Manual).
- (b) *Special area limit* - special speed limits may be imposed as part of a local area traffic management scheme or in parks, reserves, camping areas, etc. A proclaimed limit applying to the whole of the area is usually more satisfactory than speed zoning. Signs advising road users of such proclaimed area limits will usually be necessary (see Part 13 of this Manual).
- (c) *Classes of vehicles or drivers limit* –
  - (i) where the traffic regulations provide for special speed limits for certain classes of vehicle or drivers.
  - (ii) where for safety reasons, a reduced speed limit may need to be imposed on a specific class of vehicles.

### 2.2.4 Speed zones

Speed zones are always signed and take precedence over the general limit that would otherwise apply, but not over special speed limits that apply to certain classes of vehicles.

Speed zones shall comprise one of the following:

- (a) *Linear speed zone* - is applied to a length of road by means of appropriate speed limit signing at each end.
- (b) *Area speed zone* - is applied to a network of roads within a defined area with appropriate speed limit signing at each entry to and exit from the area.
- (c) *School zone* - is a speed limit associated with a school (see Part 10 of this Manual).
- (d) *Shared zone* - is a speed limit applied to an area or length of street shared by both vehicles and pedestrians (see Part 13 of this Manual).
- (e) *Hospital zone* - is a speed limit associated with a hospital. A hospital zone shall be indicated by a Speed Restriction sign (R4-1) indicating the speed limit with a supplementary sign (R4-Q07) with the words Hospital Zone. Hospital zones may be installed near hospitals where there is high pedestrian activity related to the hospital. Pedestrian crossing facilities should be provided within hospital zones to minimise conflict points between pedestrians and traffic.

### 2.2.5 Variable speed limits

Variable speed limit - the need for periodic changes in the speed limit of a linear speed zone may arise typically for reasons such as:

- (i) Changes in weather conditions that physically affect the safe speeds at which all vehicles can be driven on a particular length of road, e.g. occasional fog or crosswinds on a bridge, which can significantly affect vehicle control.
- (ii) Periodic activity, e.g. opening and closing heavy vehicle inspection stations on a highway, which may warrant a reduction in general traffic speeds past the site due to heavy vehicles leaving or entering the traffic stream.
- (iii) At school zones (refer to Part 10 of this Manual and School Environment Safety Guidelines).
- (iv) To regulate traffic flow and ease traffic congestion or for incident management as part of an adaptive speed control system.
- (v) At high pedestrian activity zones such as at entertainment areas, near sporting complexes and commercial precincts.
- (vi) During special events or routine road maintenance.

Variable speed limits should generally not be used in other circumstances, as extended use would compromise the current legislative system of regulatory speed limits.

## SECTION 3. APPLICATION OF CRITERIA BASED SPEED LIMITS

### 3.1 GENERAL

Criteria based speed limits are determined in accordance with specific criteria for each type of speed limit. A full speed limit review is not required for criteria based speed limits.

### 3.2 50 km/h LOCAL STREET SPEED LIMIT

This is the default speed limit that is applied on local streets. The primary determinant for application of the 50 km/h local street speed limit is the function of the street. The function of a local street is to *provide for direct property access and/or for limited local neighbourhood movement*. Local streets are generally characterised by having the trip start or end within the local area and are typically classified as Access or Local Streets or Minor Collector Streets as described in Table A1, Appendix A.

Roads where a noticeable proportion of trips that do not start or end in the local area (ie. trips through a local area) are not local streets as they have a traffic carrying function.

Since the 50 km/h local street speed limit is the default speed limit for local streets in a built-up area and does not apply to roads that provide a traffic carrying function. It is therefore necessary to signpost traffic carrying roads as determined through application of the procedure described in Clause 4.3. This process is initiated by identifying those streets where the local street speed limit will apply and those roads where it will not apply.

Local streets typically have the following additional characteristics:

- (i) a roadway width of 8 – 10 m or less;
- (ii) maximum 85th percentile speed or upper limit of the 15 km/h Pace of 59 km/h;
- (iii) absence of centreline markings;
- (iv) are located in built-up areas which typically have maximum block sizes up to 2,000 m<sup>2</sup>; and
- (v) have a maximum AADT of 3,000 (i.e. service up to 300 dwellings).

Speed Restriction (R4-1) signs are generally not installed on local streets. There are instances however, when 50 km/h Speed Restriction signs will need to be installed. These include at the end of school zones on local streets or when the function of a road changes from traffic carrying to local access.

Where the vehicle speeds need to be controlled in a local street, engineering measures should be implemented to change the speed environment. Speed Restriction signs should not be used to control the speed of traffic in local streets, as the installation of these signs will have a negative impact on other unsigned streets.

### 3.3 110 km/h SPEED ZONES ON UNDIVIDED ROADS

#### 3.3.1 General

The 110 km/h speed limit shall only be applied to the highest standard National and State Highways which form the intrastate routes (which constitute approximately 8,000 km of State-controlled roads).

The 110 km/h speed limit may be applied to undivided roads which adequately meet the criteria listed below.

Note: Approval for 110 km/h speed zones on undivided roads which fully satisfy the selection criteria listed must be obtained from General Manager (Corridor Management and Operations). Proposed 110 km/h zones on divided roads require the approval of the Department of Transport and Main Roads.

#### 3.3.2 Criteria

A 110 km/h speed zone may only be established when the section of road under consideration complies with the criteria listed below:

- (i) an existing 100 km/h speed limit shall apply;
- (ii) AADT not likely to exceed 3000 on long term projected volume;
- (iii) the abutting land is undeveloped and as such there is minimal movement of pedestrians, cyclists and slow-moving vehicles onto or across the road;
- (iv) major intersections are spaced not less than 10 km apart with low-volume side road intersections spaced not less than 1 km apart;

- (v) low density of access is present (generally less than 2 access points/km in total on both sides of carriageway);
- (vi) the crash rate, calculated over a period of not less than three years, shall not exceed  $\$500 \cdot 10^4 / 10^8 \text{ VKT}$ ;  
 Note: The crash profile should be examined to identify crash clusters, and consideration should be given to implementing countermeasures which address the crash history.
- (vii) the road shall be constructed to a continuous design speed of 120 km/h (an isolated curve with a lesser design speed would not preclude the use of the 110 km/h speed limit, subject to the compliance with other 110 km/h speed limit criteria);
- (viii) the cross-sectional requirements in Table 3.1 shall be satisfied;
- (ix) except as provided in section 3.3.3, the candidate road segment shall exceed a minimum length of 20 km, unbroken by lower speed limits through towns and settlements;
- (x) the limit shall have an obvious start and finish which will typically coincide with a town or settlement or a change in road environment (ie. it will not start or finish where there is no obvious change in land-use and/or speed environment);
- (xi) the roadside is conducive to safe recovery of errant vehicles (rigid objects within 9.0 metres of the edge of the travel lane should be frangible or shielded);
- (xii) at approval stage, average pavement roughness should not exceed NRM 120, with not more than 20% of the route exceeding NRM 120 and absolute maximum pavement roughness being NRM 140. However, where there are sections of road with crossfall that exceeds 5% on straight sections of road or 7% on curves absolute maximum roughness should not exceed 120 NRM. Pavement roughness should be maintained in accordance with roughness standards for National Highways in the RMPC Guidelines for Undertaking Routine Maintenance (Volume 3);
- (xiii) centreline and edgeline pavement markings shall be provided on roads with AADT of greater than 500. For roads with an AADT lower than 500, centreline marking shall be provided and edgelines should be provided;
- (xiv) where a 110 km/h zone is approved, a road safety audit shall be undertaken to identify any potential hazards, with particular attention being paid to the provision of adequate protection at embankments and the provision of bridge barriers. In addition to this, attention should be given to elements that may be contrary to motorists' expectation and these should be appropriately treated (for example, signing).

**Table 3.1 CROSS-SECTIONAL REQUIREMENTS FOR 110 km/h ZONES**

<b>AADT</b>	<b>Minimum Formation Width<sup>1</sup> (m)</b>	<b>Absolute Minimum Formation Width<sup>2</sup> (m)</b>	<b>Minimum Seal Width (m)</b>	<b>Absolute Minimum Seal Width<sup>3</sup> (m)</b>
0 - 500	9.0	8.0	7.0	6.2
501 - 1500	10.0	9.0	8.0	7.0
1501 - 3000	11.0	10.0	9.0	8.0

Notes:

- 1 Formation width measured from top of batters.
- 2 Where batter slopes are recoverable (1 on 4 or flatter), absolute minimum formation widths are permitted.
- 3 Where the seal width of a road is less than the minimum seal width, absolute minimum seal widths are permitted only if the cumulative length of the road with absolute minimum seal width does not exceed 20% of the road length being considered.

### 3.3.3 Exceptional circumstances

There may be circumstances where a candidate 110 km/h zone is fragmented by a road segment that does not meet all of the above criteria. Such a segment shall only be permitted where:

- (i) the overall zone length of the 110 km/h zone under consideration is greater than 40 km;
- (ii) there are no more than 2 such segments over a 40 km zone;

- (iii) the segment does not exceed a length of approximately 4 km (or approximately 2 minutes of travel time).

Where such a segment is permitted, the following arrangements shall be made:

- (i) for a short segment up to 0.5 km in length, (e.g. isolated curves, narrower sections of road, short segments of rough pavement) larger warning signs and/or additional warning signs shall be installed to ensure that the driver is aware of changed conditions, (e.g. road narrowing, floodway); or
- (ii) for a longer segment, between 0.5 km and 4 km, a speed limit of 100 km/h shall be implemented and larger and/or additional warning signs provided.

Where a road between two settlements/towns satisfies the criteria of section 3.3.2, a minimum segment length of 15 km is acceptable.

Note: It should be noted that the above criteria are subject to change, as the application of 110 km/h speed limits is continually under review and enhancement.

### 3.3.4 Signing of 110 km/h speed zones

The Speed Restriction (R4-1) sign shall be installed on the left hand side of the carriageway to indicate the start of the 110 km/h speed zone. R4-1 repeater signs shall be installed at regular intervals not exceeding 10 minutes interval of travel and past important intersections for the benefit of turning traffic.

At the end of the 110 km/h speed zone, Speed Restriction (R4-1) signs shall be installed to indicate the start of the lower speed zone. The start of the lower speed zone shall be duplicated on both sides of the roadway. In some instances, it may be necessary to supplement the Speed Restriction (R4-1) sign with pavement markings indicating the lower speed zone applying beyond that point.

Speed Limit Ahead (G9-79) signs shall be installed 300 m to 500 m in advance of the start of the lower speed zone and shall be duplicated on both sides of the roadway.

### 3.3.5 Audits of 110 km/h speed zones

It is essential that all 110 km/h speed zones are maintained to the highest standards as required in the *RMPC Guidelines for Undertaking Routine Maintenance (Volume 3)* and comply with these guidelines throughout the life of the speed zone. All 110 km/h speed zones should be audited for compliance with the criteria in section 3.3.2 and RMPC guidelines every 3 - 5 years.

Where it is found that the 110 km/h speed zone does not comply with the criteria in section 3.3.2, the speed limit shall be reduced.

## 3.4 SPEED LIMITS IN RURAL RESIDENTIAL AREAS

### 3.4.1 General

Speed limits in rural residential areas are criteria based and are not subject to a full speed limit review. This section provides the procedure for determining speed limits for roads in rural residential areas. For isolated strip development abutting rural roads, the procedure for determining speed limits detailed in Section 4 of this Part of the Manual shall be used.

### 3.4.2 Definition of a Rural Residential Area

A rural residential area is considered to be an area outside the urban area which contains a network of roads providing access to primarily residential blocks of sizes between 2000 m<sup>2</sup> and 10 Ha and where the property frontages, on average, do not exceed 200 metres. Where property frontages exceed 200 metres, speed limits should be determined in accordance with Section 4 of this Part of the Manual.

### 3.4.3 Functional Classification of Roads in Rural Residential Areas

For the purposes of setting speed limits, Table 3.2 provides a functional classification of roads in rural residential areas. Within this classification, only the Rural Residential Trunk Collectors are regarded as traffic carrying roads. There is no requirement for local governments to adopt this functional classification for their road hierarchy plans.

**Table 3.2 FUNCTIONAL CLASSIFICATION OF ROADS IN RURAL RESIDENTIAL AREAS**

Classification	Functional Description
Rural Residential Access Road	Used only for direct access to property. Generally used only by owners of properties along these roads.
Rural Residential Collector Road	Used for access to property and other roads and for local neighbourhood access within the rural residential area. Generally used only by owners of properties along those roads and by other people living within the rural residential area.
Rural Residential Trunk Collector Road	Used to travel through an area or as a major connector into an area. Significant use by motorists from outside the rural residential area.

### 3.4.4 Speed Limits for Roads in Rural Residential Areas

Speed limits for roads in rural residential areas are given in Table 3.3. The speed limit is based on a risk management approach where risk is measured by the frequency of property accesses on both sides of the road combined, averaged over 100 metres for the length of the road.

**Table 3.3 HIERARCHY OF TYPICAL SPEED LIMITS FOR ROADS IN RURAL RESIDENTIAL AREAS**

Road Classification	Average Accesses per 100 m <sup>1</sup>	Speed Limit
Access Road Collector Road	>2 >4	50 km/h
Access Road <sup>2</sup> Collector Road <sup>2</sup> Trunk Collector Road	1 to 2 >2 to 4 >4	60 km/h
Access Road Collector Road <sup>2</sup> Trunk Collector Road	<1 1 to 2 >2 to 4	70 km/h
Collector Road Trunk Collector Road <sup>2</sup>	<1 1 to 2	80 km/h

Notes:

1. Average number of accesses per 100 m for the length of the road for both sides combined;
2. A lower speed limit could be appropriate if the design standard of the road is compatible with the lower speed.
3. The minimum lengths of speed zones specified in Table 4.1 of this Part of the Manual still apply.

### 3.4.5 Areas under Development

In many rural residential areas, construction of buildings, and hence accesses, occurs over a number of years. To avoid frequent speed limit changes due to development along the road, the initial speed limit for a road in a developing area should be based on the estimated number of accesses that will exist after all buildings are constructed, if it is expected that:

- building construction will occur progressively and continuously;
- the majority of buildings will be constructed within approximately 5 years; and
- the majority of motorists are likely to see the speed limit as reasonable for the initial road environment.

The future number of accesses should be estimated by counting the total number of properties on both sides of the road combined, assuming one access per property.

Where building construction is likely to occur randomly, or where it is likely that the majority of buildings will not be completed within 5 years, the initial speed limit should be determined using the existing number of accesses, unless the design of the road supports a lower initial speed limit.

### 3.5 SPECIAL SPEED ZONES

Special speed limits of 40 km/h or less are typically used in situations as described in Table B1, Appendix B. The following specific requirements also apply to the use of 40 km/h and 50 km/h speed limits in special speed zoning applications:

- (a) *40 km/h speed limit* - Except at school zones, a 40 km/h speed limit shall only be applied as follows:
- (i) on local streets which have been designed to support the lower speed limit, or where appropriate traffic calming devices have been installed in accordance with Part 13 of this Manual.
  - (ii) on traffic carrying roads at strip shopping centres and commercial areas where appropriate traffic calming has been provided.
  - (iii) on streets in central business district areas which generate significant pedestrian activity and where vehicle speeds are typically less than 49 km/h.
  - (iv) on streets where facilities or land use adjacent to the road generates significant pedestrian activity at certain periods of the day. For example, entertainment areas and sporting complexes.

The 40 km/h speed limit would generally apply at all times. However, where a time based 40 km/h zone is established, electronic variable speed limit signs shall be installed.

- (b) *50 km/h speed limit* - In addition to its use as the general urban speed limit, a 50 km/h speed limit has special speed zoning applications, i.e. where the erection of Speed Restriction signs is required. Such applications include:
- (i) traffic carrying roads that have constrained or changed physical environments to support the lower limit. A typical circumstance is where nodal traffic calming scheme has been introduced or where constrained speed environment exists on roads through strip shopping centres and commercial areas. The restriction of vehicle speeds in these situations is considered as part of an integrated scheme that aims to balance land-use, parking and traffic management, safety, and amenity. Consequently, such application should only be considered where a comprehensive local area planning exercise has been completed and implemented and where vehicle speeds are typically less than 59 km/h.
  - (ii) foreshore esplanades which are not major traffic routes, and where significant recreational activity indicates that a speed limit lower than 60 km/h is appropriate.

The *nodal* approach to traffic calming or speed management aims to improve levels of safety on traffic-carrying roads in areas which support higher levels of mixed activity, while retaining suitable levels of mobility on the overall route.

A constrained environment on a traffic carrying road would generally result in vehicle speeds typically less than 59 km/h without the need for any traffic calming.

## SECTION 4. APPLICATION OF SPEED ZONING

### 4.1 GENERAL

Speed zoning is the establishment of a speed limit for a particular length of road, or network of roads, where roadside development is such that a general speed limit does not reasonably fit the prevailing road and traffic conditions. Zoning should be based on traffic engineering studies and may be higher or lower than the general limit imposed upon the surrounding area.

The aim of speed zoning is to modify traffic speeds in order to regulate flow and reduce crashes, thereby promoting safety for all road users and for persons using adjacent developments, but without needlessly restricting road users at places where higher speeds can be permitted in safety.

Altered limits must therefore reflect optimum, rather than adverse operating conditions on the roadway. The need for a speed zoning limit other than the statutory limit should be obvious to road users by both day and night.

It is found that speed zoning established in accordance with these aims -

- (a) encourages more uniform and better driving habits;
- (b) improves safety by lessening differential speeds, thereby reducing overtaking manoeuvres; and
- (c) is better observed and consequently needs less enforcement.

### 4.2 CRITERIA FOR THE ESTABLISHMENT OF SPEED ZONES

#### 4.2.1 General

The process described in this Part of the Manual is applicable to existing roads. This process should also be applied to new roads as soon as possible after opening, taking into account the need to allow sufficient time to allow for traffic patterns and flows to normalise.

In the determination of speed zones the following criteria should be considered for the particular length of road:

- (a) road function;
- (b) prevailing traffic speeds; and
- (c) speed environment.

Other issues, such as crash history and potential risk factors, are also assessed before the final determination of an appropriate speed limit.

Note: Speed limits for strip development on rural roads are determined using this procedure. Speed limits for roads in rural residential areas are criteria based and are determined in accordance with the procedure given in Clause 3.4.4.

#### 4.2.2 Road function

Road function is an important consideration in the selection of an appropriate speed limit. Ideally, the road environment should be consistent with the road function. The classification (or nominated function) of a road within a network has implications regarding the appropriate road environment and inherent levels of mobility and safety of all road users. Therefore, credible speed limits need to be determined with some recognition of road users' safety, their expectations with regard to travel speed and the perceived function of a road.

The function of a road, or its intended role within a road hierarchy, is usually planned before construction or evolves as land development occurs. The primary functions of roads range from the provision of property access (such as a suburban cul-de-sac) to the provision for travel (such as an access-controlled arterial road). However, as the function of the majority of roads has evolved over time, they often have a mixed function.

Appendix A provides a functional classification, which has been adopted, for roads in an urban environment. Refer to Appendix A, Table A1, Functional Classification of Roads in an Urban Environment.

A first assessment of the speed limit appropriate for a particular road should be obtained by determining the typical speed limit, which is based on road function. These are the limits, which are considered in the first instance to be likely to match road users' expectations of the appropriate limit for the particular road.

Appendix B details a hierarchy of speed limits in the form of two tables, B1, Hierarchy of Typical Speed Limits - Urban Environment and B2, Hierarchy of Typical Speed Limits - Rural Environment. These tables provide a guide to the speed limits that may be typically expected on roads of the type described.

### 4.2.3 Prevailing traffic speeds

A major factor in the determination of a speed limit is the prevailing traffic speed, as measured by the 85th percentile speed or by the upper limit of the 15 km/h Pace. This speed is representative of the general perception of a reasonable travel speed on a particular section of road. Although other factors may indicate that this perception may need to be modified by imposition of a lower speed limit, such a limit may be progressively ignored to an increasing extent as the difference between the prevailing traffic speed and the posted speed limit increases.

Note: In an ideal speed distribution, the 85th percentile speed is approximately equal to the upper limit of the 15 km/h Pace.

Further, research has indicated that an increase in the variation between vehicle speeds is accompanied by an increase in crash rates. Such variations in vehicle speeds can be minimised by correctly implemented speed limits.

Appendix C provides guidance for the collection and analysis of speed data, for the purposes of evaluating the distribution of prevailing vehicle speeds. Procedures are also provided concerning the determination of a speed limit that the prevailing vehicle speeds would suggest as being appropriate. A range of statistical measures is considered, including mean speed, upper and lower limits of the Pace and the percentage of vehicles within the Pace.

### 4.2.4 Speed environment

The speed environment, described as the elements of the road and traffic environment which collectively influence a road user's perception of an appropriate maximum travel speed, should also be taken into account. These elements include the following:

- (a) roadside development;
- (b) road characteristics; and
- (c) traffic characteristics.

#### 4.2.4. (a) Roadside development

Roadside development is the most important aspect to be considered in the determination of speed zones. Road users will not accept a speed limit that imposes excessive restraints on speed with little apparent relationship to the abutting roadside development, and the level of voluntary compliance will be low.

#### 4.2.4. (b) Road characteristics

The following road characteristics need to be considered in relation to the introduction of a speed limit:

- (a) *Alignment* - Speed zoning should not be used solely to control speeds on isolated substandard alignments. In such conditions speeds should be controlled by the use of alignment warning and advisory speed signs rather than by speed zoning. However, where the alignment of the road, for the substantial length of the road section, is of a lower standard than the speed limit determined by the function of the road, or the speed environment would otherwise suggest, the 85th percentile speed or the upper limit of the 15 km/h Pace should be used to determine the appropriate speed limit for the road.
- (b) *Road access* - Where adequate visibility to and from access points is available, a higher speed than might be indicated by considering roadside development only, may be permitted on divided roads -
  - (i) where service roads are provided; or
  - (ii) where shoulder or parking lanes provide adequate separation between moving traffic and roadside development or activity.
- (c) *Lane width* - Due account should be taken of the problems involved in accommodating high traffic volumes in narrow lanes, particularly where commercial vehicles are involved.
- (d) *Road junctions and intersections* - Isolated road junctions or intersections should not of themselves require a lowering of speed limits. Improving the sight distance, design layout and

warning signs are often more effective in promoting safety at the site. The effects of cross-traffic, including pedestrians, are generally reflected in the speed distribution and/or crash rate, and are taken into account elsewhere.

- (e) Adjoining road section - Care should be exercised in locating speed limit signs so that road users are not encouraged to travel at speeds inappropriate to the road section ahead, e.g. it is inadvisable to locate a speed limit sign just in advance of a sub-standard curve whose advisory speed is lower than the speed limit.

#### **4.2.4. (c) Traffic characteristics**

The following traffic characteristics need to be considered before introducing a speed limit:

- (a) *Traffic volume and pattern* - including fluctuations in volume/activity, land use influences, parking activity.

Normal speed zoning requirements should not be altered to meet conditions that arise only for short periods each day, e.g. outside a factory or in the vicinity of a sports ground.

- (b) *Traffic composition* - including proportion of heavy vehicles, pedestrians, cyclists.

Pedestrians and cyclists require particular consideration. The amount of pedestrian movement is generally related to roadside development. Under most circumstances the speed limit and pedestrian activity will therefore be compatible with one another. Should there be an excess of pedestrian or cyclist activity, over what might appear relevant to the speed environment assessed by other means, it is important that adequate and safe facilities be provided for pedestrians and cyclists so that there will not be a demand to artificially reduce the speed limit on their account.

#### **4.2.4. (d) QLIMITS speed environment analysis**

Appendix D provides guidance for utilising QLIMITS Speed Environment Analysis software for the evaluation of speed environments, and for the determination of speed limits that the environment would suggest as being appropriate. QLIMITS is available on the following website address: [www.qlimits.com.au](http://www qlimits.com.au). If access to QLIMITS is not available, the speed appropriate to the environment should be evaluated subjectively by consideration of the elements discussed above, and by reference to Tables A1, B1 and B2 in Appendix A and Appendix B respectively.

#### **4.2.5 Crash history**

High crash rates or crash concentrations are indicators of road safety problems. Inappropriate speed limits can exacerbate crash problems. The speed environment can also conceal "cues" to the existence of potential hazards and the need for drivers to adjust travel speeds.

Extensive analysis of reported crash information indicates that speed-related crashes constitute a significant proportion of total crashes. Assessment of investigated crashes also suggests that speed-related crashes may be considerably under-reported. Therefore, it is considered that the location, frequency, and nature of all crashes are an important consideration in preventing crashes for which speed is a contributing factor.

An examination of the causes of crashes will indicate the relative significance of the various contributing factors, including speed. A high incidence of road hazards or poor road conditions (e.g. standard of surface, level of protection from roadside hazards) may suggest a lower speed limit than that indicated by the speed environment. Isolated concentrations of crashes do not, however, necessarily warrant a lower speed limit, but may indicate that some additional or alternative remedial measures are necessary. An existing speed limit should not be altered in response to the occurrence of crashes, without a thorough examination of causal factors and an investigation of the potential effectiveness of all other feasible counter-measures.

Appendix E provides procedures for the collection and analysis of crash information and data, together with guidance for the consideration of crash history when selecting speed limits.

### **4.3 PROCEDURE FOR DETERMINING APPROPRIATE SPEED LIMIT**

#### **4.3.1 General**

The use of a standard procedure to determine speed limits on traffic routes is necessary to provide the following:

- (a) guidance for practitioners regarding the sequence of data collection and analysis, and the relative importance of the various criteria utilised in determining speed limits;
- (b) consistent methodologies between jurisdictions and practitioners;
- (c) consistent correlation of speed environments with speed limits;
- (d) standardised documentation, which assists in satisfying accountability and quality-management requirements; and
- (e) preservation of the integrity and credibility of speed limits.

The procedures for determining speed limits on traffic routes are provided in Clauses 4.3 to 4.6. Speed limits for local streets and special speed zones are discussed in Clauses 3.2 and 3.5.

### 4.3.2 Homogeneity of road

The speed limit review process should be applied only to segments of road which are homogeneous in terms of characteristics and speed environment. Accordingly, it is necessary to determine whether the road is homogeneous for its entire length. If not, the road should be divided into homogeneous segments and the review process applied to each segment.

Determination of separate homogeneous segments will require a subjective assessment of the continuity of a road based on the density of land-use, general speed environment, existing speed limits and traffic volume. Each length will ultimately need to meet the minimum length requirements of Clause 4.5.

The homogeneity of a road should be re-assessed following completion of the procedure described in Clause 4.3.3. Compromise may be needed in some areas to avoid frequent and continual changes in the speed limit. However, this must be balanced with the overall aim of aligning speed limits with the speed environment and the function of the road.

### 4.3.3 Standard procedure

The standard procedure for reviewing existing speed limits is outlined below. The procedure is structured around a three-stage assessment of the criteria discussed in Clause 4.2, (road function, prevailing vehicle speeds and speed environment), and a fourth and final correlation stage:

#### STAGE 1 - Assessment of Road Function:

1. Determine the Typical Speed Limit based on the function of the road (as discussed in Clause 4.2.2), and compare with the existing speed limit.
2. If there is no agreement between the Typical Speed Limit and the existing speed limit, consider the need to change the function of the road before continuing with the speed limit review.
3. If there is agreement between the Typical Speed Limit and the existing speed limit, proceed to stage 2 of the review.

#### STAGE 2 - Assessment of Prevailing Vehicle Speeds:

1. Collect and analyse speed data to determine whether the prevailing vehicle speeds are in agreement with the existing speed limit, refer to Appendix C.
2. If the prevailing vehicle speeds correlate with the existing speed limit, then, irrespective of the function of the road, the existing speed limit is retained (subject to any required road safety investigations).

Note: This is the only situation where the review process can be completed without the need for correlation between at least two suggested speed limits. If the speed environment has changed from the time that the last speed limit review was conducted, it is recommended that an assessment of the speed environment using QLIMITS be undertaken.

3. Where the prevailing vehicle speeds do not correlate with the existing speed limit, analyse the speed data to determine an alternative suggested speed limit from Table C2.

#### STAGE 3 - Assessment of Speed Environment

1. Determine a speed limit that is considered to be appropriate for the speed environment. The QLIMITS speed environment analysis software should be used. QLIMITS is available at the following website address: [www qlimits.com.au](http://www qlimits.com.au) - refer to Appendix D. Every local government and Department of Transport and Main Roads Regional office has an account manager for QLIMITS who will manage access to users within their organisation.

#### **STAGE 4 - Determination of Speed Limit**

1. Check the speed limits determined at each of the three stages above for correlation. If there is a correlation between at least two of the suggested speed limits adopt that speed limit, subject to any road safety investigations.
2. If correlation is not achieved, seek advice from external sources, and/or consider the need for physical changes to the road environment.

#### **Flowchart and Checklist**

The speed limit selection process is fully detailed in Appendix F. The Flowchart, Figure F1, and Checklist, Figure F2, have been prepared to provide detailed guidance for practitioners who undertake reviews of speed limits.

#### **4.3.4 Standard documentation**

The checklist provided in Appendix F guides the practitioner through the speed limit review process and provides the basis for standardised documentation of the procedure.

The completed checklist should be filed with other relevant documents that record the tasks and decisions undertaken in determining a speed limit for a particular road segment.

A complete speed limit review file should contain the following documents:

- (1) Checklist (Appendix F) completed to a stage required to support a speed limit recommendation.

- (2) Plan and Data Summary,

It is helpful to prepare a plan and data sheet showing:

- (a) physical features of the road, existing development, traffic control devices present and existing speed limits;
- (b) details of crashes;
- (c) traffic volumes;
- (d) results of a speed survey; and
- (e) pedestrian movement.

A typical plan and data sheet is shown in Appendix C, Figure C1.

The plan should cover the entire road segment being reviewed, and the approaches from adjacent segments.

- (3) Speed survey information including copies of data files or references to file copies, and data analysis reports and graphs. Refer to Appendix C.
- (4) Crash data analysis. Refer to Appendix E.
- (5) QLIMITS documentation, when available, including the QLIMITS Speed Environment Analysis Field Data Form (Form F1) and QLIMITS Speed Environment Report (Form F2). Refer to Appendix D.
- (6) A copy of relevant portion of the Road Hierarchy Plan.

Note: A complete file may not always contain all of the documents listed above as the complete procedure (4 stages) outlined in Figure F1 is not always required to determine an appropriate speed limit.

#### **4.3.5 Community consultation**

The determination of speed limits should be based on traffic engineering studies as described above. Consequently, consultation with those not directly involved in these studies should focus only on the following aspects of the speed limit review process:

- (i) local knowledge of crashes or other road safety issues;
- (ii) identifying the need to review existing speed limits (e.g. community requests or representations for a review of a particular road);
- (iii) establishing priorities for reviews (e.g. relative number of requests); and
- (iv) reporting the outcomes of the review process (e.g. obligations to respond to correspondence etc).

Consultation regarding the technical aspects of the speed limit review process is restricted to experienced practitioners, and relevant forums such as local Traffic Advisory Committees and Speed Management Committees.

The consultation process may be extended to include local communities only if a review of speed limits leads to local traffic management initiatives, as indicated in Appendix F, Figure F1, Note 18.

#### **4.3.6 Speed Management Committee**

Once a speed limit review has been completed by the road authority, the review findings, together with all relevant documents shall be submitted to the local Speed Management Committee for endorsement. All speed limit reviews shall be submitted to the Speed Management Committee for endorsement, including reviews where the existing speed limit is retained.

The speed limit shall only be adopted if a majority of members of the Speed Management Committee endorse the recommended speed limit. Where the majority decision of the Speed Management Committee differs from the recommendation of the road authority, the speed limit review, including all supporting documentation shall be forwarded to the Department of Transport and Main Roads for a decision.

For formation of Speed Management Committees, refer to Appendix H.

### **4.4 REVIEWING SPEED LIMITS**

Speed limits should be reviewed regularly to determine whether they are still appropriate. Typical circumstances that lead to a review of speed limits are:

- (a) It is considered that a general speed limit is no longer applicable to a particular road.
- (b) The speed limit no longer aligns with the speed environment due to factors such as:
  - (i) changed traffic or land-use patterns; or
  - (ii) changes made to the speed limit in response to community pressures or other influences.
- (c) The completion of various works over time has resulted in a range of speed environments within a road section, and it is necessary to rationalise speed zone lengths and speed limits.
- (d) Community requests, or other inquiries, have prompted a review of a particular speed limit.
- (e) Existing speed zone lengths are less than the minimum lengths specified in Clause 4.5.

### **4.5 LENGTH OF SPEED ZONES**

#### **4.5.1 Linear speed zones**

The desirable minimum length of a speed zone depends upon the speed limit as specified in Table 4.1. Where isolated hamlets or townships require a speed restriction these lengths do not apply, but a minimum length of 1 km should be used. For 50 km/h speed zones on state controlled roads through rural towns, separate guidelines apply.

Speed zones which introduce a limit lower than the generally prevailing limits should be kept as short as possible, consistent with minimum lengths in Table 4.1, and be related specifically to the section of road where circumstances warrant the lower limit.

Where development density varies along a roadway, it is desirable to keep the frequency of speed limit changes to a minimum. A zone should therefore bridge any length of road for which a higher limit would otherwise be indicated, but where the length is shorter than indicated in Table 4.1.

Wherever practicable, speed zone changes of only 10 km/h should be avoided. This applies particularly in rural and semi-developed areas where it is most important to avoid frequent changes in the speed limit.

**Table 4.1 MINIMUM LENGTHS OF SPEED ZONES**

Speed Limit km/h	Minimum length of zone km
40	0.4
40: School zone only	0.2 (see Part 10 of this Manual)
40 high pedestrian activity zone	0.2
50	0.5
60	0.6
70	0.7
80	0.8
90	0.9
100	2.0
110	20.0 (see Clause 3.3)

#### 4.5.2 Speed zones approaching intersections

Reduced speed limits can be applied on approaches to intersections with speed limits of 80 km/h or greater, which have either a high crash history or high potential risk (as assessed using tools such as NetRisk or road safety audit) as follows:

- (a) controlled approach - speed limit may be reduced **to** 60 km/h
- (b) uncontrolled approach - the speed limit may be reduced **by** up to 30 km/h

To ensure maximum compliance with the reduced speed limit, at least "B" sized Speed Restriction signs shall be installed. These signs shall be duplicated on both sides of the roadway and have a fluorescent red/orange target board. The length of the speed zone shall not exceed 300 m and Speed Limit AHEAD signs shall be used in accordance with Clause 5.1.6.

It may be necessary to install additional warning signs on the approaches to the reduced speed zones to warn drivers of the reason for the speed limit reduction (further guidance on supplementary signs can be obtained from the Department of Transport and Main Roads Safer Roads Branch).

#### 4.6 OFFSET SPEED ZONES

Speed zones on a particular length of roadway, which have different speed limits for each direction of travel may be permitted under the following conditions:

- (a) On a *divided road* where the roadside development adjacent each roadway is different to the extent that a different speed limit is clearly warranted for each.
- (b) On a *divided or undivided road* where it is not safe to increase the speed limit to that which applies in the opposite direction of travel. This could be due to geometric or road features or where there is a part time speed zone, such as a school zone, and it is not practical to align the permanent speed zones. On an *undivided road* where the speed limit AHEAD (G9-79) sign is installed, offset speed zone may be installed.

Where offset speed zones are installed, these should kept to a minimum. Offset speed zones should not exceed 500 metres.

## SECTION 5. SPEED LIMIT SIGNS

### 5.1 SPEED LIMIT SIGN DETAILS

#### 5.1.1 General

Signs used in the application of various types of speed control are listed in Table 5.1.

Note: The Speed Derestriction sign (Australian Standard sign code R4-2) is not approved for use in Queensland.

Such signs are reflectorised in accordance with Part 1 of this Manual.

The way in which these signs are used is specified in Clause 5.1.2. For the installation and location of signs refer to Clause 5.2 and Part 1 of this Manual.

**Table 5.1 SPEED CONTROL SIGNS - SIZE TABLE**

Sign	Sign Number	Size mm
Speed Restriction	R4-1A	450 x 600
	R4-1B	600 x 800
	R4-1C	900 x 1200
	R4-1D	1200 x 1600
END Speed Limit	R4-12B	600 x 1000
	R4-12C	800 x 1350
Speed Limit AREA	R4-10A	450 x 750
	R4-10B	600 x 1000
END Speed Limit AREA	R4-11A	450 x 750
	R4-11B	600 x 1000

#### 5.1.2 Signs for linear speed zones and general speed limits

The following signs shall be used:

(a) *Speed Restriction (R4-1)*



R4-1

The Speed Restriction sign shall be used to indicate the speed limit that applies in the linear speed zone about to be entered, and should be used at the beginning of a built-up area or general rural speed limit except where the requirements of Item (b) apply.

The sign shall also be used-

- (i) as a repeater sign where indicated in Clause 5.2.6.
- (ii) in conjunction with other signs at school zones (see Part 10 of this Manual).

For the signposting of variable speed limits, see Clause 5.2.9.

The Speed Restriction sign may be used as part of sign assemblies at the boundaries of area speed zones (see Clause 5.2.4).

(b) *END Speed Limit (R4-12)*

R4-12

The END Speed Limit sign shall be used at the start point of a section of road covered by the general rural speed limit where it is not practicable or desirable to indicate the speed limit applying beyond the point by means of a Speed Restriction (R4-1) sign.

This would be the case where the speed value of the alignment beyond the start point is substantially lower than the general rural speed limit or the road beyond the start point is unsealed and it is not appropriate to extend a lower speed limit into this area.

The use of this sign is the exception rather than the rule.

**5.1.3 Signs for area speed zones**

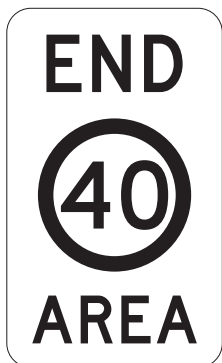
Signs at the entry and exit points to and from area speed zones shall be used as follows:

(a) *Speed Limit AREA (R4-10)*

R4-10

The Speed Limit AREA sign shall be used to indicate the speed limit within the area about to be entered.

Where repeater signs are required within the area speed zone, these shall be Speed Limit AREA (R4-10) signs (see also Clause 5.2.6).

(b) *END Speed Limit AREA (R4-11)*

R4-11

The END Speed Limit AREA sign shall be used when leaving the area covered by the area speed limit.

### 5.1.4 Signs for School Zone Speed Limits

The School Zone Speed Limit sign (R4-Q01) shall be used to indicate the start of a school zone:



R4-Q01

At the start of school zones, the standard School Zone Speed Limit sign shall be used. Refer to Part 10 of this Manual for further information on school zones.

### 5.1.5 Signs for speed limits for particular classes of vehicles

The following sign shall be used at the start of a reduced speed limit zone applying to a particular class of vehicles:

(a) Road Train Speed Limit (R4-Q05)



R4-Q05

The Road Train Speed Limit (R4-Q05) sign shall be used to indicate the speed limit that applies to road trains on a section of road. This sign is generally used where a reduced speed limit is considered necessary for safety reasons such as limited visibility in advance of a hazard or conflict. This sign may also be used to regulate the speed of road trains through towns for amenity reasons.

(b) END Road Train Speed Limit (R4-Q06)

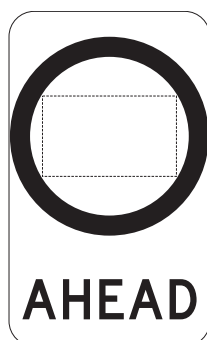


R4-Q06

The END Road Train Speed Limit sign shall be installed at the end of the speed zone where the reduced speed limit for road trains applies.

The Speed Restriction sign (R4-1) shall not be used to indicate the end of the Road Train Speed Limit zone.

### 5.1.6 Speed Limit AHEAD sign (G9-79)



G9-79

The Speed Limit AHEAD sign (G9-79) shall be used to inform drivers of the speed limit they are about to enter where there is a reduction in speed limit of more than 20 km/h and an intermediate speed zone, complying with the minimum length requirements of Table 4.1, is not required.

Where the Speed Limit AHEAD sign is used, signs shall be installed as follows:

- (a) the Speed Limit AHEAD (G9-79) sign shall be installed generally 300 m in advance of the start of the lower speed zone.
- (b) where installed on a divided road, the Speed limit AHEAD (G9-79) sign and the Speed Limit (R4-1) sign shall be duplicated on the central median.
- (c) the size of the signs shall comply with the requirements of Table 5.2.

The Speed Limit AHEAD (G9-79) sign may also be installed where:

- (i) there is insufficient sight distance to the start of the lower speed zone.
- (ii) the start of the lower speed zone is on a downhill approach
- (iii) where under normal driving expectations, the change in speed zone may not be apparent to the motorist.
- (iv) where a speed zone has been established in accordance with steps 20 and 21 of the speed zoning procedure (Figure F1).

## 5.2 SIGN APPLICATION

### 5.2.1 General

At the boundaries of general rural limit areas, built-up areas and at all changes in zoned speed, Speed Restriction signs (R4-1) should normally be provided. Speed signs are normally erected on the left side of the roadway. In special circumstances, signs may be duplicated on the right hand side of the roadway where specified herein, or in situations where other treatments have proved inadequate.

Typical applications of speed limit signs to indicate speed limits in built-up areas and general rural limits and speed zones are illustrated in Figure 5.1.

### 5.2.2 Built-up area and general rural speed limit areas

Start and end points of speed limits applicable in built-up areas and general rural speed limit areas shall be signposted in one of the following ways:

- (a) *Start of general rural speed limit areas* - Signs shall be placed to face traffic entering the general rural limit area:
  - (i) Speed Restriction 100 (R4-1) sign where the road beyond the start of the limit is of an appropriate geometric standard; or
  - (ii) END Speed Limit (R4-12) sign where the road beyond the start of the limit is not of an appropriate geometric standard or physical condition or is unsealed. See Clause 5.1.2(b).

Note: Any significant traffic route which passes through a built-up area in which the lower speed limit applies, should have speed limit signs provided at each boundary to clearly show road users where the lower speed limit starts and finishes.

- (b) *Start of speed limit in built-up area* - Speed Restriction (R4-1) signs or Speed Limit AREA (R4-10) signs are placed to face traffic entering the built-up area.

### 5.2.3 Linear speed zones

Start and end points of linear speed zones shall be signposted in one of the following ways:

- (a) *Start of linear speed zone* - The start of a speed zone shall be indicated by a Speed Restriction (R4-1) sign indicating the speed limit.
- (b) *End of linear speed zone* - The end of a speed zone shall be indicated by either:

- (i) Speed Restriction (R4-1) sign to indicate the start of a new speed zone, or the speed limit in built-up area/rural speed limit which applies beyond the end of the zone; or
- (ii) END Speed Limit (R4-12) sign where the conditions in Clause 5.1.2. (b) apply.

Note: A speed zone also ends at a dead end and where the road terminates at a T-intersection. Speed Restriction (R4-1) sign to indicate the speed limit on a through road at a T-intersection shall not be installed on the terminating leg of the T-intersection.

At freeway ramps where the length and/or geometry of the ramp does not permit the installation of a Speed Limit AHEAD (G9-79) sign and the change in speed limit exceeds 20 km/h, Speed Restriction signs shall be "C" size minimum.

A change from a lower to a higher zoned speed limit should not occur just in advance of a section of low speed value alignment or a hazard or other feature requiring a speed reduction. The lower limit should be carried through or past the section or feature.

On divided roads, Speed Restriction signs (R4-1) at the start and end of linear speed zones shall be provided on both sides of the roadway.

Where necessary on undivided roads, Speed Restriction signs (R4-1) at the start and end of linear speed zones should be provided on both sides of the roadway, particularly where there is a reduction in speed limit.

On freeways only the largest Speed Restriction signs (R4-1C and R4-1D) should be used. The location of each sign is a matter for special consideration. (See Part 8 of this Manual).

#### 5.2.4 Area speed zones

Each entry and exit point to and from an area speed zone shall be signposted in the following way:

- (a) *Entry signs* - A Speed Limit AREA (R4-10) sign shall be placed to face traffic entering the zone. It shall be positioned at a suitable distance from any intersection, to be readily seen and noticed by road users after they have turned from the intersecting street.
- (b) *Exit signs* - An END Speed Limit AREA (R4-11) sign shall be placed to face traffic leaving the zone. This sign shall be positioned at the same location as the entry sign but facing the opposite direction. Speed Restriction (R4-1) signs may be required on the road about to be entered, to indicate the speed limit on the road immediately outside the zone.

It is recommended that both entry and exit signs are "B" size minimum.

#### 5.2.5 Buffer zones

Buffer zones are not recommended for use in Queensland. Where there is a change in speed zone exceeding 20 km/h and there is no change in the speed environment leading up to the lower speed zone, the Speed Limit AHEAD (G9-79) sign shall be installed. However, where the speed environment between the higher speed zone and the lower speed zone is different and a speed zone of intermediate value can be established, the minimum length of the speed zone shall comply with the minimum length requirements of Table 4.1.

#### 5.2.6 Repeater signs

Repeater signs shall be provided as follows:

- (a) In all linear speed zones 90 km/h or less, except for the general urban speed limit and 50 km/h local streets where the default speed limit applies.
- (b) Within area speed zones, where required, to remind road users of the area speed limit.
- (c) At intersections of major traffic carrying roads, for the benefit of traffic which has turned. These signs should be placed at a suitable distance (30–50 metres) beyond the intersection, to be readily seen by road users after they have completed the turning manoeuvre (refer to Note 7 to Figure 5.1). Where merge lanes are provided, repeater signs should be placed at least 30 – 50 metres past the end of the taper.

In linear speed zones, repeater signs shall be Speed Restriction (R4-1B) signs. Sign R4-1A may be substituted in urban areas provided it is sufficiently conspicuous against the urban visual background. In 60 km/h and 70 km/h speed zones, repeater signs should be spaced at a distance of not more than 1 minute of travel. In 80 km/h and 90 km/h speed zones, repeater signs should be spaced at a maximum distance of 2 minutes of travel.

Where the zoned speed may be different from that which drivers might expect by virtue of streetlighting and roadside environment, consideration should be given to more frequent installation of repeater signs. The first repeater sign in the lower speed zone should be installed 300 m into the speed zone.

In area speed zones, repeater signs shall be Speed Limit AREA signs (R4-10).

Where variable speed limit signs have been used at the start of the speed zone, repeater signs shall also be variable speed limit signs.

Consideration should be given to providing repeater signs in 100 and 110 km/h zones at intervals of approximately 10 minutes and past rest areas.

Repeater signs should be placed on both sides of the roadway on divided roads and one-way roadways. While they are usually located in pairs, the repeater signs may be separated longitudinally by up to 1 km.

### 5.2.7 Sign size

The recommended size of the basic Speed Restriction (R4-1) sign to be used in various situations is given in Table 5.2.

**Table 5.2 RECOMMENDED SIZES OF SPEED RESTRICTION (R4-1) SIGNS TO BE USED IN VARIOUS LOCATIONS**

Application	Recommended Sign Size * for static signs*
Start or end of general rural limit or built-up area: Reduction in speed limit of more than 20 km/h All other cases (except expressways and freeways)	C B
Start or end of a linear speed zone: Reduction in speed limit of more than 20 km/h All other cases (except expressways and freeways)	C B
Start or end of an area speed zone (R4-10 and R4-11 signs)	B
Repeater signs	A or B (see Clause 4.2.6)
Expressway and freeway applications: Repeater signs Signs on ramps All other cases	C C C or D**

#### NOTES:

\* Sign dimensions are given in Table 5.1.

\*\* R4-1C type signs are usually used on roads built to freeway standards. R4-1D type signs may be used in lieu of R4-1C type signs where greater need exists for sign prominence due either to competing visual stimuli or the need to emphasize the message, or where there is excessive lateral displacement of the sign.

### 5.2.8 Uniformity of location

It is important that Speed Restriction signs are installed at locations where they are not obstructed by other signage or roadside furniture and are visible to drivers. Distance from intersections, mounting height and lateral displacement of signs are all very important as correct placement of signs assists in maintaining uniformity in travel speeds and greater compliance with the posted speed limit. In urban areas, Speed Restriction (R4-1) signs should be installed 30 – 50 m from intersections and up to 100 m from intersections in rural areas. For further information regarding the placement and mounting height of signs refer to Part 1 of this Manual.

### 5.2.9 Means of displaying variable speed limits

Variable speed limits shall be displayed in one of the following ways:

- (a) *Static variable speed limit signs* - Use of the Times of Operation supplementary plate (R9-1 Series) in conjunction with a Speed Restriction (R4-1) sign and any other supplementary plate required to inform road users of the reason for the changed speed limit e.g. school zone plates (see Part 10

of this Manual). The speed limit sign displays shall be limited to a display which is identical in design and colour to the Speed Restriction (R4-1) sign.

- (b) *Changing message variable speed limit signs* - Use of speed limit signs displaying a limit that can be changed manually, mechanically, or electrically. This method is suitable for changes that are likely to be required at either regular or irregular times. Times at which the speed limit was changed should be logged. The speed limit sign shall be restricted to a display which is identical in design and colour to the Speed Restriction (R4-1) sign.

If the reduced limit is not likely to be immediately apparent to an approaching road user, the changing message speed limit sign should be equipped with a single flashing component or twin alternately flashing yellow lights which operate when a reduced limit is being displayed

Changing message speed limit signs shall be located in exactly the same position as fixed signs, as set out for linear speed zones in Clause 5.2.3.

- (c) *Electronic variable speed limit signs* - Use of speed limit signs displaying a limit that can be changed electronically. This method is suitable for changes that are likely to be required at either regular or irregular times. Times at which the speed limit was changed should be logged. The speed limit sign shall be restricted to a display which is identical in layout to the Speed Restriction (R4-1) sign but has illuminated white numerals within an illuminated red annulus on a black background.

The electronic variable speed limit sign shall incorporate a flashing annulus that shall be programmed to flash in accordance with the guidelines in the Traffic and Road Use Management Manual. For signage installation details for electronic variable speed limits, refer to the Traffic and Road Use Management Manual.

### **5.2.10 Responsibility and authority for installation**

The Transport Operations (Road Use Management) Act 1995 provides that Official Traffic Signs shall be installed only by the authority of the Director-General, Transport and Main Roads or a local government. The Act also provides that any such sign shall be installed in accordance with the methods, standards and procedures prescribed in this Manual.

Where a regulatory speed limit sign is erected, removed or changed e.g. alteration to the speed limit or the sign size, it is necessary to record the circumstances for use in any prosecutions or litigation. Form M994 is used for this purpose for declared roads. Procedures for the recording of regulatory signs on roads controlled by the Department of Transport and Main Roads are given in Appendix C to Part 1 of this Manual. Local Governments should have in place an internal procedure for recording this information.

## **5.3 CONFLICT WITH ADVISORY SPEED SIGNS**

When speed zones are introduced or reviewed, a survey should be made of all alignment warning and advisory speed signs within the zone, to ensure that the alignment warning signs are still appropriate and the speed indicated is less than the speed limit (see Part 2 of this Manual). Speed limit signs and advisory signs showing different speed values from one another should not be placed where road users can read both at the one time.

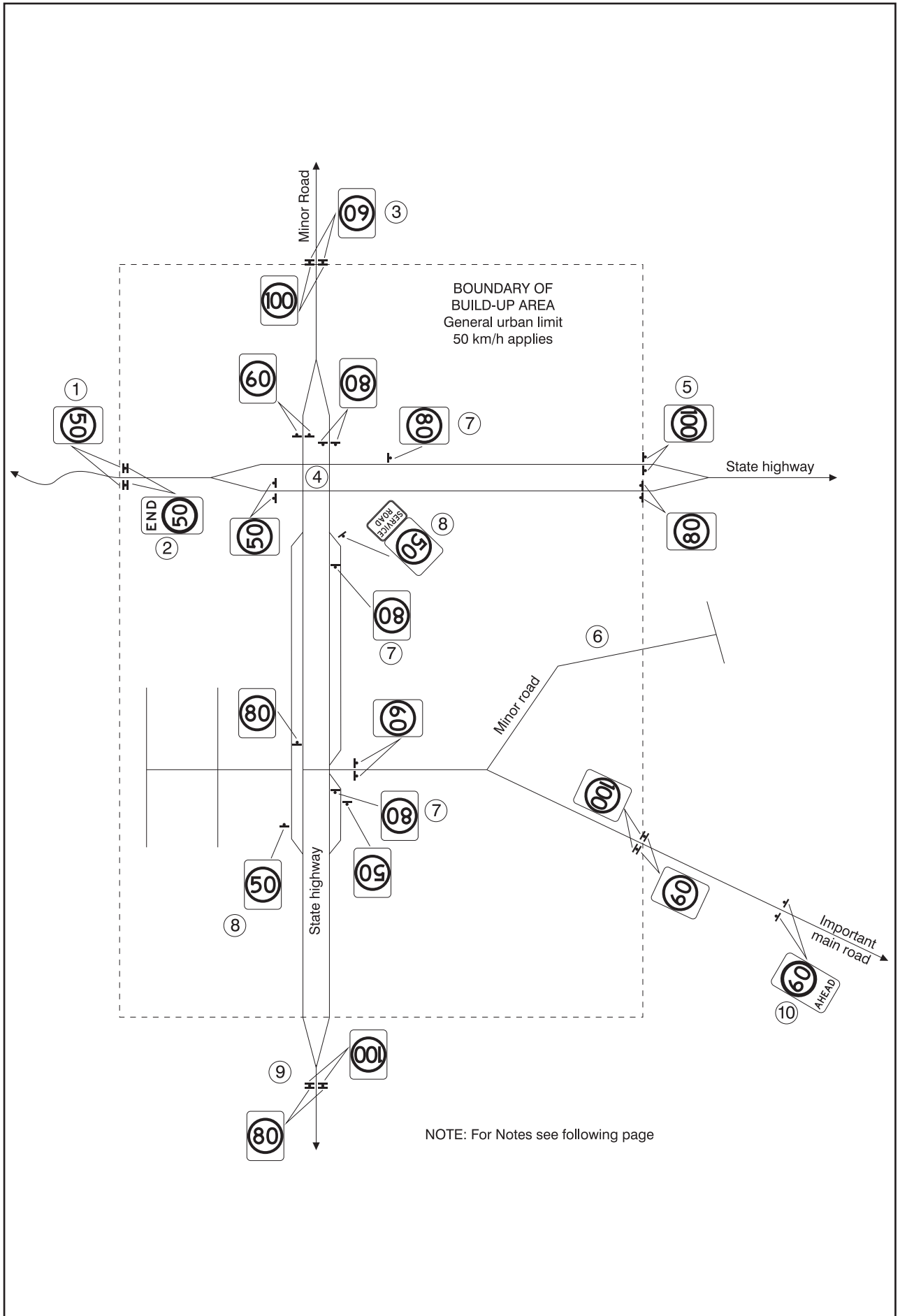


Figure 5.1 APPLICATION OF SPEED LIMIT SIGNS AT DEFAULT LIMITS AND LINEAR SPEED ZONES

**NOTES TO FIGURE 5.1:**

1. These signs advise drivers that they are entering or leaving the area covered by the default urban speed limit of 50 km/h.
2. Poor alignment or if the road is unsealed beyond this point necessitates the use of the R4-12 'END' sign rather than the R4-1 '100' speed restriction sign indicating the default rural limit.
3. A Speed Limit AHEAD sign may be required here if the reduction in speed limit exceeds 20 km/h.
4. Where there is no change in the speed environment and the crash rate through the intersection is low the higher limit applying to the state highway (80 km/h) may be continued through the intersection.
5. The Speed Restriction (R4-1) sign is installed to indicate the start of the general rural speed zone.
6. Signs advising of the default rural and urban limit should be installed where minor roads enter the town even if the start of the urban development or street lighting provides an adequate indication of the speed limit change.
7. Repeater signs may be required within a speed zone on both departure sides of an intersection of two or more major traffic carrying roads and should generally be placed 30 - 50 m from the intersection in urban areas and approximately 80 - 100 m from the intersection in rural areas.
8. A sign advising drivers that the default urban limit of 50 km/h (or other special limit) applies in the service road may be required if the speed limit differs from that on the through road. The supplementary plate SERVICE ROAD (G9-81) should be used in conjunction if the sign is visible from the through road and might be misread as applying to the through road.
9. The Speed Limit AHEAD (G9-79) is not required here as the speed limit reduction is less than 30 km/h.
10. The Speed Limit AHEAD (G9-79) sign is required here as the reduction in speed limit exceeds 30 km/h.

## SECTION 6. PAVEMENT MARKINGS

### 6.1 GENERAL

Where the pavement surface is suitable, painting of elongated numerals adjacent to the Speed Restriction sign (R4-1) may be used in the following circumstances:

- (i) at the start of a lower speed zone where the difference in adjacent speed zones is 20 km/h or higher, with the exception of the start of a school zone or other time based speed zone.
- (ii) at repeater signs at major intersections only.

Such markings shall only be used to supplement Speed Restriction (R4-1) signs and shall not be used alone. Their use is generally restricted to locations where the provision of signs alone is not adequate e.g. where the impact of the sign is reduced by the nature of the roadside environment, and it is considered that the sign needs to be augmented to increase road user perception.

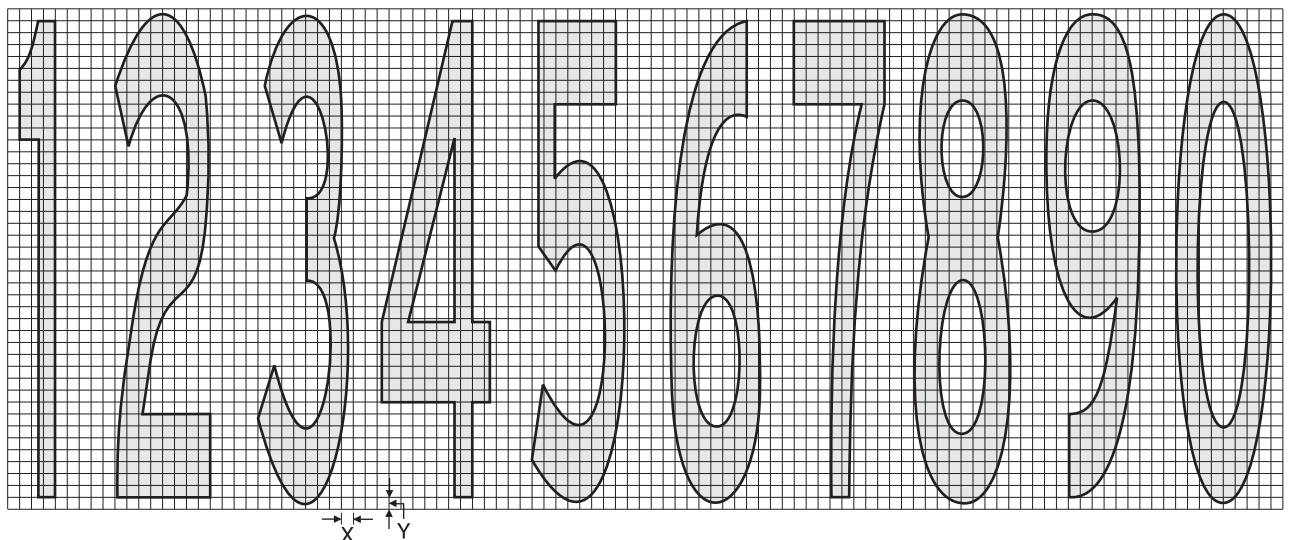
However, with the exception of school zones and other time based speed zones, the use of pavement markings is encouraged at the start of special speed zones (see Clause 3.5). Painted numerals shall not be used to indicate the speed limit on local streets.

### 6.2 MARKING DETAILS

A separate set of numerals shall be painted in each traffic lane (refer Figure 6.1) and no additional words or symbols shall be used.

The length of numerals should be not less than 2.5 m where traffic approaching them is in a speed zone of 80 km/h or less. At higher speeds, numeral lengths up to 5 m may be required. For further details, see Part 2 of this Manual.

Note: On 2-way roads, numerals should only be painted if there is a painted separation line and there is enough lateral separation between sets of numerals on opposite sides of the roadway to avoid them appearing as a single 4 or 5 digit number.



NOTE: The grid width (X) is constant at 100 mm but grid height Y may vary as follows:

$$Y = \frac{\text{Height of numeral required (mm)}}{40}$$

**Figure 6.1 PAVEMENT NUMERALS**

## APPENDIX A

### FUNCTIONAL CLASSIFICATION OF ROADS IN URBAN ENVIRONMENTS

Roads are classified in terms of their function as part of the development of a road hierarchy plan. For this Part of the Manual, the classification shown in Table A1 has been adopted for urban roads. *It is not intended that local governments be required to adopt this classification for their own road hierarchy plans.*

Note: For a typical road hierarchy plan refer to Queensland Streets, Design Guidelines for Subdivisional Streetworks, Institute of Municipal Engineers Australia, Queensland Division.

The classifications shown in Table A1 are used in Appendix B, Table B1, to determine speed limits that are typically identified with particular urban road functions.

**TABLE A1 FUNCTIONAL CLASSIFICATION OF ROADS IN URBAN ENVIRONMENTS**

Classification	Functional Description	Maximum Traffic Flow <sup>1</sup>
Access or Local Street	Access to property.	1,000 vpd
Collector Street	Access to property and other streets; local neighbourhood access.	3,000 vpd
Trunk Collector Road	Transport of people and goods within suburbs; district movement.	10,000 vpd
Sub-Arterial Road	Transport of people and goods across suburbs and between arterial roads. Typical intersection spacing: 0.3 km.	20,000 vpd
Arterial Road	Transport of people and goods across metropolitan areas. Typical intersection spacing: 0.5 - 1 km.	30,000 vpd
Controlled-Access Arterial Road, Freeway	Transport of people and goods through and around metropolitan centres. Typical intersection spacing: 1 - 2 km.	>30,000 vpd

Note:

1. Maximum traffic flows are indicated because typical traffic flows for some functional classifications will differ significantly between major South East Queensland urban areas and regional urban areas.

Although included in Table A1, traffic flows should not be used as the primary determinant for establishing functional classifications. Emphasis should be placed on the statement of road purpose e.g. access to property, transport of people and goods across metropolitan areas etc. This is not always easily established. However, the mix of trip origins and destinations provides the best indication of road function. For example, a road which carries traffic which primarily has trip origins and destinations outside a local area is regarded as *traffic carrying* and is likely to be a Trunk Collector Road, Sub-arterial Road etc.

## APPENDIX B

### TYPICAL SPEED LIMITS

The following generic speed limit hierarchy provides a guide to the speed limits that may be typically expected on roads of the types described:

**Notes to Tables B1 and B2:**

1. Special Area = Recreational areas, Roadwork sites.
2. Local Traffic Area - 40 km/h to be applied where the road geometry (horizontal and vertical) or traffic calming measures support an upper limit of the 15 km/h Pace <49 km/h.
3. The General Urban speed limit in Queensland is 50 km/h. 50 km/h speed limit also applies to Access Streets and Minor Collector Streets.
4. A speed limit of less than 60 km/h will only be applied to traffic carrying roads in special circumstances (refer Clause 3.5(b)).
5. Urban Fringe refers to residential development usually on the fringe of urban areas. Typically, block sizes are 0.5 Ha - 2.5 Ha.
6. Settlement = village, rural hamlet.
7. Where appropriate nodal traffic calming has been provided or where the roadside development, road characteristics and traffic characteristics present a constrained road environment.
8. On undivided rural roads where the design standard is less than 100 km/h over a length of at least 2 km, and the general rural speed limit is not appropriate, the use of a lower speed limit should be considered. The appropriate speed limit should be based on an analysis of prevailing traffic speeds.
9. Refer to School Environment Safety Guidelines issued by the Department of Transport and Main Roads.
10. Refer to Section 3.5(a)(iii) - speed limits that apply in central business districts of towns and cities where there is significantly high levels of pedestrian activity and vehicle speeds are typically below 49 km/h.

**TABLE B1 HIERARCHY OF TYPICAL SPEED LIMITS - ROADS IN URBAN ENVIRONMENT**

<b>Speed Limit</b>	<b>General Application Roads in Urban Environment</b>
10 km/h	Shared Zone, car park with traffic calming devices
20 km/h	Special Area <sup>1</sup> , car park, access driveways
30 km/h	Special Area <sup>1</sup>
40 km/h	Access Street - zoned local traffic area <sup>2</sup> - school zone (within 50 km/h, 60 km/h and 70 km/h limit) <sup>9</sup> - Speed limit in high pedestrian activity area <sup>10</sup>
50 km/h	General Urban Street Limit <sup>3</sup> Local Street Speed Limit <sup>3</sup> - access and collector streets Nodal traffic calming/constrained road environment in shopping or commercial centres <sup>7</sup>
60 km/h	General Minimum Speed Limit on traffic carrying roads <sup>4</sup> School zone (within 80 km/h, 90 km/h and 100 km/h limit) <sup>9</sup> Trunk Collector Road Sub-Arterial Road & Arterial Road - undivided with direct access - divided with direct access and no protection for turning vehicles, or with protection for turning vehicles and no parking lane Urban Fringe <sup>5</sup> - local access roads with >2 accesses/100 m - traffic carrying roads with >4 accesses/100 m
70 km/h	Sub-Arterial, Arterial Road - divided with direct access and protection for turning vehicles (normally with parking lane) - divided with limited access and no protection for turning vehicles - undivided with limited access Buffer Zone Urban Fringe <sup>5</sup> - local access roads with 1 - 2 accesses/100 m - traffic carrying roads with 2 - 4 accesses/100 m
80 km/h	Arterial Road - divided with limited access and protection for turning vehicles - undivided with fewer than 2 direct access points/km Urban Fringe <sup>5</sup> - local access roads with < 1 accesses/100 m - traffic carrying roads with < 2 accesses/100 m
90 km/h	Arterial Road - divided with no direct access - 100 km/h design standard Buffer Zone Controlled-Access Arterial Road - divided with no direct access - Intersections 1 - 2 km spacing Lower standard urban freeways, motorways
100 km/h	Controlled-Access Arterial Road - divided with no direct access - intersections > 2 km spacing High standard urban freeways, motorways
110 km/h	N/A

**TABLE B2 HIERARCHY OF TYPICAL SPEED LIMITS - ROADS IN RURAL ENVIRONMENT**

<b>Speed Limit</b>	<b>General Application Rural Roads</b>
10 km/h	N/A
20 km/h	N/A
30 km/h	N/A
40 km/h	School zone (within 50 km/h, 60 km/h and 70 km/h limit) <sup>9</sup>
50 km/h	Main Street or commercial centre with nodal traffic calming or constrained road environment <sup>7</sup>
60 km/h	School Zone (within 80 km/h,90 km/h and 100 km/h limit) <sup>9</sup> Local access roads with >2 accesses/100 m Traffic carrying roads with abutting development and >4 accesses/100 m See Note 8
70 km/h	Local access roads with 1 - 2 accesses/100 m Traffic carrying roads with abutting development and 2-4 accesses/100 m See Note 8
80 km/h	School Zone (within 90 km/h,100 km/h and 110 km/h limit) <sup>9</sup> Local access roads with < 1 accesses/100 m Traffic carrying roads with abutting development and 1-2 accesses/100 m Buffer zone See Note 8
90 km/h	See Note 8
100 km/h	General Rural Speed Limit
110 km/h	Special criteria apply (refer Clause 3.3)

## **APPENDIX C**

### **COLLECTION AND ANALYSIS OF SPEED DATA**

#### **C1 GENERAL**

This appendix provides guidance on the collection and analysis of speed data. It includes procedures to:

- (i) check whether prevailing vehicle speeds are consistent with the existing speed limit; and
- (ii) determine a speed limit that would be suggested by the prevailing vehicle speeds.

Where a speed limit is consistent with the general speed environment, it can be expected that the difference between the prevailing traffic speed and the posted speed limit together with the variation between vehicle speeds will be minimised. Traffic speed will then approximate a *normal distribution* as shown on the *Frequency Curve* in Figure C4.

Regardless of the type of distribution represented by a sample of vehicle speeds, each sample can be analysed to determine a range of statistical measures, including mean speed, 85th percentile speed, upper and lower limits of the Pace and the percentage of vehicles within the Pace. The assessment of these measures, and the comparison of speed distributions, provide a basis for determining relationships between speed limits, speed environments and driver behaviour.

#### **C2 DATA COLLECTION**

Speed data collection sites (stations) should be located within homogeneous segments of road within the full length of road under consideration. Each segment should contain a uniform road environment and/or be a logical segment between significant nodes (e.g. major intersection, bridge, commercial centre, railway crossing, etc.). The location of stations should be representative of the general road environment and traffic conditions within the particular segment.

For manual speed surveys, vehicle speeds should be recorded on a Speed Survey Field Sheet, refer Figure C2.

Guidelines for conducting speed surveys are included in Appendix G.

#### **C3 DATA PROCESSING**

The mean speed, 85th percentile speed, upper limit of the 15 km/h Pace, and percentage within the Pace are determined using a standard Speed Survey Calculation Sheet, refer Figure C3. Cumulative speed curves and speed frequency distribution curves for each direction of travel at each station can be plotted to assess the normality of the speed distribution, refer Figure C4.

Various speed data management software packages are available to assist practitioners to process and analyse speed data.

#### **C4 ACCEPTABLE SPEED DISTRIBUTIONS**

An *ideal* speed distribution is considered to have the following characteristics:

- (i) vehicle speeds are in a compressed band width (compared with a normal distribution);
- (ii) a low percentage of recorded speeds are below the lower limit of the 15 km/h Pace, with greater than 60% within the 15 km/h Pace; and
- (iii) the 85th percentile speed and the upper limit of the 15 km/h Pace are approximately the same value as the speed limit.

Research by the Department of Transport and Main Roads has indicated that approximately 75 percent of speed distributions can be expected to approximate the ideal distribution described above. A range of acceptable speed distributions has been developed which approximate ideal distributions. The tests described in Clause C5 are used to determine whether a speed distribution conforms to an acceptable distribution.

The acceptable speed distributions are used to check whether the speed data indicates that the existing speed limit should be retained.





Bin Range (km/h)	Mid Point of bin range (km/h)	No. of samples in bin (vehicles)	% of sample in bin (% of total)	3-bin moving sum (% of total)	Speed (Upper limit of bin ranges) (km/h)	% less than or equal to speed	(2) * (3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0 - 30	15	0	0	0	30	0	0
>30 - 40	35	0	0	0	40	0	0
>40 - 45	42.5	2	1.1	1.1	45	1.1	85
>45 - 50	47.5	6	3.3	4.4	50	4.4	285
>50 - 55	52.5	38	20.9	25.3	55	25.3	1995
>55 - 60	57.5	46	25.3	49.5	60	50.6	2645
>60 - 65	62.5	38	20.9	67.1	65	71.5	2375
>65 - 70	67.5	35	19.2	65.4	70	90.7	2362.5
>70 - 75	72.5	10	5.5	45.6	75	96.2	725
>75 - 80	77.5	7	3.8	28.5	80	100	542.5
>80 - 90	85	0	0	9.3	90	100	0
>90 - 120	105	0	0	3.8	120	100	0
<b>TOTALS</b>		182	100				11015

**Mean Speed**

$$\bar{x} = \frac{\sum \text{column 8}}{\sum \text{column 3}} = \frac{11015}{182} = 60.5 \text{ km/h}$$

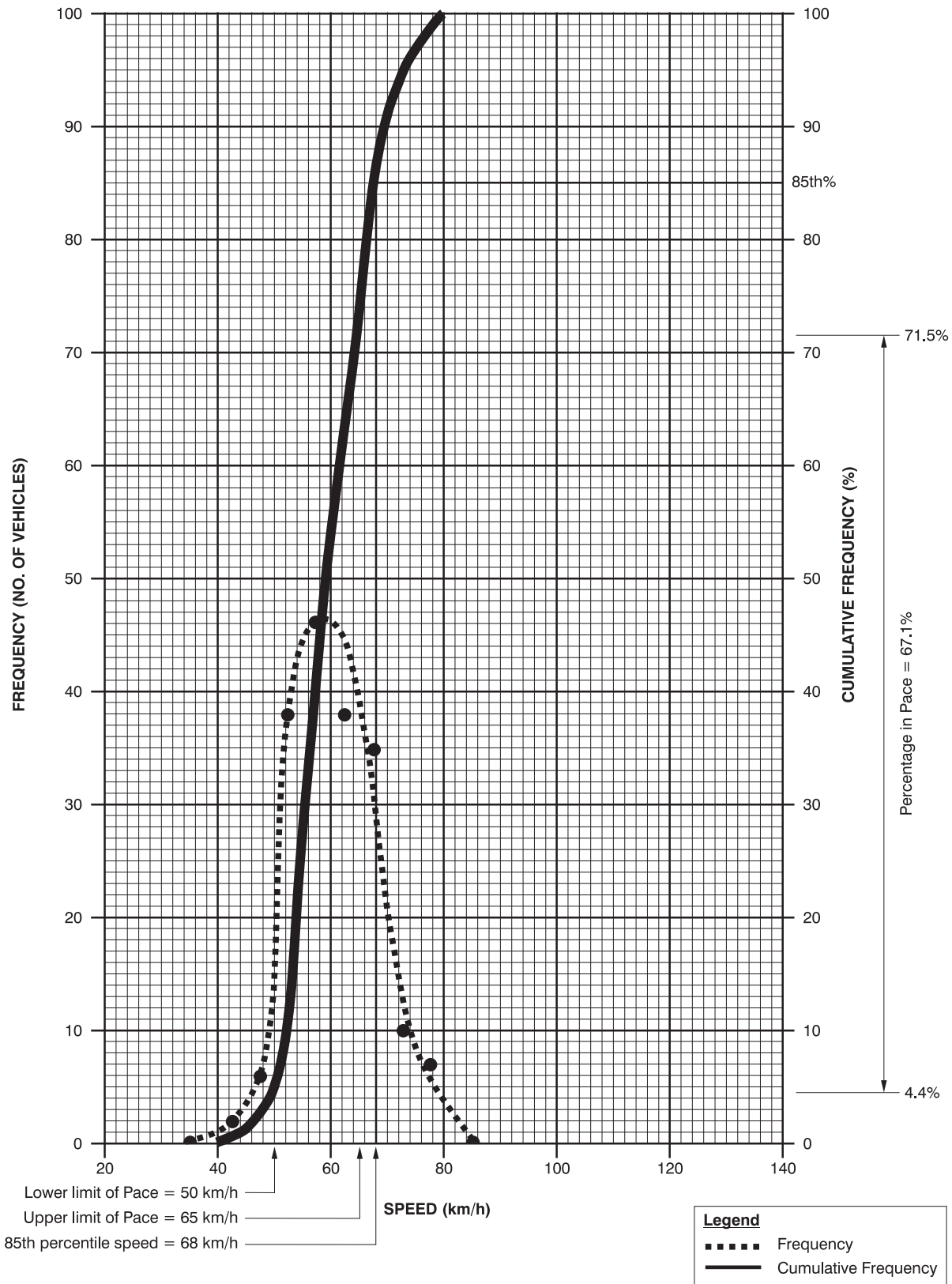
**15 km/h Pace**

1. Calculate the three point moving sum of Column 4 in Column 5.
2. Percentage in Pace is the maximum value in Column 5 = 67.1 %
3. Upper limit of Pace is corresponding value in Column 6 = 65 km/h.

**85th percentile speed**

1. Use values in columns 6 and 7 to plot a cumulative frequency graph - Figure C4.
2. The 85th percentile speed is the speed corresponding to a cumulative frequency of 85% = 68 km/h.

LOCAL GOVERNMENT: WESTERN HILLSDATE: 1-6-99ROAD: NORTH EASTERN HIGHWAYDAY OF WEEK: TuesdayLOCATION: Birdwood Ave - Burringbar RdDURATION OF COUNT: 10 AM - 10.30 AMDIRECTION OF TRAFFIC: OutboundSIGNATURE: STATION: 1**Figure C3 SAMPLE SPEED SURVEY CALCULATION**



LOCAL GOVERNMENT: WESTERN HILLS

DATE: 1-6-99

ROAD: NORTH EASTERN HIGHWAY

DAY OF WEEK: Tuesday

LOCATION: Birdwood Ave - Burringbar Rd

DURATION OF COUNT: 10 AM - 10.30 AM

DIRECTION OF TRAFFIC: Outbound

SIGNATURE: [Signature]

STATION: 1

Figure C4 SAMPLE FREQUENCY DISTRIBUTION CURVES SHEET

## C5 DATA TESTS

The speed distribution obtained from the data processing is tested against the criteria in Table C1 to determine whether it conforms to an *acceptable speed distribution* for the existing speed limit.

**TABLE C1 SPEED DATA TEST RANGES\***

Criteria	Existing Speed Limit (km/h)							
	40	50	60	70	80	90	100	110
Mean Speed	32 - 43	41 - 53	49 - 63	59 - 72	69 - 80	79 - 89	89 - 97	99 - 106
Upper Limit of 15 km/h Pace	36 - 49	46 - 59	56 - 69	66 - 79	76 - 89	86 - 98	96 - 106	105 - 114
Percentage within Pace	>60	>60	>60	>60	>60	>60	Urban >54 Rural >45	>40

Note\*: For speed data obtained using the suggested speed bin ranges from Table G2, or for individually collected speed data.

Some speed data management software can automatically apply tests to determine the conformance of data with the ranges above, advise the user of the outcome and provide graphical representations of speed distributions and cumulative data, both as an on-screen preview and as printed copy.

If the speed distribution conforms to the *acceptable distribution* for the existing speed limit, the existing speed limit is accepted subject to a review of crash data.

If the speed distribution does not conform to the *acceptable distribution* for the existing speed limit, a suggested speed limit should be determined in accordance with Clause C6.

## C6 SPEED LIMIT SUGGESTED BY SPEED DATA

If the speed distribution does not conform to the *acceptable distribution* for the existing speed limit, the upper limit of the 15 km/h Pace is used to determine the speed limit that the speed data would suggest as being appropriate. The suggested speed limit is obtained from Table C2.

**TABLE C2 SUGGESTED SPEED LIMIT FROM SPEED DATA ANALYSIS**

Upper Limit of the 15 km/h Pace	59	60 - 66	67 - 76	77 - 86	87 - 96	97 - 105	> 105
Suggested Speed Limit	<b>50</b>	<b>60</b>	<b>70</b>	<b>80</b>	<b>90</b>	<b>100</b>	<b>110</b>

If the speed limit suggested from Table C2 equals the existing speed limit, this indicates that the speed distribution did not conform to the *acceptable distribution*. Accordingly, the suggested speed limit should be discarded, and the determination of an appropriate speed limit should be based only on consideration of Speed Environment and Road Function criteria.

## **APPENDIX D**

### **EVALUATION OF SPEED ENVIRONMENT UTILISING 'QLIMITS'**

#### **D1 GENERAL**

Evaluation of the speed environment involves consideration of the following elements:

- (i) roadside development;
- (ii) road characteristics; and
- (iii) traffic characteristics.

Although these elements can be measured in various ways, their influence on the speed zoning process has historically been primarily subjective. Consequently it has been difficult to evaluate the speed environment in a uniform manner.

Computer-based expert systems are ideally suited to processes such as those used for determining speed limits, which use routine decision-making paths leading to a limited number of outcomes (speed limits). The use of such systems ensures that all decisions are made using a uniform methodology.

#### **D2 QLIMITS SPEED ENVIRONMENT ANALYSIS SOFTWARE**

QLIMITS Speed Limit Analysis software is an expert system that provides a means of more effectively evaluating the elements that influence a driver's perception of the speed environment.

QLIMITS is intended as an aid to practitioners - not as a means for providing indisputable recommendations for inexperienced users. It is intended to be used only in the context of the overall speed limit assessment process illustrated in the flowchart in Appendix F, Figure F1.

Conceptually, QLIMITS develops a "picture" of the speed environment using data relating to the following characteristics:

- (i) location of road (general environment - urban, urban fringe, rural settlement or rural);
- (ii) density and type of development;
- (iii) traffic activity (density of property accesses/intersections);
- (iv) access restrictions (divided/undivided road, service roads, geographical/other features);
- (v) number of lanes, function of road; and
- (vi) special roadside activities - schools, tourist traffic, etc.

The system also compares its recommendation with information provided on the following potential modifying factors. Users may need to exercise judgement regarding the influence of these factors on the QLIMITS recommended limit:

- (i) upper Limit of the 15 km/h Pace;
- (ii) crash rates;
- (iii) speed limits on adjacent road segments;
- (iv) standard of road alignment or amount of congestion;
- (v) roadside activities; and
- (vi) existence of traffic signals.

The above data should be recorded on a QLIMITS Field Data Form, refer to Form F1. Results are shown on the QLIMITS Report, refer to Form F2.

It can be expected that the QLIMITS recommended speed limit will occasionally differ widely from results obtained from assessment of road function or prevailing vehicle speeds. Accordingly, practitioners are encouraged to provide feedback, to enable future improvements and enhanced calibration of the system.

QLIMITS can recommend speed limits within the range 60 km/h to 100 km/h for traffic carrying roads. Special criteria apply to the application of 50 km/h, 110 km/h speed limits and roads in rural residential areas (see Clauses 3.2, 3.3 and 3.4).

QLIMITS is available on the following website address: [www.qlimits.com.au](http://www.qlimits.com.au)

---

**FORM F1 QLIMITS FIELD DATA FORM**


---

**LOCAL GOVERNMENT/DISTRICT** \_\_\_\_\_ **ROAD:** \_\_\_\_\_

**LOCATION:** \_\_\_\_\_

**RECORDER:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

Tick (✓) the appropriate box to respond

**1. LOCATION OF ROAD**

The area in which this road section is located is generally:

- |                         |  |                          |
|-------------------------|--|--------------------------|
| (i) Urban:              | Fully built-up area with consolidated residential, commercial and industrial land uses.  | <input type="checkbox"/> |
| (ii) Urban Fringe:      | Less developed area typically containing low-density residential, small scale farming, future urban and other 'developing' land uses.  | <input type="checkbox"/> |
| (iii) Rural Settlement: | Small settlements or townships located in rural areas which are typically located on through roads, and where all or most land development is concentrated on, or has direct access to, those through roads. | <input type="checkbox"/> |
| (iv) Rural:             | Areas that are rural in nature, with large property or farm holdings. The only residential properties in these areas will be scattered homesteads and farmhouses.  | <input type="checkbox"/> |

**2. LENGTH OF ROAD**

The length of road section under consideration is \_\_\_\_\_ km.

**3. UPPER LIMIT OF THE 15 km/h PACE**

The Upper Limit of the 15 km/h Pace of free vehicles on this road section is \_\_\_\_\_ km/h.

**4. DEVELOPMENT (For divided roads only)**

The development on both sides of the road is:	balanced	<input type="checkbox"/>
	unbalanced	<input type="checkbox"/>

**5. FREQUENCY OF ROADSIDE ACCESSES (for both sides of the road combined)**

- Note: (i) Abutting development on service roads is not considered and therefore only the points of access to the through traffic lanes are counted.  
 (ii) Crossroads are counted once each side of the road.

Abutting Properties:

- (a) Residences, small commercial establishments, small public buildings and other units which generate light and/or occasional activity.

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- (b) Average commercial establishments, local schools, caravan parks, light industries, public buildings and other units generating activity that is:

- (i) continuous light  
 (ii) moderate at certain regular times, such as commuting hours  
 (iii) substantial at infrequent intervals

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- (c) Heavy industry, schools, shopping centres and other units generating
  - (i) continuous moderate activity or
  - (ii) substantial activity at certain regular times.

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- (d) Large shopping centres and other units generating substantial and continuous activity. Some large industries that are tourist attractions or for some other reason generate substantial traffic volumes would be included in this activity

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

**Intersections**

- (a) Intersecting roads of substantially lesser importance than the road being studied, or intersecting roads where side road traffic and turning movements have little effect on the traffic flow pattern of the road being studied.

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- (b) Intersecting roads of lesser importance than the road being studied but where side road traffic and turning movements are such that the intersection has appreciable effect on the traffic flow pattern of the road being studied.

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- (c) Signalised intersections, roundabouts and intersections with roads comparable to or of greater significance than the road being studied. Intersections which have a pronounced effect on the traffic flow pattern of the road being studied.

Number of this type: Side 1 = \_\_\_\_\_ Side 2 = \_\_\_\_\_

- Note:
- (i) Abutting development on service roads is not considered and therefore only the points of access to the through traffic lanes are counted.
  - (ii) Crossroads are counted once each side of the road.

**6. DIVIDED OR UNDIVIDED**

- Note:
- (i) Double barrier lines do not constitute a median.
  - (ii) A painted median is sufficient to constitute a divided road if it extends for the full length of the section under consideration (excepting median breaks for turns, etc).

The section of road being studied is:

undivided		<input type="checkbox"/>
divided		<input type="checkbox"/>

- Note:
- (i) Double barrier lines do not constitute a median.
  - (ii) A painted median is sufficient to constitute a divided road if it extends for the full length of the section under consideration (excepting median breaks for turns, etc).

**7. RESTRICTION OF ACCESS**

The major part of this road has restriction of direct vehicular access on:

	neither side	<input type="checkbox"/>
	one side	<input type="checkbox"/>
	both sides	<input type="checkbox"/>

- Note: (i) This restriction may include service roads, river or railway line alongside the road or a large fenced-off area e.g. golf course, airport.



**15. LOW SPEED AREA**

Is this road a low speed area?

NO

YES (LATM area)

YES (shared-use zone)

**16. OTHER FACTORS**

(a) Is the road predominantly winding or hilly?

NO

YES

(b) Is the road unusually congested?

NO

YES

**17. SPECIAL ROADSIDE ACTIVITIES**

Are there any schools along this road section?

NO

YES

**18. CRASH RATES**

Compared to other similar road sections the crash rate is:

average or lower than average

a little higher than average

significantly higher than average

Note: Care should be exercised when using historical crash rate data. Only use relevant data pertaining to crashes that have occurred whilst the road is in its current state, e.g. if an intersection has been signalised or a road recently reconstructed, only use crash data from the period following these changes.

**19. TRAFFIC SIGNALS/ROUNDBABOUTS**

Are there any traffic signals or roundabouts along this road section?

NO

YES

---

**FORM F2 QLIMITS SPEED ENVIRONMENT REPORT**


---

**QLIMITS V3.0**  
**Individual Detailed Assessment Report**

**Organisation:****Analysed By:****User Reference:****Road Name:****Road Location:****Suburb:****Local Government:****Department of Transport and Main Roads Regional office:****Roadside Development**

Rural Settlement

**Upper Limit of 15 km/h Pace**

55 km/h

**Road Characteristics**Length of the section of road is **10 km**The AADT on this road is **2000 vpd**The existing posted speed limit on the section of road is **80 km/h****Recommended Speed Limit:****QLIMITS Suggested Speed Limit**

The suggested speed limit based on the speed environment analysis was 100 km/h prior to allowing for site specific issues.

**Frequency of Roadside Accesses**

	<b>Type of access</b>	<b>Number</b>
A	Residences, small commercial establishments, small public buildings and other units which generate light and/or occasional activity. (The weighting for this type of access is 1).	30
B	Average commercial establishment, local schools, caravan parks, light industries, public buildings and units generating activity which is either: 1. Continuous light. 2. Moderate at certain times, such as commuting hours. 3. Substantial at infrequent intervals. (The weighting for this type of access is 2).	3
C	Heavy industry, schools, shopping centres and other units generating continuous moderate activity or substantial activity at certain regular times. (The weighting for this type of access is 3).	0
D	Large shopping centres and other units generating substantial and continuous activity. Some large industries which are tourist attractions or for some other reason generate substantial traffic volumes would be included in this activity. (The weighting for this type of access is 4).	0

	Type of access	Number
E	Unsignalised intersecting roads of substantially lesser importance than the road being assessed, or intersecting roads where side traffic and turning movements have little effect on the traffic flow pattern of the road being considered. (The weighting for this type of access is 1).	1
F	Unsignalised intersecting roads of lesser importance than the road being assessed but where the side road traffic and turning movements are such that the intersection has appreciable effect on the traffic flow pattern of the road being considered. (The weighting for this type of access is 2).	3
G	Unsignalised intersecting roads of comparable or greater significance than the road being assessed. Intersections which have pronounced effect on the traffic flow pattern of the road being considered. (The weighting for this type of access is 3).	0
H	Roundabouts and signalised intersecting roads. (The weighting for this type of access is 3).	2
	<b>Average number of accesses per 100 m</b>	0.49

### Road Division

The road is **Undivided**

### Function of Road

The road is primarily used for **Traffic movement**

### Protection for Turning Traffic

The median provides **partial or no** protection for turning or crossing vehicles.

### Freeway

This road is not a freeway

### Signals

Traffic signals present on the section of road. A speed limit >80 km/h is not appropriate for road sections where there are traffic signals present. An upgrade of the intersection or use of a buffer zone on the signal approaches is required.

### Road Geometry and Congestion

There are no factors present in the road section that would indicate that a speed limit lower than might usually be applied is required.

### Special Roadside Activities

A lower speed limit may be appropriate due to the presence of special roadside activities in the area. These include:

- Recreational or tourist traffic

### Adjacent Speed Zones

**Approach 1:** 80 km/h - western approach

**Approach 2:** 100 km/h - eastern approach

### Crash Costs

**Number of crashes in the past 5 years:**

Description	No. of crashes
Head-on	1
Rear-end	4
Lane change	0
Parallel lanes, turning	0
U-turn	1
Entering roadway	0

Description	No. of crashes
Overtaking, same direction	0
Hit parked vehicle	0
Hit railway train	0
Pedestrian	0
Permanent obstruction on carriageway	0
Hit animal	2
Off carriageway, on straight	0
Off carriageway, on straight, hit object	0
Out of control, on straight	0
Off carriageway, on curve	0
Off carriageway, on curve, hit object	0
Out of control, on curve	0

The average annual crash cost is: 14.91 (\$10<sup>4</sup>)

#### **Crash Rate**

The crash rate is: 204 (\$10<sup>4</sup> per 10<sup>8</sup> VKT)

The accident rate for this section of road is average or lower than average for this type of road.

#### **Unsignalised Pedestrian Crossings**

There are no pedestrian crossings located along this section of road.

## APPENDIX E

### CRASH DATA

#### E1 GENERAL

This appendix provides guidance on the collection and analysis of crash data to determine the crash rate. The detailed process for the determination of speed limits shown on the flowchart in Appendix F, Figure F1 includes a requirement to conduct a crash investigation or safety review, if the road section has a high crash rate. Speed limits should not be changed in response to a high crash rate without a detailed investigation into the causes of the crashes and consideration of other potential countermeasures.

Crash data should be collected for the preceding 3 year period (5 years preferably). This data should be plotted on Figure C1 (Appendix C) at the locations of occurrence in the fatal, injury, or property damage only categories.

#### E2 EVALUATION OF CRASHES

Crashes should be evaluated according to the following procedure:

- (a) Identify crash history and calculate the crash rate for the road segment being reviewed (excluding major intersections\*);

\* Note: Crashes at intersections result predominantly from a higher degree of potential vehicular conflict (compared with road segments).

- (b) Identify any crash concentrations (ie. Black Spots);
- (c) Compare the crash rate to known typical crash rates for similar roads, to determine if the subject road has a safety problem.

Local governments and the Department of Transport and Main Roads are encouraged to establish tables of comparative crash rates for roads within their jurisdiction according to road function and traffic volume categories.

For comparison purposes, the following convention should be used to describe the crash rate in relation to the typical crash rates.

- Low crash rate - less than or equal to the Average Crash Rate
  - Medium crash rate - between Average and Critical Crash Rates
  - High crash rate - greater than or equal to the Critical Crash Rate
- (d) If the crash rate is high, conduct a crash investigation and safety audit or safety review to determine if remedial or preventative treatment is required.

#### E3 CALCULATING THE CRASH RATE

For the purpose of comparison, crash rates can be measured in a number of ways. However, it is considered that the most appropriate manner of measuring road crashes is in terms of exposure to risk. For road segments, the accepted measure of exposure is distance travelled.

For the purpose of speed zoning, the crash rate should be computed in terms of the cost of crashes (\$10<sup>4</sup>) per 10<sup>8</sup> vehicle kilometres travelled (10<sup>8</sup> VKT) from the following formula:

$$R = \frac{\sum_{t=1}^{20} C_t \times A_t}{S \times Y \times 365} \times 10^4$$

where:

R = Crash Rate

t = DCA Code Group (1-20) (refer Table E1)

A<sub>t</sub> = average number of crashes in DCA Code Group "t" per year

C<sub>t</sub> = cost of a crash in DCA Code Group "t" (\$)

S = length of road segment (km)

Y = AADT over segment

The crash rate (\$10<sup>4</sup> per 10<sup>8</sup> VKT) should be calculated for sections of road which have similar characteristics, and which have similar roadside development. This allows a comparison of the crash rate to be made between similar sections of the same road, or with similar sections of road in other areas.

**TABLE E1 DCA CODE GROUPS AND CRASH COSTS**

<b>TWO VEHICLE CRASHES</b>				
<b>DCA Code Group</b>	<b>DCA Codes</b>	<b>Description</b>	<b>Low Speed (&lt;80 km/h) \$</b>	<b>High Speed (≥80 km/h) \$</b>
1	100 - 109	Intersection, from adjacent approaches	78,100	178,500
2	201, 501	Head-on	178,300	311,700
3	202 - 206	Opposing vehicles, turning	77,300	153,700
4	301 - 303	Rear-end	38,800	75,100
5	305 - 307, 504	Lane change	60,600	186,600
6	308, 309	Parallel lanes, turning	54,200	152,600
7	207, 304	U-turn	74,100	157,000
8	401, 406 - 408	Entering roadway	54,900	102,000
9	503, 505, 506	Overtaking, same direction	73,400	116,700
10	402, 404, 601, 602, 604, 608	Hit parked vehicle	55,000	123,500
11	903	Hit railway train	216,700	436,800
<b>SINGLE VEHICLE CRASHES</b>				
12	001 - 009	Pedestrian	164,600	290,400
13	605	Permanent obstruction on carriageway	74,900	126,800
14	609, 905	Hit animal	40,300	45,000
15	502, 701, 702, 706, 707	Off carriageway, on straight	60,600	123,500
16	703, 704, 904	Off carriageway, on straight, hit object	116,200	210,100
17	705	Out of control, on straight	84,400	162,400
18	801, 802	Off carriageway on curve	102,700	181,300
19	803, 804	Off carriageway, on curve, hit object	137,600	235,000
20	805, 806, 807	Out of control, on curve	87,700	119,900
<b>EXCEPTIONS</b>				
21	000, 200, 300, 400, 500, 600, 700, 800, 900, 901, 906, 907, 403, 405, 606, 607, 610	Crashes which are unlikely to be attributable to any road environment factor, and which are therefore unlikely to be addressed by any road based remedial treatment. Crashes in this DCA code group will not be used in crash rates or BCR calculations or reports.		

Notes:

1. Costs are in 2007 dollars.
2. Costs are based on the costs contained in "Crash costs 2001: cost by accident-type" produced by Dr David Andreassen of Data Capture and Analysis, factored up by 2.393% for 6 years and rounded to the nearest \$100.

## **APPENDIX F**

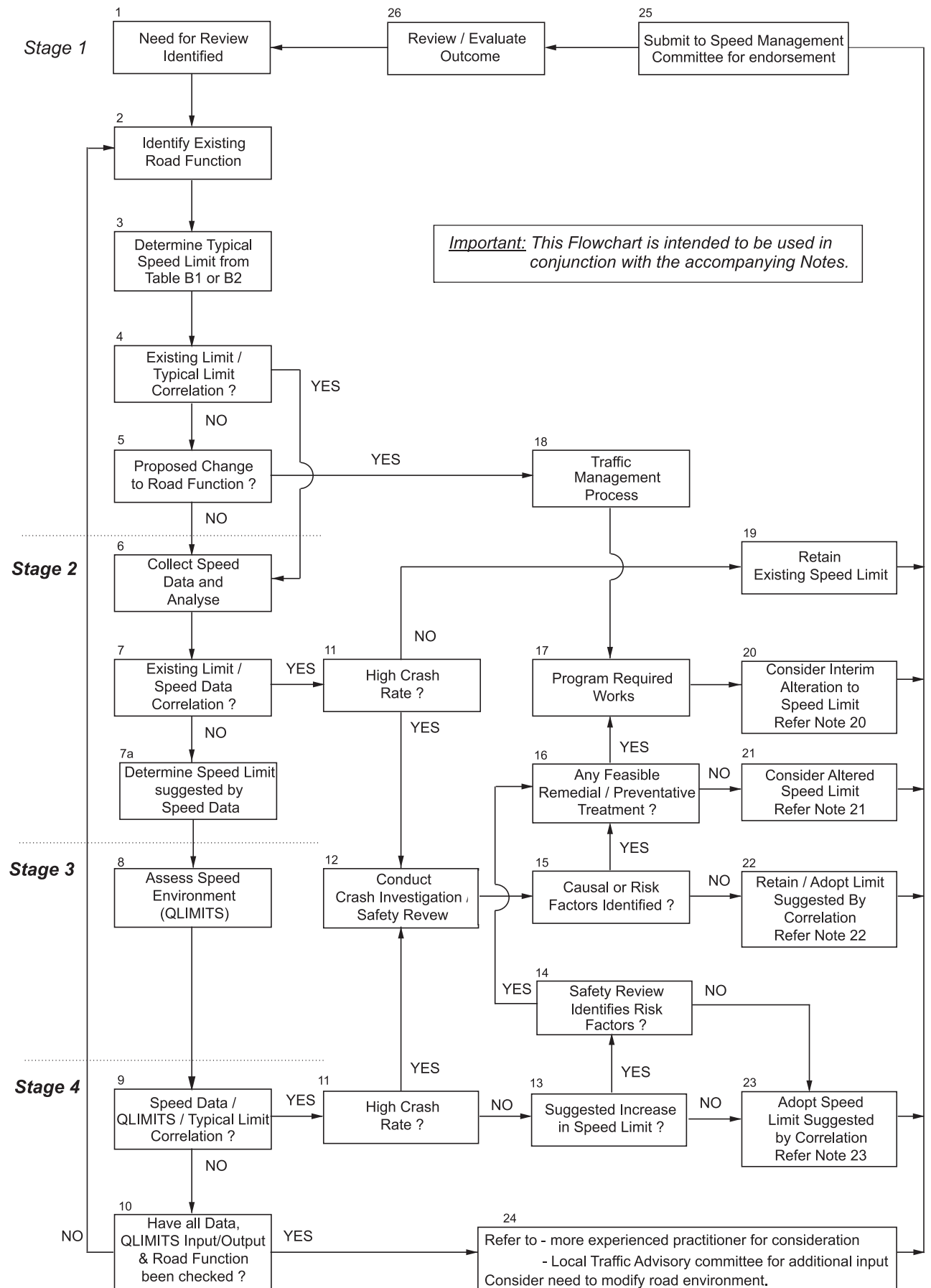
### **DETAILED PROCESS FOR THE DETERMINATION OF SPEED LIMITS**

#### **F1 SCOPE**

This Appendix contains a Flowchart (Figure F1) and Checklist to provide practitioners with detailed guidance concerning the determination of speed limits.

The Flowchart is intended to be used in conjunction with its accompanying notes.

The Checklist is also intended to be used as a record of the speed limit review process.



**Figure F1 PROCESS FOR THE REVIEW OF SPEED LIMITS**

## NOTES TO FIGURE F1

*(The following notes are numbered in accordance with the numbers used to identify the flowchart boxes in Figure F1.)*

1. Speed limits should be reviewed on a regular basis, as well as in response to identified needs.  
Refer Clause 4.4.
2. Identify the existing function of the road, according to the particular Road Authority's road hierarchy plan. Determine the corresponding functional classification.  
Refer Appendix A and Table A1.
3. Determine the Typical Speed Limit associated with the identified road function.  
Refer Appendix B and Tables B1 and B2.
4. Determine whether the Typical Speed Limit (determined from Tables A1, B1 and B2) equals the existing speed limit.  
If YES: The existing speed limit is consistent with the function of the road.  
Further assessment of the degree of correlation between the prevailing vehicle speeds, the speed environment and the existing speed limit will determine if this speed limit is appropriate.  
If NO: Further assessment will determine an appropriate speed limit.
5. If an alteration to a road's function is proposed, then it should be as a result of implementing a detailed road hierarchy plan or other traffic planning initiative.  
Refer Note 18.
6. Collect and analyse speed data.  
Refer Appendix C.
7. Determine whether the distribution of prevailing vehicle speeds is consistent with that expected from the existing speed limit.  
Refer Appendix C, Clause C5.  
If YES: This implies that the prevailing speeds and the existing speed limit are also consistent with the speed environment. Consequently, the existing speed limit appears to be appropriate, regardless of the road's function, and it is not necessary to proceed to Stage 3 to assess the speed environment.  
Although it is not a requirement to proceed to Stage 3, practitioners may do so if they wish.  
If NO: The speed environment may be inconsistent with the existing speed limit. An assessment of the speed environment, using QLIMITS must now be taken.
- 7a. Determine the speed limit that would be suggested as appropriate from the upper limit of the 15 km/h Pace.  
Refer Appendix C, Clause C6.
8. Assess the speed environment using QLIMITS. Refer Appendix D.  
Refer Appendix D.
9. At this stage of the review process, it has been established that the existing speed limit is inconsistent with prevailing vehicle speeds. In order to identify a more appropriate speed limit, correlations are sought between at least two of the three speed limits suggested by the assessed criteria. The three speed limits are as follows:
  - (i) Speed limit suggested by road function (Typical Speed Limit)
  - (ii) Speed limit suggested by speed data (Table C2)
  - (iii) Speed limit suggested by the speed environment (QLIMITS)
 Check whether there is a correlation between at least two of the above three speed limits.  
If YES: The relationship between drivers, the speed environment and the road function is sufficiently consistent to enable the review process to suggest an appropriate speed limit.

- If NO: It is possible that an error has been made in the evaluation of at least one of the criteria, or physical modifications to the road environment are required.
10. If the review process has led to this step, then it is possible that an error has been made. Check all data, data input, data analyses and interpretation of analyses.  
If no error or problem is found, refer to another officer for checking. If another officer cannot identify any error or problem, then refer to Note 24.
  - 11,12. A high crash rate will require a Crash Investigation to identify the cause of the crashes, to determine if remedial treatment is required, and to determine the implications of the situation with regard to the preferred speed limit. It is suggested that a Safety Review or Road Safety Audit should also be carried out to determine if there are any risk factors that were not identified by the Crash Investigation.  
Refer: *Road Safety Audits*, Austroads, 2002.
  13. If the review process has suggested an increase in the speed limit, a Safety Review or a Road Safety Audit, should be carried out to check that the road environment can safely support the higher speed limit.
  14. If a Safety Review or Road Safety Audit has identified any risk factors, the provision of preventative treatment should be considered before the increased speed limit is adopted.  
Refer: *Road Safety Audits*, Austroads, 2002.
  15. Determine whether a Crash Investigation or Road Safety Audit has identified any causes of the crashes, or any risk factors in the road environment.
  16. With regard to physical and/or financial constraints, determine whether there are any feasible remedial or preventative treatments to address the problems identified during a Crash Investigation, Safety Review or Road Safety Audit.
  17. Works are required to address an identified road safety problem, or as the result of a traffic management process. Proceed to program the proposed works and obtain budget approval for implementation.
  18. The term "Traffic Management Process" refers to the process used to alter or reinstate the function of a road according to a strategic road network plan or road hierarchy.  
The establishment of a road hierarchy is an essential basis for the management of all road networks and involves the coordination of town planning, traffic and transport planning, and public consultation.  
A Traffic Management Process usually combines local traffic planning and management with public consultation activities, such as those described in relevant publications, and should only be undertaken by experienced traffic engineering and town planning professionals.
  19. The distribution of prevailing vehicle speeds is consistent with that expected from the existing speed limit, which implies that it is also consistent with the speed environment. There are no indications of a road safety problem.  
Retain the existing speed limit.
  20. If there will be a delay before commencement of the required works, it is necessary to determine whether an interim alteration to the existing speed limit is required.
  21. There are no feasible remedial treatments to address the safety problems identified by a Crash Investigation, Safety Review or Road Safety Audit. It may therefore be necessary to implement one or more of the following actions:
    - (a) If the review process has suggested a higher speed limit, retain the existing speed limit.
    - (b) Consider the need for enhanced enforcement.
    - (c) Reduce the existing speed limit to attempt to reduce the number and severity of crashes.
  22. The completion of a Crash Investigation has not been able to determine any causes for the high crash rate. Consequently, it may be assumed that crashes are occurring due to influences that are not related to the road environment or vehicle speeds.

This suggests that the speed limit should not be altered in response to the crash history, as this is unlikely to offer potential improvement in the crash situation. Further, it suggests that the existing speed limit (or a limit suggested by correlations at steps 7 or 9) should be retained or

adopted, and that inappropriate or errant driver behaviour is addressed through enhanced enforcement.

23. The relationship between drivers, the speed environment and the road function is sufficiently consistent to enable the review process to suggest an appropriate speed limit. There are no indications of a road safety problem.

Adopt the suggested speed limit.

If the review process has suggested a speed limit that is lower than the limit suggested by the prevailing vehicle speeds (refer Note 7), enhanced enforcement may be required.

24. If the data and analyses have been checked by the reviewing officer and re-checked by another officer, and no errors have been found, one or more of the following actions should be implemented:

(a) Consult with another officer, in or outside the organisation (e.g. relevant areas of the Department of Transport and Main Roads), who is more experienced in the review of speed limits, regarding the technical processes undertaken and the decisions made.

(b) Consult with a local Traffic Advisory Committee, if available, regarding potential issues for consideration, which are external to the technical speed limit review processes. Use such issues to assist in re-evaluating the outcomes of the review.

(c) Investigate the need for physical modifications to the road environment.

25. The recommendations of the speed limit review shall be submitted to the Speed Management Committee for endorsement before the speed limit changes are made. The recommended speed limit shall be adopted if a majority of members of the Speed Management Committee agree with the recommendation of the road authority. If the majority decision of the Speed Management Committee differs from the recommendation of the road authority, the speed limit review together with the decision of the Speed Management Committee shall be forwarded to the Department of Transport and Main Roads for determination of the appropriate speed limit.

26. Speed limits should be programmed for review on a regular basis. Where a speed limit has been altered, the outcome should be assessed - ideally between one week and one month after the physical alteration.

Roads that contain speed limits other than the general rural limit, general urban speed Limit and criteria based speed limit should desirably be programmed for desktop review every five years. This is to ensure that any changes in traffic conditions, speed environment including land use or increase in crash rate which may influence the speed limit can be determined.

Where the desktop review shows that there is a change in traffic characteristics or the speed environment, including land use, or an increase in crash rates, a full speed limit review, in accordance with these guidelines should be conducted. The assessment of the speed environment should consider changes to clear zones, potential hazards within the clear zone and batter slopes.

Where the desktop review shows that there is negligible change in traffic characteristics or the speed environment, including land use, and there is no increase in crash rates, a full speed limit review is not required. However, a record of the desktop review must be retained for future reference.

**Figure F2 CHECKLIST FOR REVIEW OF EXISTING SPEED LIMIT**

(Not required for setting speed limits on roads in rural residential areas. Refer to Section 3.4).

**LOCATION IDENTIFICATION**

Road Owner:  MRD District Number: .....  
 LGA

LGA Number: ..... LGA Name: .....

Town/City: ..... Suburb: .....

Road Name: ..... Road Section: .....

Road Number: .....

Road Segment:

	Location or Reference Point	Chainage or distance	GPS coordinates (decimal degrees)	
			Latitude	Longitude
Start				
End				

Existing Speed Limit: ..... km/h

AADT: .....

**REVIEWING OFFICER**

Name: .....

Employer: .....

Address: .....

Phone No: .....

Date of Review: .....

Have you undertaken appropriate training in the application of Part 4? Yes  No

Notes:

1. The numbering convention used for the Checklist coincides with that used in Figure F1.
2. References to Figures and Tables are to those in Part 4 of the Manual of Uniform Traffic Control Devices.
3. Mark following selections with a tick.

**SPEED LIMIT REVIEW**

- 1. The need to review the speed limit on this road has occurred due to:
  - General Limit no longer applicable
  - Altered speed environment
  - Evidence of speed limit/vehicle speed discrepancies
  - Need to adjust speed zone lengths
  - Community request
  - Other (specify) .....

**Stage 1 - Road Function Analysis**

- 2. Road Function
 

If the road is in a rural environment, go to Step 3  
For a road in an urban environment, the function of the road has been identified as:

  - Access / Local Street
  - Collector Street
  - Trunk Collector Road
  - Sub-Arterial Road
  - Arterial Road
  - Controlled Access Arterial Road, Freeway

If Rural, go to Step 3
- 3. From Table B1 (Urban) or B2 (Rural), the Typical Speed Limit is: .....km/h
- 4. The Existing Speed Limit equals the Typical Speed Limit?
  - Yes - go to Step 6
  - No - go to Step 5
- 5. Is it proposed to alter the road function to align the Typical Speed Limit with the Existing Speed Limit?
  - Yes - go to Step 18
  - No - go to Step 6

**Stage 2 – Prevailing Vehicle Speed Analysis**

- 6. Prevailing Vehicle Speed Data
  - (a) Collected using:
    - Manual methods
    - Automatic Device (specify type) .....
    - Other (specify) .....
  - (b) Collected according to guidelines:
    - Specified in Appendix G

- Other (specify) .....
- (c) Analysed using:
  - EsdeeMan version 3.0
  - Manual methods
  - Other (specify) .....
- (d) Results from analysis:
 

No. of vehicles in sample: .....

Upper limit of 15 km/h Pace:.....km/h

% vehicles in the 15 km/h Pace: .....%

85th %ile speed:.....km/h

Mean speed:.....km/h
- 7. Speed Data correlates with Existing Speed Limit? (refer to Table C1)
  - Yes - go to Step 11
  - No - go to Step 7a
- 7a. From Table C2, Suggested Speed Limit is: .....km/h  
Go to Step 8

**Stage 3 – Speed Environment Analysis**

- 8. QLIMITS
  - (a) Field Data Form F1 (Appendix D)
    - Completed
    - Copy attached
  - (b) Analysis Report Form F2 (Appendix D)
    - Completed
    - Copy attached
  - (c) QLIMITS recommended Speed Limit ..... km/h
  - (d) QLIMITS flagged considerations?
    - No
    - Yes (refer to Report Form F2 (Appendix D))

**Stage 4 – Correlation Check**

- 9. Correlation Check
  - (a) Outputs from each Stage are:
    - Stage 1  
Typical Speed Limit .....km/h
    - Stage 2  
Suggested Speed Limit  
from Table C2 .....km/h
    - Stage 3  
QLIMITS Recommendation.....km/h

- (b) Is there a correlation between two of the three outputs from Stages 1, 2 & 3 above?
  - Yes ..... km/h - go to Step 11
  - No - go to Step 10
- 10. Have all data, QLIMITS input/output and road function been checked?
  - No - Go to Step 2
  - Yes - Go to Step 24

**Other Criteria**

- 11. (From Steps 7 and 9)
  - (a) The calculated crash rate is:
    - ..... \$10<sup>4</sup> per 10<sup>8</sup> VKT
  - (b) The Typical Crash rates are:
    - Average: ..... \$10<sup>4</sup> per 10<sup>8</sup> VKT
    - Critical: ..... \$10<sup>4</sup> per 10<sup>8</sup> VKT
  - (c) The Crash Rate is comparatively:
    - Low (= < Average)
    - Medium (between Average and Critical)
    - High (> = Critical)
  - (d) Is crash rate High?
    - Yes - go to step 12
    - No - Figure F1 leads to:
      - Step 19
      - Step 13
- 12. Crash Investigation conducted by:
  - Name: .....
  - Date: .....
  - File/Report No.: .....
  - Go to Step 15
- 13. Has the review process suggested an increase in the speed limit?
  - Yes - go to Step 14
  - No - go to Step 23
- 14. Has a Safety Review (or Road Safety Audit) identified any risk factors?
  - Yes - go to Step 16
  - No - go to Step 23
- 15. A Crash Investigation or Safety Review has identified causal or risk factors?
  - Yes - go to Step 16
  - No - go to Step 22
- 16. Is treatment feasible?
  - Yes - go to Step 17

- No - go to step 21
- 17. (From Step 16)
  - Proposed treatment / works has been listed for the financial year: .....
  - Go to Step 20
- 18. (From Step 5)
  - Refer to Figure F.1, Note 18
  - Go to Step 17
- 19. (From Step 11 via Step 7)
  - Retain Existing Limit - go to Step 25
- 20. Consider whether an interim alteration to the speed limit is necessary.
  - Go to Step 25
- 21. (From Step 16)
  - Subject to Figure F1 (Note 21), it is considered appropriate to:
    - Increase
    - Decrease
  - the Existing Speed Limit by .....km/h
  - Go to Step 25
- 22. (From Step 15)
  - Retain Existing Speed Limit with enhanced enforcement.
  - Go to Step 25
- 23. (From Step 13 or 14)
  - Adopt speed limit noted at 9(b).
  - Go to Step 25
- 24. (From Step 10)
  - The review of speed limits according to the process described in Figure F1 has failed to determine an appropriate speed limit. Action taken is as follows:
    - (a)  The Checklist, together with all relevant data and information, has been referred to another officer for consideration.
      - Referred to: .....
      - By: .....
      - Date: .....
      - The referee now has responsibility for providing recommendations at Step 25.
    - (b)  Input to the review requested from the Traffic Advisory Committee
      - Committee meeting of ...../...../..... offered the following information:
      - .....
      - .....
      - .....
      - .....

and/or advised a preferred speed limit of:

.....km/h

(c) Has information provided by the Committee assisted in determining an appropriate limit?

Yes - it is .....km/h

Go to Step 25

No - refer this speed limit review to the relevant policy administrators of the MUTCD within the Department of Transport and Main Roads

Referred to:.....

By: .....

Date: .....

25. Recommendation

Following the completion of this Checklist, which documents the process for the review of speed limits according to Figure F1 of Part 4 of the MUTCD, I submit the following:

Recommended Speed Limit: .....km/h

Recommended by: .....

Position: .....

Date: .....

Authorisation

The recommended Speed Limit is authorised for installation according to the provisions of Appendix C of Part 1, Manual of Uniform Traffic Control Devices.

The recommended Speed Limit is not authorised for the following reasons:

.....  
.....  
.....

The alternative Speed Limit to be installed or retained is: ..... km/h

Reasons for the alternative speed limit are:

.....  
.....  
.....  
.....

Authorised by:.....

Position: .....

Date: .....

Endorsement by Speed Management Committee

The recommended speed limit has been endorsed by the Speed Management Committee.

The recommended speed limit has not been endorsed by the Speed Management Committee and will now be referred to the Department of Transport and Main Roads for a decision.

Form M994 or equivalent local government Form completed by Authorising Officer and copy filed with this Checklist.

(Failure to complete this task could compromise the legality of the Speed Limit.)

26 Review / Evaluation

Will the existing speed limit be altered?

Yes - program assessment to occur 1-4 weeks after installation.

No - program for review in 5 years or sooner if required.

Where Steps 21, 22 or 23 have indicated that enhanced enforcement is required, complete the following:

Enhanced enforcement of this site by QPS has been requested by reporting the outcome for this speed limit review to:

Local Traffic Advisory Committee

Regional Speed Management Advisory Committee

Regional QPS Traffic Co-Ordinator

Reported by: .....

Position: .....

Date: .....

Written advice

Other (specify) .....

## **APPENDIX G**

### **GUIDELINES FOR CONDUCTING SPEED SURVEYS**

#### **G1 OBJECTIVE**

The objective of vehicle speed surveys is to determine the speed at which drivers generally prefer to travel under optimal conditions.

The resulting distribution of observed speeds should be characteristic of the road function and its general environment. As far as possible, this distribution should be free of the influence of any external factors such as:

- (i) roadworks;
- (ii) traffic congestion;
- (iii) adverse weather conditions; and
- (iv) special events or incidents.

Avoiding external factors will provide more reliable data, and enable comparisons of speed distributions between roads and between time periods on the same road.

#### **G2 SITE CHARACTERISTICS**

Vehicle speed survey sites should be selected based on the following characteristics:

##### **Geometry and alignment:**

Speed survey sites should be located on sections of road which are representative of the road segment under investigation. For example, if the road segment under consideration generally has restricted horizontal geometry, then it would not be appropriate to collect data at an isolated straight section of road. Similarly if a road has an isolated section with substandard geometry, the survey site should be located away from the substandard section of road.

##### **Intersections:**

Survey sites should not be in close proximity (e.g. within 200m) to major access/egress points, traffic signals and roundabouts, where acceleration or deceleration of vehicles is likely.

##### **Position of measuring equipment:**

Drivers may tend to slow down upon sighting the use of radar devices to measure vehicle speeds. Consequently, speed surveys using radar or LIDAR detection devices should be conducted as unobtrusively as possible.

##### **Equipment limitations:**

Whilst the limitations of automated speed data collection (e.g. VDAS, ARCHER etc.) equipment is generally well understood by speed zoning practitioners, the limitations and use of radar devices are less well understood. For example, significant metallic or highly dense objects that can distort any readings of vehicles can reflect radar. For further advice on the use of radar or LIDAR devices, advice should be sought from the local Queensland Police Service Traffic Branch.

##### **Safety:**

When conducting speed surveys, the safety of survey staff should not be compromised by poor site selection. For example, sites with severely restricted sight distances or lateral clearances should be avoided.

### G3 SURVEY CONDITIONS

Vehicle speed surveys should be designed as follows:

**Day of week:**

Monday to Friday (inclusive).

**Time of day:**

6:00 am to 6:00 pm, but avoiding periods of traffic congestion.

**Environmental conditions:**

Good weather, dry pavement.

**Non-typical events:**

Avoid non-typical events, such as roadworks, traffic congestion, major holidays, local happenings or incidents.

### G4 SAMPLE CHARACTERISTICS

A sample of vehicle speeds should be obtained with the following characteristics:

**Travel direction:**

Each direction of travel should be sampled individually.

**Recommended sample size:**

Speed surveys are desirably based on a minimum sample size of 200 observations. However, where it is difficult to achieve this sample size, the sample sizes shown in Table G1 may be adopted.

**TABLE G1 - MINIMUM SAMPLE SIZES**

Existing speed limit	40	50	60	70	80	90	100	110
Minimum sample size	55	65	85	95	110	130	155	200

**Sample vehicle type:**

Include all vehicle types in the survey sample (e.g. cars, trucks, and buses). As far as practicable, major vehicle types should be sampled in proportion to their relative numbers in the traffic stream.

**Sample vehicle selection:**

Draw a sample from both free flowing vehicles and platoon leaders.

**Minimum headway:**

A vehicle is considered to be operating under free flowing conditions when the preceding vehicle has at least 4 seconds headway and there is no apparent attempt to overtake the vehicle ahead.

**Data recording:**

Ideally, individual speeds to the nearest 1 km/h should be collected and analysed to give an accurate representation of traffic behaviour. However, for convenience of subsequent analysis of data in bulk, it is acceptable to record speeds using the bin system.

It is recommended that 5 km/h bins be used. If automatic equipment restricts the total number of bins available, bin sizes at the extremes of the distribution of measurements may be increased. Table G2 gives a recommended distribution of bin sizes where the number of bins is limited to 12.

**TABLE G2 - RECOMMENDED BIN RANGES**  
**UPPER LIMIT OF BIN RANGE**

<b>Bin Number</b>	<b>Speed Limit (km/h) *</b>						
	<b>40/50</b>	<b>60</b>	<b>70</b>	<b>80</b>	<b>90</b>	<b>100</b>	<b>110</b>
1	25	30	40	40	50	50	60
2	30	40	55	60	60	60	70
3	35	45	60	65	70	70	80
4	40	50	65	70	75	80	90
5	45	55	70	75	80	85	95
6	50	60	75	80	85	90	100
7	55	65	80	85	90	95	105
8	60	70	85	90	95	100	110
9	65	75	90	95	100	105	115
10	70	80	95	100	105	110	120
11	80	90	100	105	110	115	125
12	100	120	130	140	145	150	160

## **APPENDIX H**

### **SPEED MANAGEMENT COMMITTEES**

#### **H1 GENERAL**

Speed limit reviews conducted by road authorities shall be submitted to a local Speed Management Committee for endorsement. This is intended to ensure that the interests of all road users are considered before a speed zone is established and to ensure that speed zones throughout Queensland are consistent and credible. A speed zone shall only be established after the Speed Management Committee endorses the recommendation of the road authority.

#### **H2 MEMBERSHIP OF SPEED MANAGEMENT COMMITTEE**

Speed Management Committees are expected to draw relevant membership from the local Traffic Advisory Committee, including members from other local government authorities or regional councils. In urban area, Speed Management Committees are based on a single local government while in rural areas Speed Management Committee's could be based on a group of local governments. Committees are formed with the following membership:

- (a) qualified engineer from local government;
- (b) qualified engineer from the relevant Department of Transport and Main Roads Regional office;
- (c) Queensland Police Service representative; and
- (d) Department of Transport and Main Roads Road Safety Advisor

#### **H3 MEETINGS OF SPEED MANAGEMENT COMMITTEE**

Speed Management Committee meeting shall generally be held after the Traffic Advisory Committee meeting. Meetings may only be called if there are speed limit reviews to discuss. Speed Management Committee meetings may be chaired by the engineering representative of the road authority that has conducted the speed limit review. In some instances, it may not be necessary for the Speed Management Committee to formally meet and members of the Speed Management Committee may forward their approval/comments to the road authority.

#### **H4 ENDORSEMENT OF SPEED LIMIT BY SPEED MANAGEMENT COMMITTEE**

The role of the Speed Management Committee is to thoroughly deliberate on safety issues in relation to the speed limit recommended by the road authority. The Speed Management Committee needs to be satisfied that the speed limit review was conducted in accordance with this part of the Manual.

If the majority of members of the Speed Management Committee are satisfied with the recommended speed limit and advise the road authority in writing, the speed limit shall be adopted by the road authority.

If the speed limit recommended by the road authority does not comply with this Part of the Manual or differs from the majority view of the Speed Management Committee, the review, together with all supporting documentation and decision of the Speed Management Committee shall be referred to the Department of Transport and Main Roads for determination of the appropriate speed limit.

Any other changes endorsed by the Speed Management Committee shall also be forwarded to the Department of Transport and Main Roads for information. Any non-complying speed limits referred to Department of Transport and Main Roads will be investigated. Advice will then be provided to the Department of Transport and Main Roads/Council and the Speed Management Committee on an appropriate speed limit and/or the need for associated works.

## **ATTACHMENTS**

### **BLANK FORMS (MASTER COPIES)**

- **Speed Zone Plan and Data Sheet**
- **Speed Survey Field Sheet**
- **Speed Survey Calculation Sheet**
- **Frequency Distribution Curves Sheet**

<p><b>KEY -</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> House, School, Shops, etc.</li> <li> Bridge</li> <li> Level Crossing</li> <li> Street Lights</li> <li> Speed Check Station</li> <li> Pedestrian Crossing</li> </ul>	<p><b>TRAFFIC - Crashes</b>      FATAL INJURY PROPERTY DAMAGE</p> <p>From:- To:-</p> <p><b>ROAD - Lanes/Width, m</b></p> <p><b>DISTANCE, km</b></p> <p><b>TRAFFIC - Types &amp; AADT</b></p> <p><b>CRASH RATE (10<sup>8</sup> VKT.)</b></p> <p><b>DEVELOPMENT</b></p> <p><b>EXISTING ZONES, km/h</b></p> <p>V85 km/h - <span style="margin-left: 20px;">Time</span> <span style="margin-left: 20px;">Date</span></p> <p><b>PACE &amp; PERCENT IN PACE</b></p> <p><b>ROAD - Alignment</b></p> <p><b>PROPOSED ZONES, km/h</b></p>
<p><b>KEY - CRASHES</b></p> <ul style="list-style-type: none"> <li> Strike fixed objects</li> <li> Not give way</li> <li> Rear end collision</li> <li> Side swipe</li> <li> Pedestrian</li> <li> Injury</li> <li> Fatality</li> <li> Head-on collision</li> </ul>	<p><b>ROAD:</b></p> <p><b>TOWN:</b></p> <p style="text-align: center;"><b>SPEED ZONING PLAN</b></p>



Bin Range (km/h)	Mid Point of bin range (km/h)	No. of samples in bin (vehicles)	% of sample in bin (% of total)	3-bin moving sum (% of total)	Speed (Upper limit of bin ranges) (km/h)	% less than or equal to speed	(2) * (3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>TOTALS</b>							

**Mean Speed**

$$\bar{x} = \frac{\sum \text{column 8}}{\sum \text{column 3}} = \dots\dots\dots \text{ km/h}$$

**15 km/h Pace**

1. Calculate the three point moving sum of Column 4 in Column 5.
2. Percentage in Pace is the maximum value in Column 5 = ..... %
3. Upper limit of Pace is corresponding value in Column 6 = ..... km/h.

**85th percentile speed**

1. Use values in columns 6 and 7 to plot a cumulative frequency graph - Figure C4.
2. The 85th percentile speed is the speed corresponding to a cumulative frequency of 85% = ..... km/h.

LOCAL GOVERNMENT: .....

ROAD: .....

LOCATION: .....

DIRECTION OF TRAFFIC: .....

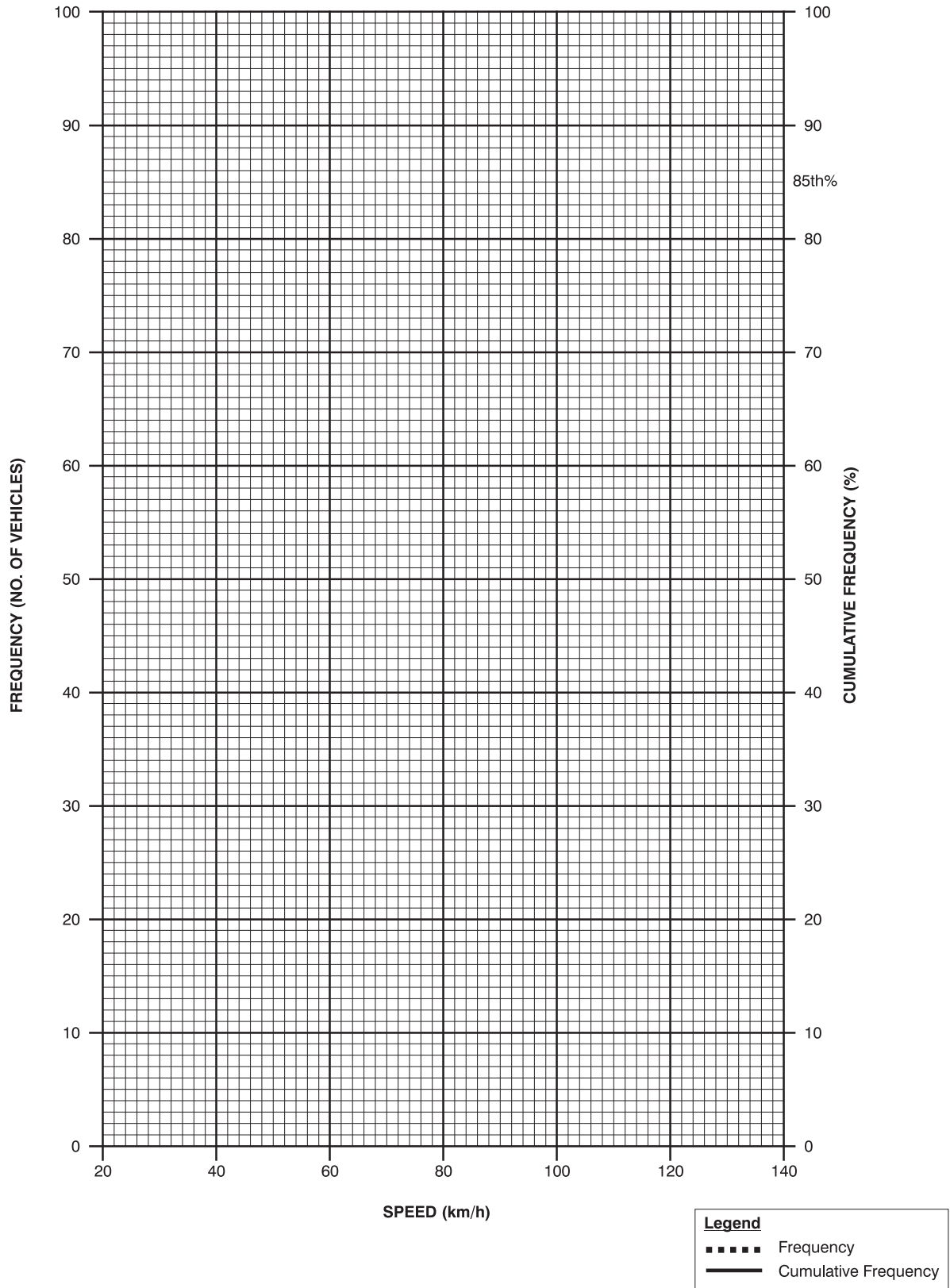
STATION: .....

DATE: .....

DAY OF WEEK: .....

DURATION OF COUNT: .....

SIGNATURE: .....



LOCAL GOVERNMENT: .....

DATE: .....

ROAD: .....

DAY OF WEEK: .....

LOCATION: .....

DURATION OF COUNT: .....

DIRECTION OF TRAFFIC: .....

SIGNATURE: .....

STATION: .....

**FREQUENCY DISTRIBUTION CURVES SHEET**

(Blank)