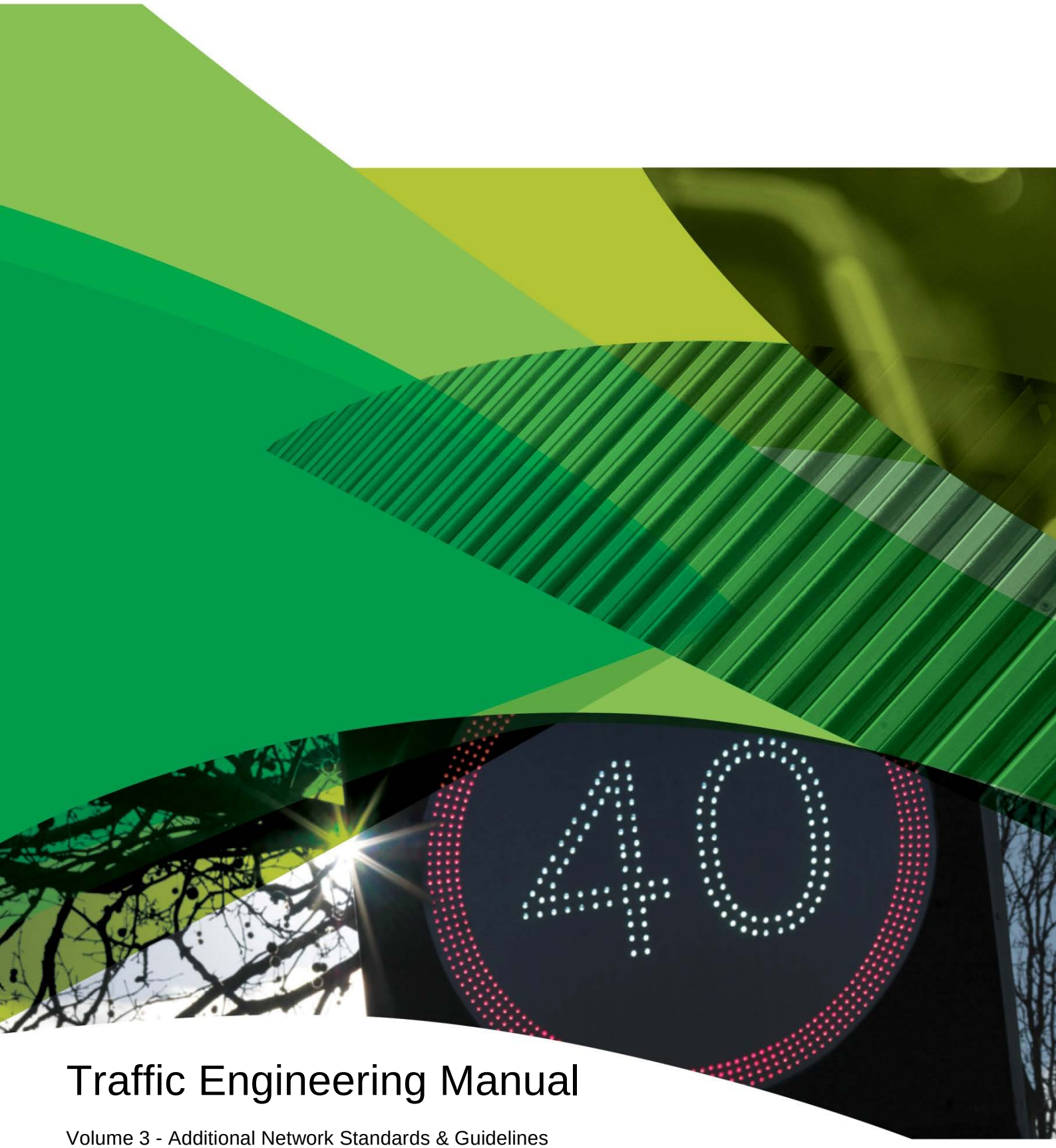


Traffic Engineering Manual

Volume 3 - Additional Network Standards & Guidelines

Speed Zoning Guidelines

Edition 1, June 2017

vicroads.vic.gov.au

Table of Contents

1. Introduction

This document is a VicRoads Supplement to the Austroads Guide to Traffic Management, the Austroads Guide to Road Safety and Australian Standards. The primary source of guidance on this topic comes from the Austroads Guides. However, for the practice of traffic management in Victoria, this document takes precedence to the extent of any conflict with other documents. The relevant sections of the Austroads Guides and Australian Standards relating to speed zoning are:

- Austroads Guide to Road Safety, Part 3: Speed Limits and Speed Management
- Austroads Guide to Traffic Management, Part 5: Road Management (Section 5)
- Austroads Guide to Traffic Management, Part 13: Road Environment Safety
- Australian Standard AS 1742.4–2008, Manual of uniform traffic control devices, Part 4: Speed controls

1.1 Safe System Approach

The primary purpose of speed management is to enhance the safety of roads and the roadside environment for all users.

Greater safety can be achieved by lowering vehicle speeds, but lower speeds may mean longer travel times. Depending on the change in speed and distance to be travelled, the increased trip duration may or may not be perceptible to the average vehicle occupant. Regardless, mobility, safety and liveability are all important considerations that must be recognised and reconciled when changes to speed limits are being contemplated.

The Safe System approach to road safety, which is the key concept in Victoria's strategy to reduce fatalities and serious injuries from road crashes, provides the overarching principle that guides the setting of speed limits and upon which these guidelines are based.

The Safe System approach is built on the premise that humans are likely to make mistakes and crashes are likely to happen, even with a focus on prevention. Human bodies can only withstand a limited amount of force in a crash before serious injuries or death results. Speed is a critical factor in managing the force that road users are exposed to. Accordingly, the road transport system needs to be designed, built and speeds managed so that in the event of a crash, the people involved do not receive fatal or serious injuries.

By applying the Safe System philosophy, the long term vision is to eliminate fatal and serious injuries arising from crashes. Safer speeds, together with safer roads, safer road users and safer vehicles, are the fundamental components of the Safe System which represent the focus of efforts to achieve this vision.

Under the Safe System, the setting of speed limits takes into account the risks to road users of sustaining fatal or serious injuries. For example, at locations where there is a significant level of pedestrian or cyclist activity, lower speed limits are appropriate. Similarly, where the potential for conflicts is high (e.g. on busy urban roads with frequent points of access) speed limits are set at a level that will minimise the chances of fatal or serious injuries in the event of a crash. However, speed management is not just about speed limit setting. Road infrastructure standards and design that create an environment that supports safe speeds, together with education and enforcement to encourage appropriate road user behaviour are also critical elements.

Lowering of speed limits may be appropriate on roads which have sub-standard infrastructure, in particular, low volume roads. Where the operational safety of a road or length of road is unsatisfactory (i.e. the crash rate or crash risk is high) the preferred response is to identify and implement infrastructure improvements that address the specific safety problem. However, where infrastructure improvement options have been exhausted or are not feasible in the short term and current risks are unacceptably high, a reduced speed limit may be appropriate.

1.2 Legislation

Legislation relating to the authority to determine speed limits is set out in the Road Management Act 2004. Regulations relating to how and where speed limits apply and the rules to be observed by road users are specified in Road Safety Road Rules 2009 (RSRR (2009)). Installation, operation and management of speed limit signs are covered by the Road Safety (Traffic Management) Regulations 2009. Both the RSRR (2009) and the Road Safety (Traffic Management) Regulations 2009 are statutory rules established under the Road Safety Act 1986. Speed limits are the maximum speed that a vehicle can be legally driven at (with the exception of vehicles specified in Rule 21(2) of the Road Safety Rules 2009 on roads with a speed limit of greater than 100 km/h).

The Road Safety Act also states that 'a person must not drive a motor vehicle at a speed or in a manner which is dangerous to the public' (section 64). The Road Safety Act (section 17A) requires that:

'A person who drives a motor vehicle on a highway must drive in a safe manner having regard to all the relevant factors, including (without limiting the generality) the:

(a) Physical characteristics of the road;

(b) Prevailing weather conditions;

(c) Level of visibility;

(d) Condition of the motor vehicle;

(e) Prevailing traffic conditions;

(f) Relevant road laws and advisory signs;

(g) Physical and mental condition of the driver.

1.3 Factors to Consider in Determining Speed Limits

The determination of a maximum safe speed limit for a set of circumstances is a complex process which takes into account a multitude of factors. Some of the key factors are:

- Road classification and its function within the network
- Road characteristics
    - Divided/undivided, number of lanes and lane widths, intersection spacing
    - Presence of service roads or plantation reserves to control abutting access
    - Pavement condition and width
    - Shoulder type and width
    - Presence of footpaths
    - Clearance to obstacles
    - Vertical and horizontal alignment.
- Extent and nature of abutting development
    - Number and density of abutting developments
    - Type and extent of traffic generated
    - Type of developments such as houses, shops, hospitals and schools.
- Road users, their movements and the number of potential conflicts between road users
    - Cars
    - Trucks
    - Bicycles
    - Motorcycles
    - Buses and trams
    - Pedestrians
    - Parked vehicles
    - Peak traffic flow

    - Recreational traffic.
- Crashes / crash risk
    - Crash history / crash risk along the road or in the area being considered.
- Seasonal issues
    - Holiday traffic
    - Harvest traffic
    - Presence or risk of ice and snow.

2. Speed Zoning Principles

2.1 Principles for Setting Speed Limits

The principles detailed in this chapter underpin the speed zoning guidelines. They are the basis of all decisions made in relation to the setting of speed limits across the State and further embed the Safe System vision.

The guidelines will cover most situations but it is recognised that there will be some situations which fall outside the scope of the guidelines or where special circumstances apply.

Where it is necessary to deviate from the guidelines, the speed zoning principles should be used to make a principle-based decision. The application of the principles and resultant decision must be documented and approved by the relevant Regional / Project Director to ensure transparency and clarity in the decision making process. The principles must be read and applied as a set, and all principles need to be considered in reaching a decision.

It is recognised that the emphasis placed on each of the principles may vary from case to case according to context. For example, transport network efficiency will be a significant consideration on a major traffic route but is less relevant for a local residential street.

The speed zoning principles, together with supporting information, are categorised under the following key themes for the setting of speed limits:

- Road Safety
- Transport Network Efficiency
- Road User Expectation
- Community Engagement
- Community Wellbeing

2.2 Road Safety Principles

The following road safety principles need to be read in conjunction with: transport network efficiency; road user expectation; community engagement; and community wellbeing principles. All principles must be considered in order to make a robust principle-based decision.

Where vehicle speeds would result in impact forces exceeding human tolerances to vehicle occupants and/or vulnerable road users, then speeds should be managed to minimise the risk of fatal and serious injury.

This principle requires consideration of both the impact forces for vehicle occupants and / or vulnerable road users and the likelihood of a crash. Potential impacts and impact speeds should be managed, as far as is practically possible, by appropriate engineering of the road and roadside environment. The setting of speed limits must take into consideration the standard of the infrastructure and the degree to which road users are exposed to potential serious and life threatening risks.

Vulnerable road users are much more likely to suffer death or serious injuries at impact speeds above 30 km/h due to a lack of protection in the event of a collision. Ideally, facilities should be provided to separate vulnerable road users from traffic, particularly on arterial roads where vehicle volumes and speeds are higher. However, this is not always practical or possible. It is therefore essential that sufficient consideration is given to vulnerable road users when setting speed limits.

Mitigation measures for vehicle occupants will generally involve the control of impact forces through speed management or upgrading infrastructure e.g. protection from roadside hazards.

A comprehensive road safety risk assessment using the Australian National Risk Assessment Model (ANRAM), or a similar tool, must be undertaken to assist with determining an appropriate solution.

When there is an increased risk of collisions due to a change in operational and / or environmental conditions, then the speed limit shall be managed to minimise the risk of fatal and serious injury to all road users.

Operational conditions can vary throughout the day which can lead to an increased risk of collisions. These can occur at set times (e.g. school start and finish times) or they can be random (e.g. high levels of congestion outside peak periods).

Environmental conditions can vary significantly and can also lead to an increased risk of collisions (e.g. strong winds, flooding etc).

It is important to manage the speed limit to reduce the risk of collisions to an acceptable level for both operational and/or environmental conditions. Variable speed limits are now commonplace to enhance pedestrian safety around schools and in precincts during times of high pedestrian activity. At the current time, the use of variable speed limits to manage safety (and traffic flow) during congested periods and incidents is confined to managed freeways. However, this capability is likely to extend to the arterial network in the future.

2.3 Transport Network Efficiency Principles

The following transport network efficiency principles need to be read in conjunction with: road safety; road user expectation; community engagement; and community wellbeing principles. All principles must be considered in order to make a robust principle-based decision.

When determining a speed limit for a road, it should generally be set in accordance with road function and standard of infrastructure.

Function is a major consideration in how a road is designed and operates. Roads have two major functions: to provide for the movement of people and goods (the movement function); and, to provide access to and service abutting land uses (the place function). Some roads are predominantly for movement (e.g. freeways) and some have a predominantly access function or place function (e.g. a road within an activity centre). In reality, many roads perform a dual role, where the predominant function may change with time of day, day of week or time of year.

VicRoads Movement and Place framework, which is based on consideration of the range of roles that roads and streets play was developed to support integrated transport and land use planning. Movement and Place is supported by SmartRoads to determine road function and assist with the operational management of the road network. The approach is to identify and prioritise competing demands for road space, which can vary throughout the day. SmartRoads Road Use Hierarchy maps have been prepared for metropolitan Melbourne. Information relating to SmartRoads, including Road Use Hierarchy maps, is available on VicRoads website (https://www.vicroads.vic.gov.au/traffic-and-road-use/traffic-management/smartroads).

Speed limits should be set so that they support the road function and are compatible with the standard of infrastructure.

When determining speed limits, the objective is to achieve operating speeds that support an efficient network wide outcome.

It is essential that decisions do not just focus on isolated sections of road but are made in the context of the overall route and the adjoining road network. Speed limits should be set to support efficient travel on roads that have a primary movement function and discourage inappropriate use of roads and streets that have a primary access or place function.

Route and network based speed limit reviews are encouraged so that consistency of speed limits is achieved over an area where issues and the road environment are similar (e.g. within the activity core of a regional city),to ensure that the frequency of speed zone changes is minimised and that network performance objectives are addressed.

When there is a change in operational conditions, then the speed limit shall be managed to minimise the overall delay to road users.

Operational conditions can vary throughout the day which can lead to increased delays due to significant changes in traffic volumes or road use across the day. These can occur at predictable times (e.g. morning

and afternoon peaks) or they can be random (e.g. incidents, roadworks etc). On traffic routes, where the movement function is a priority, variable speed limits may be used to actively manage traffic flow and reduce delays.

Lane use management systems (LUMS) and active speed management, which both utilise variable speed limit signs, are used on freeways to manage traffic flow during congested periods and incidents in order to maximise throughput and reduce delays. This capability is likely to extend to the arterial network in the future.

2.4 Road User Expectation Principles

The following road user expectation principles need to be read in conjunction with: road safety; transport network efficiency; community engagement; and community wellbeing principles. All principles must be considered in order to make a robust principle-based decision.

When determining a speed limit, it should be set so that it is consistent with speed limits on roads in a similar environment with similar characteristics and function.

Speed limits should be set in a consistent manner. Combinations of similar environments and factors should have the same speed limit, although it is recognised that no two situations will be exactly the same.

Where there are changes to the road standard and/or environment along a route, speed limits should be:

- **clear;**
- **easily understood; and**
- **the number of speed limit changes kept to a minimum.**

It is essential that decisions on speed limits do not just focus on isolated sections of a road. Changes in the road standard and / or environment along a route may justify a change in speed limit. However, minimising the number of speed limit changes is a key objective.

Minimum lengths for speed limits are outlined in Section 6 - Length of Speed Limits in this document. Speed zones that are longer than the specified minimum are preferred. In particular, use of minimum lengths for zones of different speed limits that adjoin should be avoided.

2.5 Community Engagement Principle

The following community engagement principle needs to be read in conjunction with: road safety; transport network efficiency; road user expectation; and community wellbeing principles. All principles must be considered in order to make a robust principle-based decision.

When determining or changing a speed limit, engagement with affected communities and road users shall be undertaken so that expectations and impacts are understood and considered.

Engagement is important to be able to gauge the level of support that the community and road users have for speed limit changes. A high level of support and awareness will result in better outcomes for the community through better acceptance of, and compliance with, speed limits.

The extent of community engagement will depend on the circumstance. For example, if a speed limit change is proposed for a local access road, then it is likely that only the affected residents would be consulted. However, if a significant change is proposed on an arterial road, then consultation needs to be expanded to include affected road users, businesses and others who may be impacted by a change in the speed limit.

It is recognised that there will be circumstances where the road authority will have to intervene urgently. In such situations, the road authority may be required to change the speed limit and advise the community the reasons for the change as soon as practicable.

Information relating to stakeholder consultation and community engagement as part of any speed limit change is outlined further in Section 4 - Implementation of Speed Limits.

2.6 Community Wellbeing Principle

The following community wellbeing principle needs to be read in conjunction with: road safety; transport network efficiency; road user expectation; and community engagement principles. All principles must be considered in order to make a robust principle-based decision.

Speed limits should be set at a level that supports active transport modes and minimises impacts on amenity.

Local residential roads that do not provide a through traffic function generally have low volumes of traffic. In these instances speed limits should be set at a level to enhance amenity and encourage an increased use of active transport modes.

Similarly, speed limits should be set to support active transport on and across arterial roads, where appropriate, in accordance with their designated function. For example, a 40 km/h speed limit during high activity periods is appropriate in a pedestrian priority area as designated by the SmartRoads Road Use Hierarchy.

3. Technical Guidance for Speed Limits in Victoria

3.1 Application of These Guidelines

These guidelines, which are based on the principles set out in Section 2 - Speed Zoning Principles, have been written to cover a wide variety of situations and factors. However, every location has its unique characteristics. In deciding upon the most appropriate speed limit, site specific, local and route factors need to be considered and it will be necessary to apply sound safety principles and engineering judgment in this process.

It is essential that decisions do not just focus on isolated sections of road but are made in the context of the adjoining road network to ensure that the number of speed zone changes is minimised. Network based speed limit reviews are encouraged so that consistency of speed limits is achieved over an area where issues and the road environment are similar (e.g. within the activity core of a regional city).

Where operational safety is unsatisfactory at the existing or proposed speed limit, infrastructure improvements shall be considered. Guidance on road infrastructure improvements can be obtained from Austroads guides relating to road design and traffic management and the relevant VicRoads supplements, Australian Standards relating to traffic management and the relevant VicRoads supplements, and any other relevant VicRoads Additional Network Standards and Guidelines.

Speed limit proposals that do not fall within the provisions of these guidelines will generally require the approval of the relevant VicRoads Regional Director unless otherwise stated. Any speed limit recommendations must be based on the principles set out in Section 2 - Speed Zoning Principles. Regional Directors should consult the Director Network Design Services regarding the application of the speed zoning principles, particularly in relation to proposed speed limit changes that may be controversial or have statewide implications.

These guidelines do not cover temporary speed limits that are applied during roadworks or special events. Requirements at roadworks sites are covered by Australian Standards (AS) 1742.3 - 2009 and the VicRoads supplement, and the Code of Practice for Worksite Safety – Traffic Management, which was established under the Road Management Act 2004.

3.2 Overview

The following table provides an overview of the speed limits used in Victoria. Details of how to determine the appropriate speed limit for specific locations and circumstances are set out in Section 5 - Determination of the Appropriate Speed Limit.

Table 1: Overview of speed limits

Speed limit	Application of speed limit
10 km/h	• Shared zones where pedestrians have priority (Refer to section 5.3)
20 km/h	• Car parks and similar areas where vehicles and pedestrians mix (Refer to section 5.3)
40 km/h	• Pedestrian activity areas, including shopping precincts, town centres and school zones (Refer to section 5.3) • Some local streets in urban areas (Refer to section 5.3)
50 km/h	• Default limit in urban (built-up) areas • Rural and outer metropolitan town centres (Refer to section 5.3)
60 km/h	• Most undivided urban arterial roads (Refer to section 5.2) • Divided urban arterial roads with a high number of access points and / or significant pedestrian and / or cyclist activity (Refer to section 5.2) • Some local urban collector roads (Refer to section 5.2)
80 km/h	• Divided urban arterial roads with a limited number of access points and little or no pedestrian and cyclist activity (Refer to section 5.2) • Undivided roads on the urban / rural fringe, or in a rural area where there is an elevated risk of crashes (Refer to sections 5.1 & 5.2) • Roads through small rural settlements (hamlets) (Refer to section 5.1) • Freeways where there is an elevated risk of crashes (Refer to section 5.2) • Low volume rural roads with sub-standard infrastructure (Refer to section 5.1) • Across rail level crossings on sealed rural roads (Refer to section 5.1)
100 km/h	• Default limit in rural areas • Urban freeways (Refer to section 5.2)
110 km/h	• High standard rural freeways (Refer to section 5.1)

Notes:

1. Current policy does not permit new 70 km/h and 90 km/h zones.
2. Exiting 70 km/h zones are typically found on divided urban arterial roads which have direct access to the through carriageway from abutting properties (i.e. no services roads) and undivided urban roads with a limited number of access points.
3. Existing 90 km/h zones are typically found on divided or undivided urban arterial roads on the urban / rural fringe where there is sparse development.

Table 1 expands on the strategy and policy outcomes from the 2011-2012 Victorian Speed Limit Review. Below are extracts from the Review document.

"The changes that are being made to speed limits in Victoria as a result of this review focus on simplicity without compromising safety."

"It includes fewer options for speed limits, to make the system simpler and easier for drivers to comply with."

Further background on the changes to speed limit setting in Victoria is available in the 2011-2012 Victorian Speed Limit Review available on the VicRoads website at www.vicroads.vic.gov.au under Safety & Road Rules > Road safety programs > Speed limit review.

3.3 Default Speed Limits

Default speed limits are imposed by Rule 25 of the RSRR (2009). Signing is not necessary to establish the legal effect of these limits. All speed limits that are not default speed limits require signing.

The default speed limit for built-up areas[1] is 50 km/h and the default speed limit outside built-up areas (rural areas) is 100 km/h.

3.4 Speed Limits along a Road Length or for an Area

Rule 21(3) of the RSRR (2009), specifies that a speed limit sign on a road applies to the length of road beginning at the sign and ending at the nearest of the following:

- A speed limit sign on the road with a different number on the sign
- An end speed limit sign or speed derestriction sign[2] on the road
- The end of the road if the road ends at a T-intersection or dead end.

The RSRR (2009) also allow for speed limited areas (Rule 22) and speed limited shared zones (Rule 24) which should only be applied to areas clearly identifiable to the road user (e.g. car parks) and signed appropriately.

3.5 Variable Speed Limits

Variable speed limits (VSL) may be used:

- Where the imposition of a lower than normal speed limit at certain times of the day or at certain times of the year is warranted because of elevated crash risk (e.g. icy or windy conditions, seasonal holiday resorts, high pedestrian traffic zones such as strip shopping centres and schools); or
- To improve road safety and / or traffic throughput for congested roads (e.g. freeways during congested periods, roadworks sites and traffic incidents such as vehicle breakdown, loss of loads or crashes).

On many freeways (particularly urban freeways), traffic is actively managed with the objective of maximising throughput and travel safety. Dynamic variable speed limits (DVLS) are being increasingly used, in conjunction with other tools such as coordinated ramp signalling, to manage traffic flow in order to minimise flow breakdown. Lane use management systems (LUMS), which incorporate VSL functionality, are utilised to make better use of available road space and maintain safety in response to changing conditions resulting from incidents, congestion or adverse weather.

There are some specific operational policies and practices relating to variable speed limits on freeways which differ from those set out in these Speed Zoning Guidelines. Detailed guidance regarding the use of variable speed limits on managed freeways can be found in the following references:

- Traffic Engineering Manual, Volume 3, Part 2.04: Managed Freeways Handbook for Lane Use Management, Variable Speed Limits and Traveller Information (VicRoads, 2013).
- Managed Motorways Framework, Network Optimisation & Operations Rationale and Technical Requirements (VicRoads, 2017)

3.6 Speed Limit Transitions

A change of up to 20 km/h may occur between adjacent speed limits without the use of transitional speed limit measures.

At locations where there is a reduction in the speed limit of more than 20 km/h, an advance warning sign (Figure 1) shall be installed to inform drivers on the approach to the lower speed limit. On high speed roads (100 or 110 km/h), the advance warning sign should be installed up to 300 to 400 m in advance of the posted change in speed limit. This sign may be duplicated (on both sides of the road) where additional conspicuity is required. The Speed Limit Ahead sign is also used in advance of school speed zones, 40 km/h pedestrian activity areas and 50 km/h rural and outer metropolitan town centre speed zones, irrespective of the adjacent speed zone (refer to Figure 8, 10, 11, 12, 13, 14, 15 and Figure 17 for specific examples).

[1] Refer to Appendix C for the meaning of built-up area.

[2] Refer to Section 7.3 for practices relating to the use of end speed limit signs and speed derestriction signs.

Figure 1: Example of an advanced warning sign (Speed Limit Ahead), sign no. G9-79

Prior to 2006, transitional regulatory speed limits (buffer zones) were used where there was a difference between adjacent speed limits of greater than 20 km/h. This type of transitional speed limit is being phased out.

3.7 Roadworks Speed Limits

Guidelines for the use of speed limits at worksites are set out in AS 1742.3 (2009) and the VicRoads Supplement, and the Code of Practice for Worksite Safety – Traffic Management (2010), which was established under the Road Management Act 2004.

3.8 Roads in Poor Condition

Temporary lowering of the speed limit may be appropriate when the condition of the road pavement becomes hazardous to an extent that is unable to be managed by normal routine maintenance. On roads managed by VicRoads, signing advice is set out in the "Guideline for Signing Roads in Poor Condition" (VicRoads document no. 950363)[3] Signing options available include a range of warning signs and lower speed limits. The guideline could also be applied to local roads and is available to councils on request.

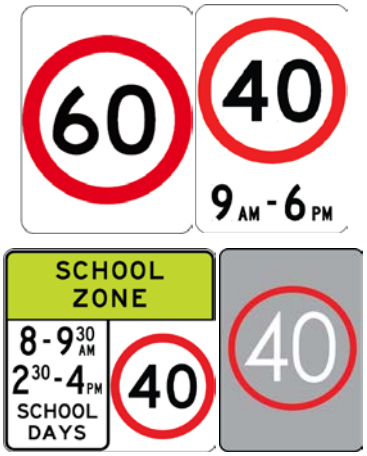
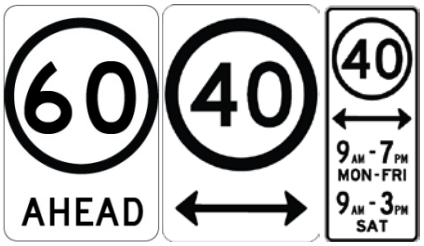
3.9 Speed Limits for Heavy Vehicles

Special speed limits are applicable to certain classes of vehicles. For example, buses with a gross vehicle mass (GVM) of over 5 tonnes and trucks with GVM over 12 tonnes are restricted to a maximum speed of 100 km/h, even if the posted speed limit is higher. This requirement is set out in RSRR (2009), Rule 21 (2) and in other Acts and Regulations. These speed limits are not signposted.

[3] This is an internal VicRoads document that is available on request (email: tem@roads.vic.gov.au)

3.10 Use and Application of Advisory and Regulatory Speed Signs

Table 2: Categories of speed signs

Regulatory signs	
	These signs are used to indicate the speed limit which applies to a length of road. These signs indicate the maximum, legally permissible speed and provide legal effect in accordance with the RSRR (2009). Regulatory signs are used on roads where the speed limit is different to the default speed limit, when entering an urban or rural default speed limit zone, or as a repeater sign to remind road users of the prevailing speed limit.
Advisory signs	
	These signs are typically used to provide advance warning of a significant reduction in speed limit ahead. Typically these signs are considered where there is a speed reduction of more than 20 km/h or prior to a low speed variable speed limit such as a school speed zone or a variable 40 km/h speed limit for pedestrian activity areas. These types of signs do not have any legal effect under RSRR (2009) but are provided to assist road users in complying with regulatory speed limits.
Advisory signs	
	These types of signs are typically used to recommend the speed for a location or a very short section of road. Typically these types of signs are used for a tight curve, a crest in the road, or a short section of road in poor condition. These types of signs do not have any legal effect under RSRR (2009) but are provided to assist road users to travel at a safe and appropriate speed for the section of road. For horizontal and vertical curves, guidance in determining the appropriate advisory speed can be found in AS 1742.2 (2009) Traffic control devices for general use, Appendix F and G respectively. For roads in poor condition, advisory speed signs shall only be used in conjunction with another warning sign to indicate the desirable speed in good weather, traffic and road conditions for comfortable travel through the hazard referred to on the warning sign. Further information on signing roads in poor condition can be found in VicRoads Guideline for Signing Roads in Poor Condition (VicRoads document no. 950363)[3].

4. Implementation of Speed Limits

4.1 Stakeholder Engagement

Prior to seeking approval for implementation of a speed limit or speed limit change, regardless of the road classification and responsible authority, engagement should occur with:

- Victoria Police
- VicRoads
- Department of Justice and Regulation (refer to Section 4.4)
- The relevant municipal council or road authority (e.g. Parks Victoria, Department of Environment, Land Water & Planning)
- In appropriate circumstances, other stakeholders such as Public Transport Victoria and public transport operators (e.g. for 40 km/h speed limits through metropolitan strip shopping centres and where trams share the road with other vehicles).

The views of other stakeholders should be taken into account in the decisions made. Engagement with the community and road users may also be necessary, depending upon the likely impacts of the proposed change. Guidance on community engagement is provided in Section 4.2.

The consultation process and management of stakeholder feedback is typically undertaken by the responsible road authority for the road in question (e.g. for a local road, the relevant municipal council would be responsible for this process).

4.2 Community Engagement

Many roads, particularly arterial roads, are used by thousands of road users every day for a variety of purposes. Some road users may live locally while others may be using the road to travel vast distances to reach their destinations. Some may be pedestrians, cyclists or public transport users. Every road is different. Its setting is different, its users are different and its function is different. Speed management may be required for a range of reasons, particularly to address safety risks to one or more groups of road users. When speed limit changes are proposed, the aspirations and opinions of the community should be considered in accordance with the community engagement principle (refer to Section 2.5).

Below is a broad approach to any community engagement relating to a speed limit review based on VicRoads Engagement Standards:

- **Define**: Clearly define the decision required, and the scope of the public participation exercise as well as the reason and objective for the speed limit review.
- **Understand**: Understand who is affected and how they should be included. Opinions from a diverse perspective or representative sample of road users should be obtained and considered.
- **Identify**: Identify the engagement approach and resources.
- **Document**: Document the public participation and management approach including a process for monitoring progress, providing feedback to stakeholders throughout the engagement and evaluating the engagement against objectives.
- **Implement**: Implement the engagement plan. The outcomes from the review need to be communicated in a clear and transparent manner and made easily accessible to the public.
- **Evaluate**: Evaluate the activities against objectives and be able to demonstrate how community views have been taken into account.

Public participation encompasses a range of public involvement, from simply informing people about what the government is doing to delegating decisions to the public. The various level of community engagement are summarised in Figure 2. Table 3 provides specific guidance in relation to proposed changes to speed limits.

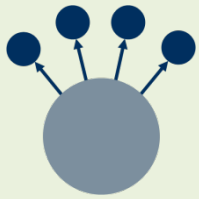
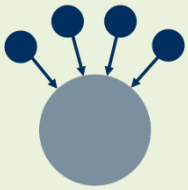
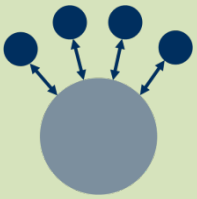
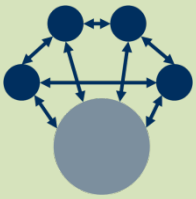
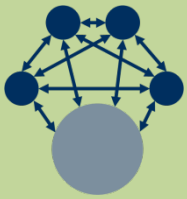
Inform	Consult	Involve	Collaborate	Empower
				
Description				
Participation The first two public participation levels—*Inform* and *Consult*—typically occur when a decision has already been made, and government wants to either communicate that decision to the public, or seek opinions on the decision.		**Engagement** The third and fourth public participation levels— Involve and Collaborate—have two-way information flows, and include sharing information within and across stakeholder communities during the decision-making process. When undertaking Engagement, decision makers commit to using stakeholder feedback to inform the decision and shape the outcome. Activity that occurs at the Collaboration level is also sometimes referred to as partnering.		**Empowerment** The fifth public participation level—Empower—is also often referred to as co-production, where decisions are made jointly between government and the community. This is typically when decision-making authority has been delegated to a group including members from both the government and the community/industry.
***Objectives**:*				
To provide balanced, objective information to support understanding by the public.	To obtain public feedback on analysis, alternatives and/or decisions.	To work with the public to ensure concerns and aspirations are understood and considered.	To engage with the public on aspects of the decision, including the development of alternatives and a preferred solution.	To create governance structures to delegate decision-making and/or work directly with the public.
Commitments				
To keep the public informed.	To listen and acknowledge the public's concerns.	To work with the public to exchange information, ideas and concerns.	To seek advice and innovations from various public parties.	To work with the public to implement agreed-upon decisions.

Figure 2: Levels of public participation

(Source: Victorian Auditor General's Office, originally adapted from the International Association for Public Participation's Public Participation Spectrum.)

Table 3: Determination of the level of public involvement for speed limit changes

INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
Description				
A decision on a speed limit change has been made and VicRoads wants to provide information to the community about the decision.	A decision on a speed limit change has been made but there is scope for the community to influence some aspects of the proposal.	A proposal to change a speed limit is being considered and VicRoads wants to exchange information and ideas with the community and understand issues and concerns. VicRoads will consider community input and report back before making a final decision.	A proposal to change a speed limit is being considered and VicRoads wants input from the community to assist with the development of alternatives and a preferred option. VicRoads will consider community input and report back before making a final decision.	A proposal to change a speed limit is being considered and the final decision is determined by the community's preference. (Note: there will be limited circumstances for which this level of engagement is possible)
Typical Circumstances				
• Immediate intervention is required to address a pressing road safety issue • To avoid delay in implementing a speed limit change that has clear community support • The extent of the change to the speed limit are limited and the impacts are minimal	• There is a clear need to change the speed limit, typically to address a safety issue. • There are some aspects of the proposal that the community can influence, such as the limits of a proposed new speed limit. • To gauge community support for / reaction to the proposed change in the speed limit • To identify any further action that may need to be considered	• Proposed changes initiated by community or interest groups • The impacts of proposed speed limit changes are expected to be localised • The need for a speed limit change may not be obvious to the community • An understanding of community opinions is required to assist with the analysis of options	• Changes to speed limits that are expected to have significant impacts • Community input is needed to generate and analyse alternatives (including those that don't involve changing the speed limit)	• Proposed changes to speed limits that affect localised communities and have little or no impact on other stakeholders
Level of Engagement				
• Inform the community of the change of speed limit and explain the reasons for the change	• Inform the community of the proposed change of speed limit and the reasons for the change • Identify those aspect of the proposal that can varied and provide opportunities for the community to submit feedback	• Work with the community to exchange information to assist with the development and assessment of alternatives • Advise the community of the decision prior to implementation	• Provide opportunities to the community to be actively involved in the development of alternatives and determination of the preferred option • Advise the community of the proposed decision and seek feedback prior to finalisation and implementation	• Work in partnership with the community to generate and assess options and reach agreed decisions
Methods of Communication / Engagement [1]				
• Advisory signs (e.g. "NEW LIMIT") • Temporary variable message signs • Public notice (e.g. in local newspaper) • News release • VicRoads web site	• Letter drop • Survey	• Public meeting • Focus groups • Drop in session • VicRoads web site - *engagevicroads*	• Interactive workshops • Advisory committee	• Citizens jury • On-line polling

Note 1: Communication / engagement methods listed for lower levels of engagement may also be utilised at higher levels

VicRoads is committed to increasing community participation in decision making. The approach to community engagement is set out in the following documents;

- Engage VicRoads – Our 5-year engagement strategy (available on VicRoads website)
- Engagement Standards, Communications and Stakeholder Engagement (VicRoads document no. 3598357)[4]

Council officers should seek advice about community engagement relating to speed limit reviews on local roads from relevant areas within their own organisations.

4.3 Speed Limit Rationalisation

When reviewing and implementing speed limits, consideration must be given to adjacent speed limits so that the number of speed limit changes is minimised, short speed zones do not result and route consistency is achieved. Generally, any rationalisation of adjacent speed limits should aim to adopt the lower speed limit. However, in circumstances in which an increase in the speed limit is considered necessary to achieve the best overall outcome, a thorough analysis of the potential risk shall be undertaken. In particular, the crash history of the relevant section of road should be examined. Minimum lengths of speed limits are discussed in Section 6 - Length of Speed Limits.

4.4 Impact on Traffic Signals and Safety Camera Operation

Where a speed limit is to be changed, the need to change traffic signal timings (e.g. intergreen times) shall be assessed at any directly affected traffic signal sites. Traffic signal phasing may also need to be assessed as part of this process. Proposed speed limit changes in the vicinity of traffic signals shall be referred to VicRoads Signal Services for these purposes.

A check shall be undertaken to determine whether the operation of any fixed safety cameras is impacted by a proposed speed limit change. The following protocols are to be applied where a change in speed limits is being considered at a location covered by an existing road safety camera (fixed) or in close proximity to a road safety camera:

1. Liaise with DJR throughout the development process. The DJR point of contact for such liaison is the Manager Camera Operations (Tel:(03) 9947 1592).
2. For lower speed limits, such as 40 km/h zones, consider whether infrastructure can be included to make the site look and feel like its new speed limit. Refer to Appendices D and E for guidance on infrastructure treatment options.
3. Conduct and report on an onsite signage audit to ensure signage is installed in accordance with current best practice as outlined in these guidelines.
4. Consider the potential road user behaviour risks associated with higher speed limit signs visible to road users from the road safety camera site.
5. Consider the need for any traffic signal changes such as 'yellow time' amendments as a result of the proposed speed limit change. The VicRoads point of contact for such liaison is the Manager - Signal Services (Tel: (03) 9881 8821 (East) or (03) 9313 1326 (West).
6. Refer details of the proposed changes, including the signage audit and (where relevant) traffic signal changes to the Fixed Camera Site Selection Committee for endorsement that road safety camera risks have been adequately considered prior to approval. The DJR point of contact for such liaison is the Manager Camera Operations (Tel:(03) 9947 1592).
7. Obtain approval from an authorised officer to the speed limit change in accordance with Road Management Act, Schedule 4 (13) – Power to Determine Speed Limits.
8. Obtain approval from an authorised officer to the location of speed signs in accordance with the Road Safety (Traffic Management) Regulations, Division 2 – Road authority power to erect traffic control devices.

[4] This is an internal VicRoads document that is available on request (email: tem@roads.vic.gov.au)

4.5 Additional Measures

The implementation of new speed limits, particularly lower speed limits, may also require that specific actions are taken to maximise effectiveness. Some measures that may need to be considered include:

- Temporary installation of ‘NEW SPEED LIMIT AHEAD’ signs (sign no. R4-V111 – see Figure 18) in advance of the start of the new speed limit in each direction, generally for a minimum period of one to two months
- Temporary installation of 'NEW LIMIT' supplementary signs (sign no. R4-V119 – see Figure 18) at the start of the new limit and, as necessary, under all other speed limit signs in the newly created zone, generally for a minimum period of one to two months
- Local media campaigns
- Speed advisory trailers for a short time period
- Appropriate enforcement.

5. Determination of the Appropriate Speed Limit

The default speed limits in Victoria are 50 km/h for roads in built-up areas and 100 km/h for roads outside built-up areas (rural areas). Lower speed limits may be adopted under certain circumstances to achieve safer travel speeds, for example, along roads and in areas where there are high numbers of vulnerable road users or where crash risk is high because of sub-standard infrastructure. Speed limits that are higher than the default speed limits may be appropriate on higher standard roads on which the crash risk is low. For example, divided arterial roads with service roads. A summary of the processes to be used in making such decisions is outlined in Figures 3 to 6.

VLimits is a software package to assist practitioners to determine appropriate speed limits. It was developed by ARRB Group Ltd some years ago to assist with the setting of speed limits. Versions of the software are used across Australia, New Zealand and the United States. Online access to VLimits is available at www.vlimits.com.au.

VLimits is only a tool to facilitate the implementation of the principles and general rules outlined in this document. The output from VLimits is an initial or suggested speed limit based on a range of inputs. Adjustments to the suggested speed limit will generally need to be made to reflect local issues and conditions, including consideration of lower speed limits in pedestrian activity areas (refer to Section 5.3 - Speed Limits for Pedestrian Activity Areas). Figure 4 and 5 show where it is appropriate to use VLimits to assist with a speed limit review.

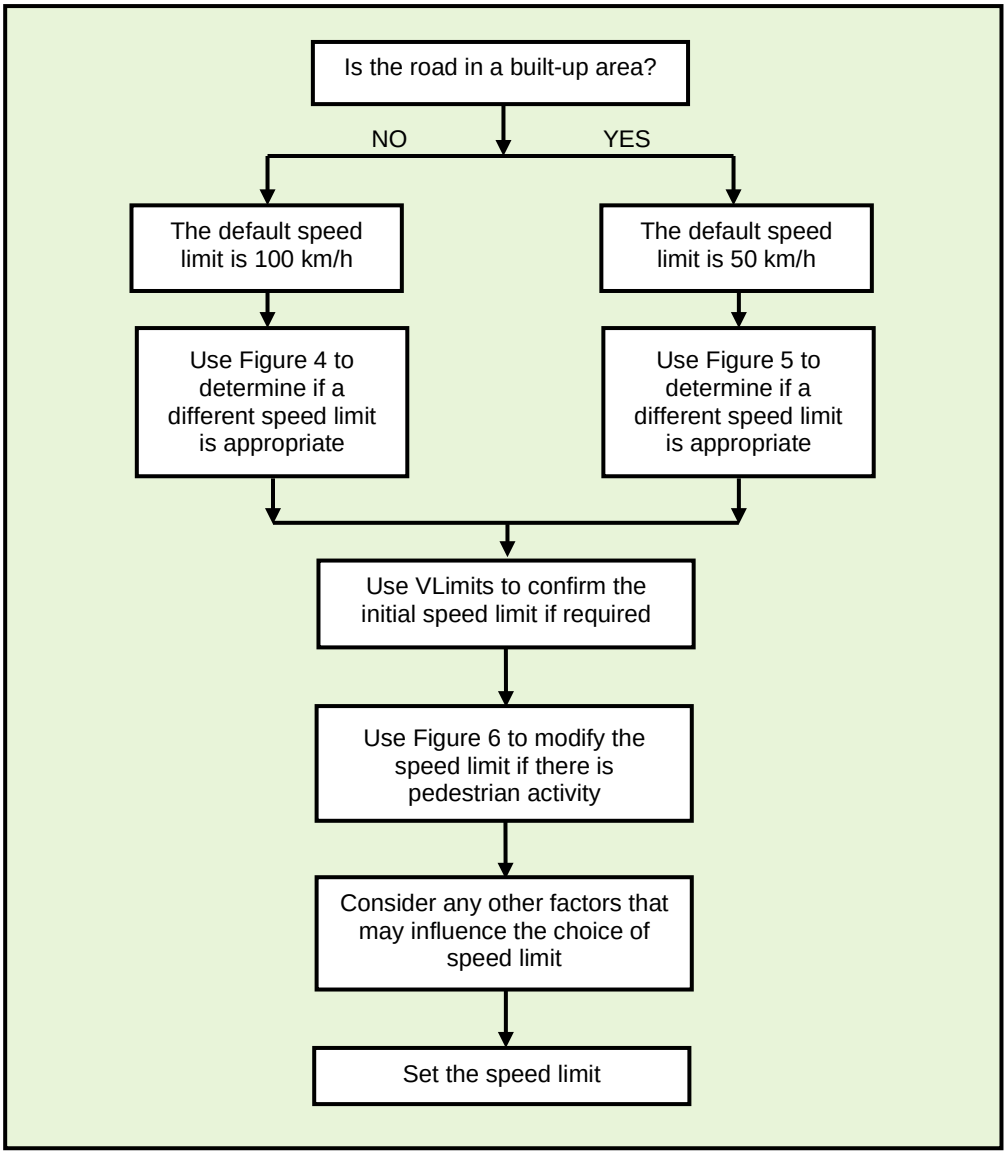


Figure 3: Summary of the process for determining speed limits

Roadside development categories (fully built-up, partially built-up etc), which are an important input in determining the appropriate speed limit, are defined in Appendix C. The definitions are from AS 1742.4 (2008), Manual of uniform traffic control devices, Part 4: Speed controls. When selecting the applicable roadside development category, the broader area surrounding the road should be considered in addition to the immediate abutting development. For example, the partial development category is unlikely to be appropriate for any roads that are within the middle and inner suburbs of Melbourne.

5.1 Speed Limits for Roads Outside Built-up Areas (Rural Areas)

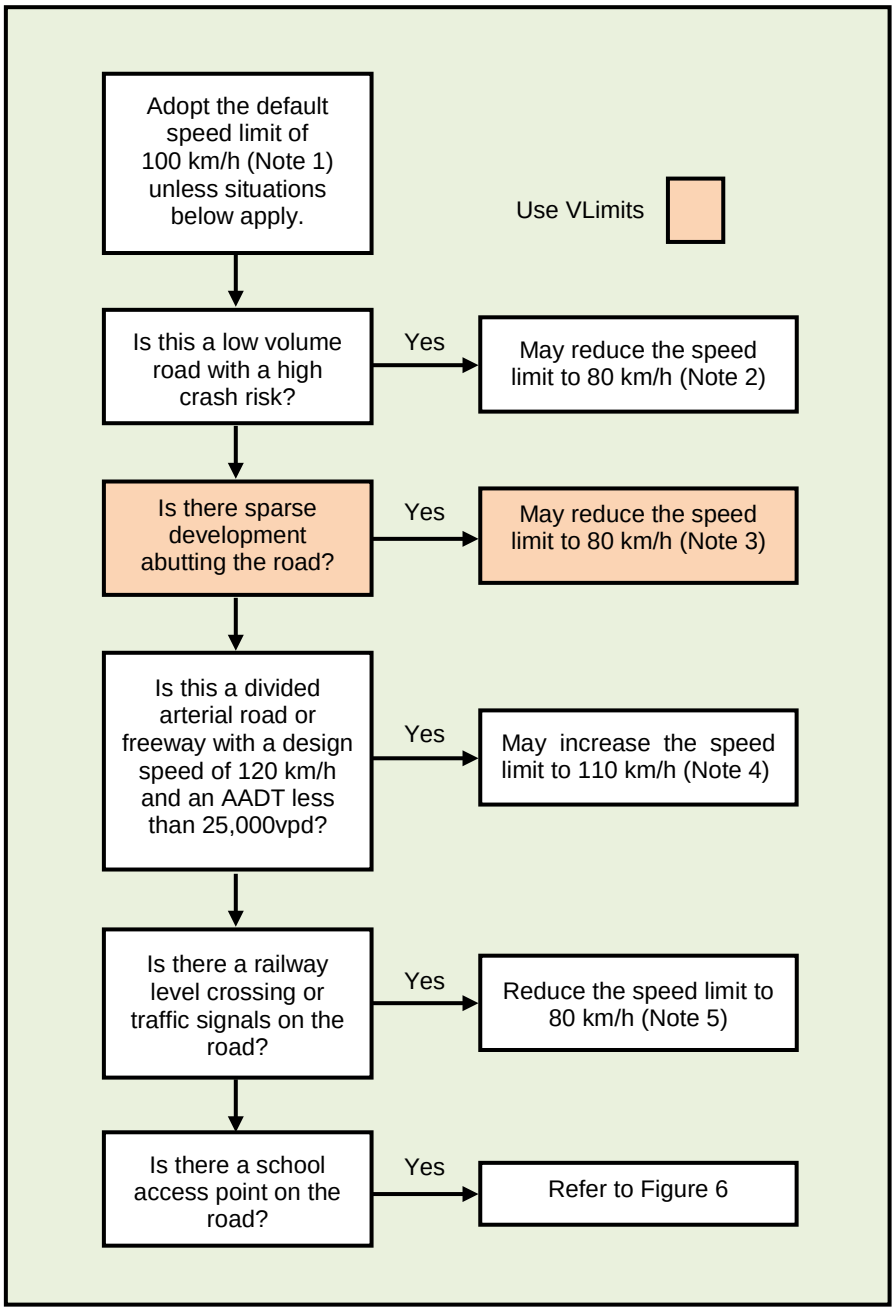


Figure 4: Process for determining speed limits outside built-up areas

Notes to Figure 4:

1. The default limit of 100km/h applies to rural roads with undeveloped abutting land or abutting farmland and no signposted speed limit.

   If operation becomes unsatisfactory (i.e. the crash rate is high) and warning signs such as advisory speed signs on curves fail to correct the problem, sections with low standard of alignment and cross-section can be:

   - Investigated for permanent improvements to curve alignment, cross-section, delineation and shoulders
   - Speed limited to a lower value if infrastructure improvements are not possible or practical in the short term.

2. On rural roads(typically arterial B and C class roads and local roads) , a speed limit of 80 km/h maybe applicable in the following situations:

   - The road carries a low volume of traffic AND
   - Has a low standard alignment and / or cross section AND
   - Has a high crash rate or demonstrated high crash risk (when assessed using a tool such as ANRAM) but is unlikely to attract funding to make it more Safe System compatible.

3. A speed limit of 80 km/h may also apply to:

   - Undivided arterial roads or local roads in sparsely built-up areas (typically the outer urban / rural fringe) OR
   - Divided or undivided roads in rural areas that have an alignment standard that is just less than 100 km/h and unsatisfactory operation is being experienced (i.e. the crash rate is high) OR
   - Divided or undivided roads in areas of sparse development where traffic signals have been installed (where the default speed limit of 100 km/h would otherwise apply) OR
   - Roads that pass through a hamlet – a small rural settlement with sparsely built-up development.

4. A speed limit of 110 km/h can generally only be applied to the highest standard rural roads. To be eligible, a road must satisfy ALL of the following criteria:

   - Perform an interstate or inter-regional transport function AND
   - Be a divided arterial road with a design speed of 120 km/h AND
   - Have full access control AND
   - Have sealed shoulders (highly desirable) and appropriate roadside clear zones AND
   - Have a crash rate not greater than 0.50 casualty crashes per km/year for the latest three years (minimum) to 5 years (desirable).

   Each individual criterion should not be viewed as an absolute warrant but should be considered in combination with others in judging the suitability of road sections for the higher limit.

   An isolated curve that has a 100 km/h design speed would not preclude a section being signposted at 110 km/h, provided that the shoulders are sealed, the curves are adequately signposted and delineated, and the crash history does not indicate a safety problem.

   Some permitted points of access may exist (generally not more than two per km per carriageway). In general, entry and exit will be by well spaced interchanges, and ramps signposted to interchange standards in the case of service centres and rest areas. However, some well spaced, low volume (< 100 vpd) at-grade intersections would not exclude the section if the crash history is satisfactory.

   Any hazard (including rigid objects) within the roadside recovery area must be frangible or be shielded by crash barriers.

   A 110 km/h speed limit is not appropriate for sections of freeways in or around the general built-up areas of Melbourne or provincial cities where there is a high proportion of commuter trips, relatively closely spaced interchanges (typically < 3km) leading to complex traffic manoeuvres or traffic volumes generally in excess of 25,000 vpd (two-way).

5. Applies at railway level crossings on sealed roads in rural areas. A speed limit of 80 km/h shall generally apply for minimum distances of 400 m on the approach to a level crossing and 100 m on the departure.

   Also applies if there are isolated traffic signals on a rural road. A speed limit of 80 km/h shall generally apply for minimum distances of 400 m on the approach to the traffic signals and 100 to 200 m on the departure.

   Note that split speed zones are permitted in these instances (i.e. the start and finish of the 80 km/h speed zone do not coincide for each direction of traffic). See VicRoads Supplement to Australian Standards AS 1742.7, Manual of uniform traffic control devices, Part 7: Railway Crossings[5] for speed signing details around railway level crossings.

[5] This document had not been released at the time of publication of this Speed Zoning Guidelines.

5.2 Speed Limits for Roads In Built-up Areas

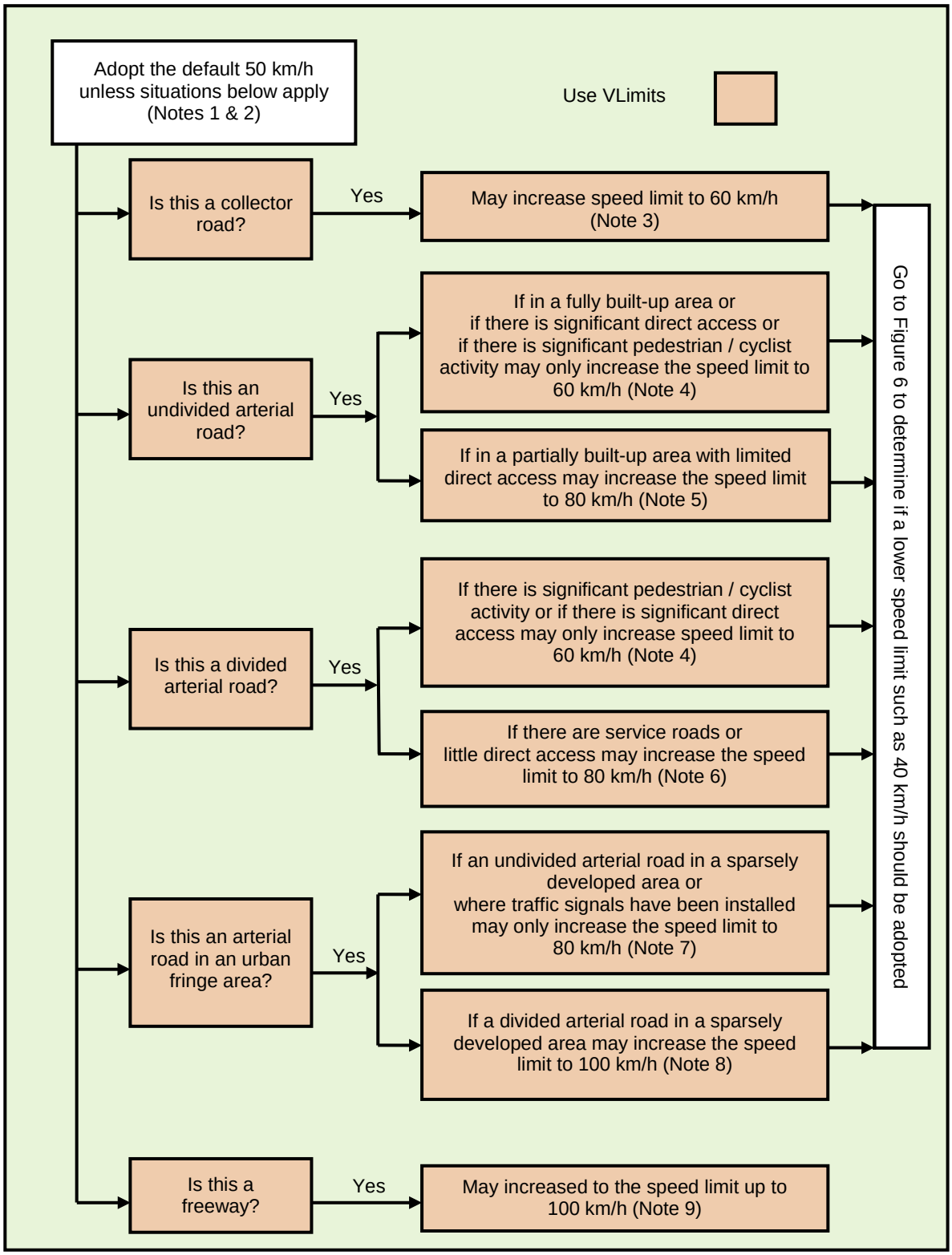


Figure 5: Process for determining speed limits in built-up areas

Notes to Figure 5

1. A signposted 50 km/h speed limit should always be used in service roads where the through carriageways are signposted at a higher level. The signs should be placed on the left side of the service road so that they are not associated with the through carriageway. However, if signing a service road is likely to cause confusion on the main carriageway, a 'SERVICE ROAD' supplementary plate (Sign No. R4-V100) should be added below the service road speed limit sign.

2. For the purposes of determining speed limits in built-up areas, a local road that is designated by the relevant municipal council as a traffic route (i.e. a road that performs a traffic function similar to an arterial road) may be categorised as an arterial road when using Figure 5 and VLimits.

3. A speed limit of 60 km/h may be appropriate on a collector road (or equivalent higher order local road if this term is not used by a local council) in a built-up area where ALL of the following apply:

   - Appropriate standard of road design and visibility AND
   - Low level of pedestrian and / or cyclist activity AND
   - Insignificant crash history, especially related to pedestrians and cyclists AND
   - Support of the local community and council.

   It is also desirable that the frequency of direct access to properties is less than is generally the case for local streets.

4. A speed limit of 60 km/h applies to undivided arterial roads:

   - In fully built-up areas OR
   - In partially built-up areas where there is a significant level of direct access to the road from abutting properties OR
   - In fully or partially built-up areas where there is a significant level of pedestrian and / or cyclist activity or if there is a history of crashes involving pedestrians and / or cyclists.

   A significant level of pedestrian activity means that there are regular movements of pedestrians across the road such that on most trips a driver would expect to see pedestrians crossing the road. Typical lengths of road include those with abutting land uses that generate significant pedestrian movements but are not continuous or at a density that would justify a 40 km/h zone, those with closely spaced, well patronised bus stops and along tram routes with kerbside stops. Lengths of road where pedestrian movements regularly occur away from controlled pedestrian crossings would have a higher priority. A designated Pedestrian Priority Area on a SmartRoads Network Operating Plan would generally be accepted as having a significant to high level of pedestrian activity subject to confirmation of the level of pedestrian movements across the road.

   A significant level of cyclist activity means that on most trips along the road a driver would encounter cyclists that share the road space and may include locations where there is an on-road bicycle lane. Generally, a road that is designated as a Priority Bicycle Route on a SmartRoads Network Operating Plan would be considered to have a significant level of cyclist activity, although the actual level should be confirmed.

   A speed limit of 60 km/h also applies to divided arterial roads in fully or partially built-up areas where the conditions for a speed limit of 80 km/h are not satisfied (see Note 6).

5. A speed limit of 80 km/h may be appropriate for an undivided arterial road in a partially built-up area where direct access is limited because of the nature and / or density of abutting development or because of access controls. In addition, the level of pedestrian and / or cyclist activity must be low.

6. A speed limit of 80 km/h applies to divided arterial roads in fully developed or partially developed areas if ALL of the following conditions exist:

   - A limited number of points of access or controlled access on one or both sides (usually via service roads) AND
   - Exclusive right turn lanes at median openings AND
   - Little or no pedestrian or cyclist activity.

   Also applies in partially developed areas if there is little or no pedestrian or cyclist activity AND:

   - There is no access control on either side of the road but there are exclusive turning lanes at all median openings OR
   - There is controlled access on one or both sides (usually via service roads), there is partial or no protection for right turn or crossing traffic, and the number of right turn and crossing movements is relatively low OR
   - There is a narrow median with few points of access to the main carriageways.

   May also apply in fully developed areas where the median is narrow and there is partial or no protection for right turn and crossing traffic provided that:

   - There are few points of access to the main carriageways or there is control of direct access on both sides of the road (usually via service roads) AND
   - At unprotected median openings the number of right turn and crossing movements is low.

7. In sparsely built-up areas (typically the outer urban / rural fringe) a speed limit of 80 km/h may apply to:

   - Undivided arterial roads OR
   - Divided or undivided roads where traffic signals have been installed (where the default speed limit of 100 km/h would otherwise apply). In such cases, a speed limit of 80 km/h shall generally apply for minimum distances of 400 m on the

approach to the traffic signals and 100 to 200 m on the departure. Note that split speed zones are permitted in these instances (i.e. the start and finish of the 80 km/h speed zone do not coincide for each direction of traffic).

8. A speed limit of 100 km/h will generally apply to divided arterial roads in sparsely built-up areas (typically the outer urban / rural fringe), subject to a satisfactory safety record.

9. Applies to urban freeways with full access control, well spaced interchanges and high design standards. Lower speed limits may be appropriate on a permanent or variable basis to address geometric and operational concerns on specific sections such as:

   - A low standard of alignment or reduced sight distance for a significant length OR
   - Closely spaced interchanges and complex weaving manoeuvres OR
   - High levels of congestion OR
   - Turning roadways or ramps at interchanges OR
   - Tunnels with confined cross-sections OR
   - At freeway terminals OR
   - Congestion and driver behaviour at incidents OR
   - A poor crash history which cannot be addressed through improvements to the road infrastructure in the short term OR
   - Sections that are subject to severe levels of wind or adverse weather, such as elevated roadways (generally variable speed limits would apply, dependent on the conditions) OR
   - High traffic volumes where a lower speed limit would optimise traffic flow.

   Where variable speed limits exist on freeways or are proposed, practitioners should investigate opportunities to use variable message signs to advise motorists of the reason for the reduction in speed limit (e.g. congestion ahead, incident ahead).

5.3 Speed Limits for Pedestrian Activity Areas

The link between impact speed and the risk of death or serious injury when a pedestrian or cyclist is involved in a crash is well established by research (refer to Appendix A). In areas where there are high levels of pedestrian activity or the risk to pedestrians is high, the speed limit based on either Figure 4 or Figure 5 should be reviewed and a lower speed limit adopted where appropriate in accordance with Figure 6.

Pedestrian activity areas include locations where pedestrians and vehicles mix (e.g. shared zones and shopping centre car parks), local residential streets, road crossings used by school children, shopping precincts, town centres and locations where there is a concentration of land uses that generate a high level of pedestrian movements across roads.

While the focus of this section is primarily on pedestrian safety, the principles apply equally to cyclists. The presence of cyclists is an additional factor that should be considered when deciding on whether a lower speed limit is justified in an activity area.

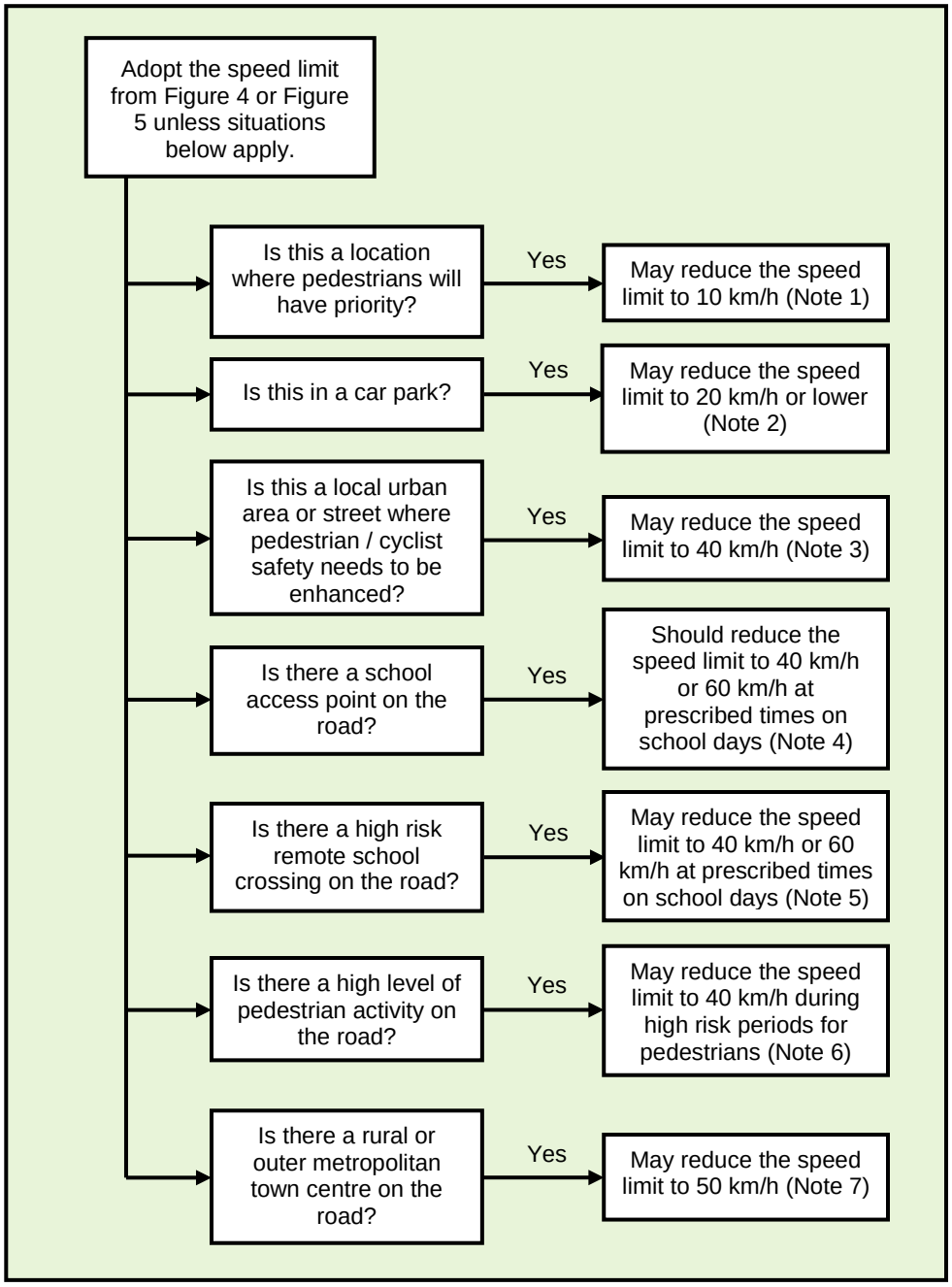


Figure 6: Process for determining speed limits in pedestrian activity areas

Notes to Figure 6

1. SHARED ZONES

A speed limit of 10 km/h or 20 km/h may be applied by creating a Shared Zone in streets where pedestrians are given priority over vehicles while maintaining basic access for motor vehicles. The speed limit in a Shared Zone is covered by Rule 24 of the RSRR (2009). This type of speed limit requires road engineering that is integrated with the surrounding built environment. Information relating to the design of Shared Zones is provided in the VicRoads Supplement to Austroads Guide to Traffic Management (AGTM) - Part 8 (2008), Section 7.5.7.

2. CAR PARKS

All roads and aisles within a car park are 'roads' as defined in RSRR (2009). Accordingly, the Road Rules apply in car parks.
A speed limit of 20 km/h may be applied in shopping centre and other car parks where motor vehicles mix with pedestrians and / or cyclists. A speed limit of 40 km/h may be appropriate on access roads to car parks.
Speed limit signs will generally not be required where the geometry or other factors will limit vehicles to 20 km/h or lower. Area speed limit signs (Schedule 2 of RSRR (2009)) may be appropriate. A Shared Zone (see Note 1) may be implemented in a car park subject to appropriate design.

3. LOCAL URBAN AREAS & STREETS

A speed limit of 40 km/h may be applied to an area comprising a network of local urban streets. The area should be bounded by arterial roads and/or collector roads and/or a physical barrier such as a railway line or river. Local area traffic management (LATM) devices or other road design measures should generally be used to support the 40 km/h speed limit (see the VicRoads Supplement to AGTM Part 8 and AS 1742.13). Where the nature of any road within the area is such that speeds greater than 40 km/h are unlikely (for example, a narrow street where kerbside parking usage is high), LATM treatments may be unnecessary. In general, the minimum LATM requirements for a 40 km/h area include threshold treatments at all entry points and suitable devices to control speeds on any roads where the 40 km/h limit is likely to be exceeded by the majority of traffic without enforcement. Threshold treatments must be designed so that it is obvious to drivers that they are entering an area throughout which a 40 km/h speed limit applies.

A 40 km/h speed limit may also be applied to local urban streets that are identified as pedestrian or bicycle priority routes by a plan that is formally adopted by a council (e.g. a Principal Pedestrian Network). Consideration should be given to LATM treatments, including threshold treatments if the road environment does not support a 40 km/h speed limit, (see Appendix D - Speed Management Treatments for Permanent Lower Speed Limit Road Environments).

4. SCHOOL SPEED ZONES

Applies at all primary and secondary schools on roads that have boundary gates used for student access. The following limits are to be used:

- Roads with a speed limit of 50 km/h – either a permanent or time-based 40 km/h speed zone
- Roads with a speed limit of 60 km/h or pre-existing 70 km/h – a time-based 40 km/h school speed zone
- Roads with a speed limit of 80 km/h or greater – a time-based 60 km/h school speed zone shall generally apply. Where a flagged school crossing exists, a 40 km/h time-based school speed zone shall be used.

The times of operation of time-based school speed zones are 8:00 am to 9:30 am and 2:30 pm to 4:00 pm on school days (see Appendix C for the meaning of school days).

5. REMOTE SCHOOL CROSSINGS

Time-based school speed zones may be applied at remote school crossings that are determined to be high risk in accordance with the criteria and assessment process detailed in Appendix B.

The speed limits to be used at remote school crossings and the times of operation shall be in accordance with Note 4 above.

Refer to Appendix C for the definition of remote school crossing.

6. PEDESTRIAN ACTIVITY PRECINCTS

A speed limit of 40 km/h may apply on roads where there is a high level of pedestrian activity and a lower speed limit is desirable to reduce the risk to pedestrians and cyclists. Pedestrian activity precincts include strip shopping centres, rural and outer metropolitan town centres as well as other locations where the land uses abutting the road generate high levels of pedestrian activity. In principle, if there are frequent pedestrian movements across the road, a significant proportion of which are not at controlled crossing points (a strip shopping centre on an undivided road is a typical example), a 40 km/h speed limit may be appropriate. Eligible sites must meet the following criteria:

- Continuous and directly abutting retail development and / or other types of land uses, for not less than 400 m, that generate frequent pedestrian movements across the road AND
- The abutting development that generates the pedestrian movements should preferably be on both sides of the road but may be predominantly on one side provided that there are frequent movements of pedestrians across the road (for example to access car parking) AND
- A high level of pedestrian activity for a minimum of four hours per day, and preferably five days a week AND
- The presence of kerbside parking resulting in frequent parking manoeuvres is preferable.

In addition to shopping precincts, land uses that may generate high levels of pedestrian movements (as well trips by bicycle) include train stations, public transport interchanges, offices, hospitals, medical centres, restaurants, municipal offices, pre-schools and child minding centres. Lowering of speed limits is not appropriate for isolated facilities but may be considered where there is a combination of these types of land uses. Seasonal activity may be prevalent at locations such as beach frontage roads where lower speed limits may be justified for part of the year.

Divided roads with service roads will generally not be suitable, unless there is a history of crashes involving pedestrians that cannot be addressed by other measures (such as pedestrian operated signals).

This type of speed limit should not be used on Preferred Traffic Routes (as identified in VicRoads SmartRoads Network Operating Plans) except where they coincide with a Pedestrian Priority Area.

The times of operation of time-based 40 km/h speed zones are to be tailored to match the times of high pedestrian activity. Permanent 40 km/h zones may be permitted where activity is high for the large majority of each day, seven days a week. Signing arrangements are set out in Section 7.8 - Signing Arrangements for Specific Speed Limits.

7. RURAL AND OUTER METROPOLITAN TOWN CENTRES

Permanent 50 km/h speed zones may be applicable in rural and outer metropolitan (generally more than 30 km from the Melbourne CBD) town centres where there is:

- Continuous and directly abutting, predominantly retail development on both sides of the road for not less than 200 m, or most of the development on one side of the road with the majority of parking on the opposite side of the road AND
- Frequent movement of pedestrians across the road AND
- Kerbside parking which results in frequent parking manoeuvres AND
- Support from the local community and the municipal council.

Roads with service roads will generally not be suitable unless there is a history of crashes involving pedestrians that cannot be addressed by other measures (such as pedestrian operated signals).

5.4 Finalising the Speed Limit

After having determined the most appropriate speed limits using Figure 3, 4, 5 and 6, a review should be conducted to check for consistency of speed limits along each length of road, or across a network of roads. It is important to provide road users with consistent and predictable speed limits to minimise potential confusion. Generally, it will only be appropriate to reduce a speed limit as part of such a review for the purposes of consistency within an area.

5.5 Existing 70km/h & 90km/h zones

This section provides some guidance on the use of existing 70 km/h and 90 km/h speed zones which expand on the strategy and policy outcomes from the 2011-2012 Victorian Speed Limit Review. Below are extracts from the Review document.

"Having fewer numerical speed limits will make it easier for motorists to comply with speed limits without compromising safety."

Existing 70km/h zones

"VicRoads aims to replace them with 60 km/h or 80 km/h on a case-by-case basis after assessing the area where they are operating. This action will occur over the long term and, for now, many 70km/h speed limits will stay in place."

While many of these reviews have been undertaken, any future case-by-case review of existing 70 km/h zones shall be undertaken in accordance with Section 4.2 - Community Engagement.

Existing 90km/h zones

"Each will be reviewed and gradually replaced with either 80 km/h or 100 km/h, depending on the location. In many cases this will mean removing a 90 km/h speed zone so that a 100 km/h zone can continue unchanged."

"In other cases this will mean removing a 90 km/h zone between a 100 km/h zone and an 80 km/h zone, which will allow road users to slow down to 80 km/h at their own rate rather than at the prescribed step-down speed.

This will occur over the long term and, for now, many 90 km/h speed limits will remain on the road network."

While many of these reviews have been undertaken, any future case-by-case review of existing 90 km/h zones shall be undertaken in accordance with Section 4.2 - Community Engagement.

Deviations from above guidance

Any deviations can only be considered in accordance with Section 2 - Speed Zoning Principles of this document. The installation of new 70km/h or 90km/h zones is considered to be a deviation from these guidelines.

6. Length of Speed Limits

Minimum speed limit lengths are used to restrict the frequency of changes to speed limits along a given route. The minimum lengths are shown in Table 4. Where a speed limit is to apply to an isolated short section of road, such as through a small town on a rural road, the minimum length may need to be reduced. In such cases, Victoria Police shall always be consulted because shorter lengths can create enforcement difficulties.

Table 4: Minimum length of speed limits

Speed Limit (km/h)	Minimum length of speed limit[1]
10	• Site specific
20	• Site specific
40	• 400 m • 500 m (shopping strips and other pedestrian activity precincts) [2] • 200 - 400 m (school speed zones only)
50	• 500 m • 300 m (rural and outer metropolitan town centres only) [3]
60	• 600 m • 300 - 600 m (school speed zones only)
80	• 800 m • 500 m (at railway level crossings and isolated traffic signals in rural areas only)
100	• 2 km
110	• 10 km (on a freeway that is predominantly 100 km/h) • 5 km (on a freeway that is predominantly 110 km/h)

Notes:

1. The minimum length of speed zones in this table do not apply to variable speed limits or dynamic variable speed limits on managed motorways
2. Minimum length of appropriate abutting development is 400 m (refer Figure 6, Note 6)
3. Minimum length of appropriate abutting development is 200 m (refer Figure 6, Note 7)

7. Speed Limit Signing

Speed limit signs are often placed on both sides of the road to ensure that all motorists can see them. This is particularly important on multi-lane roads where a single sign could be obscured by other vehicles.

The signs to be used, and their arrangement, should be in accordance with the RSRR (2009), Rules 21 to 25, Part 20 and Schedules 2 and 3.

Any speed zone signing scheme needs to provide legal functionality for enforcement purposes and fairness to ensure that compliance is maximised. The legal effect of speed limit signs is covered by the RSRR (2009), Rules 315, 316 and 317. Fairness is an important function to ensure road users are aware of the speed zone in which they are travelling.

Practitioners need to design the speed signing scheme to ensure appropriate repeater signs are installed in accordance with Section 7.6 (Repeater and Confirmatory Speed Signs) and Tables 5 and 6 of this guide. In addition, installation of warning signs (refer to Figure 18) will provide advice to motorists of the speed limit ahead, or the speed limit of the road they are about to enter. Typical signing arrangements are shown for pedestrian activity zones school speed zones and 50 km/h town centre zones in Figure 8 to Figure 17.

The use of electronic signs is primarily a measure to ensure fairness on busy roads where time-based variable speed limits are implemented.

By following these guidelines, both the legal and fairness objectives should be achieved. However, additional warning signs and / or repeater regulatory signs may be needed in some circumstances to ensure that fairness is achieved. The arrangement of speed limit signs at freeway interchanges is shown in the VicRoads Supplement to AS 1742.2 – Manual of uniform traffic control devices (2009), Clause 3.8.

7.1 Speed Sign Sizes

A range of sizes is available for standard, regulatory speed signs depending on the circumstances outlined in Table 5. Available sizes for other speed signs are shown in Figure 18.

Table 5: Overview of speed sign sizes

Speed sign sizes[1]	Application of relevant speed sign size
Size 'A' 450 mm x 600 mm	• The normal repeater speed sign size. However, if traffic volumes or speeds are high then larger repeater speed signs may be appropriate.
Size 'B' 600 mm x 800 mm	• The normal size used to begin a new speed limit where the reduction is 20 km/h or less. • The normal size to begin a new speed limit where it increases to any value except 110 km/h (the high standard rural freeway limit). • Use this size for the first repeater sign for speed limits within pedestrian activity areas (including school zones, town centres, strip shopping centres and other pedestrian activity precincts) on roads with a prevailing speed limit of 60 km/h or more.
Size 'C' 900 mm x 1200 mm	• This size is used to begin a new speed limit where additional emphasis is desired over that provided by the 'B' size. • Generally used where the speed limit reduction is more than 20 km/h. • The usual size used on freeways to commence speed limits and as repeater signs on both the main carriageways and the ramps.

Size 'D' 1200 mm x 1600 mm	• This size is normally used to begin a new speed limit at the end of a 110 km/h speed limit on a high standard rural freeway. • It may also be desirable where the speed reduction from the 100 km/h rural default speed limit is more than 20 km/h and, due to the positioning of the sign or other local conditions, the prominence of the sign needs to be enhanced to ensure its effectiveness.

Note:

1. Sign dimensions will be greater than shown below if additional information other than the speed limit is included on the sign, e.g. variable time based speed limits that include times of operation.

7.2 Signing of Area Speed Limits

An area speed limit may be applied to a network of roads within an area by erecting appropriate signing at each entry to and exit from the area. The network may be comprised of:

- Local streets
- Access roads and aisles within a car park
- Access and internal roads within a recreational park.

The area speed limit should generally only be applied to roads which have been designed to support this lower speed limit, or where appropriate traffic calming devices have been installed in accordance with the VicRoads Supplement to AGTM Part 8 (2008) and AS 1742.13 (2009).

In Victoria, area speed limits in local streets should be 40 km/h whereas those in car parks or recreation parks may be 20 km/h or 40 km/h depending on the nature of the access roads.

Area speed limit signs should be erected at each entry and end area signs should be erected at each exit (see Figure 7). A repeater sign should be provided beyond the initial area speed limit sign (refer to Table 6).

Figure 7: Area and end area speed limit signs

7.3 Signing and Default Speed Limits

While the default speed limit does not require signing, 100 km/h speed limit signs are used on major roads when they depart from towns, ending the built-up area speed limit and remind road users that the 100 km/h speed limit applies.

A 100 km/h speed limit is also signposted on the departures of key intersections along a route where the intersecting road is signposted at a value less than 100 km/h.

An end speed limit sign [6] (e.g. “END 60”) may only be used when leaving a built-up environment to an unsealed road where it is not desirable to encourage travel at the default speed limit because of poor alignment or the condition of the unsealed road. End speed limit signs should be installed at a location where it is appropriate for the speed limit to return to the default speed limit.

Although the RSRR (2009) provide for the use of speed derestriction signs[6], current policy is that they are not to be installed in Victoria.

[6] Refer to Rule 21 and Schedule 2 of the Road Safety Rules 2009 (Statutory Rule No. 94/2009)

Signing is not required on roads in built up areas where the 50 km/h default speed limit applies. However, there are some situations where 50 km/h signs may need to be installed so that the speed limit is clear to road users. Some examples are:

- On the fringe of a built up area to define where the 50 km/h speed limit starts e.g. when entering a country town on a local road
- On a local street where there is a signed speed limit along part of the road e.g. where a 40 km/h speed limit is in place near a school and the default speed limit is intended to apply along the balance of the street
- Where there may be confusion about the speed limit and there is a need to remind road users e.g. on a local residential street that has divided carriageways.

7.4 Signing for Variable Speed Limits

If variable speed limits are appropriate, they can be established using static speed limit signs that have times of operation inscribed on them (e.g. at school speed zones), or electronic variable speed limit signs[6]. For variable speed signs, the times when the speed limit is changed must be recorded for enforcement purposes.

Supplementary sign plates may be used to indicate a special hazard where it is necessary to inform drivers of the reason for a lower speed limit than might be expected (e.g. “Road Works” and “No Shoulder”). In special circumstances (refer to Section 7.8 - Signing Arrangements for Specific Speed Limits), manual folding signs can be used subject to the approval of the VicRoads Regional Director.

Guidance on signing for variable speed limits on freeways is provided in the following references:

- Traffic Engineering Manual, Volume 3, Part 2.04: Managed Freeways Handbook for Lane Use Management, Variable Speed limits and Traveller Information (VicRoads, 2013)
- Managed Motorways Framework, Network Optimisation & Operations Rationale and Technical Requirements (VicRoads, 2017)

7.5 Signing at Road Safety Camera Sites

“Road Safety Cameras Operate in this Area” signs (refer to VicRoads Supplement to AS 1742.15, Section 4, sign no. P2-V111) shall be installed at intersections at which there is a safety camera. A sign shall be located on each approach road, approximately 150 metres in advance of the intersection.

7.6 Repeater and Confirmatory Speed Signs

Repeater speed limit signs are used to ensure that motorists are always aware of the correct speed limit by reminding them at frequent intervals. This has become more important with the high levels of speed limit enforcement in Victoria and increased use of speed limits for specific purposes.

Repeater speed limit signs are used to:

- Remind road users of the prevailing speed limit, particularly just beyond the beginning of a zone where the speed limit is reduced
- Re-assure road users of the speed limit in situations where the speed limit might appear to be inconsistent with surrounding development e.g. where there is a short length of relatively open country between two built up areas which is too short to be signposted with a higher speed limit
- Advise drivers turning into a road at a busy intersection of the speed limit that applies to that road. This is not usually necessary in rural areas where the speed limit is the same on all intersecting roads (i.e. default speed limit of 100 km/h in rural areas).

Repeater speed limit signs should be located in accordance with Table 6. For the first two signs after the speed limit change, repeater speed signs should be erected at the spacing shown. They should be erected on both sides of the carriageway (i.e. duplicated) for speed limits of 60 km/h and higher and may be arranged in a staggered fashion if it is considered that this will give an increased effect (e.g. in busy shopping areas). For speed limits less than 60 km/h, a single repeater sign located on the left of the carriageway will generally be sufficient.

Beyond the first two signs, repeater speed signs should be installed on arterial roads on the departure side of all important intersections, at a distance of approximately 50 m to 200 m from the intersection.

"Important" should be generally interpreted as meaning all arterial road intersections, intersections with collector roads that are signposted at 60 km/h or above and other roads where there are traffic signals at the intersection. Once this requirement is met, the spacing for additional repeater signs shall be as specified in Table 6.

Repeater signs for use in 40 km/h shopping strips and other pedestrian activity zones, in 50 km/h rural and outer metropolitan town centres, and within school speed zones are outlined in Section 7.8 and related figures.

Care should be taken to ensure that any speed limit signs are not placed in locations where they can be misleading. Speed limit signs and advisory speed signs showing different values shall not be placed where drivers can read both signs at the same time. For example, an 80 km/h speed limit sign followed immediately by a curve warning sign with an advisory speed of 60 km/h may lead to driver confusion.

Table 6: Spacing of repeater signs

Speed Limit (km/h)	Approximate Spacing of Repeater Signs		
	First Repeater Sign	Second Repeater Sign	Beyond First Two Signs
10	Site specific	Site specific	Site specific
20	50 m	Site specific	Site specific
40	50 m	Section 7.8	Section 7.8
40 AREA	50 m	Not required	Not required
50[1]	50 m	300 m (Figure 17)	300 m (Figure 17)
60	100 m	300 m	500 m
70[2]	100 m	300 m	500 m
80 (built up areas)	100 m	300 m	500 m
80 (rural areas)	200 m	500 m	2 km
90[3]	100 m	500 m	1 km
100[4] / 110	200 m	500 m	5 km

Notes:

1. Only applies where the speed limit is signposted.
2. Applicable to existing 70 km/h speed zones. No new 70 km/h speed zones are permitted under these guidelines.
3. Applicable to existing 90 km/h speed zones. No new 90 km/h speed zones are permitted under these guidelines.
4. Repeater signs should only be used on roads where the rural default speed limit applies in cases where drivers may not be aware of the prevailing speed limit.

Repeater signs on freeways, particularly urban freeways, may need to be located at intervals closer than specified in Table 6 to suit freeway traffic management systems and / or closely spaced interchanges. Typical locations of repeater signs on freeways at interchanges are shown in the VicRoads Supplement to AS 1742.2 (2009), Clause 3. Also, further guidance with regard to repeater signs on Managed Freeways can be found in the VicRoads Managed Freeways Handbook for Lane Use Management, Variable Speed Limits and Traveller Information (2013), Chapter 3 (TEM Volume 3 – Part 2.04).

Repeater signs can be used to confirm a speed limit after a discontinuity in a road e.g. at a Y junction where a road name change occurs. In these cases, in the absence of signs, there may be doubt as to whether the speed limit legally continues through the discontinuity. In such cases, the speed limit should be confirmed by installing signs just beyond the discontinuity.

7.7 Speed Limit Pavement Markings

Speed limit pavement markings are advisory only – they have no legal effect and should only be used where it is necessary to provide additional advice to drivers of a change in the speed limit.

VicRoads usual practice is to avoid the use of speed limit pavement markings on arterial roads.

When the use of pavement markings is being considered, whether on an arterial or local road, the following principles and guidance should be applied:

Principle 1: Pavement markings should have a practical function that cannot be provided adequately by regulatory speed limit signs.

The primary purpose of pavement markings is to provide enhanced information to drivers to support regulatory speed limit signs. Generally, they should only be used at the start of a speed zone where there is a reduction in the speed limit and the effectiveness of the regulatory signs is compromised (e.g. the signs may be offset further from the traffic stream than desired). Pavement markings should not be relied upon to reduce vehicle speeds. Research relating to the effect of pavement numerals on the speed behaviour of drivers is inconclusive.

Principle 2: Pavement markings must be clear and comprehensible.

Where pavement numerals are used to provide supplementary speed limit advice to drivers they should comply with AS 1742.4, Manual of uniform traffic control devices, Part 4: Speed controls.

The responsible road authority shall be prepared to maintain the pavement markings. Pavement markings should be maintained or remarked if the condition of the markings shows signs of deteriation.

Principle 3: Pavement markings should not cause confusion.

Pavement marking should only be used at locations where there is little or no chance of confusion regarding the prevailing speed limit. Situations may arise where there is a conflict between the pavement markings and the speed limit e.g. if a temporary lower speed limit is in force during roadworks or an event. The implications of possible confusion should be considered before installing speed limit pavement markings. Practitioners should note that the risk of possible confusion resulting from temporary lower speeds such as during roadworks is increased where the permanent speed on the roads is greater than 40 km/h.Pavement markings must not be used in conjunction with variable speed limits.

7.8 Signing Arrangements for Specific Speed Limits

Table 7 sets out the signing arrangements for specific speed limits.

Table 7: Signing arrangements for specific speed limits

Speed Limit	Signing
Shared zones 10 or 20km/h 	• 'SHARED ZONE' and 'END SHARED ZONE' signs (Rule 24, RSRR (2009)) • Generally signed as 10 km/h • Another speed value is permissible under the Road Rules • All entry and exit roads to the zone must be signed.
Shopping centre car parks and recreation reserves 20 km/h or below	• Signing is not necessary where the geometry or other factors will limit speeds to 20 km/h or less • A 20 km/h speed limit will generally be appropriate in shopping centre car parks and recreation reserves • An area speed limit may be appropriate in large car parks or reserves that have a network of roads • The major access and circulatory roads in large shopping centre car parks or recreation reserves may be signed at 40 km/h.
Local streets 40 km/h	• Signpost each street with 40 km/h or use '40 AREA' speed limit signs and 'END 40 AREA' speed limit signs (generally 'B' size) at all entries to and exits from the area • A single repeater sign (generally 'A' size) should be located approximately 50 m after the start of a 40 km/h area
Shopping strips and other pedestrians activity areas 40 km/h (Refer to Figure 8)	• A '40 AHEAD' sign (generally 'B' size) 100 m before the change in speed limit to provide advance warning on roads with a prevailing speed limit of 60 km/h or more • Two electronic variable speed signs at each end of the speed limit to introduce the zone • Single repeater electronic variable speed signs should be located at 400 m - 500 m spacing • All roads that intersect the road with the 40 km/h speed limit will require advisory signs to be installed a maximum of 50 m in advance of the intersection • Static repeater signs should be placed within 20 m to 50 m of each intersection, in both directions, to give road users entering the pedestrian activity area a clear indication of the applicable speed limit • Where the intersecting road is an arterial road (or a road of similar significance) electronic repeater signs (instead of static signs) should be placed within 20 m to 50 m of the intersection, on each departure from the

Speed Limit	Signing
	intersection • The signing arrangements shown in Figure 8 should, in practical terms, mean that the 40 km/h speed limit is signed in such a way as to provide a repeater sign 50 m after the start of the speed limit and then at spacings no greater than every 150 m (electronic or static) in each direction. If this is not the case, additional static repeaters may need to be erected to achieve the 150 m maximum spacing • Two permanent speed signs (generally 'B' size) are required at each end of the zone to reinstate the prevailing speed limit for the road.
School speed zones 40 & 60 km/h (Refer to Figure 9 to Figure 16)	• See details in Table 8.
Rural and outer metropolitan town centres 50 km/h (Refer to Figure 17)	• A '50 AHEAD' sign (generally 'B' size) 100 m before the change in speed limit to provide advance warning on roads with a prevailing speed limit of 60 km/h or more • Two permanent 50 km/h signs (generally 'C' size) to introduce the speed limit • Repeater signs on the left, 50 m after the start of the speed limit and then on both sides at maximum intervals of 300 m • Additional repeater signs may be required within the 50 km/h speed zone, 20 m - 50 m from any intersection with a major side road • Two permanent speed signs (generally 'B' size) are required at each end of the zone to reinstate the general speed limit for the road.
Built-up area default & service roads 50 km/h	• Default 50 km/h limits are changed to 50 km/h signed speed limits only in special cases, including where the speed limit changes to 50 km/h along a road and on service roads where the through carriageway speed limit is higher. 50 km/h signs may also need to be installed where road users may be confused about the applicable speed limit (e.g. along a residential street that is divided). • Service road speed limit signs should generally be placed at the left edge of the service road to avoid any impression that the speed limit may apply to the main carriageway. However, if signing on a service road is likely to cause confusion on the main carriageway, a 'SERVICE ROAD' supplementary plate (Sign No. R4-V100) should be added below the service road speed limit sign.
Other speed limits	• See Sections 7.1 to 7.6

Table 8 provides details for school speed zones.

All Victorian school speed zones are made under Rule 21 of RSRR (2009). They are provided on school boundary roads that have gates used for student access. They may also be installed at high risk remote crossings that are used by school children in accordance with Section 5.3.

Three types of school speed limit signing apply in Victoria, namely:

- Type 1 school zones may be installed in 50 km/h local roads by erecting permanent standard 40 km/h speed limit signs
- Type 2 school zones may be installed on 50 km/h, 60 km/h and some higher speed roads, by erecting static time-based signs
- Type 3 school zones are provided with electronic time-based signs to improve the conspicuity of the zone for drivers where speed limits or traffic volumes are relatively high.

In addition, there may be situations (e.g. distracting information in the background to the signs) where enhancements to the signing arrangements are required in order to make the signs more conspicuous to approaching drivers. Possible enhancements are included in Table 8.

Table 8: Signing arrangements for school speed zones

Base Speed Limit / School Speed Zone Type [1,7]	Sign Type	Sign Size [8]	Suggested Conspicuity Upgrade [4]
50 km/h roads			
50 km/h default Type 1 - Figure 9 [13]	Permanent static 40 km/h Repeater signs to be installed after intersections	B A	Duplicate B B
50 km/h default or signposted Type 2 - Figure 10 [14]	Static time based 40 km/h [6]	B	Duplicate B
60 km/h roads [5,11]			
Type 2 - Figure 10 [14] < 5,000 vpd	Static time based 40 km/h [6]	B	C or duplicate B
Type 2 - Figure 11 [14] 5,000 ≤ 10,000 vpd	Duplicate static time based 40 km/h [6]	B	C
Type 2 - Figure 11 [14] > 10,000 and ≤ 20,000 vpd	Duplicate static time based 40 km/h [6]	C	Duplicate electronic signs with Regional Director approval [9,12]
Type 3 - Figure 12 [14] > 20,000 vpd	Duplicate electronic time based 40 km/h [6,9]	B size electronic	Larger electronic signs with Regional Director approval [9]
> 60 km/h roads [3,5,10]			
Type 2 - Figure 13 [14] < 500 vpd and 80 km/h speed limit [2]	Duplicate static time based 60 km/h [6]	B	C
Type 2 - Figure 13 [14] < 500 vpd and 100 km/h speed limit	Duplicate static time based 60 km/h [6]	C	Larger advance warning signs

Type 3 - Figure 14 [14] > 500 vpd and ≥ 80 km/h [2]	Electronic time based 60 km/h [6,9]	B (80 km/h road) or C (100 km/h road) electronic [9]	Larger electronic signs with Regional Director approval [9]
Type 3 - Figure 12 [14] > 500 vpd and 70 km/h speed limit [3]	Electronic time based 40 km/h [6,9]	B size electronic [9]	Larger electronic signs with Regional Director approval [9]
Type 3 - Figure 15 [14] Flagged school crossing and 70 or 80 km/h speed limit [2]	Duplicate electronic time based 40 km/h [6,9]	B size electronic [9]	Larger electronic signs with Regional Director approval [9]

Notes:

1. Figure 8 to 17 show typical signing layouts for a range of common situations. Where the conditions are different (for example, where there is a signalised intersection within a school speed zone), the signing layout should be based on the relevant typical layout and modified to suit.
2. Where there is a pre-existing time based 40 km/h school speed zone on a road on which the speed limit is to be increased from 70 km/h to 80 km/h, the 40 km/h school speed limit shall be retained.
3. Signing arrangements that relate to 70 km/h speed limits apply only to pre-existing 70 km/h speed zones as no new 70 km/h speed zones are permitted under these guidelines.
4. Advance warning signs shall be installed 100 m in advance of the school speed limit, on all roads with a prevailing speed limit of 60 km/h or more. For sites with poor conspicuity, advance warning signs (or larger advance warning signs if one already exists) can be used irrespective of speed limit.
5. 450 mm wide repeater signs (sign no. R4-V106A – see Figure 18) shall be installed 50 m after the start of the school speed limit on all roads with a prevailing speed limit of 60 km/h or more.
6. If a time based school speed limit extends greater than the usual distance (e.g. serves two schools), additional time based repeater signs are required. Where time based electronic signs are used, time based static or electronic signs may be used as repeater signs. The distance between speed limit signs shall not exceed 300 m. If schools are up to 500 m apart, a single school speed limit should generally be used to cover both schools to avoid a short length of road that has a different speed limit between the schools.
7. When a school is near a town centre speed limit, the town centre speed limit should extend past the school speed limit to avoid frequent changes in speed limits.
8. Smaller narrow format signs may be used on side roads where there are physical constraints in positioning larger signs, as repeater signs, or in low traffic volume environments.
9. Electronic signs will be controlled by clocks that are programmed at the start of each school year. These signs will usually be turned off when the school speed limit is not in operation.
10. On roads with a speed limit of 80 km/h or greater, where there is a flagged school crossing, the school speed zone shall be 40 km/h and the signs will be time based electronic signs together with advance warning signs (as per Note 4 above).
11. On roads with a speed limit of 60 km/h where there is a 40 km/h school speed limit and traffic volumes greater than 20,000 vpd, install time based electronic signs together with advance warning signs (as per Note 4 above).
12. On roads with a speed limit of 60 km/h carrying a traffic volume of more than 10,000 and up to 20,000 vpd, duplicate electronic signs may be used (layout as per Figure 12) with the approval of VicRoads Regional Director.
13. On roads where a Type 1 treatment (i.e. a permanent 40 km/h zone) is installed, a repeater sign should be installed close to any intersecting road to advise motorists turning from the side road.
14. At locations where Type 2 or Type 3 treatments are installed, all intersecting side roads are to have a sign installed to show the speed limit in the school speed zone to provide advance notice to motorists turning from the side road. In addition, a 'SCHOOL TIMES' supplementary plate shall be installed. Narrow format signs may be used if the side road speed limit is 60 km/h or less or there are width constraints.

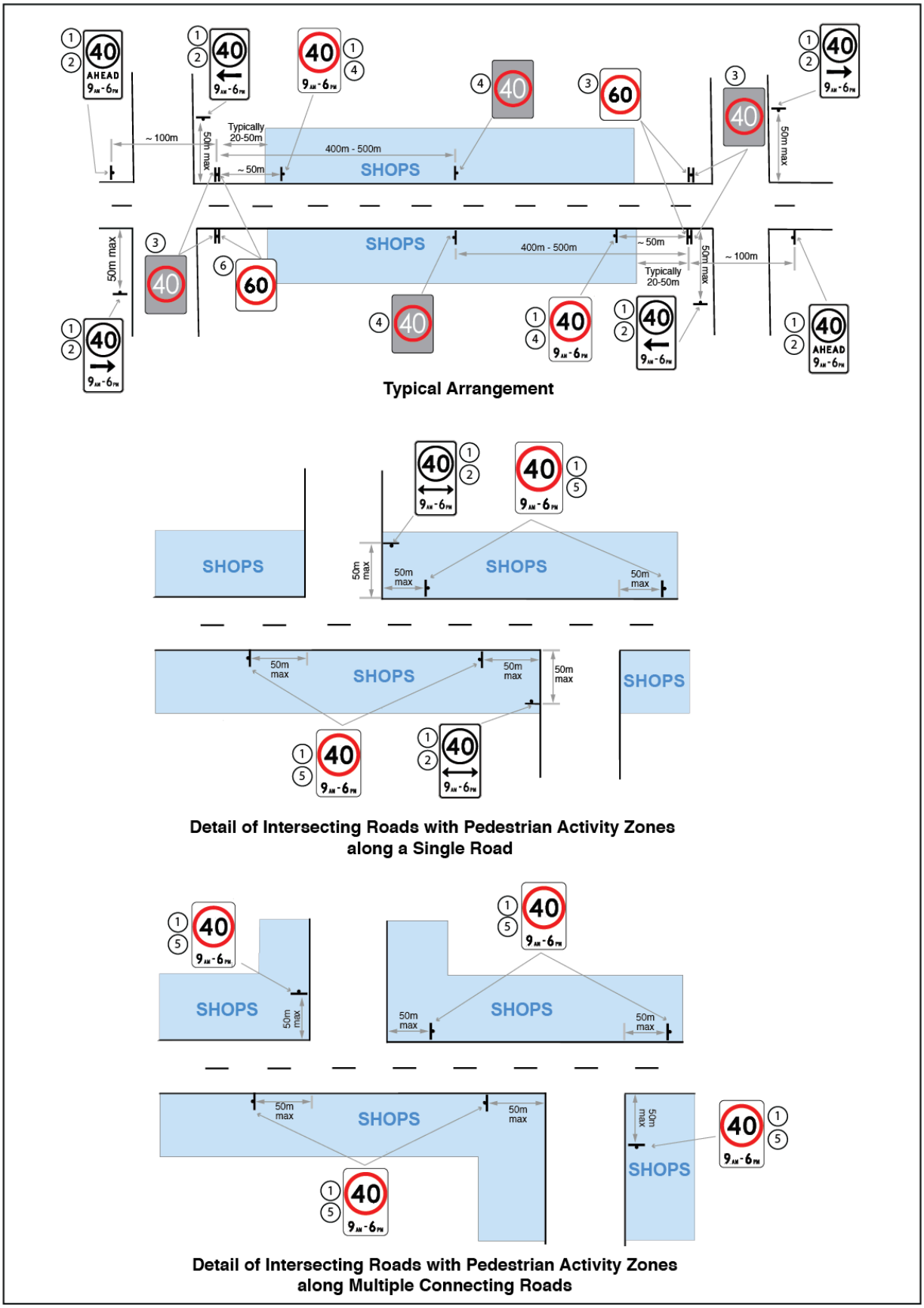


Figure 8: Typical sign layout for 40 km/h pedestrian activity zones

Notes:

1. Time vary to suit site requirements.
2. Warning signs are used on all approaches to the lower speed limit, including on side streets. These signs do not have any legal effect under RSRR (2009) but provide an important fairness function to ensure road users are aware of the speed zone that they are about to enter.
3. Electronic signs are used to establish the lower speed limit that applies to a length of road. These signs indicate the maximum legally permissible speed and have legal effect in accordance with RSRR (2009) when operating. They also serve a fairness function on busy roads where time-based variable speed limits are implemented by providing a higher level of conspicuity. These electronic signs are installed on both sides of the road, which also serves to enhance conspicuity for the purposes of fairness.
4. Repeater speed limit signs (either static or electronic) shall be installed at a spacing of no greater than 150 metres in both directions. Static regulatory signs are used except where the lower speed zone is longer than 500 metres, in which case a single electronic repeater speed limit sign shall be installed every 400 to 500 metres. Both static and electronic repeater signs indicate the maximum, legally permissible speed and have legal effect in accordance with RSRR (2009). They also serve an important fairness function by reminding drivers of the prevailing speed limit.
5. Repeater signs shall be installed after every intersecting street. Static regulatory signs are generally used for this purpose. However, where an intersecting street is another important traffic route (e.g. arterial road) an electronic repeater sign is to be used in place of a static sign.
6. Two static regulatory speed limit signs, one on each side of the road, are installed at the end of the zone to reinstate the prevailing speed limit for the road.

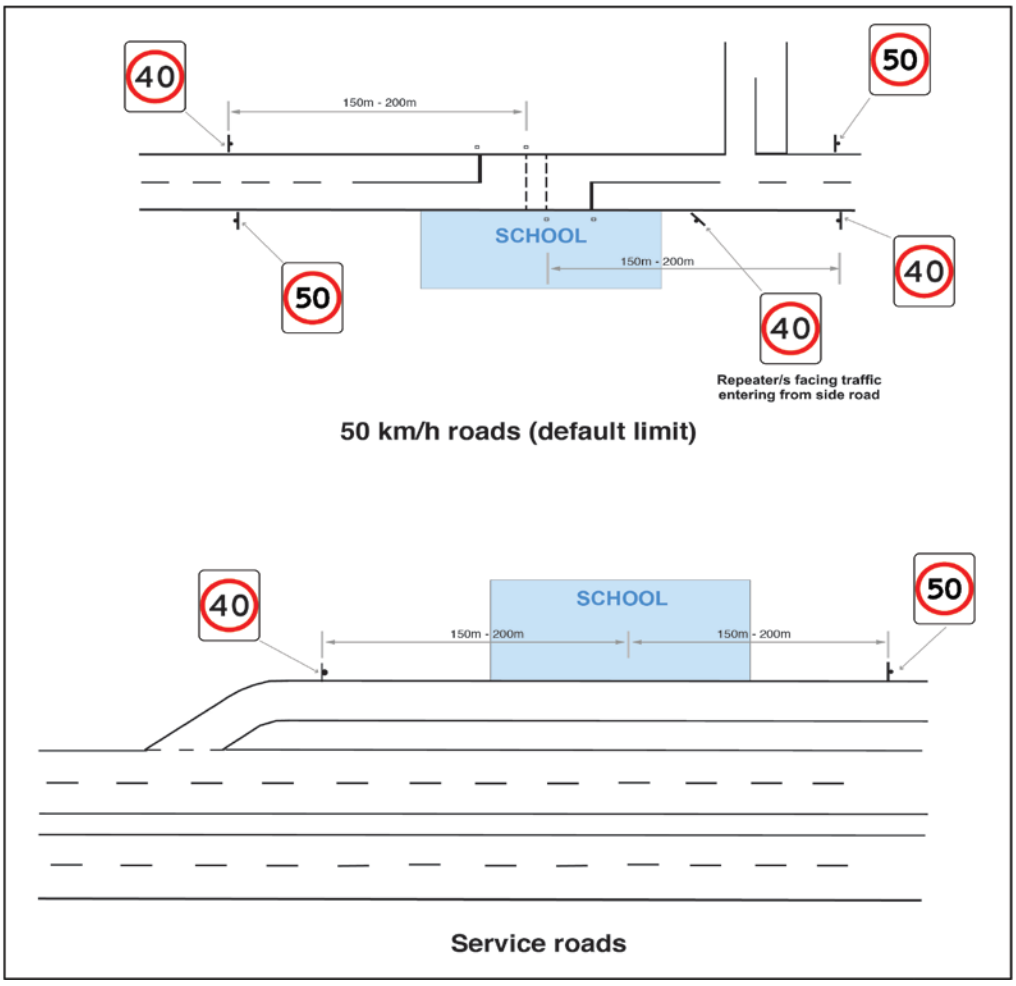


Figure 9: School speed zones on roads with 50 km/h default speed limit. Type 1 layout with permanent signs.

Notes:

1. Where children cross the major road in the vicinity of the school that abuts a service road, a school speed limit is also required on the major road carriageway/s.
2. If a speed limit sign on a service road is likely to cause confusion on the main carriageway, a 'SERVICE ROAD' supplementary plate (Sign No. R4-V100) should be added below the service road speed limit sign.
3. The length of the 40 km/h zone is typically measured from the crossing or the school gate if there is no marked crossing.

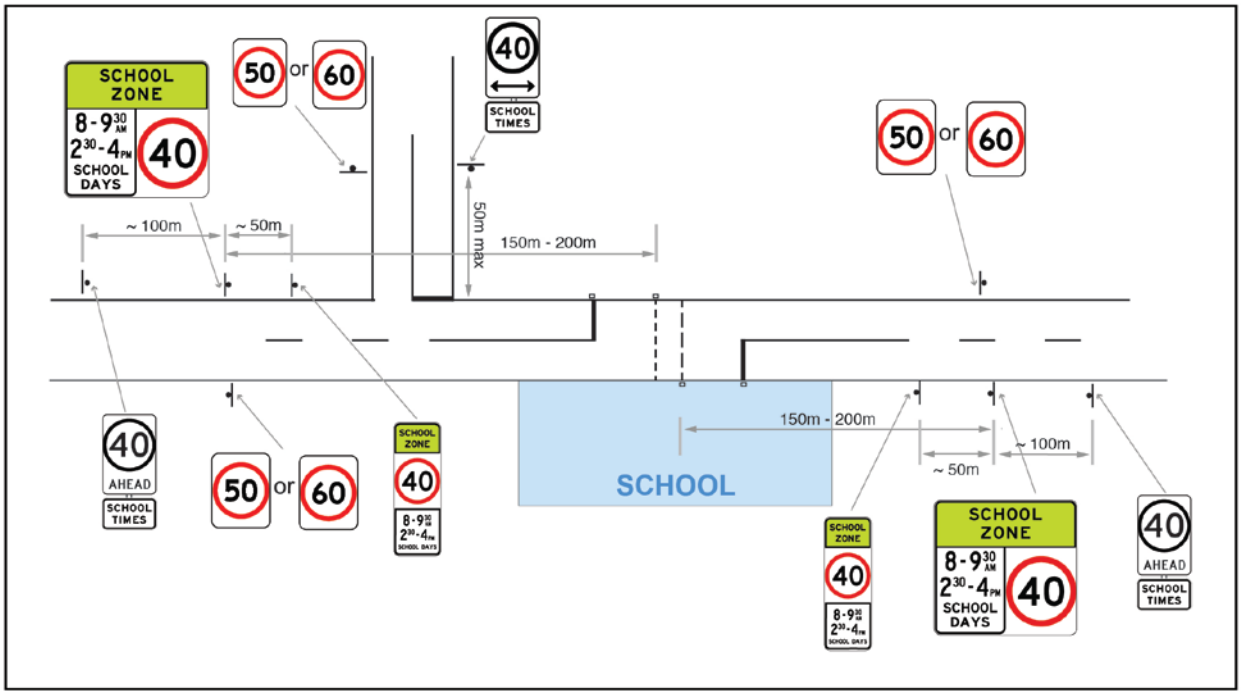


Figure 10: School speed zones on 50 km/h roads (with default limit or signposted) or 60 km/h roads with less than 5,000 vpd. Type 2 layout with static time based signs.

Note:

The length of the school speed zone is typically measured from the crossing or the school gate if there is no marked crossing.

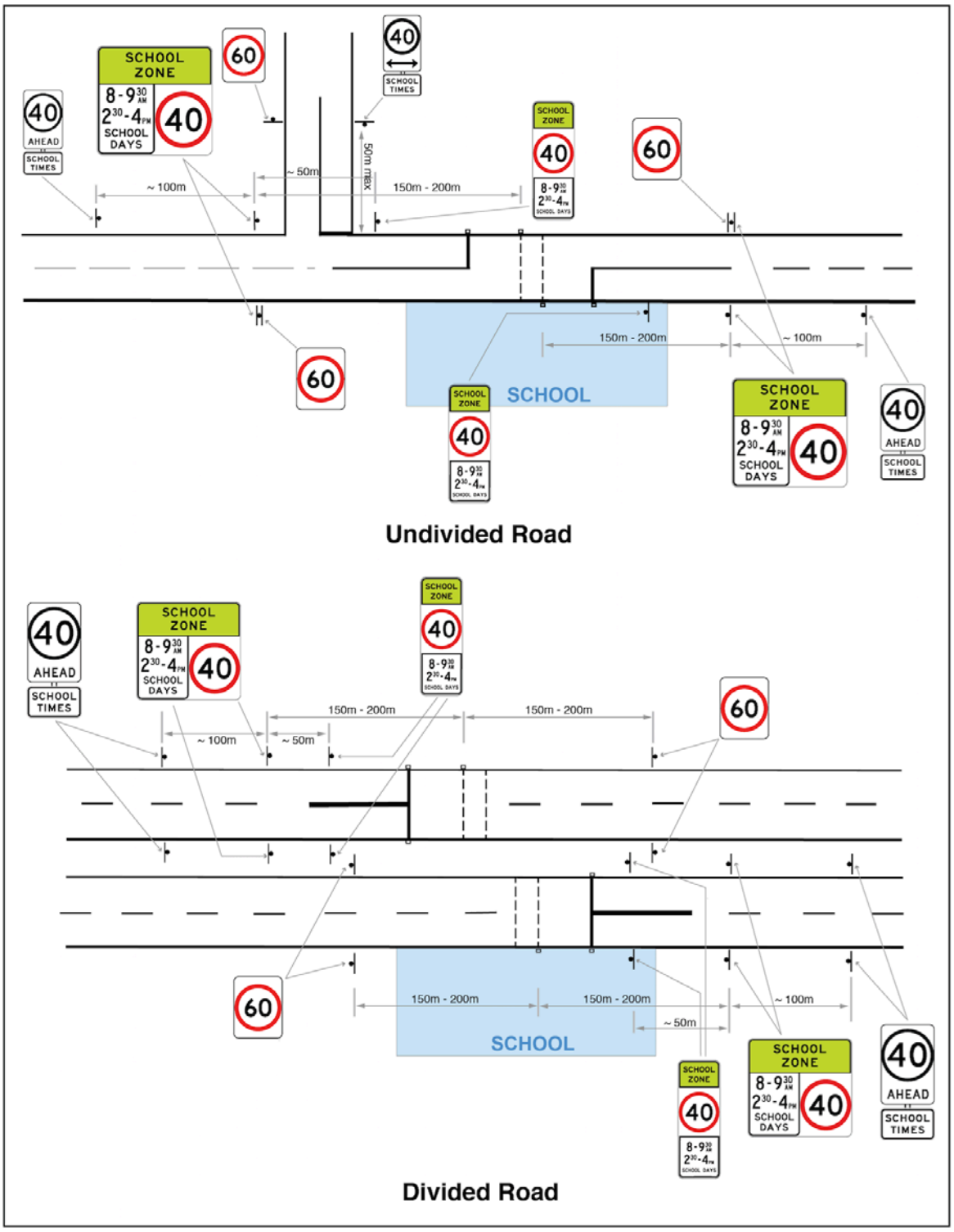


Figure 11: School speed zones on 60 km/h roads with 5,000 vpd to 20,000 vpd. Type 2 layout with duplicate static time based signs.

Notes:

1. Where a road carries a traffic volume of more than 10,000 and up to 20,000 vpd, duplicate electronic signs may be used (layout as per Figure 12) with the approval of VicRoads Regional Director.
2. The length of the school speed zone is typically measured from the crossing or the school gate if there is no marked crossing.

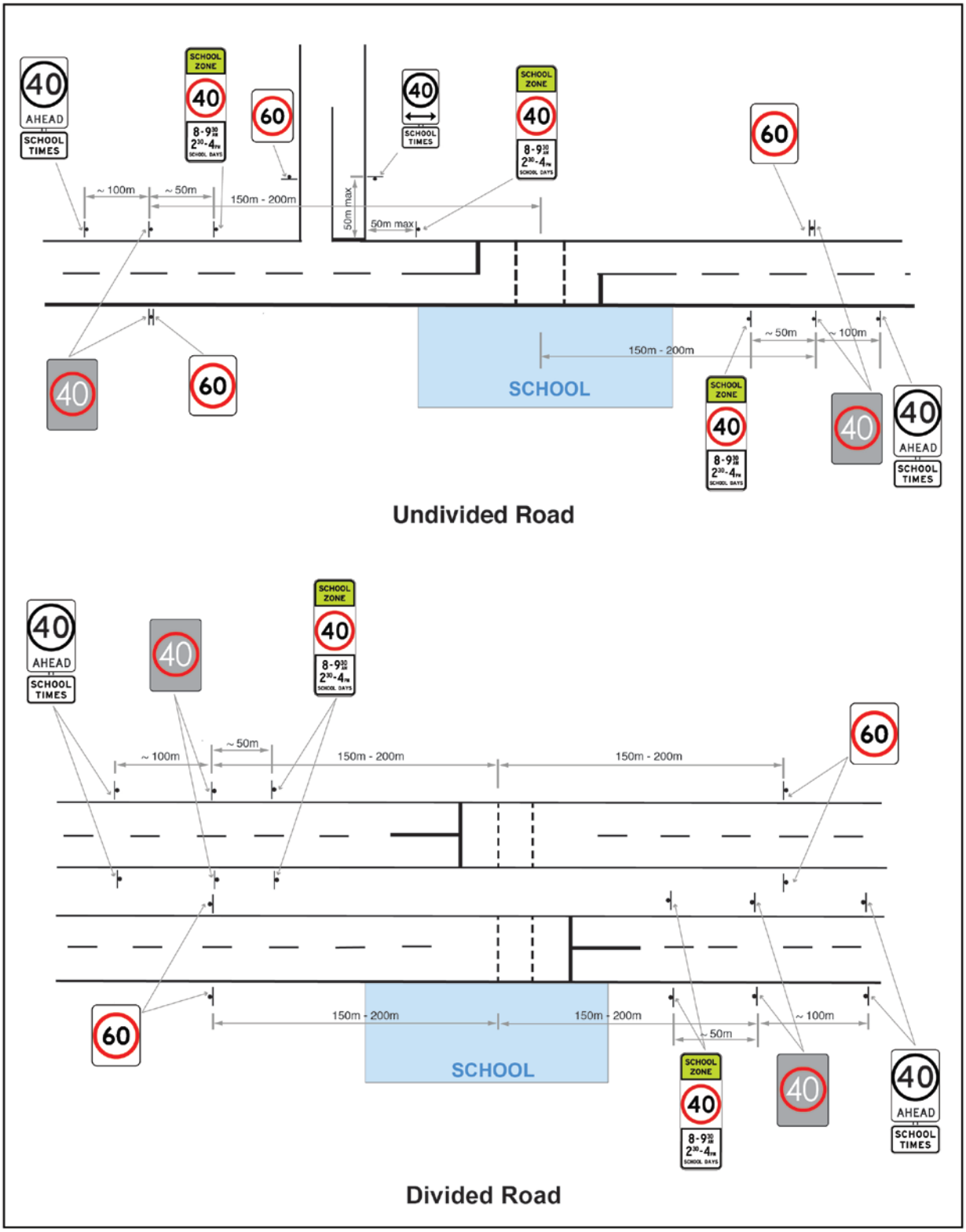


Figure 12: School speed zones on 60 km/h roads with more than 20,000 vpd. Type 3 layout with duplicate electronic signs.

Notes:

1. These layouts may also be used on roads with a pre-existing speed limit of 70 km/h and more than 500 vpd.
2. The length of the school speed zone is typically measured from the crossing or the school gate if there is no marked crossing.

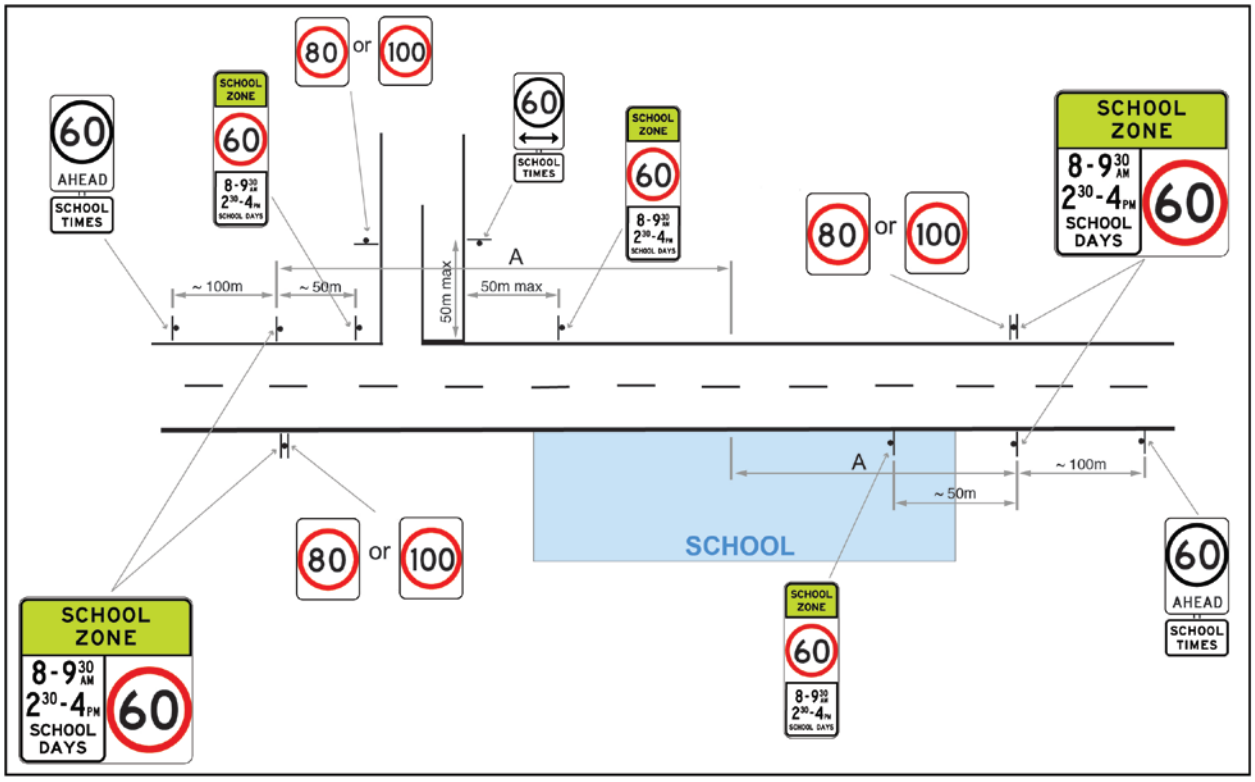


Figure 13: School speed zones on 80 km/h or 100 km/h roads with less than 500 vpd. Type 2 layout with duplicate static time based signs.

Notes:

1. For an 80 km/h speed limit, A = 150 m to 200 m
2. For a 100 km/h speed limit, A = 200 m to 300 m.
3. This signing arrangement may also be used on roads with a pre-existing speed limit of 90 km/h (where A = 150 to 200m)
4. The length of the school speed zone is typically measured from the school gate or the marked crossing if pedestrian operated signals exist.

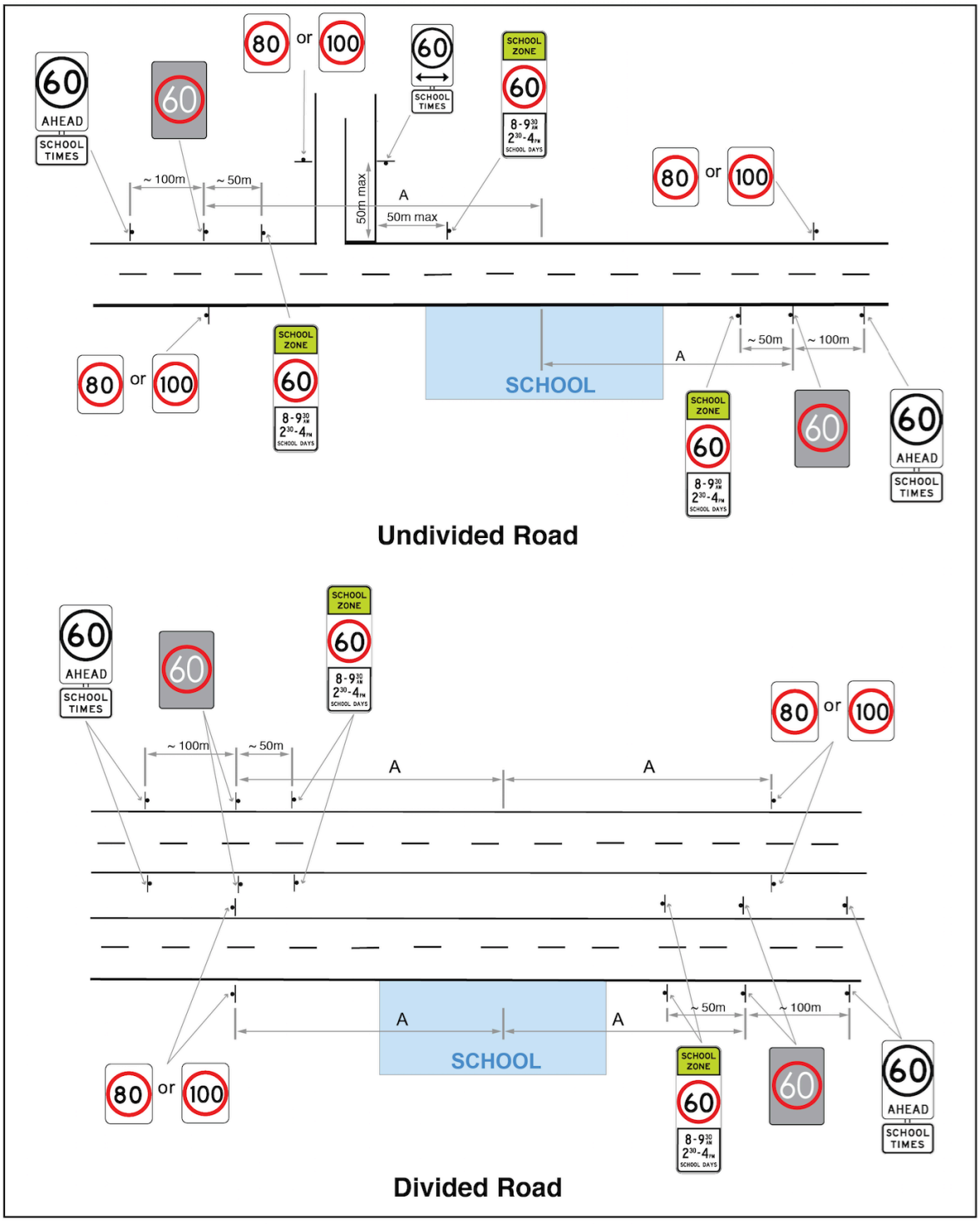


Figure 14: School speed zones on 80 km/h or 100 km/h roads with more than 500 vpd. Type 3 layout with electronic signs.

Notes:

1. For an 80 speed limit, A = 150 m to 200 m
2. For a 100 km/h speed limit, A = 200 m to 300 m
3. These signing arrangements may also be used on roads with a pre-existing speed limit of 90 km/h (with A = 150 to 200m)
4. The length of the school speed zone is typically measured from the school gate or the marked crossing if pedestrian operated signals exist.

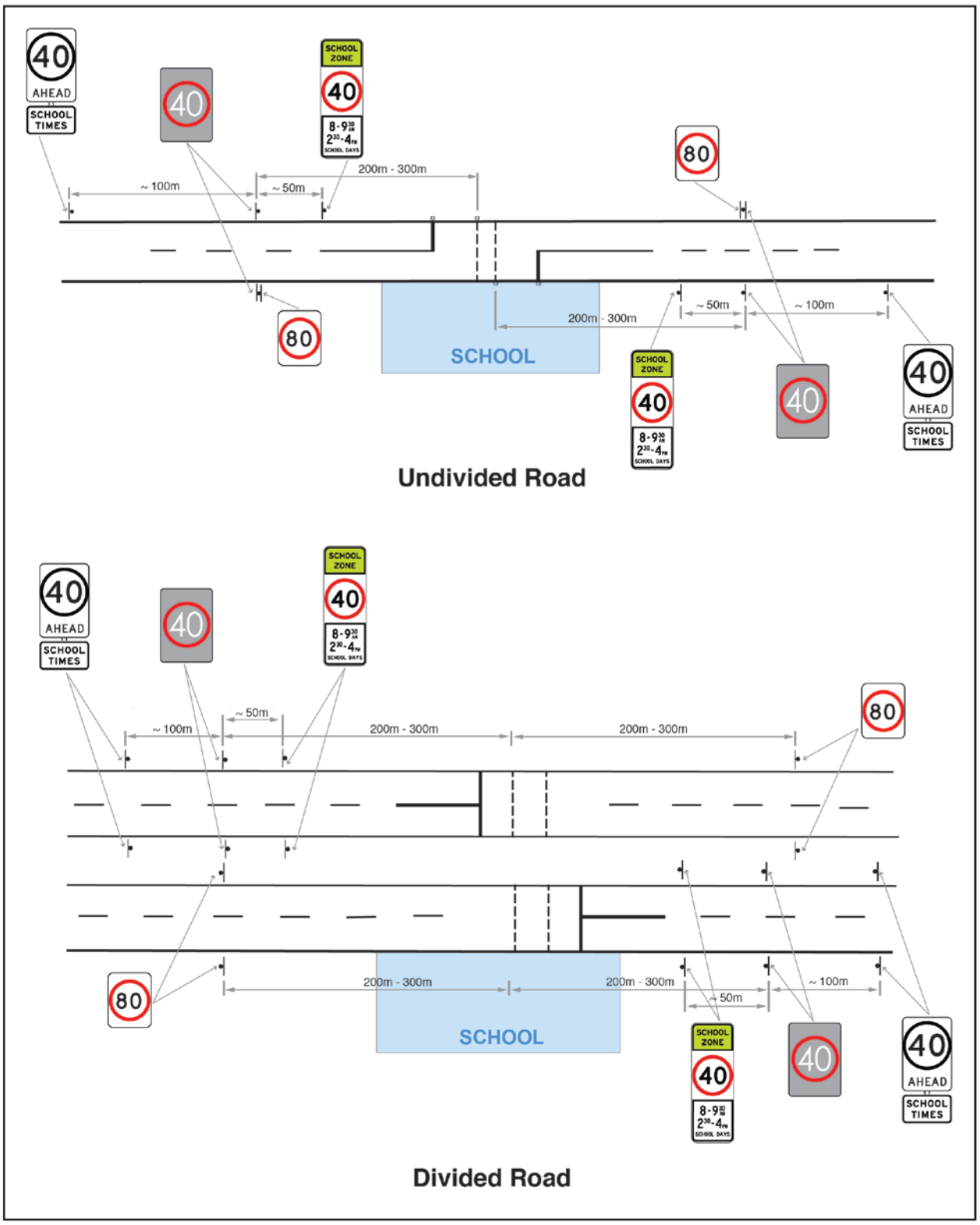


Figure 15: School speed zones on 80 km/h roads with a flagged children's crossing. Type 3 layout with duplicate electronic signs.

Note:

These layouts may also be used at flagged school crossings on roads with a pre-existing speed limit of 70 km/h

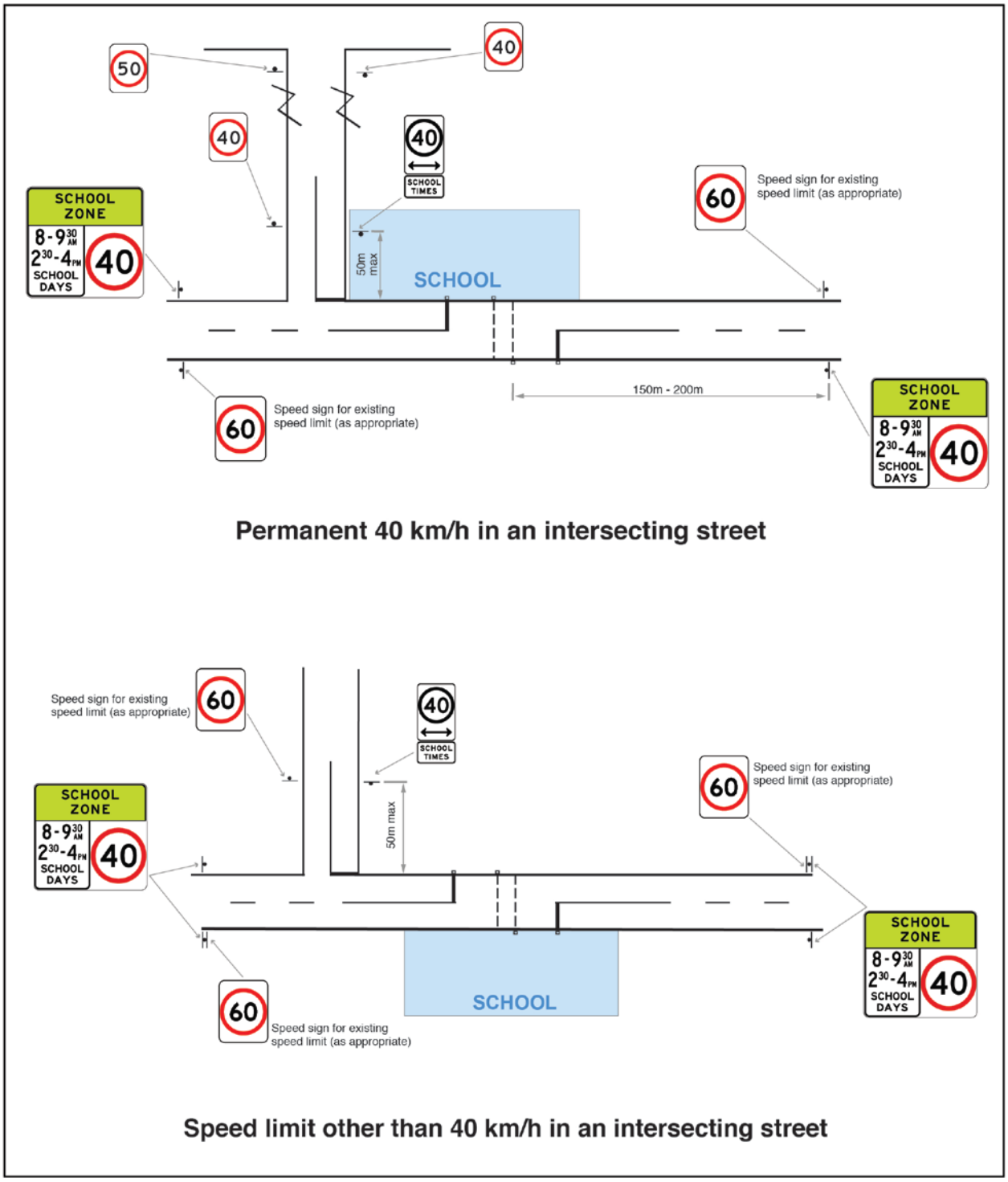


Figure 16: School speed zones – examples of sign layouts in intersecting streets

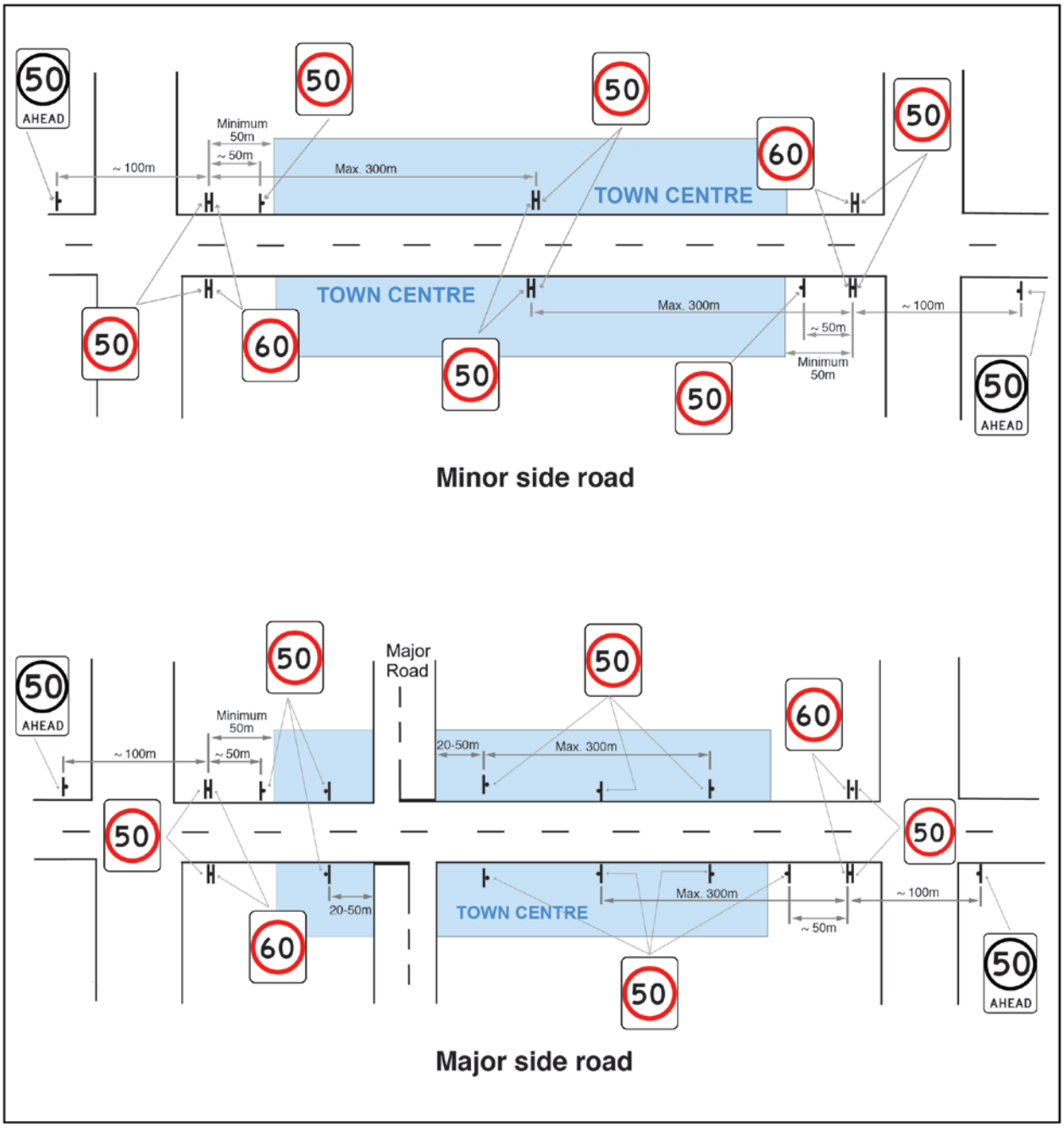


Figure 17: Typical signing layouts for 50 km/h rural and outer metropolitan town centres

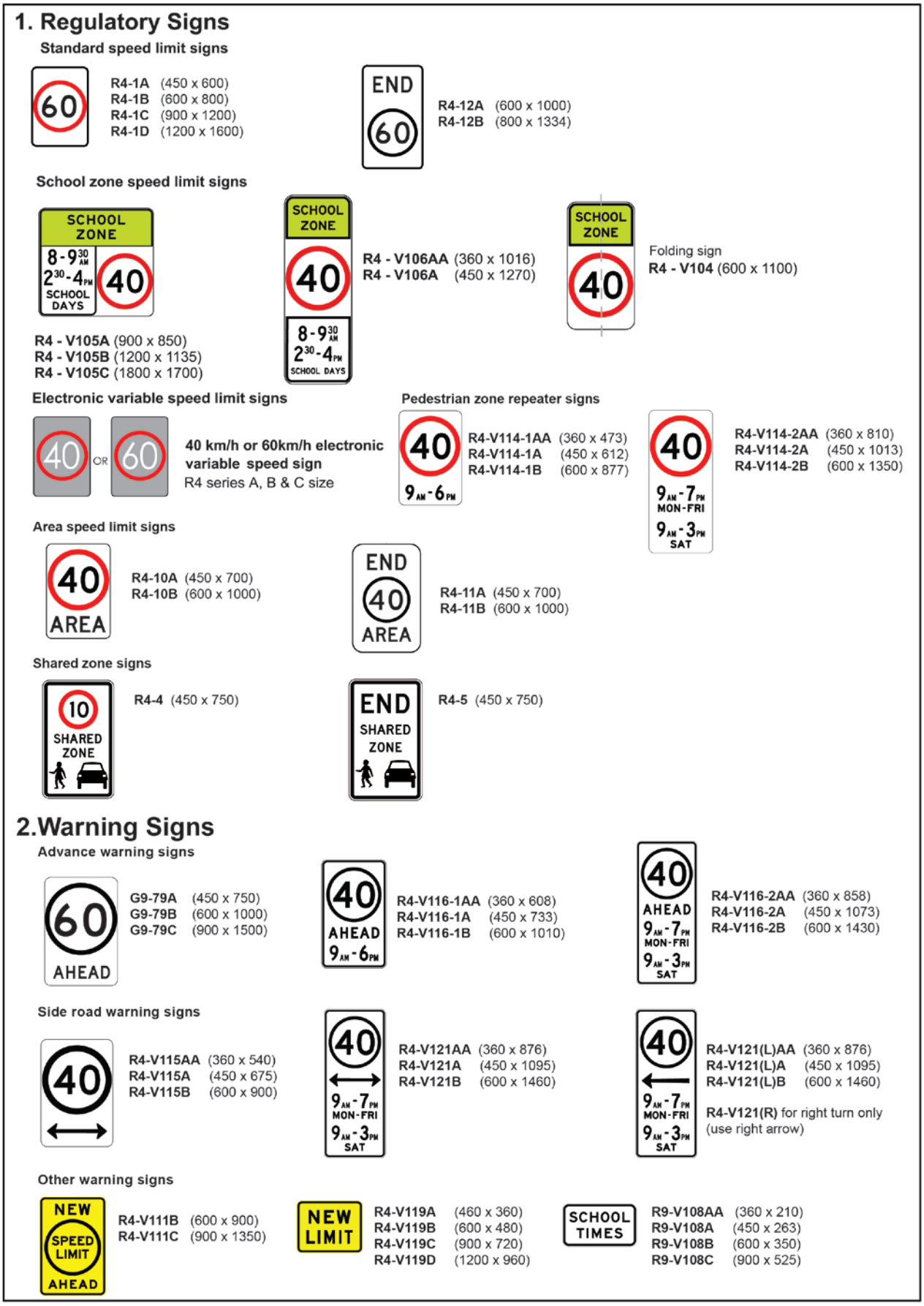


Figure 18: Sign schedule

8. Supporting Treatments for Permanent 40km/h Road Environments

Where existing road environments do not encourage vehicles to travel at low speeds, speed management treatments may be used to support 40km/h speed limit signs.

To encourage drivers to travel at safe speeds, road geometry and infrastructure treatments may be used to influence the drivers' expectation of the appropriate driver behaviour and speeds. The concept of 'self-explaining roads' involves designing a road system in which the driver's expectations created by the road environment are implicitly in line with the safe, appropriate behaviour for the road. This allows motorists to receive consistent speed information from the roadway, speed limit signs and the environment. In this way, it is often important to combine speed limit signs with road infrastructure solutions to achieve safer speeds, safer road systems and safer driver behaviours.

There are various treatment solutions that range in cost and effectiveness. The ideal treatment may vary based on each individual road environment and so, engineering judgement is required to determine if and what treatment is to be used. Appendix D details a number of speed management treatments suitable to support 40km/h speed roads. Note: this list is not exhaustive but provides a thorough basis of researched treatments.

9. Administrative Matters

Speed limits on the road network should be reviewed where there are concerns expressed by the community and when there are changes in the level of abutting development or changes to the road itself. In areas of high population growth, factors affecting speed limits should be monitored and speed limits changed, as necessary, in accordance with these guidelines.

Speed limit signs should be maintained in good condition, particularly in relation to the visibility of signs.

Speed limit signs are Major Traffic Control Devices under the Road Safety (Traffic Management) Regulations 2009, and the written consent of VicRoads is required to erect, establish, display, maintain or remove such signs. Refer to TEM Volume 3 – Part 2.2 Authorisation of Traffic Control Devices (2015).

Applications for a new speed limit or alterations to an existing speed limit must be submitted to the relevant VicRoads region. This can be initiated by the local Council, VicRoads, Victoria Police or other road authorities (e.g. Parks Victoria, shopping centre operators). Proposals initiated by municipal councils are to be submitted using the Speed Sign Management System (SSMS). Proposals shall be based on consideration of all relevant information (refer to Section 5 - Determination of the Appropriate Speed Limit) including the extent of abutting development, the locations of existing speed limit signs, the proposed location of the new signs, the crash history and any available information about road user movements, particularly in relation to pedestrians and cyclists. A VLimits assessment shall be submitted with the application if requested by VicRoads.

Access to SSMS is available at the following website address: www.openofficeonline.com.au/SSMS. Users are required to have a registered user name and password.

All documentation in relation to a speed limit change shall be retained by the coordinating road authority (refer to Appendix C) in an accessible form for possible future legal purposes, particularly the document of written consent and the date of installation, modification or relocation of speed limit signs. This requirement also applies to temporary roadwork speed limits.

Where a speed limit change is on a local road, any queries or concerns raised by stakeholders regarding its installation shall be resolved by the relevant municipal Council.

These guidelines are intended to clearly define the appropriate speed limit for a set of circumstances. Consultation with stakeholders including Victoria Police, DJR, local government and the community shall be undertaken as required, in accordance with these guidelines, prior to the implementation of speed limit changes.

Situations where the application of the guidelines is not clear and interpretation is required shall be referred to VicRoads Manager Traffic Engineering.

Appendix A - The Relationship between Speed and Road Trauma

Higher speed increases the risk of crashes and injury because it reduces the time available to avoid a collision and leads to higher impact speeds and consequently more severe injuries (Oxley & Corben, 2002, Fildes et al, 2004). Small changes in vehicle speeds can have a significant impact because crash severity increases exponentially with speed and increased speeds significantly increase crash risk.

Research has indicated (references below) that:

- Car occupants are limited in their capacity to sustain impact forces associated with vehicle crashes. In a vehicle that affords good crash protection to its occupants, it is possible to experience a frontal crash with another vehicle at 70 km/h without long term injuries. For impacts with poles or trees when only 20-25% of the frontal structure is directly contacted, any speed above 30 km/h is highly likely to result in serious injury to the car occupants. For side-impact crashes by another light passenger vehicle, the vehicle struck in the side can only offer occupant protection without likelihood of serious injury when the striking vehicle is impacting at a speed under 50 km/h and the impacted vehicle has full occupant protection including side and curtain air bags. For side-impact crashes into a tree or pole this speed is 30 km/h.
- In a 60 km/h speed limit area, the risk of a casualty crash doubles for each 5 km/h increase in speed above the posted 60 km/h speed limit as shown in the following Figure A.1.

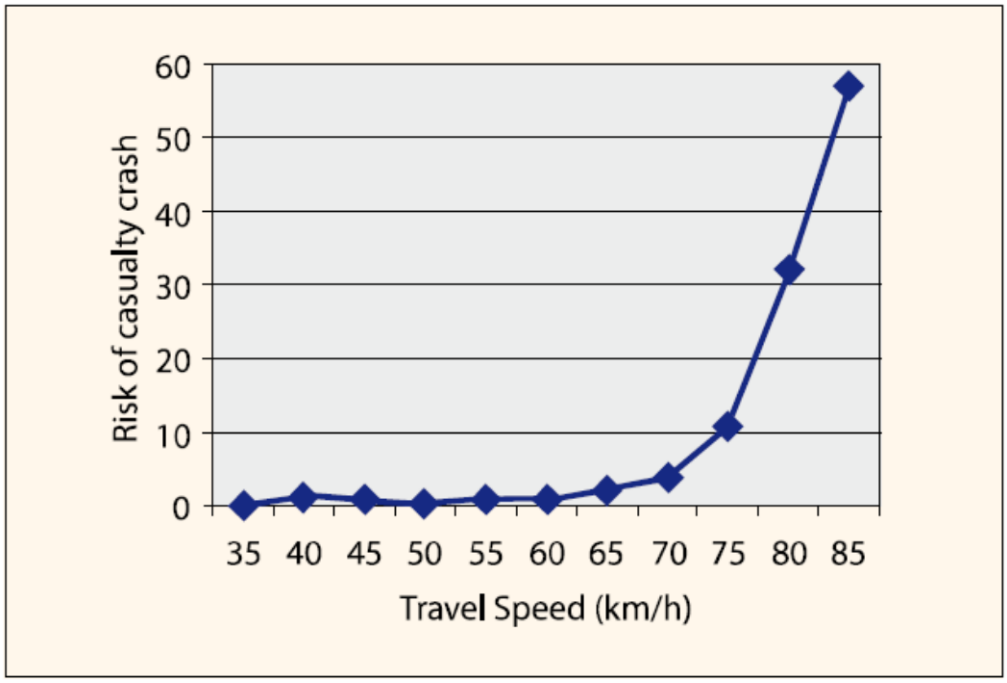


Figure A.1: Relative risk of involvement in a casualty crash

- Studies have indicated that the introduction of the 50 km/h default built-up speed limit in Victoria resulted in a reduction in all casualty crashes of around 12%, and a 25-46% reduction in pedestrian fatal and serious injury crashes on those roads.
- The relationship between vehicle speed and crash severity is critical for pedestrians as shown in Figure A.2. Pedestrians and cyclists are likely to be relatively safe only in areas with traffic speeds of below 40 km/h. At this speed, most potential collision situations can be recognised by drivers and avoided. If a collision occurs, damage and injury will be light to severe but rarely fatal. On average, eight out of ten pedestrians die if hit by a car travelling at 50 km/h, while only one out of ten dies if the car is travelling at 30 km/h.

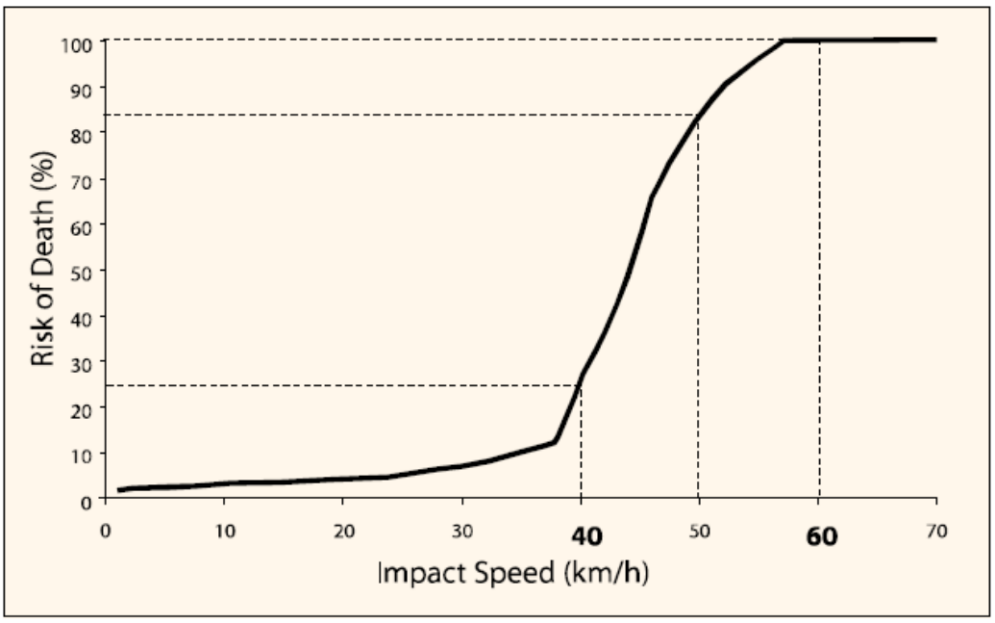


Figure A.2: Risk of pedestrian death as a function of vehicle impact speed (Source: Anderson et al, 1997)

Without appropriate speed limits, drivers can tend to travel above safe speeds because they lack full awareness of the risk of crashes and the consequences of crashes. Recent research has suggested that road characteristics can influence or restrict drivers so that they travel at an appropriate speed. However, many roads give misleading messages to drivers and riders and speed limits are considered to be the most powerful road feature that determines speed choice. Surveys have found that many drivers regard the posted speed limit as an indication of a target speed to be maintained under any road or vehicle conditions. This is not an appropriate mindset. Surveys have also found that drivers underestimate their travelling speed and also believe themselves to be safer and more skilled than the average driver.

References:

‘Effective Speed Management’ J Oxley & B Corben, Monash University Accident Research Centre, 2002.

‘Balance Between Harm Reduction and Mobility in Setting Speed Limits: A Feasibility Study’ B Fildes et al, Austroads, 2005.

‘An Evaluation of the Default 50 km/h Speed Limit in Victoria’ E. Hoareau, S Newstead & M Cameron, Monash University Accident Research Centre, 2006.

‘Vehicle Travel Speeds and the Incidence of Fatal Pedestrian Crashes’ R.W.G. Anderson, A.J, McLean, M. J.B, Farmer, B.H, Lee & C.G. Brooks, Accident Analysis and Prevention Vol. 29, pp 667-674, 1997.

Appendix B - Assessment of Remote School Crossings

In accordance with Section 5.3, a school speed zone may be established at a remote school crossing at which the safety risk for students using the crossing is high.

The risk at remote school crossings shall generally be determined based on consideration of the following factors which are representative of the likelihood and potential severity of a crash involving a school student:

- Traffic speed
- Number of school children using the crossing
- Traffic volume
- Proportion of heavy vehicles
- The type of crossing
- Number of traffic lanes to be crossed
- Number of conflicting traffic movements
- Sight distance limitations.

The minimum requirements for a site to be considered for a school speed zone are:

- The presence of a marked pedestrian crossing (excluding "zebra" crossings at left turn slip lanes)
- At least 20 school students using the crossing in an hour
- At least 300 vehicles per hour (two-way)
- A speed limit of 60 km/h or higher
- A level of risk that exceeds the threshold specified by VicRoads.

The level of risk is determined by calculating a risk score for a remote school crossing. The score is indicative of the relative risk based on consideration of the factors listed above. An Excel spreadsheet which has been developed for this purpose is available on VicRoads' website at the same location as the TEM, Volume 3.

The following information provides guidance on how to determine the risk score and use of the Excel spreadsheet.

Relative Risk Factors

There are nine inputs related to the risk factors that are required to be entered into the spreadsheet. Each of these is selected from a drop down menu. The spreadsheet assigns a relative risk factor for each of the inputs. The relative risk factors are based on research or expert opinion where relevant research is not available. The risk score for a site that is being assessed is the product of the relative risk factors for that site.

Traffic Speed

The traffic speed is to be taken as the speed limit at the location of the crossing that is being assessed. Where the speed of traffic approaching a crossing is affected by traffic congestion, the risk rating relating to speed is modified to account for the impact of congestion. Congestion is to be rated as follows:

- High if the speed of traffic is reduced below the speed limit by 10 km/h or more as a result of congestion
- Medium if the speed of traffic is reduced below the speed limit by around 5 km/h
- Low if traffic conditions are such that vehicles are able to travel at or close to the speed limit.

Pedestrian Volume

The pedestrian volume is the peak number of school children (primary or secondary) using a crossing in any one hour of a typical school day. The number from the drop down menu that is closest to the actual measured volume is to be selected.

Traffic Volume

The traffic volume is the number of vehicles passing over the crossing during the hour corresponding to the peak pedestrian volume. One-way volumes are to be used on divided roads where the risk associated

with the crossings on each carriageway are being assessed separately because crossing movements are staged (more information regarding the assessment of divided road crossings is provided below). The number from the drop down menu that is closest to the actual measured volume is to be selected.

Proportion of Heavy Vehicles

A heavy vehicle is any vehicle with a gross vehicle mass (GVM) of more than 4.5 tonnes. The proportion of heavy vehicles to be used is that which corresponds to the hour of the peak pedestrian volume.

Type of Crossing

One of the following types of pedestrian crossing is to be selected from the drop down menu:

- Marked pedestrian crossing at signalised intersections
- Mid-block pedestrian operated signals
- "Zebra" crossing
- Flagged school crossing

Number of Traffic Lanes

The number of traffic lanes to be crossed is to be limited to through lanes and other lanes where traffic can traverse the crossing at or close to the speed limit. Right and left turn lanes shall generally be excluded as the introduction of a school speed zone would have no impact on the risk of crossing these lanes.

Conflicting Traffic Movements

Traffic movements (or traffic directions) that potentially conflict with pedestrian movements are taken into consideration into the risk assessment where they may be made at or near the speed limit. Low speed traffic movements (e.g. right turn movements across a crossing at a signalised intersection) are excluded because the introduction of a school speed zone would not impact on the risk associated with these movements.

The number of conflicting traffic movements will generally be:

- One, for one-way roads and for cases where the crossing of carriageways of divided roads are being assessed independently because crossing movements are staged
- Two, for two-way undivided roads and divided roads where the pedestrian movements are not staged.

In a limited number of cases, the number of conflicting movements may be three e.g. at a skewed intersection where it is possible to execute a right turn movement at or close to the speed limit or at an intersection with more than four legs.

Sight Distance

Where the sight distance on the approach to a crossing is below standard, the risk at the crossing will be higher. The relative risk is modified based on the sight distance being approximately 2/3 or 1/3 of the required standard for the speed limit. For the purposes of this assessment process the required minimum sight distance shall be taken from table below.

Table B.1: Minimum sight distance requirements

Speed limit	Sight Distance
60 km/h	80 m
70 km/h	105 m
80 km/h	130 m
90 km/h	160m

Divided Roads

The risk assessment of crossings of each carriageway of a divided road shall be undertaken independently if crossing movements are staged. The risk scores for each carriageway crossing are then added to determine the total risk score for the site for the purpose of ascertaining if the score exceeds VicRoads threshold.

Appendix C - Glossary of Terms

Built–up area – In RSRR (2009), a "built-up area, in relation to a length of road, means an area in which either of the following is present for a distance of at least 500 m or, if the length of road is shorter than 500 m, for the whole road – (a) buildings, not over 100 m apart, on land next to the road; (b) street lights not over 100 m apart".

Coordinating road authority – the road authority responsible for managing the road in accordance with the Road Management Act 2004.

Outer metropolitan town centre – typically a town centre within the metropolitan and rural interface councils.

Remote school crossing – a formal pedestrian crossing (including flagged school crossings, zebra crossings, pedestrian operated signals and marked pedestrian crossings at signalised intersections) that is used by school children and is located on a section of road that does not have a gate that is used by students to access a school.

Road – A 'road' is defined by Rule 12 of RSRR (2009) as 'an area that is open to or used by the public and is developed for, or has as one of its main uses, the driving or riding of motor vehicles…'.

Roadside development categories – are defined in AS 1742.4, Manual of uniform traffic control devices, Part 4: Speed controls, as follows:

- **Fully built-up** – residential, business or industrial development extending along at least 90% of the road frontage on both sides of the road. The development may include schools, shops, playing fields etc.
- **Partially built**-up – residential, business or industrial development along 25% to 90% of the road frontage on both sides of the road. This is typical of an urban fringe area or a rural township.
- **Sparsely built-up** – similar to partially built-up but the development extends along less than 25% of the road frontage or occurs on only one side of the road. This is typical of the rural / urban fringe or a small rural village.
- **Farmland** – not more than 20 residences per kilometre (the total of the two sides), generally set well back (typically 50 m or more) from the road and no other development.
- **Undeveloped** – no development on either side of the road except for isolated houses set well back (typically 50 m or more) from the road and less than 5 access points per kilometre.

Rural area – an area outside the built-up area.

Rural town centre – the fully built-up centre of any township outside the Melbourne metropolitan area.

School days – a "declared school day" is defined in RSRR (2009) (Rule 317A (3)) as "any day determined by the Minister administering the Education and Training Reform Act 2006 under regulation 10 of the Education and Training Reform Regulations 2007 to be a day on which a Government school is to be open for attendance by students, and that is not one of the following:

- A Saturday or a Sunday; or
- A day appointed under the Public Holidays Act 1993 as a public holiday in the place in which the traffic control device is located."

For information on the Victorian school term dates, refer to the 'Term Dates' section of the Department of Education and Training website (http://www.education.vic.gov.au/about/department/Pages/datesterm.aspx) or from The Department of Education and Training homepage by clicking on About the Department > Our Department > Key Dates > Term Dates.

Shared zone – is defined in RSRR (2009) (Rule 24(2)). A shared zone is:

- A length of road between a shared zone sign and an end shared zone sign or dead end, along which there are no intersections.
- A network of roads within an area with a shared zone sign on each road into the area (showing the same speed limit) and an end shared zone sign on each road out of the area.
- A road related area between a shared zone sign and an end shared zone sign.

A shared zone is used in streets where it is desirable for pedestrians to have priority over vehicles whilst maintaining a basic level of access for motor vehicles (refer to the VicRoads Supplement to AGTM Part 8,

Section 7.5.7). A “driver driving in a shared zone must give way to any pedestrian in the zone” (RSRR (2009), Rule 83).

Vehicle – see RSRR (2009), Rule 15.

Appendix D - Speed Management Treatments for Permanent Lower Speed Limit Road Environments

This appendix provides information on a range of traffic management treatments that may be used to modify the road environment to support lower speed limits. Typically, the treatments presented are suitable for non-arterial roads, although some may be adapted for use on arterial roads. All treatments reduce traffic speeds to some extent and provide a visual cue indicative of a lower speed environment. A broad effectiveness rating is shown for each treatment to indicate the possible impact on traffic speeds. One star represents limited effectiveness, four stars indicates highly effective.

D1 Parking and Bicycle Lanes

Description

Marked parking and bicycle lanes are on-road facilities that can be used to formally reallocate road space and reduce the trafficable width of the roadway.

Bicycle lanes enhance safety for cyclists by providing spatial separation between bicycles and motor vehicles. Bicycle lanes are generally most effective where there is a significant difference between bicycle and vehicle speeds.

Local streets do not usually require bicycle lanes as the low speed environments mean that bicycles and vehicles generally interact well. However, they may be justified on wide roads in 40 km/h zones near schools to reduce lane widths available to vehicular traffic.

On streets where bicycle lanes are used in combination with speed management devices, such as road humps and slow points, care needs to be taken to ensure that the mobility and safety of cyclists are maintained.

Effectiveness

There is no evidence to demonstrate that marked parking and / or bicycle lanes are effective treatments for reducing vehicle speeds, although they are effective at reducing crash risk (Morris et al, 2004).

The effectiveness in 40 km/h school speed zones could be improved by combining the treatment with kerb outstands or threshold treatments.

Installation

Parking and bicycle lanes can be marked on any road given authorisation from the relevant road authority. A bicycle lane must have a bicycle lane sign at the beginning and, in most cases, an end bicycle lane sign at the end as per Rule 153 of Roads Rules – Victoria.

Care must be taken with the design of pavement markings to ensure that they comply with appropriate standards. The width of bicycle lanes and combined bicycle / parking lanes should comply with the standards specified in Austroads Guide to– Road Design, Part 3, Geometric Design.

Where kerbside parking is permitted, designs that reduce or eliminate the risk of ‘car dooring’ crashes should be considered.

Further information

Further information including details of lane configurations with and without parked cars can be found in:

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- Australian Standard AS 1742.9 – 2000, Manual of Uniform Traffic Control Devices, Part 9: Bicycle Facilities

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Low cost way of changing the road environment • Reduced riding stress for cyclists • Encourages greater bicycle use • Reduced risk of bicycle crashes	• Effectiveness in reducing vehicle speeds is limited • Risk of 'car dooring' crashes where kerbside parking is permitted	Low	★

Examples

Keck Street, Flora Hill, Bendigo

Highett Street, Richmond

D2 Transverse Lines

Description

Transverse lines consist of intermittent pavement markings, which may be flush or raised, that extend across the traffic lanes. They are a common low cost treatment that is used to alert drivers that they are approaching a hazard or a potentially hazardous location at which they are required to reduce speed. They have typically been used on the approaches to dangerous intersections and low speed curves.

Raised transverse lines have a rumble effect. Rumble strips provide an audible and tactile sensation to drivers. Gupta (1994) found that rumble strips can increase noise levels by up to 6 to 8 decibels, making them less appealing for use in residential areas.

Provision may need to be made for cyclists to bypass raised transverse lines if they are likely to affect cyclists' stability or comfort.

Effectiveness

Research into the effectiveness of rumble strips is generally inconclusive although some studies have shown reductions in speed of between 5 per cent and 12 per cent.

Flush transverse lines have limited influence on travel speeds. Their benefit is largely confined to a visual indication to motorists of a change in road conditions ahead.

Installation

The treatment generally involves marking the full width of the approach lane(s) in advance of the hazard. It is common practice to reduce the spacing between successive transverse lines in the direction of vehicle travel to create the impression that the closure speed is too fast so the driver is encouraged to respond. However, evenly spaced lines may also be used. Research on whether the former pattern is more effective is inconclusive.

Care must be taken to ensure that transverse lines have adequate skid resistance which, as far as is practical, is similar to the surrounding road surface.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Can be effective in reducing speeds if raised • Easy and inexpensive to install	• Rumble strips can increase noise levels • Potential for objections from nearby residents	Low	★ Flush ★★ Raised

Examples

Jumping Creek Road, Wonga Park

Maltravers Road, Ivanhoe

D3 Perimeter Threshold

Description

Perimeter threshold treatments are generally coloured or textured road surfaces that contrast with the adjacent street pavement. They are useful treatments to alert drivers that they are entering a lower speed zone.

Treatments should be at least around five metres long to ensure adequate visual impact, though longer is preferable.

A painted treatment may be used as a lower cost alternative, although care needs to be taken to ensure that skid resistance is not compromised.

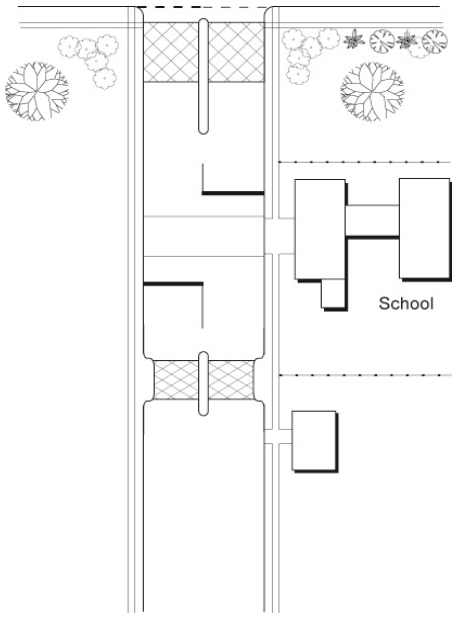
On wide streets threshold treatments are often combined with kerb outstands and / or splitter islands to enhance their impact.

A threshold treatment at each end of a 40 km/h school speed zone in a local street is a useful option to define the lower speed environment in the vicinity of a school.

Effectiveness

Threshold treatments are used to alert motorists of a change in the road environment. When used in isolation their effect on vehicle speeds is likely to be limited. Accordingly, other measures may be required to continue to reinforce the need for reduced speed along a street in which threshold treatments have been installed.

Installation



Typical installation of perimeter threshold treatment

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Relatively low cost treatment to alert drivers to a change in speed environment	• Limited effectiveness in reducing speeds • Possible confusion of pedestrian and vehicle priority	Low - Medium	★

Examples

Orchard Valley Avenue / Pakenham Road, Pakenham

Orange Grove / Scoresby Road, Bayswater

D4 Kerb Extensions

Description

On wide roads the space available to moving traffic can be reduced by extending the kerb beyond its normal alignment. Generally this is achieved by creating a number of short, regularly spaced outstands (usually in pairs opposite each other) along the section of road being treated.

Kerb extensions may be constructed at intersections, mid-block or a combination of both. They are often provided in combination with a parking lane and / or a bicycle lane.

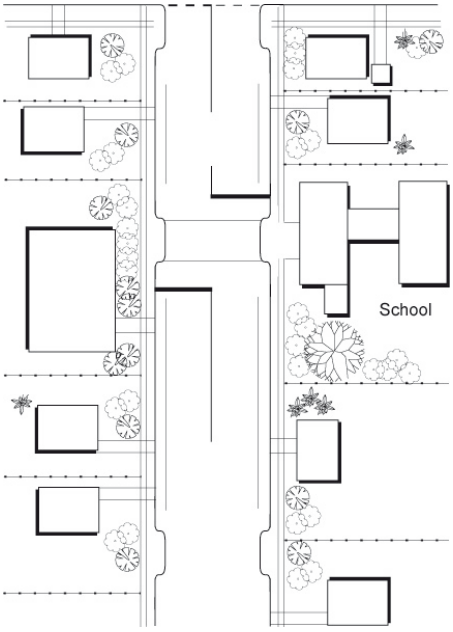
Care should be taken in the design of a kerb extension to ensure that pinch points are not created for cyclists. Provision for cyclists (such as a bicycle lane or bypass path) should be considered in the design of any road narrowing treatments.

Effectiveness

Kerb extensions physically change the road environment by reducing the road width available to moving traffic. They therefore encourage lower speeds.

Kerb extensions also reduce the crossing distance for pedestrians and can improve visibility between pedestrians and traffic.

Installation



Typical installation of kerb extension treatment

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• May reduce traffic speed • Reduces the crossing distance for pedestrians • Usually improve the visibility of pedestrians • Provides landscaping opportunities • Relatively low cost	• Reduction in kerbside parking • May make parking manoeuvres more difficult • May be difficult to provide a safe area for cyclists	Medium	★★

Examples

Lincoln Street, Richmond

Victoria Road, Hawthorn East

D5 Road Cushions

Description

Road cushions are a form of road hump, but are installed in narrow segments that can be straddled by wide vehicles. They allow bicycles and wide wheel base vehicles (trucks, buses, and many emergency vehicles) to traverse them unimpeded (depending on the vehicle's tracking width).

Road cushions are more acceptable to bus operators than other types of road humps and traffic management devices that are restrictive for buses.

Effectiveness

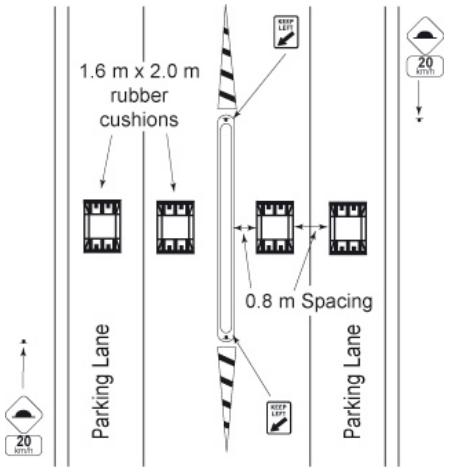
Road cushions are an effective device for reducing car speeds and increasing pedestrian safety. They can reduce car speeds by up to 20 per cent when spaced at appropriate intervals. Average car speeds over road cushions are generally in the range of 25 km/h to 30 km/h.

Road cushions may also deter through traffic.

They are less effective at reducing the speed of wider vehicles and motorcycles, as these vehicles are generally able to pass the road cushions unimpeded.

Installation

Road cushions are administered as road humps, which are Major Traffic Control Devices. Councils have delegated approval to install road humps on local roads subject to complying with the conditions associated with the delegation.



Typical installation of road cushions

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management
- Department of Transport (2008), Public Transport Guidelines for Road Use Development (available at http://economicdevelopment.vic.gov.au/transport under About transport in Victoria > Guidelines for land use development)

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective in reducing car speeds • Deterrence to through traffic • Minimal impact on buses and emergency vehicles • Easy to use as a trial	• Perceived increase in traffic noise • Possible diversion of traffic onto adjacent streets • Potential objections from nearby residents	Low - Medium	★★★

Examples

Wynnstay Road, Prahran

McMahons Road, Ferntree Gully

D6 Median Treatment

Description

In a wide street, a median can be provided to narrow the trafficable roadway. Medians can be raised or flush with the pavement. Flush medians can be created using linemarking only, although a contrasting surface material can be more effective.

Medians near schools can also be used as pedestrian refuges. However, care needs to be taken to ensure that children use controlled crossings where they exist. Raised median treatments provide a higher level of protection for pedestrians. However, they should be free of obstructions that would affect sight lines if used as a pedestrian refuge and Disability Discrimination Act (DDA) compliant crossing points should be provided at regular intervals.

Flush median treatments are often preferred to raised medians in local streets as they do not restrict access to and from driveways.

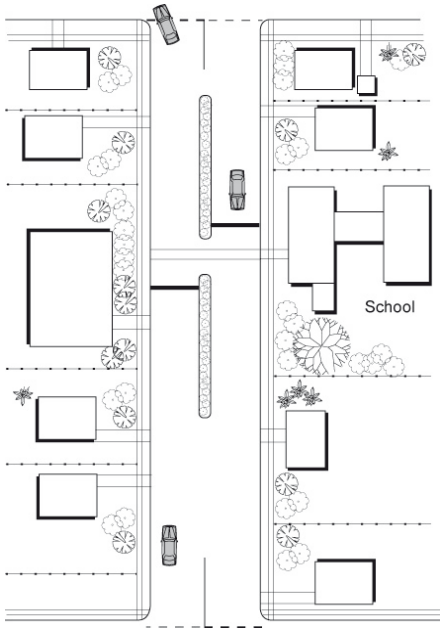
Effectiveness

Mid-block median treatments can be effective in reducing vehicle speeds and crash risk whilst increasing pedestrian safety. The treatment should preferably be consistent along the length of road as short sections are less effective. The use of planted trees can, over time, create a canopy that may further encourage lower vehicle speeds. However, care must be exercised to ensure that trees are not hazardous or restrict sight lines, particularly to pedestrians.

The potential impact on cyclist safety and mobility as a consequence of reduced road space should be assessed when considering the use of median treatments.

Installation

The linemarking adjacent to flush median treatments may be continuous or broken depending upon the traffic movements to be permitted across the median.



Typical installation of median treatments

Further Information

- Austroads (2008), Guide to Traffic Management, Part 8: Local Area Traffic Management
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management
- AS1742.2 (2009) – Manual of Uniform Traffic Control Devices, Part 2: Traffic Control Devices for General Use

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective way of reducing width of traffic lanes • Provides opportunity for landscaping • May provide protection / refuge for pedestrians	• May reduce kerbside parking • May restrict access to abutting properties • May reduce cyclist safety	Low-High	★★

Examples

Whitehorse Road, Balwyn

Victoria Road, Hawthorn East

D7 Road Humps

Description

Road humps are vertical deflection devices that extend laterally across the roadway with the objective of slowing traffic. They have a curved profile with a maximum height of 100 mm. The Watts profile is the preferred shape for on-road applications in Victoria. The sinusoidal profile, which was previously acceptable, is no longer to be used as its maximum height (120 mm) has been found to be excessive.

Road humps (Watts profile or similar) are generally not acceptable on bus routes (including school buses) or in streets with a high content of commercial vehicles.

Bypasses of road humps should be provided for cyclists where practical, particularly on streets where a bicycle lane is provided and on other popular bicycle routes.

Effectiveness

Road humps are very effective in moderating vehicle speeds. However, they tend to provoke strong resident response – both for and against.

Speed reductions of around 30 per cent are generally experienced in the immediate vicinity of road humps. To achieve speed reduction benefits over a length of road, a series of regularly spaced road humps is required. Spacing should typically be in the range of 80 to 120 metres.

Road humps may also deter through traffic.

Installation

Road humps are Major Traffic Control Devices. Councils have delegated approval to install road humps on local roads subject to complying with the conditions associated with the delegation.

They are commonly constructed using asphalt and must be delineated by road hump pavement markings unless they consist of material that contrasts with the adjacent road surface.

Road hump warning signs together with 20 km/h advisory speed signs are required to be erected at most installations. Adequate sight distance must be provided for approaching traffic and street lighting is required.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management (Includes details of road hump markings and hump dimensions)
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Deterrence to through traffic	• Perceived increase in traffic noise • Possible diversion of traffic to other streets • Potential objections from nearby residents • Not favoured on bus routes	Medium	★★★★

Examples

Scarborough Road, Epping

Orange Grove, Bayswater

D8 Raised Pavements / Safety Platforms

Description

Raised pavements, or flat top road humps, are raised sections of roadway with a flat top and ramps that are raised above the normal road level usually by 90 to 100 mm. In mid-block locations they extend laterally across the roadway and are usually two to six metres in length (excluding the ramps).

Raised pavements may also be located at the intersection of two local streets or as a raised threshold at the entry to a local street. For intersection applications, the ramps should not be within the intersection.

Raised pavements are generally not acceptable on bus routes (including school buses) or in streets with a high content of commercial vehicles.

Bypasses of raised pavements should be provided for cyclists where practical, particularly on streets where a bicycle lane is provided and on other popular bicycle routes.

Effectiveness

Raised pavements are very effective in moderating vehicle speeds. However, they tend to provoke strong resident responses – both for and against.

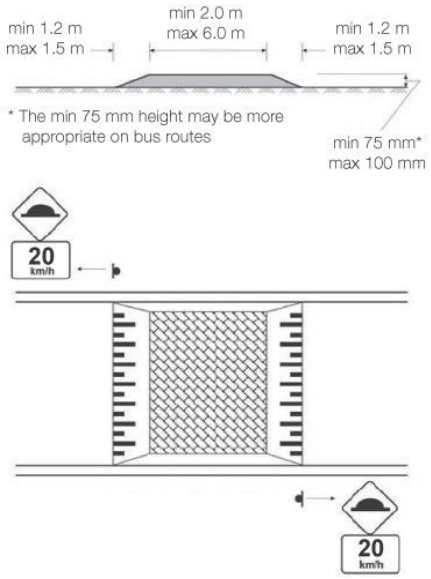
Raised pavements have been found to be effective in reducing vehicle speeds by around 25 per cent in 40 km/h zones in the immediate vicinity of the device. To achieve speed reduction benefits over a length of road, a series of regularly spaced raised pavements is required. Spacing should typically be in the range of 80 to 120 metres.

Raised pavements may also deter through traffic.

Installation

Raised pavements are a form of road hump which are Major Traffic Control Devices. Councils have delegated approval to install road humps on local roads subject to complying with the conditions associated with the delegation.

Requirements relating to delineation, warning signs, sight distance and lighting are as for road humps.



Typical installation of a raised pavement

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management (Includes details of road hump markings and hump dimensions)
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Deterrence to through traffic	• Perceived increase in traffic noise • Possible diversion of traffic to other streets • Potential objections from nearby residents • Not favoured on bus routes	Medium	★★★★

Examples

Bamfield Street, Sandringham

Perkins Avenue, Ivanhoe

D9 Wombat Crossings

Description

Wombat crossings are a variant of the raised pavement with the flat top marked for a pedestrian crossing. They were initially used mainly for pedestrian crossings (i.e. zebra crossings). However, they are now commonly used at school crossings.

Wombat crossings not only enhance the visibility of the pedestrian crossing, but also force vehicles to slow down as they approach the crossing. They also give the driver a sense that they are encroaching into pedestrian space, rather than the pedestrian encroaching within the road space.

Because of the raised pavement, wombat crossings are generally not acceptable on bus routes (including school buses) or in streets with a high content of commercial vehicles.

Bypasses of wombat crossings should be provided for cyclists where practical, particularly on streets where a bicycle lane is provided and on other popular bicycle routes.

Effectiveness

Wombat crossings are effective in reducing vehicle speeds within the immediate vicinity of a pedestrian or school crossing. They enhance crossing visibility and can reduce the crash risk for pedestrians.

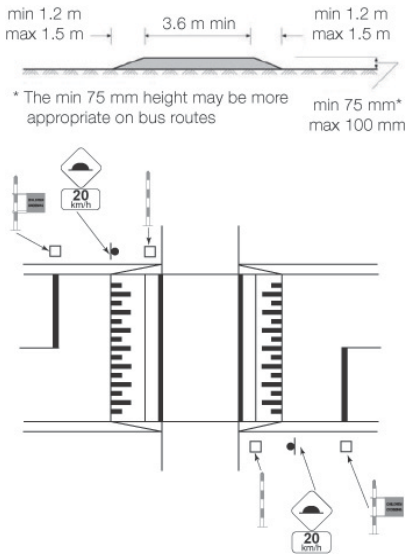
Wombat crossings are commonly used in combination with other treatments, such as a sequence of raised pavements or kerb extensions, which enhances their effectiveness.

Installation

Raised pavements incorporated into wombat crossings are Major Traffic Control Devices. Councils have delegated approval to install road humps on local roads subject to complying with the conditions associated with the delegation.

Requirements relating to delineation, warning signs, sight distance and lighting are similar to those for road humps but with the addition of the appropriate crossing markings and signs.

Ideally, the raised platform and the adjacent footpath should be at or about the same level.



Typical application of a wombat crossing

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management (Includes details of road hump markings and hump dimensions)
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Deterrence to through traffic	• Perceived increase in traffic noise • Possible diversion of traffic to other streets • Potential objections from nearby residents • Not favoured on bus routes	Low - Medium	★★★★

Examples

Wallarano Drive, Noble Park

Richardson Street, Middle Park

D10 Urban Landscaping

Description

Various forms of landscaping can be used to alter drivers' perception of the road environment in order to influence vehicle speeds. Often this will involve reducing the width of traffic lanes by constructing kerb outstands or modifying the alignment of kerbs over an extended length. Treatments which create a feeling of being in a more enclosed space can be effective (Westerman et al, 1993).

Tree planting on nature strips or in kerb outstands can be used to create a canopy over the roadway which creates a sense of enclosed space. Appropriate clearances to trees must be provided for operational and safety reasons.

Effectiveness

The effectiveness of landscaping will vary for different types of treatments. Treatments that include a reduction in the width of traffic lanes and create a sense of a more enclosed space are more likely to reduce travel speeds.

The use of bollards on gravel roads has been found to be an effective speed reduction treatment around schools in rural settings.

Installation

Care should be taken to ensure that obstacles close to the road do not increase crash risks and are forgiving of driver error.

Landscaping should be designed to avoid any reduction in sight distance, pedestrian visibility and obstruction to either underground or overhead services (Corben and Duarte, 2006).

If bollards are used they should be 150 – 200mm diameter and approx. 800mm high so they are visible to pedestrians and reversing vehicles.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• More pleasant road environment • Effective in changing the perception of the speed environment	• Some treatments may increase crash risk • Reduction in parking for some treatments • Trees take time to reach maturity • Effect on vehicle speeds may be limited	Medium	★★

Examples

Wynnstay Road, Prahran

Sasses Avenue, Bayswater

D11 Angled Slow Point (Chicane)

Description

Angled slow points are created by extending the kerbs on each side of the roadway. The kerb extensions are offset so that they form a chicane. The result is that the roadway is narrowed and the path of vehicles passing through the device is deflected and their speed is reduced.

Angled slow points may be single lane (which requires a driver to give way to a vehicle which has entered or is about to enter the slow point from the opposing direction) or two lane. Two lane angled slow points usually require a median island to be installed to ensure effective speed control.

Single lane angled slow points are not acceptable on bus routes, including school bus routes.

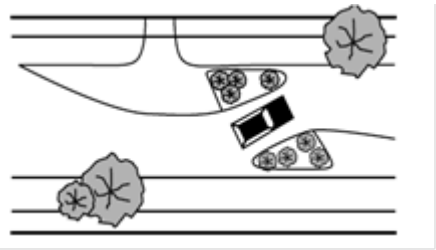
Effectiveness

Angled slow points are effective for reducing vehicle speeds in the vicinity of the treatment. Single lane facilities are generally more effective in controlling vehicle speeds than two lane slow points. For effective speed control over an extended length, spacing for slow points should be similar to that for speed humps – 80 to 120 metres is common.

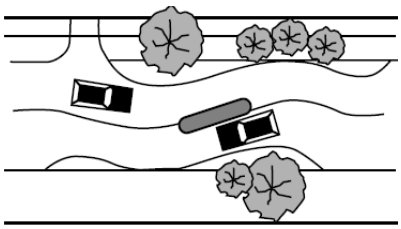
Careful design is required to ensure that roadside safety is not compromised. For example, angled slow points should be located so that there are no trees or power poles on the departure side of the device.

Slow points will force bicycles into the traffic stream, possibly creating conflicts with vehicles and discomfort for cyclists. This may be a particular issue in the vicinity of schools where children ride to school. Design should therefore carefully consider the needs of cyclists and alternative routes provided where possible.

Installation



Single lane angled slow point



Two lane angled slow point
Typical installation of slow points

Note: Landscaping must not restrict visibility of pedestrians.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13: Local Area Traffic Management (Includes typical layouts of one and two lane angled slow points)
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Deterrence to through traffic • Provides opportunity for landscaping	• Reduction in parking • Possible diversion of traffic to other streets • Doesn't reduce the speed of motorbikes • Reckless drivers may see them as a challenge and try to speed through them • Single lane slow points are unacceptable on bus routes	Medium - High	★★★

Examples

Dobson Street, Ferntree Gully

Kent Street, Richmond

D12 Blister Island (Chicane)

Description

Blister islands are oval or similar shaped islands in the centre of the roadway which may reduce the lane width and cause traffic to be deflected from a straight path in much the same way as at a roundabout.

They may also be used as pedestrian refuges, a function that may be useful within school zones.

Landscaping must not restrict visibility of pedestrians and appropriate clearances provided to trees for operational and safety reasons.

Blister islands may be used on bus routes (with agreement of the bus operator) provided that they are designed to cater for a large vehicle. However, this may reduce their effectiveness to moderate the speeds of smaller vehicles.

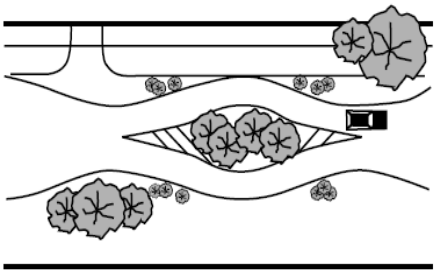
Effectiveness

Blister islands have been shown to be effective in reducing vehicle speeds in the immediate vicinity of the treatment. It is recommended that they be installed at regular spacing or combined with other treatments to spread the effectiveness along the road.

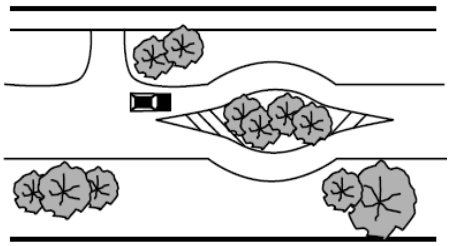
As with other types of slow points, blister islands have the potential to create squeeze points for bicycles if not designed carefully. The design should therefore carefully consider the needs of cyclists and alternative routes or bypasses provided where possible.

When used as a pedestrian refuge they can enhance pedestrian safety.

Installation



Blister island on a narrow road



Blister island on a wide road

Typical installation of blister islands

Road widening is required to construct a blister island on a narrow road whereas on wider roads the kerbs may need to be extended on the approaches to the island.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- VicRoads Supplement to AGTM (2015) - TEM Volume 1, Part 2.8 – Local Area Traffic Management

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Provides opportunity for landscaping • Can be used as a pedestrian refuge	• Reduction in parking • May affect ease of access to abutting properties • Limited effect on the speed of motorcycles • Reckless drivers may see them as a challenge and try to speed through them	Medium – High	★★★

Examples

Mathoura Road, Toorak

Beverley Road, Heidelberg

D13 Roundabouts

Description

Roundabouts are a form of intersection treatment that are designed so that all vehicles passing though the intersection are forced to deviate from a straight travel path to negotiate a circular or near circular central island.

Raised traffic islands on the approaches to a roundabout are also desirable to guide traffic through the intersection and assist with speed control. However, on narrow road approaches it may be necessary to provide painted islands on the approaches.

The construction of roundabouts at each end of a 40 km/h speed zone on a local street is an option that could be used to define a school zone and moderate vehicle speeds.

Effectiveness

Roundabouts effectively control the speed of vehicles travelling through an intersection and in the immediate vicinity. Because they reduce the relative speed and potential impact angle between conflicting vehicle movements, roundabouts typically have lower crash rates than most other types of intersections.

Pedestrians do not have priority over vehicular traffic at roundabouts and this can cause some confusion and difficulties. However, the speed control features of roundabouts make them a safer alternative in local streets for pedestrians than intersections controlled by give way or stop signs.

Installation

A roundabout must be designed to cater for the vehicle types that are expected to use the intersection. Roundabouts are generally not favoured on bus routes, and in local streets it may be difficult or impractical to provide for buses due to space constraints. There are a number of publications that provide design guidance, including those listed below.

Consideration must also be given to the needs of cyclists as roundabouts can pose problems for them.

Further Information

- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management
- Austroads (2013), Guide to Traffic Management, Part 6: Intersections, Interchanges and Crossings
- AS1742.13 – 2009, Manual of Uniform Traffic Control Devices, Part 13: Local Area Traffic Management
- VicRoads Supplement to AS 1742.12:2000 - TEM Volume 2, Part 2.12 – Bus, transit, tram and truck lanes
- Department of Transport (2008), Public Transport Guidelines for Land Use Development (available at http://economicdevelopment.vic.gov.au/transport under About transport in Victoria > Guidelines for land use development)

Advantages	Disadvantages	Cost Rating	Effectiveness Rating
• Effective speed reduction • Safe form of intersection control • Can deter through traffic • Provide opportunities for landscaping	• Relatively expensive • Generally not favoured on bus routes • Can be difficult to negotiate for cyclists and pedestrians	Medium – High	★★★★

Examples

Jardier Terrace, South Morang

Abbott Street, Sandringham

D14 References

- Austroads (2008), Guide to Road Safety, Part 3: Speed Limits and Speed Management
- Austroads (2014), Guide to Traffic Management, Part 5: Road Management (Section 5)
- Austroads (2015), Guide to Traffic Management, Part 13: Road Environment Safety.
- Australian Standard AS 1742.4–2008, Manual of uniform traffic control devices, Part 4: Speed controls.
- Austroads (2016), Guide to Traffic Management, Part 8: Local Area Traffic Management. Austroads, Sydney, NSW, Australia.
- Christchurch City Council (2000), Local Area Traffic Management Policy and Guidelines Draft Report. City Streets Unit, Christchurch City Council, Christchurch, New Zealand.
- Corben, B., and Duarte, A. (2006), Injury Reduction Measures in Areas Hazardous to Pedestrians, Stage 1: Countermeasure Options. Monash University Accident Research Centre (MUARC) Report No. 169. Melbourne, Australia.
- Department of Transport (2008), Public Transport Guidelines for Land Use Development. Department of Transport, Public Transport Division, Melbourne, Victoria.
- Ewing, R. (1999), Traffic Calming: State of Practice. Publication No. IR-098. Prepared by the Institute of Transportation Engineers (ITE) for the U.S. Department of Transportation, Federal Highway Administration, Office of Safety Research and Development and Office of Human Environment, Washington, USA.
- Fildes, B., Godley, S., Triggs, T and Jarvis, J. (1997), Perceptual Countermeasures: Simulator Validation Study. Report No. CR169. Prepared by the Monash University Accident Research Centre for the Federal Office of Road Safety and Road Safety Bureau, RTA, NSW, Australia.
- Gorrill, D. (2007), Transportation Research Synthesis (TRS 0701). Transverse Rumble Strips. Minnesota Department of Transport, St Paul, Minnesota, USA.
- Gupta, J. (1994), Development of Criteria for Design, Placement and Spacing of Rumble Strips. Project No. 14465. Ohio Department of Transport, USA.
- Knapp, K.K, (2000), Traffic-Calming Basics. Civil Engineering – ASCE, Vol. 70, No. 1, January 2000, pp46-49.
- Morris, P., Damon, P., Brindle, R., Gan, C. (2004), Guide to Traffic Engineering Part 10 – Local Area Traffic Management. Austroads Publication No. AP-G11.10/04. Austroads, Sydney, Australia.
- Queensland Transport (1991), A Seminar on Local Area Traffic Management. Proc. A Seminar on Local Area Traffic Management, Brisbane, Sponsored by Queensland Transport, Queensland, Australia.
- Ratio Consultants (2002), Bayside City Council Road Safety Strategic Plan Draft Report. Prepared by Ratio Consultants Pty Ltd and Hennessey Services Pty Ltd. Ref No. 4547#3/MR. Bayside City Council, Australia.
- Roads and Traffic Authority (2011), Technical Direction for Traffic and Transport Practitioners: Use of Traffic Calming Devices as Pedestrian Crossings. Reference No. TDT 2001/04a. Roads and Traffic Authority (RTA), NSW, Australia
- Roads and Traffic Authority (1990), Neighbourhood Road Safety and Amenity. Produced by Geoplan Town Planning for the Western Sydney Regional Organisation of Councils and the Roads and Traffic Authority (RTA), Sydney, Australia.
- Saferoads (2004), Looking out for Pedestrians an Outline, A Guide to Programs to Improve Pedestrian Safety in Local Communities, A Resource for Local Government. Roads Corporation, Victoria.
- Saferoads (2005), Not So Fast, An Information and Enforcement Program to Tackle Speeding in Local Communities, A Resource for Local Government and Community Road Safety Councils. Roads Corporation, Victoria.
- Standards Australia (2000), Australian Standard AS 1742.9 – 2000 Manual of Uniform Traffic Control Devices, Part 9: Bicycle Facilities. Standards Australia, Homebush, NSW.
- Standards Australia (2009), Australian Standard AS 1742.2 – 1994 Manual of Uniform Traffic Control Devices, Part 2: Traffic Control Device for General Use. Standards Australia, Homebush, NSW.
- Standards Australia (2009), Australian Standard AS 1742.13 – 1991 Manual of Uniform Traffic Control Devices, Part 13: Local Area Traffic Management. Standards Australia, Homebush, NSW.
- Victorian Government Gazette (1999), Road Rules – Victoria. Government Printer for the State of Victoria.
- Westerman, H., Black, J., Brindle, R.E., Lukovich, T. and Sheffield, D. (1993), A Practitioner's Guide to Managing the Road Environment of Traffic Routes Through Commercial Centres. Report prepared for the Federal Office of Road Safety and the Roads and Traffic Authority, NSW, Australia.

Appendix E - Speed Management Treatments for Time Based Lower Speed Limit Road Environments

This appendix provides information on traffic management treatments that may be used to modify the road environment to help motorists recognise and adhere to time-based lower speed zones. The treatments may be adapted on arterial and non-arterial roads to alert drivers that they are entering a different driving environment which has a lower speed limit during certain times of the day.

The purpose of this section is to encourage practitioners to trial various treatments and increase the safety, credibility and compliance on roads with time-based lower speed zones, such that VicRoads can collect robust information that can be used in the future on a wider network. VicRoads Traffic Engineering team welcomes any feedback and findings about the application of these treatments.

Although some of these treatments have been proven to be effective in reducing the speed of motorists on permanent low speed environments, the effectiveness of these treatments on time-based lower speed environments will be determined as part of the data collection process during the trial period.

E1 Gateway Treatments

Description

Gateway treatments are designed to inform drivers that they are entering an area with a different road environment which has a lower speed limit. These treatments are normally used as transition points between high and low speed environments and can be made up of a single treatment (e.g. time-based or variable speed limit signs only) or a combination of treatments which can include some form of physical measures, signs and pavement markings. An example of a gateway treatment for time-based lower speed environments is shown in Figure E 1 below.

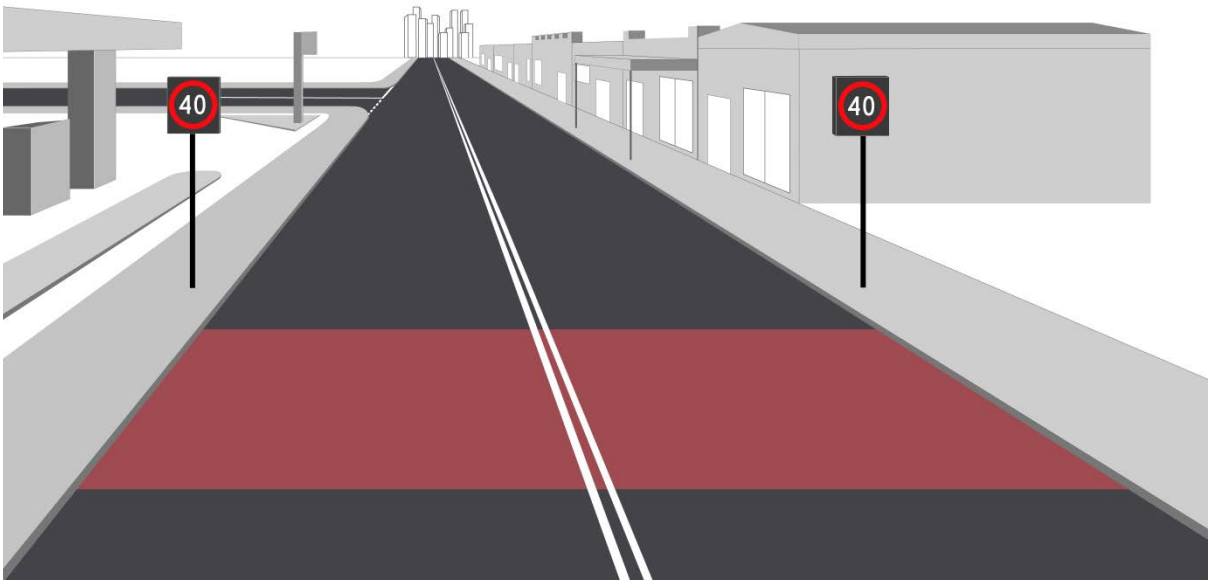


Figure E 1: Example of gateway treatment in conjunction with coloured pavement

Key Considerations

Research (Austroads 2014a, Charlton & Baas 2006) identified the following considerations where such a treatment is to be implemented:

- The speed reduction resulting from the gateway treatments may dissipate within 250 m unless the lower speed is reinforced downstream with visual and/or physical road conditions (e.g. increase in urban density, narrower lanes, increased traffic, roadside furniture, etc).
- Gateways are found to be most effective if placed at the start of development.
- Physical treatments that are likely to cause deflection or discomfort (chicanes, speed humps, transverse rumble strips etc) may be unsuitable for speed changes higher than 30-50km/h.
- There are additional maintenance costs associated with this treatment.

Further information

- Austroads Research Report AP-R449-14, Methods for Reducing Speeds on Rural Roads - Compendium of Good Practice
- Austroads Research Report AP-R508-16, Speed Reduction Treatments for High Speed Environments
- Austroads Technical Report AP-T295-15, Road Geometry Study for Improved Rural Safety
- Austroads (2016), Guide to Traffic Management, Part 10: Traffic Control and Communication Devices
- Charlton, S.G & Baas, P.H (2006), Speed Change Management for New Zealand Roads, Land Transport New Zealand Research Report 300, 144pp.
- Makwasha, T & Turner, B (2013), Evaluating the use of rural-urban gateway treatments in New Zealand, Journal of the Australasian College of Road Safety, Volume 24, Issue 4, Dec 2013:14-20.

E2 Vehicle Activated Signs

Description

Vehicle activated signs (VAS) are electronic roadside signs that aim to alert drivers of the change in the road environment and slow down the approaching vehicles. The signs will be activated by a sensor if the approaching vehicles are detected to be exceeding a pre-set speed. The VAS reminds targeted drivers of the hazard so they adjust their driving behaviour accordingly. VAS can be applied in different situations, such as speed control at pedestrian crossings and school zones.

There are two common types of VAS: speed advisory and hazard warning signs.

Speed-advisory VAS are electronic roadside signs that display a message when the approaching vehicles exceed the pre-set speed. Potential locations for speed-enforcing VAS include locations with speeding problems or where the effectiveness of standard speed signs is limited in lowering vehicle speeds.

Vehicle activated hazard warning signs display the hazard type, recommended speed or a message when the approaching vehicles exceed a pre-set speed. They are commonly installed on the approaches to hazards and alert drivers to adjust their driving behaviours for the changed road conditions.

This speed reduction treatment has been trialled in Australia and New Zealand. However, its application in time-based speed zones is limited. Therefore, the effectiveness of this treatment will be determined after more trial data has been collected.

Some examples of vehicle activated sign for time-based lower speed environments are shown in Figure E 2 and Figure E 3 below.

Figure E 2: Example of Vehicle Activated Sign in the form of Variable Message Signs, image source: AGTM10-16

Figure E 3: Example of VAS

Key Considerations

The use of different types of VAS depends on site-specific conditions and requirements with varied message types, display times and threshold speeds. Site selection for VAS needs to take the following into account:

- Sites where there is a recent crash history with speed as a contributory factor
- Sites where speeding is believed to be a potential problem.

Before making a decision to install VAS, the road environment should be assessed to maximise its effectiveness. The road geometry, poor site lines and existing road furniture may affect the visibility of the VAS, resulting in insufficient time to display the message to the drivers. The VAS should only be installed after determining that the existing signs and road markings are all visible and comply with the current standards. In addition, ongoing maintenance needs to be carefully planned and considered as vandalism has been identified as a problem which may result in the signs not working as intended.

Further information

- Austroads Research Report AP-R508-16 Speed Reduction Treatments for High-speed Environments
- AS 1742.1-2014, Manual of uniform traffic control devices – Part 1: General introduction and index of signs
- AS 1742.15-2007,Manual of uniform traffic control devices – Part 15: Direction signs, information signs and route numbering
- Technical Note 160 Vehicle Activated Signs (VAS), August 2016, Department of Transport and Main Roads, State of Queensland.

- Winnett, MA & Wheeler, AH 2002, Vehicle-activated signs - a large scale evaluation, report 548, TRL Limited, Crowthorne, UK.

E3 LED Raised Pavement Markers

Description

Light Emitting Diode (LED) Raised Pavement Markers (RPM) are a type of treatment that can be used to enhance delineation, reduce speeds, raise drivers' awareness of hazards, improve the safety of pedestrians and cyclists and provide directional cues for road users at dangerous locations.

Different to the standard Retro-reflective Raised Pavement Markers (RRPM), LED RPMs can be solar powered or hardwired (powered by wiring to a power source such as signal controllers). The former can be automatically turned on by the built in sensors when the ambient light falls below a preset level while the latter can operate during day time as a treatment to increase safety and compliance on the road.

Hardwired LED RPMs, which are found to be brighter than the solar-powered LED RPMs, can be used at any time of the day and in inclement weather conditions to supplement pavement markings for increased effectiveness. They are also effective in warning drivers of potential hazards on the road and speed control. Hardwired LED RPMs can be used as a single treatment or in conjunction with other treatments such as vehicle activated signs, speed limit signs and coloured pavement. The combined treatments increase the effectiveness of alerting drivers of the change of road environment and reducing their speeds.

Example of the application of LED RPMs on local roads is shown in Figure E 4 below.

Figure E 4: Example of LED RPMs

Key Consideration

LED RPMs can be used on locations where the standard RPMs or RRPMs are installed but would require powered cables between studs.

The installation of LED RPMs is normally carried out by the supplier's trained crew and requires saw cutting and/or coring.

Further information

- Donegan, K 2011, Conference paper: Internally Illuminated Road Studs.

- LED Raised Pavement Markers, U.S. Department of Transportation, Federal Highway Administration http://safety.fhwa.dot.gov/intersection/conventional/unsignalized/tech_sum/fhwasa09007/fhwasa09007.pdf

E4 Transverse Pavement Markings

Transverse pavement markings usually consist of intermittent pavement markings, which may be flush or raised, that extend across the traffic lanes, such as dragon's teeth, rumble strips, transverse bars and zig-zag markings. These markings are inexpensive and can also be used as either a threshold treatment to make drivers aware that they are entering a different environment and encourage them to lower their speed, or as a downstream traffic calming for gateway treatments.

Although the installation of transverse pavement markings are considered inexpensive, the treatments below are subject to traffic wear and require regular maintenance to ensure its visibility and effectiveness. Consideration should also be given to motorcyclists using the road as the installation of these markings may result in skid resistance issues for motorcyclists. The visibility of transverse markings may also be greatly affected on dark and wet conditions.

Some of the types of transverse pavement markings are described in E5 to E8 below.

E5 Dragon's teeth

Description

Dragon's teeth are a series of white triangular road markings that are laid in pairs on each side of the road to create a visual change and road narrowing effect. There are no limitations to the number of dragon's teeth markings as this would be dependent on the road geometry and location. The general size of the dragon's teeth is 750mm base and 600mm height (DMRB, 2004)[7], however the dimensions can be increased to create a perception of road narrowing and encourage drivers to lower their speeds.

Figure E 5: Example of dragon's teeth markings, image source: AGTM10-16

Key Considerations

Dragon's teeth are only fully visible to drivers as they get close to them and contributions to the reduction of speed are likely to be small.

The use of dragon's teeth at gateways can increase gateway's conspicuity and enhance its effectiveness in slowing down approaching vehicles.[7]

[7] Highways England (2004), Design Manual for Roads and Bridges, Volume 6 Road Geometry, Section 3 Highway Features, Part 5 TA87/04: Traffic calming on trunk roads a practical guide.

E6 Zig-zag markings

Description

Zig-zag markings are angular shaped markings having sharp turns from side to side. This pattern is often used as a part of a gateway treatment to alert drivers that they are approaching a pedestrian crossing or a school zone. Figure E 6 below shows the design concept of zig-zag markings on the approach to a pedestrian crossing. An example of zig-zag markings used as part of a gateway treatment is shown in Figure E 7.

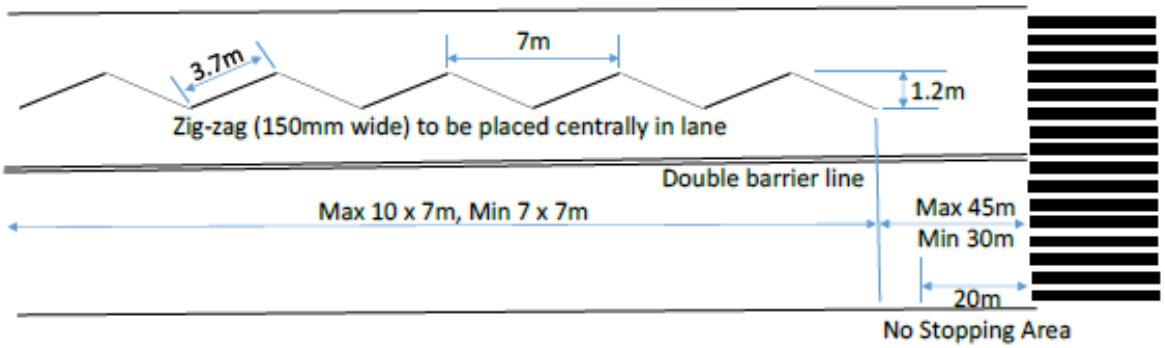


Figure E 6: Example of zig-zag road markings on the approach to a pedestrian crossing, image source: AGTM10-16

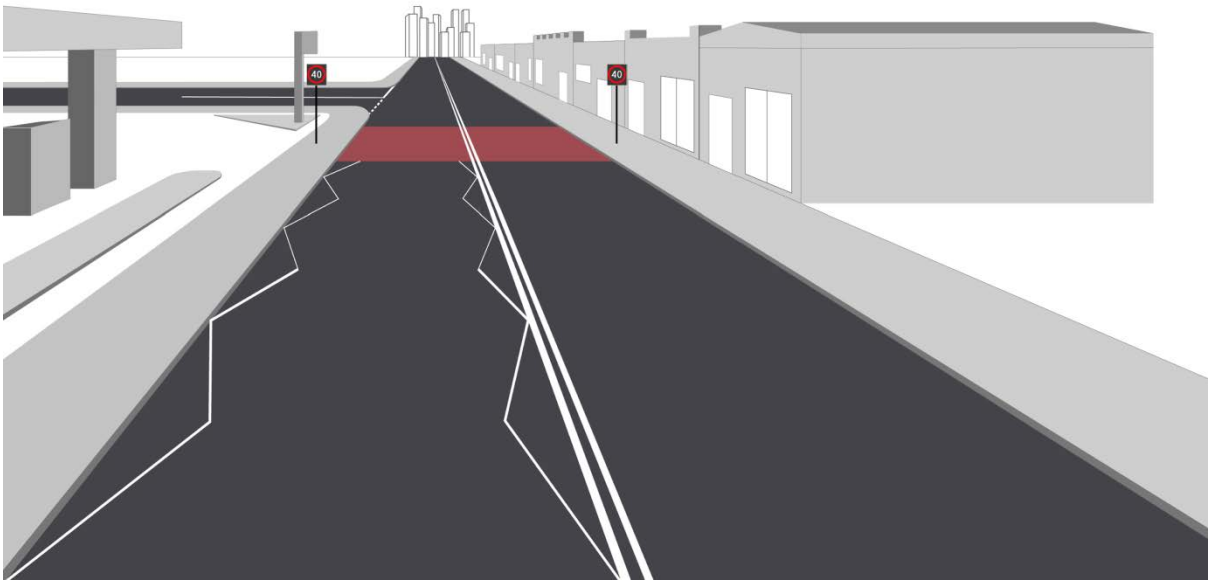


Figure E 7: Zig-zag markings at a gateway

Key Considerations

Different road agencies have different uses and designs for zig-zag markings. It is advisable to refer to the latest guidelines to ensure consistency in the network.

The level of understanding of the function of zig-zag pavement markings increases when this treatment is used in conjunction with gateway treatments, vehicle activated signs, LED raised pavement markers and coloured pavements or when it is located near pedestrian crossings.[8]

E7 Transverse bars or optical speed bars

Description

Transverse bars or optical bars are a type of flush transverse linemarking which create the perception for drivers that they are travelling too fast and therefore encourage them to slow down. This treatment can be made up of a series of horizontal bars that are placed at equal intervals across the traffic lanes or evenly spaced peripheral bars that extends approximately 1m from the edge lines.[9] Examples of evenly spaced transverse and peripheral optical speed bars are shown in

Figure E 8: Example of transverse speed bars, image source: VTRC, 2007

and respectively.

Figure E 8: Example of transverse speed bars, image source: VTRC, 2007[10]

[8] Virginia Transportation Research Council (2010).Best Practices in Traffic Operations and Safety: Phase II: Zig-zag Pavement Markings, Report No. FHWA/VTRC 11-R9,

[9] Hallmark, S, Knickerbocker, S.L and Hawkins, N.R (2013), Transverse Speed Bars for Rural Traffic Calming, Institute for Transportation, Iowa State University

[10] Virginia Transportation Research Council (2007), Evaluation of Best Practices in Traffic Operations and Safety: Phase I: Flashing LED Stop Sign and Optical Speed Bars, Report No. FHWA/VTRC 07-R34.

Figure E 9: Example of peripheral speed bars, image source: VTRC, 2007[1011]

Key Considerations[10]

Transverse speed bars should be located in advance of the targeted speed reduction area in order to alert drivers of the change of speed environment and to prepare to slow down.

Extending transverse speed bars across the traffic lane results in greater effectiveness in lowering approaching vehicles' speed compared to the short extension from the centreline or edge line.

The application of thermoplastic tape for transverse speed bars is likely to create a rumble sensation when motorists traverse them, which also might increase their effectiveness in slowing down vehicles.

The function of transverse speed bars with thermoplastic tape is similar to rumble strips, however with less tactile effect and lower noise level.

E8 Rumble strips

Description

Rumble strips are raised markings which are placed across the carriageway or near the edges of traffic lanes to provide an audible and tactile sensation to drivers. Transverse rumble strips are effective in reducing the speed of approaching vehicles and alerting drivers of a hazard ahead. They can be placed on the approach to lower speed zone.

Rumble strips are normally installed by forming grooves in the pavement, grinding the existing pavement or through the application of a raised tacked-on strip of rough pavement material constructed generally using a spray seal (Austroads 2016). Alternatively, polymer modified binder may be used to spray rumble strips on top of the existing pavement. Figure E 10 below shows an example of transverse rumble strips on the approach to the gateway.

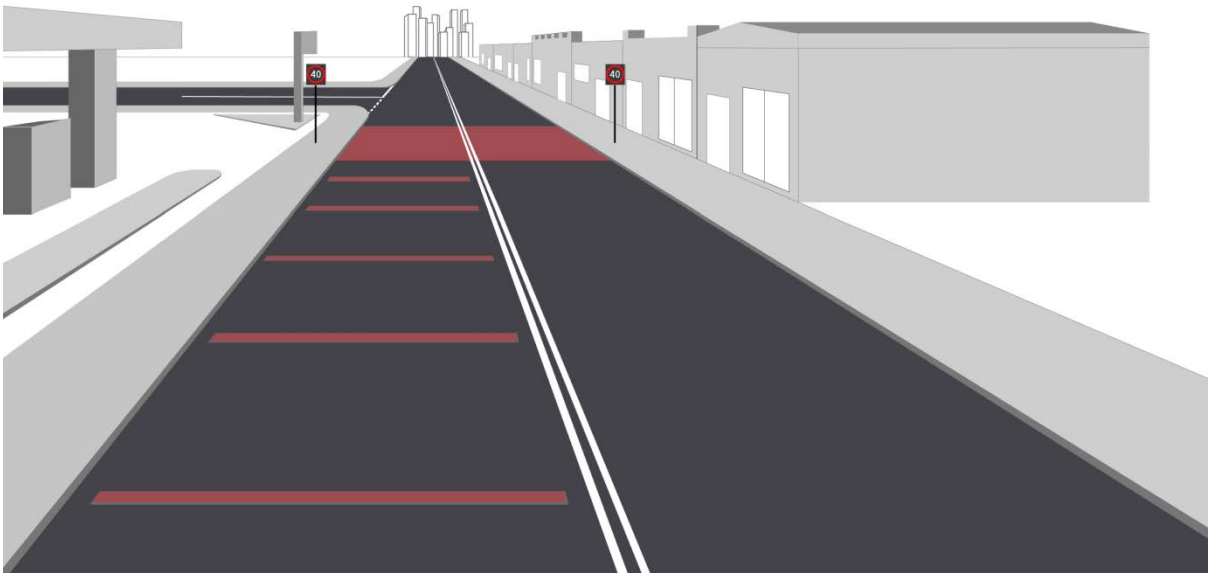


Figure E 10: Transverse rumble strips at gateways

Key Considerations

Research (Austroads 2014a, Charman et al. 2010) identified the following considerations where such treatment is to be implemented:

- It is important to ensure that the profile of rumble strips is appropriate for motorcyclists, so as not to present a hazard to these road users.
- Due to the high noise level generated by rumble strips, the installation of rumble strips in residential areas is not desirable.
- It is recommended that rumble strips are used together with other treatments such as signs to inform drivers of the purpose of the strips.
- Provision for cyclists to bypass the rumble strips may be needed if their stability or comfort is likely to be affected.

Further information

- Austroads (2016), Guide to Traffic Management, Part 10: Traffic Control and Communication Devices
- Austroads Research Report AP-R508-16, Speed Reduction Treatments for High Speed Environments
- Austroads Research Report AP-R518-16, Safe System Roads for Local Government

E9 Coloured Pavement

Description

Coloured pavement surface treatments can be used in particular areas such as school zones, pedestrian paths or crossings, bus lanes and bicycle paths. They help enhance lane recognition and improve compliance with speed limits.

Coloured pavements can be used as part of a gateway treatment to increase conspicuity and reinforce its ability to slow down approaching vehicles.

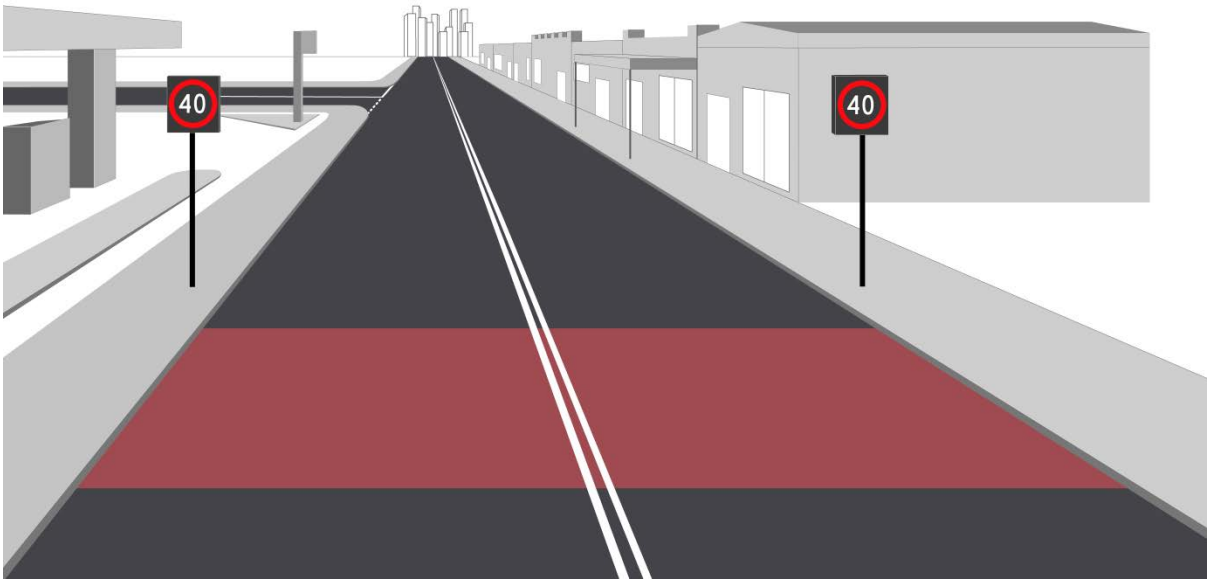


Figure E 11: Example of a coloured pavement at a gateway

Key Considerations

Coloured pavements are subject to traffic wear and the relevant road authority must be prepared to accept the additional maintenance costs associated with this treatment.

Terracotta is the common colour used in local area traffic managements (e.g. thresholds, platforms) while yellow pavement is the commonly used to reinforce the priority of pedestrians and remind drivers to give way.

When applying coloured pavement to address safety issues for a particular area, it is important to take into consideration the pavement colours used for special-use facilities, to avoid confusion. The colours used by VicRoads are shown in Table E 1. It is also important to make allowance for cost, as surfacing for this type of treatment is can be expensive.

Table E 1: Pavement colour for special-use facilities, source: AS 2700-2011

Facility	Colour	Suggested AS colour
Bus lane	Red (1)	Signal red R13
Bicycle lane	Green	Emerald green G13
Pedestrian crossing	Yellow	Golden yellow Y14
LATM (e.g. thresholds, platforms)	Terracotta	Terracotta R52

1 *In WA, terracotta-coloured asphalt is used for bus lanes.*

Further information

- Austroads (2009), Guide to Pavement Technology, Part 3: Pavement Surfacings, section 3.3.7
- Austroads (2016), Guide to Traffic Management, Part 10: Traffic Control and Communication Devices, section 6.6
- AS 1742.2 (2009), Clause 5.2.6 Colours
- AS 2700 (2011), Colour standards for general purposes
- Guidelines For The Use Of Coloured Pavement Surface Treatments And Markings In Brisbane City Council, prepared by Strategic Asset Management City Assets Branch, Brisbane Infrastructure Division, Revision 2.1: November 2008.

Document Information

Title:	Speed Zoning Guidelines
Department:	Traffic Engineering
Directorate:	Network Design Services
Approved by:	Con Stasinos Director – Network Design Services
Date of Approval:	June 2017

Amendment Record

Edition / Revision	Pages(s)	Issue Date	Amendment Description
Ed 1	All	February 1993	Initial release (ref. F:\PTE\93\EB93019C.JJ)
Ed 1 Rev 1	All	December 1993	Total Review
Ed 1 Rev 2	All	March 1994	Revision table, Contents page, Fig 1, Fig 2, Page nos.
Ed 1 Rev 3	10, 14, 22, 23	June 1996	50 km/h local traffic precinct added with relevant minor changes to 60 km/h zone, reference to traffic routes deleted, Section 6 amended to include administrative arrangements, Section 9 Notes on worksite speed limits added minor changes, school speed zones and seasonal speed zones given a sub heading.
Ed 1 Rev 4	5, 10, 17, 20, 22, 23	July 1997	Minor amendments
Ed 2		September 1997	General release
Ed 3	All	December 1999	Amendments related to Road Rules - Victoria
Ed 4	All	October 2006	New Edition
Ed 4 Rev 1	All	November 2009	Amendments following release of Road Safety (Traffic Management) Regulations 2009 and Road Safety Road Rules 2009
Ed 4 Rev 2	5	June 2010	Amendments related to TEM being a supplement to the Austroads Guide to Traffic Management and Austroads Guide to Road Safety
Ed 5	All	November 2013	New Edition
Ed 1 (ANS&G Part 2.11: Speed Zoning Guidelines)	All	June 2017	First Edition – replaces VicRoads Traffic Engineering Manual Volume 1 – Chapter 7 – Speed Zoning Guidelines

Previous versions of this document are available on request by contacting the VicRoads – Traffic Engineering team.

For enquiries regarding this supplement, please contact the VicRoads – Traffic Engineering team via tem@roads.vic.gov.au or 9854 2417.