

Flying Minute: Submission to the Review of the Main Roads Pedestrian Crossing Facilities Guidelines

By Max Bushell, Policy Officer Road Safety and Infrastructure

1. That the following principles regarding the design and implementation of pedestrian crossings be endorsed:
 - a. **Planning at the local level**
A detailed understanding of modal networks at the local level and/or local transport plans should inform where and which pedestrian crossing types are implemented.
 - b. **Pedestrian Crossings are essential**
High-speed, high-volume roads are the major barrier to active transport that must be resolved.
 - c. **Pedestrian Priority**
Pedestrian travel should be given equal weight to vehicular travel. High-quality, cost-effective, pedestrian-priority crossings should be implemented wherever possible. Pedestrian Crossings on roads with heavy vehicles should also be given higher priority toward the implementation of a safe, pedestrian- priority crossings in the Guidelines, based on the risk to the pedestrian.
 - d. **Cost**
Cost-effective pedestrian-priority crossings should be considered first, rather than high-cost facilities. The Guidelines should provide guidance on the cost of installing pedestrian crossing facilities and general information on which party may bear the costs.
 - e. **Proactive Approach**
Forecast pedestrian demand based on network planning, rather than existing pedestrian counts should be used to plan appropriate crossings.
 - f. **Speed**
Vehicle travel speed requirements for implementing pedestrian crossings must not be a barrier to selecting and installing pedestrian-priority crossings, but should be a consideration in selecting cost-effective designs.
 - g. **Intersections**
Intersection designs, including roundabouts, should accommodate pedestrian crossing priority.
2. That the submission to Main Roads WA on the draft Pedestrian Crossing Facilities Guidelines be endorsed.

RESOLUTION 229.FM/2023

CARRIED

Executive Summary

- Main Roads provided the draft Pedestrian Crossing Facilities Guidelines to WALGA for review and comment.
- Seven overarching principles are proposed to inform revisions to the draft Guidelines document:
 - That planning at the Local Government level be considered in determining where and which crossing types are implemented;
 - That pedestrians must be accommodated with facilities, regardless of vehicle speeds and vehicle volume considerations;
 - That high-quality, pedestrian-priority crossings be considered first rather than last;

- That lower cost high-quality, pedestrian-priority crossings be considered first, rather than higher cost crossings
 - That the guidelines incorporate a proactive approach, rather than react to pedestrian demand, which is often not present;
 - That the operating speed to implement high-quality, pedestrian-priority crossings be increased, so this is not a barrier to implementing pedestrian crossings;
 - That intersection designs, particularly roundabouts, be included that support pedestrian-priority crossings.
- These principles guide numerous proposed revisions to the text of the draft Guidelines.
- Revisions to the Pedestrian Crossing Facility Guidelines are important to Local Government, as Local Governments maintain most of the path network, have a nuanced understanding of transport in their jurisdiction, and often prepare active transport planning documents that include priority pedestrian networks.

Attachments

- Draft Pedestrian Crossing Facilities Guidelines with WALGA comments and revisions
- WALGA submission to Main Roads WA on the Pedestrian Crossing Facilities Guidelines

Policy Implications

This submission creates a new policy position, which outlines seven general principles that enable Local Governments to provide pedestrian crossings to support a safe, comfortable, and connected pedestrian network.

Background

WALGA has been invited by Main Roads WA to review and provide comment on a draft version of the Pedestrian Crossings Facilities Guidelines (the Guidelines) from the Local Government perspective. The current Guidelines were published in 2020. This is part of our standard review process for Main Roads WA policies that affect Local Governments. Main Roads WA have invited individual Local Governments to make submissions, so this was not duplicated by WALGA.

The Infrastructure Policy Team considered this issue on 28 July 2023 and unanimously supported a recommendation to consider this issue in a State Council Flying Minute. Comments are due to Main Roads WA on 31 August 2023.

Comment

The Guidelines provide advice on appropriate types, locations, and treatments for pedestrian crossing facilities and outline the warrants for implementing pedestrian crossing facilities. The stated intent of the Guidelines is to support the provision of facilities for safer, accessible, and convenient pedestrian movements.

WALGA identified elements of the Guidelines that limit the capacity for Local Governments to manage the safe, comfortable, and connected movement of pedestrians, which are outlined in the bullet points below.

- **Planning Documents/Sound Planning:** Local Governments are often responsible for active mobility infrastructure, including the provision of footpaths. The implementation of the pedestrian network of infrastructure elements is often guided by an Integrated Transport Plan, Walk and Ride Plan, or other strategic planning document. No mention is made of Local Government's plans in planning for pedestrians in the Guidelines.
- **Vehicle Volumes/Speed:** The Guidelines, as written, make implementing high-quality pedestrian priority crossing facilities very difficult on roads with higher speeds/higher traffic

volumes. However, it is precisely on these roads that such crossing facilities are fundamental to the creation of a safe, comfortable, and connected pedestrian network.

- **Pedestrian Priority:** A cornerstone of delivering a safe, comfortable, and connected pedestrian network is providing crossings with pedestrian priority, i.e. where motorists give way to pedestrians. The Guidelines make it very difficult to implement pedestrian-priority crossings, e.g. zebra/wombat crossings or pedestrian signals, and clearly state that vehicle delay is more important than pedestrian delay.
- **Cost:** Particularly on higher speed or higher volume roads, the Guidelines recommend treatments that are often prohibitively expensive for Local Governments to implement (pedestrian bridges or pedestrian signals). If the Local Government cannot afford the treatment, then pedestrians are not accommodated to cross at all.
- **Retrospective Approach:** Pedestrian demand is a key determinant of the type of crossing that would be proposed or considered. However, without a crossing in place, it is unlikely that pedestrian demand can be demonstrated.
- **Speed Reduction Stipulation:** In order to implement an at-grade pedestrian priority crossing, vehicle speeds must be reduced to 30 km/h or below at that location. This is exceedingly difficult to achieve without substantial cost implications for Local Governments and is particularly difficult to achieve on higher speed roads, making this well-intentioned stipulation a barrier to implementing pedestrian crossings. In addition, Local Governments do not have authority to set speed limits.
- **Crossings at Intersections:** Roundabouts are particularly unfriendly to pedestrians in that vehicles are not required to stop. This guide reinforces vehicular priority at roundabouts. Designs do exist to create roundabouts that are safer and more comfortable for people walking (pedestrian priority), but are not proposed in the Guidelines.

To realise the goals identified in Local Government planning documents (e.g., Integrated Transport Plans, Walk and Ride Plans) of developing a safe, comfortable, and connected pedestrian network, seven principles to inform revisions to the Guidelines are presented below.

These principles align with the following State Strategies/Initiatives:

- Driving Change – Road Safety Strategy for Western Australia – “Community feedback shows widespread support for **traffic calming measures in busy areas** that will prevent collisions with pedestrians and cyclists and **make local communities more people-friendly.**”
- Foundations for a Stronger Tomorrow: State Infrastructure Strategy – Under Tomorrow 2042 - “Fully integrated planning and delivery results in more efficient and flexible connections between transport modes and stimulates and supports greater infill housing development, with **a modal shift towards greater public transport use and active transport.**”
- WA Active Mobility Strategy – “The WA Active Mobility Strategy (AMS) will be an overarching strategic document that outlines **a coordinated approach to increase active mobility in Western Australia.**”
- Your Move: More Ways to Get There – “Your Move is a Department of Transport program that helps **people find alternative, active ways** to get to and from work, school and around their local community.”

1. Planning at the Local Government Level

Local Governments have a nuanced understanding of their modal networks. The State Government does not share this micro-level understanding of the local context. These guidelines should acknowledge this expertise and allow sound planning at the Local Government level to inform where and which pedestrian crossing types are implemented.

2. Pedestrian Crossings are Essential

High-speed, high-volume roads are the barrier most likely to be encountered by people completing trips on foot across WA. The guidelines should acknowledge that pedestrian crossings are essential regardless of vehicle speed and volume and that not providing a safe crossing is an unacceptable outcome.

3. Pedestrian Priority

The Guidelines identify non-priority crossings as the crossings to consider first. However, this type of crossing provides the lowest level of safety and comfort for pedestrians. The guidelines should recommend starting with high-quality, cost-effective, pedestrian-priority crossings in the first instance and recommend only implementing non-priority crossings as a last resort. Pedestrian travel should be given equal weight to vehicular travel. Pedestrian Crossings on roads with heavy vehicles should also be given higher priority toward the implementation of a safe, pedestrian- priority crossings in the Guidelines, based on the risk to the pedestrian.

4. Cost

Local Governments are responsible in most instances for the installation and maintenance of active mobility facilities within their jurisdictions. The Guidelines recommend installing pedestrian signals or grade-separated pedestrian crossings under certain circumstances. However, these are often very expensive to construct and maintain. The guidelines should recommend the implementation of lower-cost pedestrian-priority crossings first, rather than high-cost facilities. The Guidelines should also provide guidance on the cost of installing pedestrian crossing facilities and general information on which party may bear the costs.

5. Proactive Approach

As vulnerable road users, pedestrians are unlikely to cross in large numbers in areas that are unsafe. The Guidelines should adopt a more proactive approach and acknowledge the value of network planning, instead of responding to pedestrian demand, which will not be present in areas with no crossing facilities. Additionally, a suite of appropriate design options should be provided to fit every situation.

6. Speed

The Guidelines mandate an operating speed reduction to 30 km/h at pedestrian crossings. Most roads in WA are speed zoned at 50 km/h or higher. While this reduction in operating speed is laudable from a safety perspective, this requirement effectively acts as a barrier to implementing pedestrian crossings, due to the difficulty in achieving this reduction without very costly infrastructure improvements and the prevailing high speeds on most roads in WA. Local Governments also do not have the authority to set speed limits.

7. Intersections

Certain infrastructure types, while safer for vehicles, can be very difficult to navigate for pedestrians, particularly roundabouts. The Guidelines should provide designs that accommodate pedestrians with priority at roundabouts to support the creation of a safe, comfortable, and connected pedestrian network.

FLYING MINUTE OUTCOME

Poll created: 03/08/2023 at 14:42

Poll closed: 11/08/2023 at 12:00

Total invited to survey: 24

Total finished survey: 19

Endorse the Recommendation: 18

Endorse the Recommendation subject to comment below: 1

Do not endorse: 0

First Name	Last Name	Completed Date
Carol	Adams OAM	08/08/2023 22:00
Phillip	Blight	11/08/2023 7:27
Laurene	Bonza	11/08/2023 12:00
Ruth	Butterfield	11/08/2023 11:49
Cheryl	Cowell	Not completed
Frank	Cvitan	09/08/2023 12:23
John	Daw	07/08/2023 12:57
Tony	Dean	04/08/2023 11:09
Catherine	Ehrhardt	04/08/2023 9:38
Russ	Fishwick JP	07/08/2023 12:10
Moirira	Girando JP	11/08/2023 9:55
Patrick	Hall	03/08/2023 15:00
Logan	Howlett JP	08/08/2023 12:39
Paul	Kelly	10/08/2023 9:49
David	Lagan	Not completed
Peter	Long	08/08/2023 12:39
Chris	Mitchell JP	07/08/2023 12:57
Chris	Pavlovich	Not completed
Les	Price	03/08/2023 20:18
Michelle	Rich	11/08/2023 12:00
Helen	Sadler	Not completed
Ken	Seymour	Not completed
Stephen	Strange	10/08/2023 11:44
Doug	Thompson	08/08/2023 11:47

Responses

(18) Endorse the Recommendation: Cr Les Price, Mayor Patrick Hall, President Cr Tony Dean, Cr Catherine Ehrhardt, Cr Chris Mitchell JP, Cr John Daw, Cr Russ Fishwick JP, Mayor Peter Long, Mayor Logan Howlett JP, Cr Doug Thompson, Mayor Carol Adams OAM, Cr Frank Cvitan, Cr Paul Kelly, President Cr Phillip Blight, President Cr Moira Girando JP, Mayor Ruth Butterfield, President Cr Michelle Rich, President Cr Laurene Bonza

(1) Endorse the Recommendation subject to comment below: President Cr Stephen Strange

(0) Do not endorse

Comments

President Cr Stephen Strange:

As per feedback from the Shire of Kondinin re cost sharing/negotiations and higher priority with heavy vehicles. Under the cost point, 1(d) of the recommendation the following sentence should be added:

“The Guidelines should provide guidance on the cost of installing pedestrian crossing facilities and general information on which party may bear the costs.”

Under 1(c):

“Pedestrian Crossings on roads with heavy vehicles should also be given higher priority toward the implementation of a safe, pedestrian- priority crossings in the Guidelines, based on the risk to the pedestrian.”

Secretariat Comment

Cr Strange's comments are noted. The submission to Main Roads (with WALGA comments and revisions) has been updated accordingly.



mainroads
WESTERN AUSTRALIA

*We're working for
Western Australia.*

Pedestrian Crossings Facilities Guideline

Network Operations Directorate

Printed copies are uncontrolled unless marked
otherwise. Refer to iRoads for current version.

Dxx#xxxxx
June 2023

Contents

1	PURPOSE	4
2	SCOPE	4
3	ROLES & RESPONSIBILITIES	5
4	DEFINITIONS	5
5	GENERAL CONSIDERATIONS	8
5.1	Location	8
5.2	Visibility.....	8
5.3	Speed	10
5.4	Crash Investigation	11 10
5.5	Movement and Place	11
5.6	Pedestrian volume and types	12
5.7	Traffic volume and composition	16 16
5.8	Gap Acceptance	18 18
5.9	Desire Lines.....	21 20
5.10	Lighting.....	21 20
6	HIGH LEVEL CROSSING TYPE EVALUATION TOOL	23 22
7	DETAILED ANALYSIS AND SELECTION OF CROSSING TYPES.....	25 24
8	TYPES OF CROSSINGS.....	26 25
8.1	Non-Priority Crossings	26 25
8.2	Zebra Crossings	33 32
8.3	Pedestrian Operated Signals	44 43
8.4	Grade Separated Pedestrian Crossings.....	49 48
8.5	Warden Controlled Children's Crossings.....	51 50
8.6	Shared Zones	53 52
9	SUPPORTING TREATMENTS	54 53
10	APPLICABLE DRAWINGS	70 69
11	REFERENCES AND RELATED DOCUMENTS	71 70

Document Control

Owner	Manager Traffic Management Services
Custodian	Traffic Services Management
Document Number	Dxx#xx
Issue Date	June 2023
Review Frequency	5 years

Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.
0	TBC	GUIDELINE CREATED	ALL

1 PURPOSE

The purpose of this guideline is to provide ~~best practice~~ advice on the provision of the most suitable type, location, and treatment pedestrian crossing facilities for safer, accessible and convenient pedestrian movements.

In this guideline, the word pedestrian includes all non-vehicular mobility, including people walking, wheelchairs users, people with mobility-impair~~ments~~ed, e-rideable devices users and people cycling that are using pedestrian infrastructure.

2 SCOPE

Pedestrians form the largest, single road user group in Western Australia (WA) and are classified as vulnerable road users, due to the lack of physical protection and vehicle traffic speed and volume, ~~that is~~ which create conditions that make it unsafe to cross or adequately separate pedestrians from traffic.

It is essential to provide appropriate facilities to enhance pedestrian safety throughout the road network. The benefits of moving active mobility include but ~~it is~~ are not limited to increased health and wellbeing; improvements to community cohesion, livability, and safety; reduction in congestion; providing provision of alternative transport options that is are accessible to everyone; reduction in gas emissions, air and noise pollution; enhanced economic opportunity for retailers and increased social and community connections.

This document provides guidance for all practitioners on where and how to apply crossings as follows:

- Non-priority crossings,
- Zebra and Wombat crossings,
- Signalised crossings (pedestrian-operated signals),
- Warden-controlled children's crossings,
- Grade separated crossings, and
- Shared Zones.

The selection of type and treatment adopted will depend on the circumstances at each location. This guideline does not prescribe a single approach or intervention, but presents a variety, along with their advantages, disadvantages and limitations, and the circumstances when each would be most appropriate. It recognises that financial, technical, and political factors may affect what can be achieved at any particular location or time.

Pedestrian crossing facilities at signalised intersections (including their slip lanes), pedestrian crossings at railway level crossings and bicycle crossing facilities are not within the scope of this guideline.

This guideline should be read in conjunction with the references listed in Section 11.

Formatted: Underline

Commented [MB1]: I think this should be called out in some way, as it forms the basis of this policy.

Commented [MB2]: It would also be helpful to include approximate cost. Some of the crossing types can be cost prohibitive for Local Governments.

Commented [MB3]: This is confusing, as the policy identifies people cycling as "pedestrians" above. I've clarified that cyclists are included in this policy "when they are using pedestrian infrastructure."

3 ROLES & RESPONSIBILITIES

Under the Road Traffic Code 2000 Regulation 297 (1), the Commissioner of Main Roads is the sole authority with power to "erect, establish or display, and may alter or take down any road sign, road marking or traffic-control signal". Furthermore, under Regulation 297 (2) "The Commissioner of Main Roads may allow an authorised body to erect, establish, display, alter or take down any particular road sign, road marking or traffic-control signal, or road signs or traffic-control signals of a class or type of classes or types, and in the circumstances (if any), specified in the instrument of authorisation".

Other roles and responsibilities are outlined below.

Role	Responsibility
Manager Traffic Management Services or Regional Manager	Approval of pedestrian crossing facilities removal, modification, or installations
Traffic Management Services Manager	Review of pedestrian crossing facilities removal, modification, or installations
Traffic Management Services Coordinator	Recommendation of pedestrian crossing facilities removal, modification, or installations

4 DEFINITIONS

Refer to *Main Roads Glossary of Terms* guidelines which provide the most common terminology used by Main Roads. Other terms useful in this Guideline and their definitions are shown below.

Term	Definition
Arterial Road	A main road through an area that carries traffic from one area or suburb to another.
ASD	Approach Sight Distance - The minimum level of sight distance which must be available on the minor road approaches to all intersections to ensure that drivers are aware of the presence of an intersection.
CSD	Crossing Sight Distance – The distance necessary to ensure that the pedestrian can see approaching traffic in sufficient time to judge a safe gap and cross the roadway.
Desire Line	A straight line between the origin and the destination of a potential pedestrian trip.
Grade Separated Pedestrian Crossing	The separation of any conflict between vehicles and pedestrians by providing either a pedestrian underpass or overpass.
Kerb	A raised border of rigid material formed between the roadway and the footpath.

Commented [MB4]: I would argue that this isn't necessarily a straight line. I would revise to "The fastest and most convenient route between the origin and destination of a potential pedestrian trip"

Term	Definition
Kerb Crossing	A place designed to facilitate convenient pedestrian access between the footpath and roadway, at a kerb ramp or, if at the same level, at a blended kerb crossing.
Kerb Extension	A localised widening of the footpath at an intersection or mid-block, which extends the footpath into and across parking lanes to the edge of the traffic lane.
Kerb Ramp	A localised area where part of the footpath is lowered to the same level as the roadway next to it to facilitate convenient entry to the roadway.
Main Roads	Main Roads Western Australia
Mid-Block	Located between the intersections or cross streets.
Mid-Block Pedestrian Signals	Traffic signals that are not at intersections, that stop traffic to permit pedestrians to cross the roadway.
Median	A continuous painted or raised strip along the centre of the roadway, which separates carriageways for traffic travelling in opposite directions.
Pedestrian Operated Signals	Crossing with signals to stop traffic for pedestrians to cross.
Relevant Rider	A rider of a bicycle or electric rideable device as defined in the Road Traffic Code 2000.
Roundabout	Circular intersection where traffic moves in one direction around a central island.
Shared Zones	Places of high place value and minimal movement significance where pedestrians, bicyclists and motorised traffic share the same road space.
Sight Distance	The distance, measured along the roadway, between a pedestrian about to enter the roadway and an approaching driver, or between two drivers, or between a driver and an object on the roadway.
SISD	Safe Intersection Sight Distance – SISD is the minimum sight distance which should be provided on the major road at any intersection.
Slip Lane	An area of carriageway for vehicles turning left that is separated, at some point, from other parts of the road by some form of painted or traffic island (Road Traffic Code 2000).
Traffic sign	Sign as recognised in the Australian Standards or Main Roads signs index.

Commented [MB5]: These are not necessarily completely continuous. Perhaps delete this word?

Term	Definition
Unsignalized Intersection Side Road	Uncontrolled intersection, where no traffic lights, road markings or signs are used to indicate the right-of-way <u>priority for specific users</u>
Children's Crossing	Warden or guard-controlled crossing point to assist students crossing the road by the warden or guard stopping traffic to give pedestrian's priority over traffic.
Zebra Crossing	A pedestrian crossing point with longitudinal white 600mm wide stripes and supplemented by the R3-1 Pedestrian Crossing Sign, where traffic is required to give way to pedestrians on the crossing. Legally, they are called pedestrian crossings.

5 GENERAL CONSIDERATIONS

Prior to selecting the most appropriate type of pedestrian crossing or supporting treatment(s), practitioners should consider a range of factors. ~~These is information factors~~ will provide the basis for ~~which the~~ initial ~~evaluation of~~ pedestrian crossings ~~evaluations rely on~~ and includes the road environment, type and number of road users and the speed environment. ~~Further information on~~ ~~these factors are discussed further~~ ~~is presented~~ in this section.

Warrants are different from design requirements for the safe installation of crossing facilities. Design requirements are described in the following sections and include sight distances and vehicle speeds. ~~All warrants should be used as a guide only, with the final decision based on an understanding of local conditions and experience.~~

5.1 Location

Road function, hierarchy, layout, geometry, conditions, and infrastructure are important factors to consider when selecting a crossing facility. The number and width of traffic lanes in each direction, room to accommodate certain types of crossings, the surrounding land use, parking areas, bus stops, ~~and~~ driveways require careful consideration and are critical to ensure an appropriate balance of both safety and ~~operational efficiency~~.

One ~~in-person~~ site visit is essential to assess the location and ensure that crossings are appropriately sited with respect to the road geometry (i.e. avoid bends, departure sides of crests) and also ensure sight lines are not obscured by parked cars, vegetation, landscaping, utility poles or street furniture.

For roads through built-up activity centres or past schools, changing the road environment ~~(reducing traffic speeds, increasing motorists' awareness of pedestrian activity)~~ may be necessary before a safe crossing can be installed.

5.2 Visibility

Pedestrian crossing facilities should be placed where motorists can see a pedestrian with sufficient time to stop before reaching the crossing and pedestrians can see a vehicle far enough to safely ~~cross the road before the vehicle arrives~~. Adequate and uninterrupted sight lines are essential at all non-signalised pedestrian crossing facilities. In addition, parked vehicles, trees or street furniture must not obscure or restrict visibility.

Both Approach Sight Distance (ASD) and Crossing Sight Distance (CSD) are to be provided at pedestrian crossings.

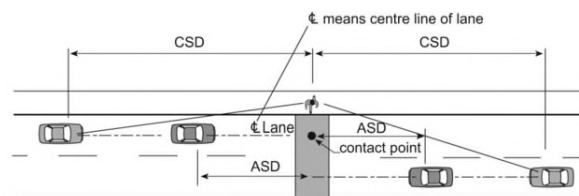
Commented [MB6]: This seems to indicate then next sections. Can you specify which sections?

Commented [MB7]: This is not how warrants are interpreted. They are seen as hard-and-fast rules. If this is the case, then Local Governments, who have a much more nuanced understanding of the local context and have typically undertaken substantial community consultation around active mobility, should be able to install pedestrian crossings at their discretion. Local Governments also have a vision for their community. In some cases, the current volumes may not warrant a crossing, but the installation of a crossing will be the catalyst for people walking. This should also be considered and Local Governments should have the discretion to install crossings based on community vision, based on sound planning (i.e. without regard for retrospective engineering considerations).

Commented [MB8]: For whom? I assume this is for vehicles. If so, please state explicitly.

Commented [MB9]: Please provide links/guidance on how this should be done. What happens if Main Roads rejects a Local Government application to reduce traffic speeds or make motorists' more aware of pedestrian activity? Does that mean the crossing is rejected as well? Please clarify. Perhaps even including a flow chart of the approvals process would be helpful here.

Commented [MB10]: This will be very different, dependent on priority, i.e. if the pedestrian has priority or not. It seems as if this only applies for unsignalised non-zebra crossings, specifically the bit about pedestrians having sufficient time to safely cross the road before the vehicle arrives.



Any type of crossing

ASD – Approach sight distance
CSD – Crossing sight distance

Plan

Approach Sight Distance (ASD) is the minimum level of sight distance which must be available on the minor road approaches to all intersections to ensure that drivers are aware of the presence of an intersection.

ASD should be provided between approaching vehicles (1.1m eye height) and the surface of roadway (0m) at the crossing.

Where it is unreasonable or extremely difficult to achieve ASD, then as an absolute minimum, Stopping Sight Distance (SSD) should be provided.

In the application of Table 3.1, the following guidance is provided:

- A reaction time (R_T) of 2.5s shall be used as the Main Roads desirable minimum and a reaction time of 2.0s shall be used as the Main Roads absolute minimum.
- Absolute minimum reaction time should not be used in combination with other minimum design standards.
- A reaction time of 1.5 seconds shall not be used in Western Australia.

Formatted: Subscript

Design speed (km/h)	Based on approach sight distance for a car ¹ $h_1 = 1.1, h_2 = 0, d = 0.36^2$			
	$R_T = 2.0s$		$R_T = 2.5s$	
	ASD(m)	K	ASD(m)	K
40	40	7.2	45	9.3
50	55	13.8	62	17.5
60	73	24.0	81	29.8
70	92	38.9	102	47.5
80	114	59.5	126	71.6
90	139	87.3	151	103.8

Commented [MB11]: It would be helpful to provide a legend, so readers have an understanding of what R_T , H_1 , H_2 , and K mean.

100	165	123.6	179	145.3
110	193	170.1	209	198.0
Truck stopping capability provided by the minimum crest curve size ⁴		d = 0.22, h ₁ = 2.4m, h ₂ = 0m		

Approach sight distance (ASD) and corresponding minimum crest vertical curve size for sealed roads (S<L)

Notes:

1. If the roadway is on a grade, calculate the approach sight distance (ASD) values using the correction factors in Table 3.4 (or use Equation 1 in Section 3.2.1) by applying the average grade over the braking length.
2. A coefficient of deceleration (d) of 0.36 shall be used in Western Australia.

Crossing Sight Distance (CSD) is the minimum level of sight distance which must be available for pedestrians to see a vehicle far enough to safely cross the road before the vehicle arrives.

$$CSD = \left(\frac{d}{Vs} \times \frac{Va}{3.6} \right)$$

D = crossing distance (m)

Vs = walking speed (m/s) – use 1.2m/s unless there is need to consider slower speed

Va = vehicle approach speed (km/h) – use Design Speed (posted speed limit + 10km/h)

Crossing Distance: distance measured perpendicular to the direction of traffic from kerb line to kerb line. Where kerb is not provided, it should be measured from the edge of the sealed carriageway. For medians or pedestrian refuges, the separate carriageways shall be measured separately provided there is a physical island (not painted), and the refuge is at least 1.8m wide.

Where required, crossing sight distances cannot be provided, they can be reduced with devices such as kerb extensions or refuges, or the traffic speed can be slowed. If neither is possible, provision of any facility that would encourage pedestrians to cross at that point should not be installed.

5.3 Speed

Speed is of critical importance to pedestrian safety, as it is a major factor in the severity of injury and likelihood of death if hit by a car. In addition, in higher speed zones, it is more difficult for pedestrians to judge safe gaps and for drivers slow down, in a higher speed if required. From Safe Systems principles, there is very strong evidence in the research that the probability of a crash between a vehicle and a pedestrian resulting in a fatality or serious injury rises significantly, if the impact speed of the vehicle is over 30km/h. By applying the Safe System approach, Main Roads' long-term vision is to eliminate fatal and serious injuries arising from crashes.

Commented [MB12]: This is not very wide and will barely accommodate a bicycle. A distance of 1.8m is also likely too small to safely provide refuge for someone with a pram. 2m and more would be a much better minimum starting point.

Commented [MB13]: What if the desire line is there?

Commented [MB14]: This should be defined, either here or in the Definitions section. How does Main Roads interpret the Safe System approach?

If there are no suitable crossing types for the road's speed environment, or the only appropriate type is not viable (due to economic reasons, space constraints, etc.), treatments such as reduced speed limits, variable speed limits, traffic calming and strategies to reduce traffic volumes can be applied along areas with high number of **pedestrians**.

5.4 Crash Investigation

Main Roads primary objective is to improve the safety of the road network **to an acceptable level** by reducing the road environment contribution to fatal crashes.

The objective of the crash investigation is to identify any road environment safety issues that could represent unnecessary and/or unreasonable hazards to road users. The investigation incorporates analysis of the road crashes recorded at the location to determine crash rates, trends, and crash types.

Crash records show that specific pedestrian crashes may be reduced by providing crossing assistance, ~~or that perceptions of poor safety are discouraging walking.~~

5.5 Movement and Place

The concept of Movement and Place strikes a balance between the roads' dual purposes of transporting people, goods and services (movement) and as destinations in their own right (place).

~~Aligning Understanding the movement and place functions in the design of roads can support allowing choosing the selection of the appropriate type of pedestrian crossing facility that provides users of all ages and abilities a better, safer and healthier travel options while creating vibrant places where people want to live, work and play.~~

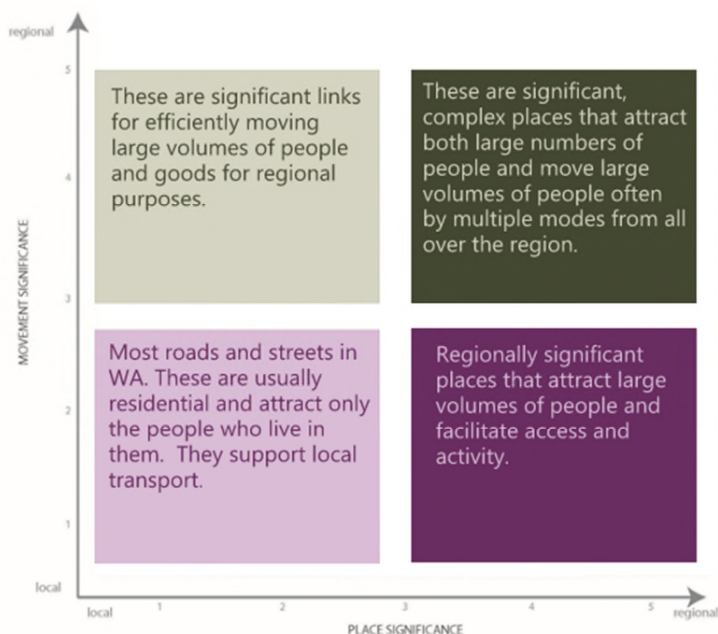
Movement and Place supports the delivery of the Safe System. ~~It, and the~~ *National Road Safety Strategy 2021-30* states that greater emphasis is needed for the safety of all types of pedestrian activity, and that walking should be recognised as a mode of transport.

~~Pedestrian crossing movements are an Appropriate pedestrian crossings can be considered when both important consideration in the determination of~~ the movement and place function of streets and corridors in relation to the wider network, ~~are defined, known as a Movement and Place classification.~~ Pedestrian crossings assist a street in achieving its desired movement and place functions by prioritising movements according to its classification.

Commented [MB15]: What if the presence of high speeds and high volumes means there aren't any pedestrians, but the Local Government wishes to create a pedestrian-friendly environment, in line with the Strategic Plan or Transport Plan? Is there a provision whereby a Local Government can look forward, rather than having to demonstrate volumes of pedestrians that will never occur, due to unfavourable conditions for walking in the current day? Can the inclusion of areas in a Strategic Plan or Transport Plan be the basis for reducing speed/traffic volumes to create the conditions to support a pleasant and safe walking environment? Including sound planning as an option here would help Local Governments to use their understanding of the local context to implement a connected pedestrian network.

Commented [MB16]: Is this Safe Systems thinking? Safe Systems accepts no death or serious injury on the road network. There is no acceptable level except zero. Safe Systems = Maximise safe mobility, Conventional Traffic Engineering = Tradeoffs between safety and mobility (travel time reduction, vehicle throughput). I would suggest adopting a Safe Systems approach and maximising safe mobility for all users.

Commented [MB17]: How?



In WA, Metropolitan roads are categorised according to their functional hierarchy. With the movement and place concept, generally, the higher the road hierarchy classification, the greater the movement value of the roadway.

Commented [MB18]: Not all roads?

Locations with a high place value and low movement value, generally have a higher number of pedestrians. In these locations, drivers are more aware of pedestrians and are generally more cautious. Therefore, a lower level of protection for pedestrians may be appropriate in these locations.

Locations with a low place value and high movement value, such as at intersections along primary distributor roads, generally have a low number of pedestrians. In these locations, drivers rarely are less likely to encounter pedestrians crossing the road. Therefore, a higher level of protection for pedestrians may be appropriate in these locations.

There are locations with a high place value and high movement value, such as town centres on primary distributor roads. In these locations, the safety of the pedestrians must be the most important consideration and every effort should be made to minimise the impact of the pedestrian crossing on traffic efficiency and provide the right balance between safety and efficiency.

Currently, the WA 'Movement and Place Framework' is being developed in consultation with a number of key stakeholders. Once developed, this framework shall be incorporated within this guideline.

Commented [MB19]: Again, this seems counter to Safe System thinking. I would suggest "...effort should be made to maximise safe mobility for all users of the transport system." Otherwise, this idea of minimising the impact of pedestrian crossings is problematic as it asserts the primacy of motor vehicles over every other mode. Why? The pedestrian network and its completeness is just as important as the vehicular network, especially in places with high place and movement values or where higher place values are desired.

5.6 Pedestrian volume and types

People's physical and cognitive characteristics can vary considerably among the population from person to person, according to many factors, such as age. Other factors such as the time of day, weather conditions and purpose of the trip will may also impact a person's cognitive and perceptual decision-making capacity. Pedestrian crossing facilities must be located and designed to accommodate users of all ages and abilities.

Therefore, in order to determine the necessity of and assist the necessity and in selection of the most suitable crossing type, it is essential to determine:

- Type of pedestrian:
 - fit ambulant
 - young children and seniors: reduced ability to see and be seen from the kerb, reduced capacity, and/or false sense of confidence to judge whether the crossing is safe to complete, may have difficulty to cross in crossing or require more time to cross due to mobility issues
 - wheelchair users, pedestrian with prams: reduced walking speed, require larger circulation space
 - vision or hearing impairs - reduced ability to judge their safety, require tactile surface indicators (TGSIs)
 - people cycling and e-rideable users: require larger circulation space
- Pedestrian volume: locations that experience periods of high demand or overcrowding may not be suitable for two-stage crossing facilities or left-turn slip lane crossings, as pedestrians may not have space to safely store within the median or traffic island refuge provided. Further to this, if high pedestrian numbers are expected during normal day-to-day operation or frequent large-scale events, then wider crossings may need to be considered.

Commented [MB20]: All crossings should be designed to accommodate these users.

Commented [MB21]: While these modes are legally allowed to use pedestrian infrastructure, catering to these modes should probably only occur along identified corridors (in the Long-Term Cycle Network, for instance)

Commented [MB22]: Again, it would be good to include something here about future demand for pedestrian crossing facilities. See comment under section 5.3.

Commented [MB23]: For crossings without pedestrian priority? Please specify

5.6.1 Pedestrian delay based on Movement and Place

Based on the target Levels of Service by Movement and Place, the acceptable delay for pedestrians based on Movement and Place is shown below.



Where the place value is high, i.e., there is a high number of pedestrians and the movement is low, pedestrians should be prioritised and should not be experiencing delays. This can be achieved through shared zones, zebra crossings, or sufficiently low traffic volumes and high pedestrian volumes, such that the average delay is close to zero.

Commented [MB24]: I find this logic troubling. It seems that pedestrians are happily accommodated in areas where there isn't traffic, but that pedestrians shouldn't be accommodated in areas where there are high vehicular volumes. Pedestrians need to be safely and comfortably (and from a Local Government perspective, relatively cost-effectively) accommodated regardless of traffic volumes. Just because having a pedestrian crossing facility (ideally with pedestrian priority) will increase vehicle delay should not be a reason not to implement one.

5.6.2 Pedestrian delay based on Level of Service on SIDRA

The Level of Service based on pedestrian delay is lower than for signals. This can be explained by

the fact that at signals, pedestrians are aware that there will be a dedicated phase for them to cross. On the other hand, when waiting at a non-priority (kerb ramp) crossing, pedestrians have no ability to know whether there is an upcoming gap in traffic and whether they will be able to cross in the foreseeable future. As delays begin to exceed 30 seconds, pedestrians may begin to assume that if there has not been a gap in the previous 30 seconds, then there is no reason to assume there will be a gap in the next 30 seconds.

Level of Service	Average Delay per Pedestrian, d (s)		Likelihood of Risk-Taking Behaviour
	Signals	Non-Priority	
A	$d \leq 10$	$d \leq 5$	Usually no conflicting traffic
B	$10 < d \leq 20$	$5 < d \leq 10$	Occasionally some delay due to conflicting traffic
C	$20 < d \leq 30$	$10 < d \leq 20$	Delay noticeable to pedestrians but not inconveniencing
D	$20 < d \leq 40$	$20 < d \leq 30$	Delay noticeable and irritating, increased likelihood of risk taking
E	$40 < d \leq 60$	$30 < d \leq 45$	Delay approaches tolerance level, risk-taking behaviour likely
F	$d > 60$	$d > 45$	Delay exceeds tolerance level, high likelihood of pedestrian risk taking

Commented [MB25]: A legend would be helpful here, e.g. s = seconds, d = delay

5.6.3 Pedestrian delay based on calculation

In the absence of empirical information, such as for new roads, the expected LoS for a non-priority crossing for a mid-block or side road crossing can be estimated using the formula below. This formula is based on Austroads Guide to Traffic Management Part 2: Traffic Theory Concepts Equation 5.2, where the average delay (d_{av}) of a minor stream (pedestrians at a non-priority crossing) is given by:

$$d_{av}(d \geq 0) = \frac{1}{qe^{-qT}} - \frac{1}{q} - T$$

where

d_{av} = average delay of pedestrians (seconds)

q = the volume of vehicular traffic (vehicles/second)

T = the size of the critical gap (seconds) as calculated in Appendix A

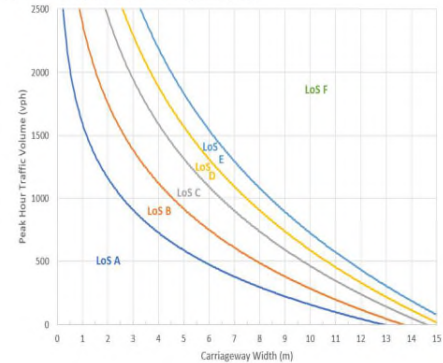
This is based on a random arrival of vehicles, thus is not appropriate at roundabouts where rolling queues on the approach and consistent traffic streams on the departure make the frequency of vehicles less random. Further, if there is reason to believe that arrivals of vehicles will not be random, such as downstream from a signalised intersection where traffic arrives in platoons, then the below is not appropriate.

For 2-way undivided roads, the 2-way traffic volume should be used, while for carriageways separated by a Same-Direction Pedestrian Refuge, the 1-way traffic volume should be split by the

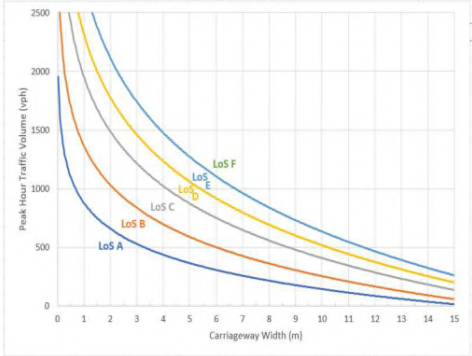
Commented [MB26]: Using this method would not account for localised knowledge of the area and an understanding of community wishes and desires. Local Governments may wish to use this as a guide, but would want to supplement with their knowledge of the context in making the final determination.

estimated proportion/volume of traffic expected to pass on each side of the pedestrian refuge (e.g. based on downstream directional distribution).

Pedestrian Delay LoS Estimate – 1-Way Carriageway



Pedestrian Delay LoS Estimate – 2-Way Carriageway



Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

5.7 Traffic volume and composition

Traffic volume affects the delays experienced by pedestrians, but with facilities that give priority to pedestrians, there are delays to other road users. Consideration is given to the delay caused to motorists stopping for pedestrians, compared to the delay experienced by pedestrians trying to cross a road.

5.7.1 Traffic Delay based on Movement and Place

Based on the target Levels of Service by Movement and Place, the acceptable delay for vehicles at zebra / wombat crossings based on Movement and Place is shown below.



5.7.2 Traffic Delay based on Level of Service on SIDRA

The SIDRA Intersection User Guide, Highway Capacity Manual, and Austroads Guide to Traffic Management Part 3: Transport Study and Analysis lists Level of Services for vehicles based on delay.

which is shown below. The Level of Service (LoS) for Unsignalized Intersections can apply to zebra crossings, while Signalised Intersections' LoS is appropriate for Pedestrian Operated Signals.

Commented [MB27]: Does this mean that delay for vehicles is more important than the delay for pedestrians? If so, I would disagree. Both users of the transport network should be treated equally or the needle tipped in favour of pedestrians, as vulnerable road users and the mode that forms the basis of the entire transport system (everyone walks, not everyone drives).

Commented [MB28]: These thresholds are very low. Depending on the length of the crossing, it's unlikely that someone with physical or visual impairment could cross the road in 10 or even 20 seconds. Nonetheless, these users should be accommodated across and throughout the pedestrian network.

Commented [MB29]: What is this guidance saying about what level of service is appropriate at urban intersections? The flaw of the Level-of-Service model is that it is assumed that A is better than F, which is not necessarily the case. In an urban environment with substantial movements for people using different modes of transport, I would say that a LOS of C or D would be acceptable for vehicles. Urban areas are not highways or areas where movement of vehicles is the absolute priority, so striking a balance where the competing needs of different road users are either balanced or skewed more toward modes that correspond with stated community goals (environment, health, safety, community) would make the most sense.

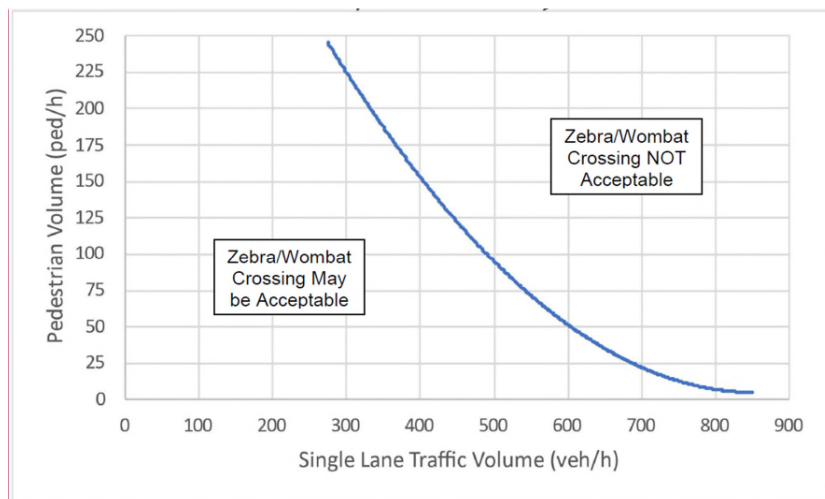
Level of Service	Average Delay per Vehicle, d (s)		
	Signals	Unsignalised	Roundabout
A	$d \leq 10$	$d \leq 10$	$d \leq 10$
B	$10 < d \leq 20$	$10 < d \leq 15$	$10 < d \leq 20$
C	$20 < d \leq 35$	$15 < d \leq 25$	$20 < d \leq 35$
D	$35 < d \leq 55$	$25 < d \leq 35$	$35 < d \leq 50$
E	$55 < d \leq 80$	$35 < d \leq 50$	$50 < d \leq 70$
F	$d > 80$	$d > 50$	$d > 70$

Commented [MB30]: Legend would help interpret here

5.7.3 Traffic Delay based on calculation

In the absence of empirical information, such as for new roads, the expected LoS for a non-priority crossing for a mid-block or side road crossing can be estimated using the Figure below developed through a SIDRA analysis of zebra crossings with different pedestrian and vehicular volumes. This is based on a random arrival of vehicles, thus is not appropriate at roundabouts where rolling queues on the approach and consistent traffic streams on the departure make the frequency of vehicles less random. Further, if there is reason to believe that arrivals of vehicles will not be random, such as downstream of a signalised intersection, then the below [figure](#) is not appropriate.

The peak hour pedestrian volumes should be used with the peak hour vehicular volumes of the single busiest lane. Pedestrian volumes should include cyclists and other relevant riders using the crossing.



Commented [MB31]: As I've commented before, this type of analysis will often be used as a hard-and-fast rule. In some cases, accommodating pedestrians safely by giving them priority amidst high volumes of traffic is important. One case is outside of schools. Another would be near key community destinations likely to attract children or near aged care facilities. I think it's also important to acknowledge here the issue of planning of walking/cycling to school before building the school/associated road infrastructure. Please add something about children's crossings, acknowledging that schools may be built near major roads and children's crossings may not necessarily be adjacent or even within 500m of a school site.

Considerations should be given ~~with the~~ vehicle classifications.

While heavy vehicles ~~are~~ typically represent a small percentage of traffic composition, they can have a significant impact on pedestrian safety, and this must be considered when assessing a pedestrian crossing facility.

Heavy vehicles often have blind spots due to their size, resulting in drivers potentially not being able to observe a recently arrived pedestrian at a crossing point. They also require a longer distance for deceleration. As such, the intersection geometry should be assessed with respect to the likelihood of conflicts between pedestrians and turning heavy vehicles.

In addition, where heavy vehicle aprons are installed at slip lanes to cater for the wider swept path of large turning vehicles, there may be a need to discourage pedestrians from standing in the apron due to the possibility of conflicts with turning vehicles.

~~There is a n~~eed to consider sight distance restrictions (for other drivers and pedestrians) caused by a ~~bus~~-stationary ~~bus~~ at ~~a~~the stop, particularly where the bus stop is located on the approach. Pedestrian facilities at the intersection should enable safe crossing of the roads and safe access to the bus stop. They should also take account of the needs of waiting and disembarking passengers.

5.8 Gap Acceptance

Critical gap is defined by the time in seconds below which a pedestrian will not attempt to begin crossing the road.

If the available gap is greater than the critical gap, it is assumed that the pedestrian will cross; but if the available gap is less than the critical gap, it is assumed that the pedestrian will not cross.

The ability for pedestrians to cross a road safely is primarily related to the traffic volumes on the road, during the time period in question. At low traffic volumes, there are regular gaps of sufficient length for pedestrians to cross safely with minimal delay. When volumes are high and pedestrians

Commented [MB32]: This seems only to relate to crossings without pedestrian priority. If that is the case, please state this.

need to cross a road with more than four lanes in addition to the median, the number of acceptable gaps in traffic decreases, and this may lead to pedestrians attempting to cross during smaller gaps, choosing an alternative longer route, or choosing not to walk altogether. This does not promote active travel as a viable option and can also lead to dangerous interactions between pedestrians and vehicular traffic, which can result in death or serious injury.

Making the decision to cross the road safely in relation to available traffic gaps is a complex task for pedestrians, particularly at unsignalized mid-block locations. Gaps are defined by the characteristics of the site and are dependent on the conditions present at the time a pedestrian attempt to cross. The adequate gap for a site is determined by dividing the crossing distance by the walking speed and adding an appropriate reaction time.

Calculation

Calculation of pedestrian crossing time is based on the New Zealand Transport Agency Guidelines for the Selection of Pedestrian Facilities.

$$t_{cp} = \frac{d_c}{v_w} F_s + C$$

where	t_c	=	critical safe gap (s) – pedestrian crossing time
	d_c	=	crossing distance (m) – kerb line to kerb line
	v_w	=	walk speed (m/s) – 1.2m/s
	F_s	=	Factor of Safety – 1.1
	C	=	confirmation time (s)
		-	2s to cross one direction of traffic
		-	4s to cross two directions of traffic

Crossing Distance, d_c

Crossing distance is the distance measured perpendicular to the direction of traffic from kerb line to kerb line. Where kerb is not provided, it should be measured from the edge of the sealed carriageway. For medians or pedestrian refuges, the separate carriageways shall be measured separately, provided there is a physical island (i.e. not a painted island) and the refuge is at least 1.8m wide.

Walk Speed, v_w

Different jurisdictions use different walk speeds (average, 15th percentile, 5th percentile). Given the factor of safety and confirmation time provided, it is not necessary to take the most conservative value. A The 15th percentile walking speed of 1.2m/s should be used.

Commented [MB33]: Should this be used in every situation? What about near aged care facilities or school crossings?

Factor of Safety, F_s

The factor of safety is applied to account for errors in judgement by pedestrians. Sources of possible error include:

- Underestimating how long it will take to cross
- Underestimating vehicle speed
- Overestimating vehicle distance

A factor of safety of 1.1 should generally be used.

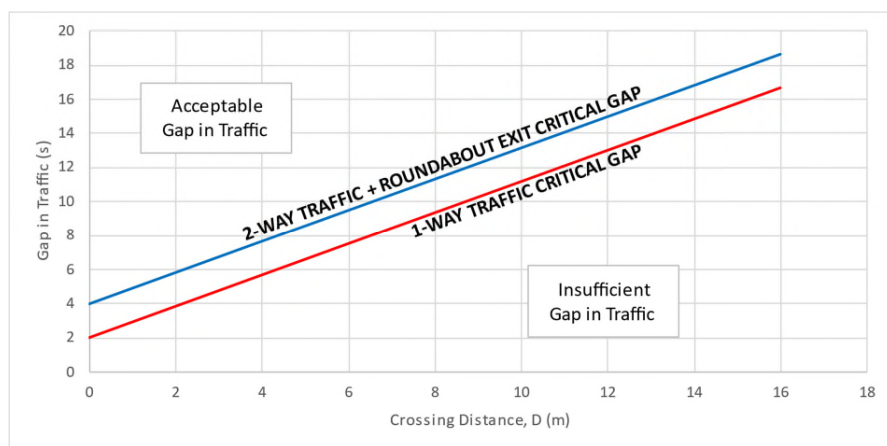
Confirmation Time, C

Confirmation time is the time required for a pedestrian to observe and confirm to themselves that there is a suitable gap in traffic. While some jurisdictions scale this based on the proportion of “sensitive pedestrians”, it is not always practicable to measure the proportion of “sensitive pedestrians” as their volume may be suppressed by the type of crossing or lack-there-of.

Given 2 seconds is the minimum reaction time for drivers in Western Australia for design purposes, a confirmation time of 2 seconds should be used for 1-way carriageways (including 2-way carriageways with a pedestrian refuge).

For 2-way carriageways (not separated by a pedestrian refuge) where pedestrians must observe approaching traffic from multiple directions, the Confirmation Time should be doubled to 4 seconds. This also applies to the exit of roundabouts where pedestrians must observe traffic from multiple legs of roundabouts.

Commented [MB34]: This logic doesn't make sense to me and seems like a self-fulfilling prophecy. You're basically saying, "If there are no sensitive pedestrians, then we just won't cater for them." To create an environment friendly to active transport/pedestrians, ensuring that all pedestrians, particularly children and the elderly, are catered for should be paramount.



5.9 Desire Lines

The ability to accommodate crossings where people want to go or come from is a primary consideration.

Pedestrian desire lines are the direct routes naturally taken by pedestrians, because of environmental factors such as street layout, land uses, trip generators and attractors. Crossings should be located as close as possible to the pedestrian desire line. Where this is not possible or unsafe, supplementary treatments may be used to mitigate the risks. Guidance treatments may also be used or use guidance for to direct pedestrians to the nearest crossing point.

By utilising a pedestrian desire line, a crossing can easily integrate into pedestrians' trips, removing barriers and achieving compliant crossing behaviour. Locating a crossing away from a pedestrian desire line may result in low usage or create a road safety risk for all road users if they-pedestrians continue to follow their cross in accordance with their preferred desire lines.

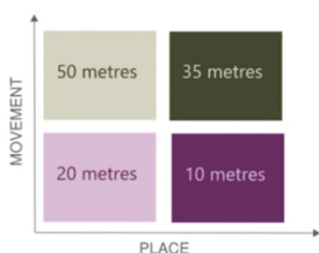
Generally, a pedestrian becomes highly likely to cross away from a crossing and take risks when the deviation from their desire line is greater than 50m.

Monitoring behaviour, identifying whether they cross in one place or are spread out along a route or at an intersection, as well as observational studies, such as examining worn surfaces and forced gaps in median landscaping, will assist in identifying desire lines.

For crossings in new developments, desire lines should be anticipated based on an assessment of the proposed land uses, proximity to schools, train stations, bus stops and trip attractors in the area, as well as the current patterns of pedestrian movement in the surrounding area.

It should be noted that desire lines may differ amongst user groups, such as elderly and disabled individuals, and are influenced by elements such as seating availability, level surface, and crossing distance.

The acceptable deviation from the desire line for pedestrians based on Movement and Place is shown below.



Commented [MB35]: This might be a good spot to mention Children's Crossings being planned ahead of time, rather than being put in retrospectively. Often, children's crossings are put in place under conditions which are not favorable (e.g., at roundabouts), but where they are nonetheless necessary. Planning ahead can solve this problem.

Commented [MB36]: This doesn't make sense to me. It seems that the danger posed by traffic (high speed, high volume, heavy vehicles) is higher, so the tolerance for seeking a safer crossing location is higher. The desire line is still in the same place. Instead of differentiating by Movement and Place, I would suggest providing a standard deviation distance for all pedestrians, regardless of movement and place, e.g., 10 metres standard and 20 metres at most.

5.10 Lighting

Adequate lighting at pedestrian crossings is essential to provide motorists advanced warning of a crossing and enhance pedestrian conspicuity. It also enhances the safety of pedestrians by enabling them to identify hazards at the crossing point, orient themselves, and discourage crimes.

Where lighting is designed primarily for the vehicular roadway, the positioning of lights should be checked to ensure that they not only meet the minimum code requirements for the carriageway, but also provide above average levels at locations where pedestrians are likely to require illumination.

The design for supplementary lighting for pedestrian crossings shall comply with the requirements of MRWA's *Lighting Design Guidelines for Roadways and Public Spaces and Road Lighting Part B*.

6 HIGH LEVEL CROSSING TYPE EVALUATION TOOL

This section can be used to eliminate certain crossing types depending on a road's traffic flow and traffic speed. Practitioners should use the tool to qualitatively assess their site for what may be an appropriate crossing type and limit the scope of the Detailed Analysis in **Section 7**.

This document refers to desirable and required speeds at the location of pedestrian crossings, which does not necessarily refer to the free flow operating speed of the road, nor the speed limit. The speed may be reduced at the location of the pedestrian crossing through the alignment of the road or by supporting treatments as described in **Section 9**.

Figure below shows the general suitability of each crossing type on a road based on the traffic speed and traffic flow.

		Traffic Flow	Traffic Speed		
			<30km/h	>35km/h <70km/h	>70km/h
Mid-Block Crossing	Non-Priority	Low	Green	Green	Yellow
		Medium	Green	Green	Red
		High	Green	Yellow	Red
	Zebra/Wombat	Low	Green	Yellow	Red
		Medium	Green	Yellow	Red
		High	Green	Yellow	Red
	Warden-Controlled Children's Crossing	Low	Green	Yellow	Red
		Medium	Green	Yellow	Red
		High	Green	Yellow	Red
	Pedestrian Operated Signals	Low	Red	Yellow	Green
		Medium	Green	Green	Yellow
		High	Green	Yellow	Yellow
Grade Separated	Low	Red	Yellow	Yellow	
	Medium	Red	Yellow	Yellow	
	High	Red	Yellow	Green	
Shared Zones	Low	Green	Yellow	Yellow	
	Medium	Green	Yellow	Red	
	High	Green	Yellow	Red	

Commented [MB37]: What about pedestrian volumes? In some cases, the pedestrian volumes are an order of magnitude greater than vehicle volumes. Pedestrian volumes, in those cases, should take precedence over vehicle volumes (and considerations of vehicle delay).

Commented [MB38]: There are currently almost no facilities with a speed limit of 30 km/h or less, more or less precluding many of these crossing types. I understand that speeds should be brought down to 30km/h, but with much higher speed limits, that is very difficult. All access roads, barring a few areas, are speed zoned at 50 km/h. I would suggest revising these speeds to correspond with the current reality.

Commented [MB39]: The inherent issue with this diagram is that on roads with speeds greater than 60/70km/h with moderate traffic volumes, the only crossings that are considered suitable are pedestrian-operated signals and grade-separated crossings. This is problematic in that the former is very hard to get approval to implement (often only through direct political intervention) and the latter are very expensive. From a pure safety perspective, this makes sense (higher speed --> higher likelihood of death/serious injury to pedestrian). However, from a pedestrian network perspective, this is a terrible outcome. These high speed facilities, much like trenching of roads, create substantial barriers to pedestrians and reduce the likelihood of people walking. Of course, this is then contrary to community goals and the vision for a safer and connected network for active transport.

Commented [MB40]: Please repeat the headers on this chart for ease of reference

Commented [MB41]: Likewise here, it seems like these guidelines incentivise giving up on pedestrians/active transport when the impact on/conflict with vehicular traffic is higher, in favour of vehicular movement. It's unlikely that grade-separated crossings will ever be built on all pedestrian desire lines and people will continue to cross, regardless of infrastructure. Zebra/Wombat crossings are the best way to accommodate them, but basically aren't recommended on roads above 30 km/h (of which there are next to none across WA).

Commented [MB42]: Roundabout design in WA rarely accommodates pedestrian crossings with priority. This, however, can be designed in (see Canberra Example - <https://the-riotact.com/act-government-reveals-plans-to-roll-out-european-style-intersections-across-canberra/659682>). This guideline would preclude any design incorporating pedestrian priority on higher speed roads (60 km/h or greater), which essentially means that some pedestrians (children, elderly, low vision, mobility impairments) will be unable to cross certain roads safely.

High Medium Low

7 DETAILED ANALYSIS AND SELECTION OF CROSSING TYPES

The Detailed Analysis should first establish the strategic function of the road, namely whether it is appropriate to give pedestrians priority over vehicular traffic. If the crossing is intended for pedestrian priority (e.g., in activity centres; places of high place function, but ~~lower movement function~~), then it is not necessary to analyse non-priority (kerb ramp) crossings.

If pedestrian priority is not appropriate, it should then be considered whether non-priority (kerb ramp) crossings will be acceptable for pedestrians, from both safety and delay points of view. If not, then practitioners should move on to determine the appropriate type of controlled crossing, typically either a zebra crossing or pedestrian operated signals. An example of the steps to be taken is shown below:

1. Is it a pedestrian priority area?
Yes (go to 3)
No (go to 2)
2. Is the delay for non-priority beyond limits?
Yes (go to 3)
No: **NON-PRIORITY CROSSING**
3. Can the speed at the crossing be limited to below 30km/h?
Yes (go to 4)
No (go to 5)
4. Will a zebra crossing cause unacceptable delays to traffic?
Yes (go to 5)
No: **ZEBRA CROSSING**
5. Is the speed limit 70km/h or less?
Yes (go to 6)
No (go to 7)
6. Can pedestrian operated signals meet level of service for both pedestrian and vehicles?
Yes: **PEDESTRIAN OPERATED SIGNALS**
No (go to 7)
7. Is grade separation viable (cost, space, convenience?)
Yes: **GRADE SEPARATION**
No: **Consider changing general considerations**

Formatted: Strikethrough

Commented [MB43]: I would remove this. Pedestrian priority may be appropriate in areas with high movement function.

Formatted: Strikethrough

Commented [MB44]: What about from the perspective of developing a safe, comfortable, and connected pedestrian network? Community plans (Integrated transport plans, walk and ride plans, etc.) would also have something about pedestrian crossings and may provide a priority pedestrian network. This should also be considered.

Commented [MB45]: The consideration to provide a non-priority crossing is only based on delay, which supports vehicles not giving priority to pedestrians. I would argue that this whole question flow chart should be inverted and that the best conditions for pedestrians should be considered first and non-priority crossings (as the least safe/least comfortable crossing type) be implemented last.

Commented [MB46]: Again, I would use a higher speed here, as it can be difficult to limit speeds to under 30 km/h on roads that are speed zoned at much higher speeds without significant intervention.

Commented [MB47]: This is problematic for two reasons. 1) this assumes that vehicular delay is more important than pedestrian delay and 2) there should be a higher tolerance for delay in urban areas.

Commented [MB48]: What does this mean specifically? I am reading this to mean that the idea of allowing pedestrians to cross a road be abandoned or be subject to providing infrastructure changes (very expensive) or reducing speed limits (which can be difficult to achieve under current speed zoning guidelines, especially with expensive infrastructure improvements). Local Governments attempt to create places where people can safely walk and cycle. This guideline should provide implementable solutions to support this goal, instead of giving up when it gets too hard.

8 TYPES OF CROSSINGS

8.1 Non-Priority Crossings

Non-Priority Crossing types assist pedestrians to cross by shortening the crossing distance ~~that in~~ which pedestrians are exposed to vehicular traffic, simplifying the crossing task, increasing visibility, providing safe gaps for pedestrians to cross the road, reducing vehicle speeds, and/or encouraging courtesy between drivers and pedestrians. ~~These crossings do not give pedestrians priority over vehicles (except at slip lanes), which means pedestrians must select an appropriate gap for cross.~~

The objectives of non-priority crossings are:

- Reduce conflict between vehicles and both pedestrians and cyclists by providing priority to vehicles
- ~~Simplify~~ the decisions which drivers, pedestrians and cyclists must make by clearly identifying priority
- Provide continuous and connected bicycle routes for cyclists and to improve access for pedestrians

In most circumstances, under the *Road Traffic Code 2000*, the only locations a pedestrian is not permitted to cross a carriageway is "within 20m of a warden-controlled children's crossing, marked foot crossing (pedestrian operated signals) or pedestrian crossing (zebra crossing) on the carriageway". Therefore, the provision of kerb ramps to create a non-priority pedestrian crossing does not legally change whether a pedestrian is permitted to cross.

Application

- Moderate volumes of crossing traffic
- Noticeable desire line or cycle path route
- There is difficulty crossing full width of road in one stage due to:
 - long delays or unsafe gap selection
 - long crossing length or multiple lanes
 - high vehicle flows or high speed
 - insufficient sight distance to enable a crossing length of both directions of traffic
- Need of provision for people with disability or mobility difficulty
- Pedestrian crossings are not expected by motorists
- There are poor crossing options at other locations, or best location to cross is unclear
- There are crossings at numerous locations along short section of road

Locations:

- Mid-block,
- Unsignalized intersections,
- Roundabout, and
- Slip lanes.

Commented [MB49]: I'm not sure much of this is true. Most non-priority crossing types, except kerb bulb-outs, just provide a suggestion of where to cross and very minimal protection via a pedestrian refuge island. The crossing task is simplified in some cases by the provision of a kerb cut, but visibility isn't necessarily better as a result of the infrastructure, nor are vehicle speeds reduced necessarily. I'm also not sure how courtesy is encouraged either. I would remove all of this except the kerb cuts bit.

Commented [MB50]: These do provide a suggestion to where to cross, but I'm not sure they improve access. I would remove.

Commented [MB51]: Isn't this everywhere? Shouldn't all crossings provide people with disabilities and mobility issue regular and safe access? I would remove this.

8.1.1 Mid-Block

A Mid-Block non-priority crossing refers to designated locations along a carriageway where kerb ramps are provided for pedestrians on either side of the carriageway, but no formal marked crossing is provided.



Parameter	Description
Pedestrian Delay	<div>Maximum acceptable pedestrian delay based on movement and place</div> <div><div><div>30 seconds</div><div>20 seconds</div><div>10 seconds</div><div>5 seconds</div></div></div>
Proximity to Other Crossing	<div>Should a zebra crossing, pedestrian operated signals, or grade separated pedestrian crossing be warranted due to pedestrian delays, a non-priority crossing – kerb ramps may be acceptable if there is:</div> <div><div><div>A suitable crossing within 200m.</div><div>Less or equal 5 pedestrians' movement or desire line.</div><div>The movement function is higher than the place function.</div></div></div>
Spacing of Kerb Ramps	<div>In general, non-priority crossings as a minimum should be located every 100m, subject to site constraints.</div>

Commented [MB52]: I'm confused. Why would the zebra crossing not just be implemented, regardless of other crossings, pedestrian movements, or movement and place? This seems like another way of getting out of providing a safe, comfortable, and convenient crossing for pedestrians. Please remove this caveat.

Warrants	Description
Sight Distance	<div>Sufficient Crossing Sight Distance (CSD) must be available based on the Section 5.2.</div>
Number of Lanes	<div>Non-Priority Crossings are not encouraged across 3 or more lanes unless accompanied by additional treatments, such as wigwags.</div>

Design Considerations

- Signs and pavement markings for non-priority crossings at mid-blocks shall be in accordance with Main Roads' Standard Drawings 200331-0139 and 200331-0140.

8.1.2 Unsignalized Intersection

Non-priority crossings are the default treatment for pedestrian crossings on the side road(s) of unsignalized intersections. As described above, vehicles on the through road are required to give way to crossing pedestrians when turning onto the side road.



Parameter	Description
Minimum Requirement	As a minimum, kerb ramps must be provided across all side roads where there is a pedestrian demand along that side of the road.
Pedestrian Delays	Maximum acceptable pedestrian delay based on movement and place <div></div>

Warrants	Description
Sight Distance	Approach Sight Distance (ASD) should be available as calculated in Section 5.2. Crossing Sight Distance (CSD) should be available as calculated in Section 5.2.
Distance from Intersection	Side road pedestrian crossings must be within 10m of the intersection. Preferably, there should be 6m clear space between the give way/stop line and the kerb ramps.
Operating Speed	The operating speed at the location of the crossing must be 30km/h or less.

Commented [MB53]: I believe these considerations are in place to allow space for cars to give way to pedestrians that are crossing. Can this be verified and included here for clarity?

8.1.3 Roundabout

Non-priority crossings are the default treatment for pedestrian crossings at roundabouts. Unlike at other intersections, turning vehicles are not required to give way to pedestrians and relevant riders on the carriageway.

An important consideration for non-priority pedestrian crossings of roundabouts is the distance from the roundabout to the kerb ramps. The closer the kerb ramps are, the worse the effect of rolling queues (unless close enough that queues are stationary) and means pedestrians are required to see further down the side roads to observe oncoming traffic. The further the kerb ramps are from the roundabout, the less convenient it becomes for pedestrians with greater detours from desire lines and the higher the vehicle speeds become. In general:

- Non-priority crossings should not generally be located within 6m of the holding line to enable pedestrians to pass behind a vehicle, and
- Non-priority crossings should not be located further than the maximum deviation from the desire line of pedestrians.

Practitioners should look to minimise the deviation from a pedestrian’s desire line while maintaining an appropriate number of gaps in traffic to ensure pedestrian delays are below the levels deemed acceptable.



Parameter	Description
Minimum Requirement	As a minimum, kerb ramps must be provided on all legs of a roundabout which may have any level of pedestrian demand.
Pedestrian Delay	Maximum acceptable pedestrian delay based on movement and place <div><div><div>MOVEMENT</div><div><div>30 seconds</div><div>20 seconds</div><div>10 seconds</div><div>5 seconds</div></div><div>PLACE</div></div></div>

Commented [MB54]: It would be great if this wasn't the default, but an option. There is one crossing with pedestrian priority at a roundabout that I am aware of (near Redcliffe Station). Why can't this become the standard? That would, after all, contribute to creating a safe and connected pedestrian network. There are design options for this. More generally, these guidelines should support better and safer pedestrian crossings, not mandate the least safe option.

Commented [MB55]: I would add another option here to install a roundabout with pedestrian priority. The design allows one car to exit the roundabout, give way to the pedestrian, and then continue on, so the roundabout itself isn't blocked.

Commented [MB56]: Without priority and particularly during peak hour, these delay times can be blown out substantially.

Warrants	Description
Distance from Roundabout	<p>Non-priority kerb ramp crossings should not be located within 6m of the holding line to enable pedestrians to pass behind a vehicle.</p> <p>Non-priority kerb ramp crossings should not be located further than the maximum deviation from the desire line of pedestrians as set out in Section 5.9.</p>
Operating Speed	It is desirable to reduce vehicular speeds past the crossing points. Ideally, traffic speeds are reduced to below 30 km/h.
Sight Distance	Pedestrians waiting to cross require Crossing Sight Distance (CSD) as calculated in Section 5.2. On the departure leg, this CSD needs to be available for all approach legs to the roundabout.

Commented [MB57]: Again, this is so low that it will be almost unachievable in many cases.

8.1.4 Slip Lane

A “Slip Lane” is defined by the *Road Traffic Code 2000* as:

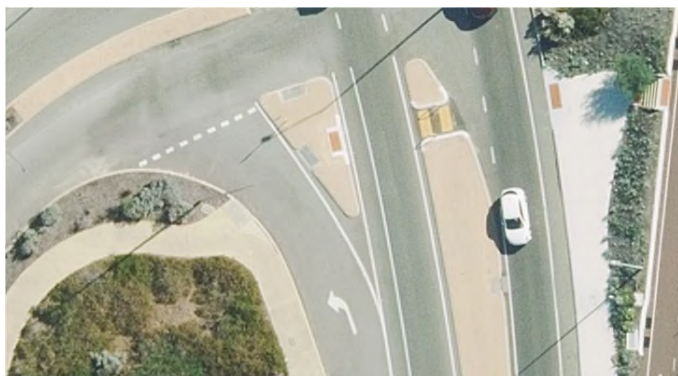
“An area of carriageway for vehicles turning left that is separated, at some point, from other parts of the road by some form of painted island or traffic island.”

Slip lanes at unsignalized intersections can be categorised into 2 types:

- High entry angle slip lanes (unsignalized intersections):
 - Speeds should already be slow, therefore it should not be difficult to reduce traffic speeds to below 30km/h
 - Provides additional guidance to drivers to give way to pedestrians
 - Longer vehicles may store across zebra crossing
- Free flow slip lanes (unsignalized intersections and roundabout):
 - Ensures clarity to drivers that they must give way to pedestrians
 - Traffic speeds can be high, reducing traffic speeds to below 30km/h may be difficult

Non-priority crossings are the default treatment for pedestrian crossings on slip lanes. They are provided to allow pedestrians to cross from the kerbside to an island which separates the left turning traffic from through traffic so pedestrians can then either cross the side road, through road, or roundabout.

As per Road Traffic Code 2000, drivers turning left in the slip lane must give way to pedestrians on the slip lane.



Parameter	Description
Minimum Requirement	As a minimum, non-priority crossings must be provided across all slip lanes which may have any level of pedestrian demand.
Pedestrian Delay	Slip lanes do not form the main crossing of the road (i.e., it is a supplementary crossing to crossing the main carriageway or side road). Drivers are required to give way at a slip lane crossing; therefore, pedestrians should expect a high Level of Service (LoS). Non-priority crossings of slip lanes should achieve a LoS B, equating to pedestrian delays of no more than 10s.

Commented [MB58]: Again, it would be great to see this as an option, not the default.

Commented [MB59]: This is confusing, especially considering the picture below. So, who has priority? It's a non-priority pedestrian crossing, but this says that drivers must give way? Please reword for clarity.

Commented [MB60]: So pedestrians do have priority? How is it a non-priority crossing then? No zebra crossing? If pedestrians have priority anyway, why not just mark the crosswalk, so it's very clear to everyone. In practice, vehicles rarely give way to pedestrians at slip lanes, so more clarity as to who has priority in accordance with the law should be the goal. I would make this option a rarity and have the standard option be a zebra crossing, since the law already states that vehicles must give way.

Location	<p>Non-priority crossings of high angle entry slip lanes should be located to allow sufficient space for one vehicle to store between the give way or stop line and the crossing. This is also generally around where vehicle speeds are the lowest. The kerb ramps should generally be located 6m clear from the give way or stop line. However, consideration should be given to the available sightlines.</p> <p>Non-priority crossings of free flow slip lanes should ideally be located to minimise pedestrian deviation from the desire line, typically aligned with the crossings of the side roads or the roundabout.</p>
----------	---

Warrants	Description
Distance from stop line	Non-priority kerb ramp crossings should not generally be located within 6m of the holding line to enable pedestrians to pass behind a vehicle.
Operating Speed	<p>Pedestrians crossing at non-priority crossings are not protected from traffic, hence it is desirable to reduce vehicular speeds past the crossing points. Ideally, traffic speeds are reduced to below 30 km/h.</p> <p>High entry angle slip lanes should generally achieve this as vehicles are required to slow down for the upcoming give way or stop line, however, for free flow slip lanes, the radius of the curve should be minimised to help lower speeds <u>as far as is reasonably practicable and supporting treatments considered.</u></p>
Sight Distance	<p>Slip lanes, particularly free flow slip lanes, often involve a curving alignment which can inhibit sight distance from pedestrians to oncoming traffic. Pedestrians waiting to cross require Crossing Sight Distance (CSD) as calculated in Section 5.2.</p> <p>The vehicle design speed should be based on the appropriate speed for the horizontal curve based on the horizontal curve speed equation.</p>
Number of Lanes	<p>As slip lanes involve left turns, multiple lanes result in restricted sightlines.</p> <p>Therefore, non-priority crossings of slip lanes should not be used across slip lanes with 2 or more lanes of traffic.</p>

Commented [MB61]: Please remove this caveat, as it basically is an out to not using a tight turning radius.

8.2 Zebra Crossings

A zebra crossing is a section of the road marked with white longitudinal strips 600mm wide running from kerb to kerb where vehicles must be at a speed at which the driver can, if necessary, stop safely before the crossing and must give way to any pedestrian who is on a zebra crossing.

The objectives of a zebra crossings are:

- Minimise conflict between pedestrians crossing the road and vehicles travelling along the road
- Enhances the visibility of the location where pedestrians are crossing
- Allocate short time periods for use of a section of road by pedestrians crossing the road
- Pedestrians have priority
- Improves accessibility for pedestrians

From Safe Systems principles, the probability of a crash between a vehicle and a pedestrian resulting in a fatality rises significantly if the impact speed of the vehicle is over 30km/h. Furthermore, at lower speeds drivers are more likely to give way. **All zebra crossings must be installed with supporting treatments such that the design speed of traffic at the location of the crossing is less than 30km/h.** This may be achieved through speed limits, physical speed reduction aids (preferred) and/or signs and line marking.

Application

- Regular crossings used by ~~young or older~~ pedestrians
- May have ~~noticeable peak crossing demand~~
- Used for lower speed zones (<30km/h)
- Is suitable for crossing two-lane two-way, low-speed roads that have high-volumes or insufficient gaps, and high entry angle left-turn slip lanes at arterial road intersections
- ~~Is not suitable on multilane roads~~

➤ Wombat Crossing

Reference to zebra crossings in this guideline also include the preferred treatment of a wombat crossing, a zebra crossing which is located on a raised plateau at footpath level. This raised surface is generally effective at reducing the operational speed of vehicles and improves the visibility of the crossing, however, should not be used on routes leading to emergency facilities.

Where a raised platform cannot be installed, the operational speed of vehicles must still be reduced below 30km/h at the point of the zebra crossing by other means with justification given as to why a wombat crossing is not feasible.

The Pedestrian Crossing sign (R3-1B) is to be installed on both approaches to the zebra crossing. Where there is limited visibility of the Pedestrian Crossing signs due to road curvature or other local conditions, the Pedestrian Crossing Ahead (W6-2B) advance warning sign is to be installed.

Application

- Appropriated on two-lane roads with short crossing distances,
- Appropriated on roads with low traffic speeds and ~~low traffic volumes~~,

Commented [MB62]: Again, I think meeting this warrant will be very difficult, particularly on higher speed roads. Please increase the speed to something more achievable, so this priority crossing treatment can actually be implemented.

Commented [MB63]: This isn't a specialised treatment for young or older pedestrians. Zebra crossings provided priority for all pedestrians. Please remove "young or older"

Commented [MB64]: This is troubling. How can demand be demonstrated, if the treatment isn't already in place. Basically, no one will cross, if it is dangerous to do so. I would suggest allowing 'sound planning' to come into play here and pedestrian and bicycle plans/other strategic infrastructure plans to identify locations where priority crossings are necessary. This is a proactive way of improving the pedestrian network, rather than just responding to demand (which often can't be demonstrated without the treatment in place).

Commented [MB65]: Under Mid-Block on page 35, this guideline states "Mid-Block Zebra Crossings across more than 2 lanes must be staged with a median or pedestrian refuge at least 2.5m wide." With this in mind, I would delete this sentence, as zebra crossings are suitable for multilane roads with supporting elements.

Commented [MB66]: While wombat crossings are the preferred option, this is often a higher-cost treatment. It would be great to see more wombat crossings, but this guideline should also be encouraging more pedestrian priority crossings, rather than making it more difficult. As such, I would recommend just including this an option, rather than the preferred option.

Commented [MB67]: Why low traffic volumes? This is a great treatment to actually get vehicles to give way. I'm not clear why this shouldn't also be implemented in areas where there are higher volumes.

- Appropriate on roads with consistent pedestrian usage throughout the day,
- Appropriate where there is pedestrian storage space on the verge,
- Ensure street lighting,
- Ensure good visibility of the crossing and pedestrians,
- Appropriate on left turn slip lanes, when it is possible to achieve 30km/h operational speed,
- Should not be used on busy multi-lane roads,
- Should not be used on high-speed roads (>60 km/h),
- Should not be used where sight distance is restricted,
- Wombat crossings should be avoided on bus routes and other routes used by heavy vehicles, as these users could be adversely affected by the raised platform.

Commented [MB68]: While I understand the rationale here, I think this treatment is the best option for ensuring that vehicles give way and could be implemented in areas where the lack of yielding is a problem.

Commented [MB69]: I think bus routes makes sense, but heavy vehicles? I think the benefits to pedestrian safety and comfort should outweigh a perceived cost in time (to give way) for heavy vehicle drivers.

Locations:

- Mid-block,
- Unsignalized intersections,
- Roundabout, and
- Slip lanes.

8.2.1 Mid-Block



Parameters	Description
Pedestrian Delay	<div>Maximum acceptable pedestrian delay based on movement and place</div> <div><div><div>MOVEMENT</div><div>PLACE</div><div><div>30 seconds</div><div>20 seconds</div><div>10 seconds</div><div>5 seconds</div></div></div></div>
Staging of Crossing	Mid-Block Zebra Crossings across more than 2 lanes must be staged with a median or pedestrian refuge at least 2.5m wide.
Lightening	Should be as per MRWA standard
Movement and Place	<div>Mid-Block Zebra Crossings can be considered at:</div> <div><div><div>high place low movement</div><div>low place low movement</div></div></div>
Parking	Parking to be restricted a minimum of 20m before the crossing and the 10m following
Proximity to Other Crossing	<div>Zebra crossings should not be installed where there is:</div> <div><div><div>A suitable zebra crossing, pedestrian operated signals, or grade separated pedestrian crossing within 200m</div><div>less or equal 5 pedestrians' movement or desire line.</div></div></div>

Commented [MB70]: This does not correspond to my understanding of how movement and place will work in WA. Also, the Zebra Crossing at a mid-block location is a good treatment to provide pedestrians with a safe place to cross, regardless of the movement function of the road. This seems like another stipulation to disallow zebra crossings on major roads, which are precisely the facilities that pedestrians need supportive infrastructure to cross. I would delete this section entirely.

Commented [MB71]: This is also unreasonable. Pedestrians will cross at the desire line. I think 50m would be a more reasonable distance to consider here. This is also problematic in urban centres where there are likely to be many different crossing points within close proximity (Albany Highway in East Victoria Park, for example). Multiple zebra crossings should be permitted in those locations.

Commented [MB72]: What does this mean? How will this be measured? As I mentioned before, if there is no treatment, it's unlikely that many people will cross. Zebra crossings should be allowed as part of 'sound planning' on Local Government roads to support a safe, comfortable, and connected pedestrian network.

Warrants	Description
Sight Distance	Sufficient Approach Sight Distance (ASD) must be available to a zebra crossing's pavement marking as calculated in Section 5.2 and Main Roads' Supplement to Austroads Guide to Road Design Part 4A. Zebra crossings may be appropriate if Crossing Sight Distance is not available for non-priority crossings – kerb ramps, but ASD is available.
Speed Limit	The maximum posted speed limit appropriate for mid-block zebra crossings is 60km/h. The operating speed at the location of the crossing must be 30km/h or less.
Number of Lanes	Zebra Crossings shall not be permitted across more than 2 lanes in a single crossing or in a single movement.
Traffic Volume	Mid-block Zebra Crossings may not be permitted where the AADT for the carriageway is greater than 10,000 vpd.
Pedestrian Volume	Zebra Crossings shall not be permitted where pedestrian volumes are 5 or less per hour (in any hour). Vulnerable pedestrians shall be counted as 2 pedestrians.

Commented [MB73]: Again, this will be very difficult to achieve in many instances. I would suggest increasing this.

Commented [MB74]: This basically means that crossings will not be provided on these roads, as signalised mid-block crossings are very difficult to implement and grade-separated crossings are too expensive in most cases. As such, this means that pedestrians will be faced with an insurmountable barrier at high volume roads and will likely cross anyway, creating a dangerous situation. Please reconsider this warrant.

Commented [MB75]: This is also very problematic. How will this be determined? Zebra crossings provide a safe treatment for people to cross and should not be tied to volumes of pedestrians. Also, it's unlikely that any zebra crossing could meet this requirement, as fewer people are walking in the middle of the night. I would suggest removing this entirely.

Design Considerations

- Signs and pavement markings for zebra crossings at mid-blocks shall be in accordance with Main Roads' Standard Drawings 200331-0164.

8.2.2 Unsignalized Intersection



Zebra crossings on side roads do not change the requirement for vehicles turning onto the side road to give way to pedestrians crossing the side road. They do, however, increase drivers’ awareness of the requirement to give way to pedestrians crossing the road they are entering. Furthermore, the inclusion of a zebra crossing on a side road introduces the requirement for vehicles on the side road approaching the intersection (including on the far side of cross intersections) to give way to pedestrians on the zebra crossing.

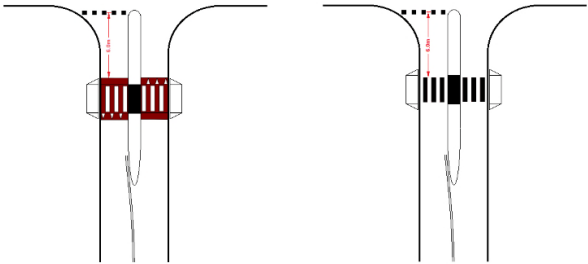
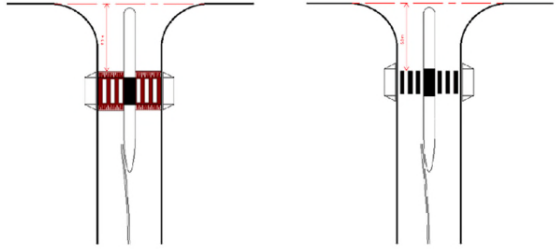
Parameter	Description
Activity Centres	Roads with a high “Place” value under the Movement and Place Framework should consider zebra crossings across unsignalized side roads.
Pedestrian Delay	<div>Maximum acceptable pedestrian delay based on movement and place</div> <div></div>

Commented [MB76]: As in previous comments, zebra crossing support the development of a connected pedestrian network and should be considered, regardless of place value.

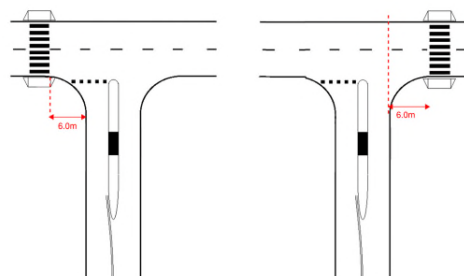
Vehicular Delay	Zebra crossings should not be used when delays to vehicles exceed the vehicular delays set out in Section 5.7.
Traffic Volume	Mid-block Zebra Crossings may not be permitted where the AADT for the carriageway is greater than 10,000 vpd.
Pedestrian Volume	Zebra Crossings shall not be permitted where pedestrian volumes are unlikely to exceed 5 per hour (in any hour). Vulnerable pedestrians shall be counted as 2 pedestrians.
Staging of Crossing	Mid-Block Zebra Crossings across more than 2 lanes must be staged with a median or splitter island at least 2.5m wide.

Commented [MB77]: Again, vehicular delay should not be considered as having higher value than pedestrian delay. Precisely in places where vehicular delay is likely to be high is where pedestrians need supportive infrastructure to cross. Please remove this consideration.

Commented [MB78]: This basically means that crossings will not be provided on these roads, as signalised mid-block crossings are very difficult to implement and grade-separated crossings are too expensive in most cases. As such, this means that pedestrians will be faced with an insurmountable barrier at high volume roads and will likely cross anyway, creating a dangerous situation. Please reconsider this warrant.

Warrants	Description
Operating Speed	All zebra crossings must be installed with supporting treatments as described in Section 9 such that the design speed of traffic at the location of the crossing is less than 30km/h.
Sight Distance	Crossing Sight Distance (CSD) is required for pedestrians. CSD is calculated on Section 5.2 Approach Sight Distance (ASD) is required from approaching vehicles (1.1m eye height) and the pavement markings of the zebra crossing. ASD is calculated on Section 5.2 or as in <i>Main Roads' Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections</i> .
Distance from Intersection	<p>Preferably, there should be 6m clear space between the give way/stop line and the zebra crossing and should best fit the desire line of pedestrians.</p> <p>For a wombat crossing, 6m to be to the start of the ramp. For a zebra crossing, the distance to be 6m to the zebra markings.</p>  <p>If there is no give way or stop line, the 6m is measured to the edge of the road (kerb extension), as shown below:</p> 

Crossings on the major road, the 6m is measured to the edge of the road (kerb extension), as shown below:

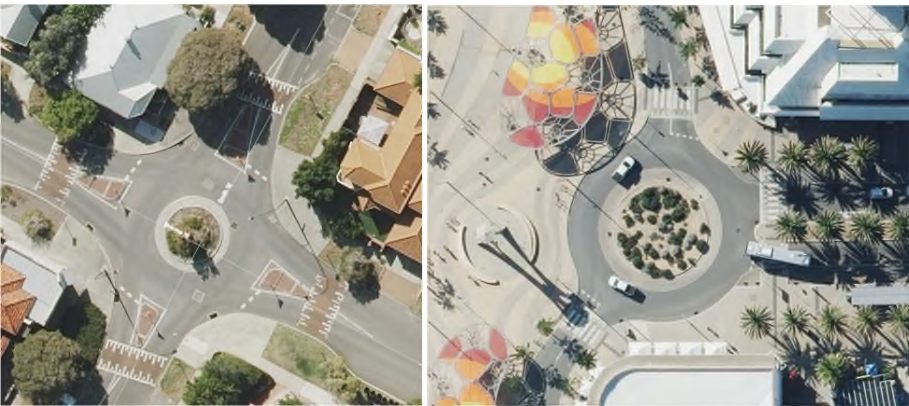


8.2.3 Roundabout

Zebra crossings may be provided on legs of a roundabout where non-priority crossings are deemed inappropriate. They require drivers to give way to pedestrians on the crossing hence removing potentially length delays for pedestrians which can be common at roundabouts.

An important consideration for zebra crossings at roundabouts is the distance from the roundabout to the kerb ramps. On the departure leg, zebra crossings too close to the roundabout can cause vehicle queuing into the circulating carriageway. The further a zebra crossing is from the roundabout, the less convenient it becomes for pedestrians with greater detours from desire lines and the higher the vehicle speeds become, both reducing pedestrian safety and the likelihood that drivers will stop for pedestrians.

Practitioners should generally seek to minimise the distance of the zebra crossing from the roundabout. Distances may need to be increased on departure legs of roads with higher "Movement" function under the Movement and Place Framework to limit vehicular queuing into the circulating carriageway. Zebra crossings on the approach and departure of the same leg of a roundabout should generally be aligned with each other so far as is reasonably practicable.



Parameter	Description
Activity Centre	In areas with a "Place" value of P4 or P5 under the Movement and Place Framework, it may be desirable to provide zebra crossings at small single-lane roundabouts.
Pedestrian Delay	Maximum acceptable pedestrian delay based on movement and place. <div></div>
Vehicular Delay	Zebra crossings should not be used when delays to vehicles exceed the vehicular delays set out in Section 5.7.

Commented [MB79]: While compliance (drivers giving way to pedestrians) is an issue at zebra crossings, it should not be used as a justification for not implementing a treatment.

Commented [MB80]: I would suggest, as in the image on the left, that a space for one car to give way outside of the roundabout be included.

Commented [MB81]: Again, I don't think Movement and Place is applied in this way. Functional classification of roads is not determined via Movement and Place, so why should crossing infrastructure. M&P is more a strategic level planning tool, rather than a design-specifying tool in its conception in WA.

Commented [MB82]: Again, vehicular delay should not be considered as having higher value than pedestrian delay. Precisely in places where vehicular delay is likely to be high is where pedestrians need supportive infrastructure to cross. Please remove this consideration.

Distance from Roundabout	<p>Zebra crossings may be located at the location of the roundabout (i.e., directly adjacent the give way line) where the road serves a low "Movement" function but a high pedestrian or "Place" function under the Movement and Place Framework.</p> <p>If not located directly adjacent the roundabout, the zebra crossing should be located at least 6m from the give way line to allow a vehicle to store after <u>or before giving way at</u> the zebra crossing.</p> <p>Zebra crossings should not be located further than the maximum deviation from the desire line of pedestrians as set out in Section 5.9.</p>
Traffic Volume	Roundabout Zebra Crossings may not be permitted where the AADT for the carriageway is greater than 10,000 vpd.
Pedestrian Volume	<p>Zebra Crossings may not be permitted where pedestrian volumes are unlikely to exceed 5 per hour (in any hour).</p> <p>Vulnerable pedestrians shall be counted as 2 pedestrians.</p>
Staging of Crossing	Roundabout Zebra Crossings across more than 2 lanes must be staged with a median or splitter island at least 2.5m wide.

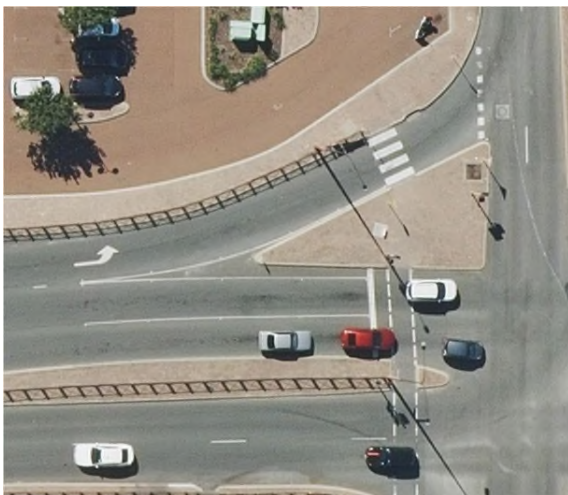
Commented [MB83]: See comment above.

Commented [MB84]: Again, on these roads is precisely where a pedestrian priority crossing is necessary. Roundabouts are bad for pedestrians, in that the vehicles are never required to come to a full stop. On single-lane roundabouts, the delay for a vehicle to allow a pedestrian to cross will be minimal.

Warrants	Description
Number of Lanes	Zebra crossings must only be installed at roundabouts where there are 2 lanes or less on any given carriageway.
Operating Speed	<p>All zebra crossings must be installed with supporting treatments as described in Section 9 such that the design speed of traffic at the location of the crossing (both on the approach and departure) is less than 30km/h.</p> <p>If it is not possible, restrict radii to 25m or less as an option.</p>
Posted Speed	The posted speed limit must be less than or equal to 50km/h.
Sight Distance	<p>Crossing Sight Distance (CSD) is required for pedestrians. CSD is calculated on Section 5.2</p> <p>Approach Sight Distance (ASD) is required from approaching vehicles (1.1m eye height) and the pavement markings of the zebra crossing. ASD is calculated on Section 5.2 or as in <i>Main Roads' Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections</i>.</p>

Commented [MB85]: This is also problematic. Roundabouts on 60 km/h roads also require safe pedestrian crossing ability.

8.2.4 Slip Lane



Zebra crossings on slip lanes do not change the legal requirement for drivers to give way to pedestrians on the slip lane, however, compliance is typically much better if a zebra crossing is installed.

Commented [MB86]: See comments under "slip lane" under "non-priority crossing" above.

Parameter	Description
Vehicular Delay	<p>Zebra crossings require drivers to give way to pedestrians on the crossing. In areas of high pedestrian activity, this can cause significant vehicular delays. Zebra crossings should not be used when delays to vehicles exceed the vehicular delays set out in Section 5.7.</p> <p>Where traffic volumes are low, non-priority crossings may be more appropriate. Where vehicular volumes are high on free flow slip lanes, pedestrian operated signals may be more appropriate to balance the flow of both pedestrians and traffic.</p>
Raised Platform	<p>As a default, wombat crossings (raised platforms) are the preferred treatment for zebra crossings as they are generally effective at reducing the operational speed of vehicles.</p> <p>If a raised platform cannot be installed, the operational speed of vehicles must still be reduced below 30km/h at the point of the zebra crossing by other means with justification given as to why a wombat crossing is not feasible.</p>

Commented [MB87]: Again, vehicular delay should not be used as a measure here or really at all. Providing pedestrian priority is about creating a safe, comfortable, and connected pedestrian network. Using vehicle delay just means giving up when the volumes are too high.

Commented [MB88]: However, as stated, vehicles must give way, so why not just make everything clear and mark a zebra crossing.

Warrants	Description
Carriageway Speed	<p>Zebra crossings shall only be installed on single lane slip lanes as the curvature of slip lanes makes sight distance poor for dual lane slip lanes due to masking.</p> <p>Dual lane slip lanes shall be controlled by pedestrian operated signals.</p>
Design Speed	<p>All zebra crossings must be installed with supporting treatments as described in Section 9 such that the design speed of traffic at the location of the crossing is less than 30km/h. This may be achieved through speed limits, physical speed reduction aids (preferred) and/or signs and line marking.</p>
Sight distance	<p>For a driver to give way to a pedestrian on the zebra crossing, sufficient sight distance must be available.</p> <p>Crossing Sight Distance (CSD) is required for pedestrians. CSD is calculated on Section 5.2</p> <p>Approach Sight Distance (ASD) is required from approaching vehicles (1.1m eye height) and the pavement markings of the zebra crossing. ASD is calculated on Section 5.2 or as in Main Roads' Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.</p>

Heavy Vehicles	May not be suitable where more than 10% HV (excluding buses) turning and conflicting with pedestrians.
----------------	--

Design Considerations

- Signs and pavement markings for zebra crossings at slip lanes shall be in accordance with Main Roads' Standard Drawings 200531-0038.

8.3 Pedestrian Operated Signals

Pedestrian operated signals are installations that provide a dedicated phase for pedestrians to cross. The signals are activated by pedestrians, vehicles are stopped, pedestrians cross and then vehicles are allowed to proceed.

This section should be read in conjunction with Main Roads Network Operations *Traffic Signals Approval Policy* as the approval of any new, modification or removal of signalised pedestrian crossing facility is subject to Main Roads Network Operations *Traffic Signals Approval Policy*.

Benefits	Implications
<ul style="list-style-type: none"> Clearly show pedestrians when to cross, which means lower pedestrian judgment required, Pedestrians are guaranteed a protected phase even though they may have to wait <u>a while</u>. Generally, pedestrians would accept the longer wait, compared to non-priority facilities, Greater guarantee at-grade that traffic will stop for pedestrians to cross, Allows provision of audible cues which is suitable for pedestrians with a visibility or mobility impairment, May be acceptable where sight distance is insufficient for a non-priority or zebra crossing, Pedestrians group and cross together instead of crossing intermittently. 	<ul style="list-style-type: none"> <u>Potential for high-speed collisions (> 30 km/h) if</u> traffic does not give way, Pedestrians may walk into the road when the signal changes without checking vehicular traffic <u>have</u> come to a complete stop, Pedestrians who are slower than average, such as those with mobility impairments, children or elderly may still be on the road when vehicles are <u>released</u> Pedestrians must wait for the signal before crossing whereas it may take considerably less time to cross at a zebra crossing, Vehicles can be unnecessarily held when the crossing is clear, More expensive to install, operate and maintain than other crossing types.

Commented [MB89]: While this potential is there, vehicles are much more likely to give way at a signal.

Commented [MB90]: This is a signal timing issue, which can easily be solved by reducing the crossing distance/second below the current standard of 1.2m.

Recommended parameters
<ul style="list-style-type: none"> Use a traffic signals analysis package to model the expected delays to pedestrians and other users under signal operation. Compare the delay and safety performance with other options calculated using the Pedestrian crossing facilities calculation spreadsheet. <u>Mid-block pedestrian signals are the only option for multi-lane roads and on busy two-lane roads where continuous pedestrian streams can cause problems.</u> They can be combined with kerb extensions, raised medians and islands. Because safe use of pedestrian signals depends on good compliance, ensure signal timings provide a satisfactory pedestrian level of service. Where there is a need for special provision for the vision impaired and where a signalised mid-block crossing would get insufficient use, signalising a nearby junction and incorporating pedestrian facilities can provide a better safety and traffic management <u>solution</u>.

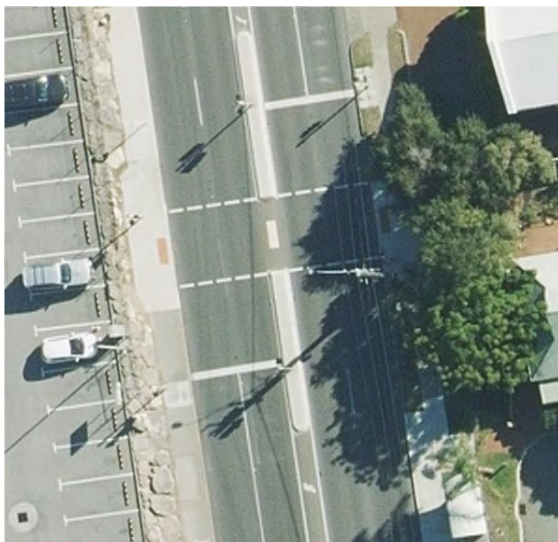
Commented [MB91]: This is clearly written from the perspective of traffic engineering for vehicles. Continuous pedestrian streams indicate that it is a vibrant area and all efforts should be made to better accommodate pedestrians. As such, vehicle delay should not be considered, e.g., most of the CBD.

Commented [MB92]: This is not a good solution for providing a safe, comfortable, and connected network for pedestrians. Accommodating pedestrians on desire lines is much better than making pedestrians go often long distances out of their way to cross.

Locations:

- Mid-block,
- Unsignalized intersections (not applicable),
- Roundabout, and
- Slip lanes (not applicable).

8.3.1 Mid-Block



Parameter	Description
Staging of Crossing	Pedestrian Operated Signals across multiple carriageways may operate as a single crossing or staged crossing. Staged crossings must be staggered at the median, preferably left-right so that pedestrians face oncoming traffic in the median.
Proximity to Other Crossing	<p>Pedestrian Operated Signals should generally not be required if there is:</p> <ul style="list-style-type: none"> A suitable zebra crossing, pedestrian operated signals, or grade separated pedestrian crossing within 200m. No significant pedestrian movement or desire line. The movement function is higher than the place function.
Distance from Intersecting Roads	<ul style="list-style-type: none"> Pedestrian Operated Signals shall not be installed within 20m of a side road if a right turn movement is conflicting (measured from the centreline of the intersecting road). Consider banning the conflict turning movement if required. Pedestrian Operated Signals shall not be installed within 5m of a side road if a left turn movement conflicts (measured from the nearest point of the intersecting carriageway). Consider signalling the entire intersection if required.

Commented [MB93]: This is very long for zebra crossings, particularly in highly desirable areas for pedestrians.

Commented [MB94]: Again, I don't think the M&P Framework is conceived to determine specific infrastructure. In areas with high volumes of vehicles, these types of crossings are all the more important.

Warrants	Description
Pedestrian Delay	Average pedestrian delays over a 15-minute period to cross a carriageway are greater than the maximums set out in Section 5.6, but a zebra crossing is inappropriate due to the number of lanes, speed limits, delays to vehicles, sight distance requirements, or other reasons.
Sight Distance	<p>Sufficient Stopping Sight Distance (SSD) must be available to the signal aspects of Pedestrian Operated Signals Austroads Guide to Road Design Part 4A.</p> <p>Pedestrian Operated Signals may be appropriate if ASD is not available for a zebra crossing, but SSD is available.</p>
Speed Limit	The maximum speed limit appropriate for Pedestrian Operated Signals at mid-blocks is 70km/h.
Pedestrian Volume	<ul style="list-style-type: none"> Pedestrian Operated Signals at mid-blocks shall not be permitted where pedestrian volumes are unlikely to exceed 5 per hour (in any hour). Vulnerable pedestrians shall be counted as 2 pedestrians.
Number of lanes	<ul style="list-style-type: none"> More than 2 lanes.

Commented [MB95]: There are some two-lane roads that have pedestrian signals and I think the application of signals could be warranted in some cases. Please remove this.

Heavy Vehicles	<ul style="list-style-type: none">• Suitable where more than 10% HV (excluding buses) conflicting with pedestrians.
Crashes	<ul style="list-style-type: none">• A zebra crossing exists, and two or more pedestrian accidents have occurred on or near the crossing within the past three years.

Commented [MB96]: This is not a requirement, correct

Commented [MB97]: This also shouldn't be a requirement, but a consideration.

Design Considerations

- Signs and pavement markings for pedestrian operated signals at mid-blocks shall be in accordance with Main Roads' Standard Drawing 200431-0116.

8.3.2 Roundabout



Parameter	Description
Staging of Crossing	Pedestrian Operated Signals close to roundabouts across more than 2 lanes must be staged with a median or splitter island at least 2.5m wide.
Proximity to Other Crossing	<div>Pedestrian Operated Signals should generally not be required if there is:<ul style="list-style-type: none">A suitable zebra crossing, pedestrian operated signals, or grade separated pedestrian crossing within 200m.No significant pedestrian movement or desire line.The movement function is higher than the place function.</div>
Distance from Roundabout	<div><ul style="list-style-type: none">Pedestrian Operated Signals should be in a reasonable distance from the give way line to not block the roundabout. It should be assessed in a case-by-case basis, depending on the traffic volume at the roundabout.</div>

Commented [MB98]: This is problematic. Without a crossing, there won't be significant pedestrian movements.

Commented [MB99]: See other M&P Comments

Warrants	Description
Pedestrian Delay	Average pedestrian delays over a 15-minute period to cross a carriageway are greater than the maximums set out in Section 5.6, but a zebra crossing is inappropriate due to the number of lanes, speed limits, delays to vehicles, sight distance requirements, or other reasons.
Sight Distance	<div>Sufficient Stopping Sight Distance (SSD) must be available to the signal aspects of Pedestrian Operated Signals Austroads Guide to Road Design Part 4A.</div> <div>Pedestrian Operated Signals may be appropriate if ASD is not available for a zebra crossing, but SSD is available.</div>
Speed Limit	The maximum speed limit appropriate for Pedestrian Operated Signals is 70km/h.
Pedestrian Volume	<div><ul style="list-style-type: none">Pedestrian Operated Signals close to roundabouts shall not be permitted where pedestrian volumes are unlikely to exceed 5 per hour (in any hour).Vulnerable pedestrians shall be counted as 2 pedestrians.</div>
Number of lanes	<div><ul style="list-style-type: none">More than 2 lanes.</div>

Heavy Vehicles	<ul style="list-style-type: none">Suitable where more than 10% HV (excluding buses) conflicting with pedestrians.
Crashes	<ul style="list-style-type: none">A zebra crossing exists, and two or more pedestrian accidents have occurred on or near the crossing within the past three years.

Commented [MB100]: This should be a consideration, but not a requirement

Design Considerations

- Signs and pavement markings for pedestrian operated signals shall be in accordance with Main Roads' Standard Drawing 200431-0116.

8.4 Grade Separated Pedestrian Crossings

Grade separation refers to the structure that removes pedestrians from the road, i.e., eliminate conflict by putting pedestrians and vehicles in physically different areas by providing both pedestrian underpasses and overpasses.

These treatments tend to be very high cost and typically require a careful benefit/cost analysis to justify the expense. In addition, it is desirable to be planned in the earliest project stage.

Grade Separation often causes significant deviation from pedestrian desire lines (vertically and horizontally) thus providing pedestrians with a poor Level of Service. The design must be careful to limit the inconvenience for pedestrians.



Benefits

- Allows pedestrians to cross the road freely, with no interruptions,
- Significantly reduces conflicts and **accidents** **crashes** with vehicles,
- Minimises severance in communities with heavily used roads,
- Allows for the uninterrupted flow of vehicle traffic **including active transportation**,
- Can be integrated with existing development.

Overpasses:

- Are usually cheaper than an underpass in an existing environment,
- Can be covered to protect against the weather.

Underpasses:

- Can be cost-effective when part of a new development,
- Reduced user effort,
- Increased network connectivity by providing direct connections,
- Reduced travel time delays.

Implications

- **It is**Are expensive to construct and maintain,
- May need long ramps, resulting in longer travel times and more effort, reducing pedestrian usage,
- It is only effective where pedestrians perceive it is easier and faster to use than crossing at-grade,
- May increase the risk for those pedestrians who continue to cross at-grade,
- May require the relocation of utilities,
- May create unsafe walking environment as it is removed from street-level activity and the **associated** passive surveillance **benefits it provides**

Overpasses:

- More likely to be open to the weather,
- Potential for thrown/dropped objects on the roads,
- Require greater vertical separation than underpasses and, therefore, longer ramps and travel distance.

Underpasses:

- Less personal security than overpasses due to lower natural surveillance,
- Can have drainage problems,

	<ul style="list-style-type: none">Uninviting environmental conditions due to irregular maintenance or cleaning,<ul style="list-style-type: none">Can encourage high cycling speeds
--	--

Commented [MB101]: I'm not sure there is much evidence of this.

Formatted: Indent: Left: 1.27 cm, No bullets or numbering

Recommended parameters

- Grade separation can include under- and overpasses for motor vehicles with the pedestrian route remaining at-grade. This overcomes issues regarding greater travel distances for pedestrians using such facilities. Where the road user hierarchy favours pedestrians this may be the preferred approach.
- Where deemed necessary, the grade-separated route must appear more desirable to pedestrians than any other option. This may require restricting other options, for example by installing fencing around dangerous potential at-grade crossing areas, or by improving the convenience and aesthetics of the grade-separated option.
- Crime Prevention through Environmental Design (CPTED) should be applied to the design of underpasses to improve physical and perceived safety for users. These principles include improving surveillance, maintaining legibility of movement, defining territory, encouraging community ownership and legitimate users, improving management, and reducing vulnerability.
- The provision of grade separated pedestrian crossings must ensure that the walkways/ramps are in accordance with *AS1428.1 – Access for Design and Mobility – New Building Work*. Grades should be limited to the values considered a “walkway” rather than a ramp.

Commented [MB102]: Unless the road is completely elevated, the associated ramps to facilitate a vehicular overpass creates significant barriers to crossing a multiple locations and should be avoided.

8.5 Warden Controlled Children's Crossings

A warden-controlled children's crossing is a warden or guard-controlled crossing point, which assists students to crossing the road by a warden or guard stopping traffic to give pedestrians priority over traffic. The crossing is generally attended by wardens during the school hours of 7:30 to 9:00 AM and 2:30 to 4:00 PM.

There are two types of children's crossings:

- Type A
- Type B

Type A children's crossings have wardens supplied by the WA police; whereas Type B children's crossings require a warden to be supplied by the applicant.

Type A (Primary School or combined Primary / High School) requires –

- A minimum of 20 students and 200 vehicle movements within the hour immediately before and immediately after school

Type A (High School) requires –

- A minimum of 20 students and 700 vehicle movements occurs within the hour immediately before and immediately after school

Type B (Primary School or combined Primary/High School) requires –

- A minimum of 10 students and 100 vehicle movements occurs within the hour immediately before and immediately after school

Type B (High School) requires –

- A minimum of 10 students and 350 vehicle movements occurs within the hour immediately before and immediately after school

The WA Police Force is responsible for the warrants, approval and operation of warden-controlled children's crossings. A warden-controlled children's crossing can only be applied for by either a School Principal or a recognised school/parent organisation, by contacting the Children's Crossings Unit at WA Police. All applications are referred to the Children's Crossings and Road Safety Committee (CC&RSC) for consideration. The committee includes representatives from the WA Police, MRWA, WALGA, and the Department of Education.

Commented [MB103]: The WA Police isn't strictly responsible for the approval of children's crossings, but rather the Children's Crossings and Road Safety Committee of the WA Police.



Benefits	Implications
<ul style="list-style-type: none"> Pedestrians using the crossing are offered greater protection than zebra or non-priority crossing, Traffic wardens can confidently assess vehicle traffic and find suitable gaps to assist children in crossing, Traffic warden balances the flow of traffic against the demand to cross the road, Unnecessary restrictions are not imposed on drivers outside the start and finish of normal school hours, Motorists less likely to assume that no one will be crossing the road, and children are less likely to cross the road where it is unsafe to do so. 	<ul style="list-style-type: none"> Requires undertaking to manage traffic wardens and can be potentially expensive to fund a traffic warden, More expensive than zebra or non-priority crossings to install and maintain, More than one warden may be required on a busy road, Potential for high-speed collisions (>30 km/h) if traffic does not give way.

Commented [MB104]: Allowing pedestrians to cross is not an 'unnecessary' restriction, but rather a component of providing a safe, comfortable, and connected pedestrian network.

Recommended parameters

- For multi-lane roads a refuge in the median is desirable,
- Avoid installing too close to the exit or approach side of ~~intersections~~
- Ensure crossing is located within the field of view of approaching drivers, particularly for turning vehicles,
- Wig Wags may be used where their installation may be of benefit. They are only considered where prior approval has been granted by Main Roads – refer to Main Roads Network Operations *Wig Wags Policy*,
- To remain effective, a guard (where warranted) must be available and present during operation.

Commented [MB105]: While this condition is desirable, it is unfortunately often not feasible to install children's crossings in other locations.

This section should be read in conjunction with Main Roads Network Operations ~~XXXXXX~~ Policy and Application Guidelines and Wig Wags Policy.

Design Considerations

- Signs and pavement markings for Warden-controlled children's crossings shall be in accordance with Main Roads' Standard Drawings 9120-0174 and 9531-2169.

8.6 Shared Zones



A Shared Zone is a length of road with both a “shared zone” sign and an “end shared zone” sign with no intersection between the signs. It is a legal term that has been designed to give priority to pedestrians while significantly reducing the dominance of vehicles.

The route is physically constrained for vehicles by landscaping, structures and tight turning radii, with no delineation between the footpath and roadway. This reduces the number of vehicles and slows significantly reduces the speeds, resulting greater sense of community in a safer and more pleasant pedestrian environment and urban form.

Commented [MB106]: This isn't the case in the picture above.

Under the *Road Traffic Code 2000*, a driver in a shared zone is required to give way to any pedestrian in the zone.

Benefits	Implications
<ul style="list-style-type: none"> • Pedestrians have legal priority, • Enhance environmental conditions through lower noise levels and visual amenity from landscaping, • Improve social interactions for residents and shoppers as the streets become open spaces for walking, sitting, playing and talking, • Reduce occurrence of crashes and less severely injured casualties if <u>a crash</u> occurs, • Improve security from increased natural surveillance. 	<ul style="list-style-type: none"> • May be expensive to <u>incorporate in retrofit on</u> existing roads <u>that need to be converted</u>, • May push traffic to adjacent roads, • Motorists may not observe speed restrictions during periods of low pedestrian and rider use • Usually restricts certain vehicle types (e.g., RAV) • May be expensive to maintain.

Recommended parameters

- Shared zones are most suitable for streets and compact areas with a low traffic demand.
- Their maximum size is restricted by the need to maintain response times for emergency services and to limit the extent of roadway that must be negotiated at low speeds by motorists accessing their properties.
- Parking places should be designated.
- Posted speed limit must be either 10 or 20km/h
- Success requires full and active community participation and consensus.

This section should be read in conjunction with Main Roads Network Operations **XXXXXX** Shared Spaces Policy and Application Guidelines.

9 SUPPORTING TREATMENTS

Once a suitable pedestrian crossing facility has been selected, supporting treatment(s) should be chosen based on what is appropriate. Supporting treatment(s) should be implemented to make the pedestrian crossing (regardless of the type) as safe as is reasonably practicable.

Should further analysis deem the crossing unsuitable (e.g., due to insufficient gaps in traffic for pedestrians, excessive speed at the crossing location, etc.), then the supporting treatments may need to be revisited. If all appropriate supporting treatments have been implemented, but the pedestrian crossing cannot achieve the relevant parameters to be considered a safe crossing, then practitioners should consider a different pedestrian crossing type.

Supporting treatments improve the safety or functionality of all different at-grade pedestrian crossing types. They typically are in the form of either:

- Treatments which reduce speed at or before the crossing point which:
 - Reduce the severity of crashes should they occur,
 - Increase the likelihood of drivers stopping to give way (at zebra crossings), and
 - Provide a more comfortable environment.
- Treatments which raise the awareness for the potential for pedestrians crossing, or
- Treatments which reduce the crossing distance and typically improve sight distance to/from pedestrians.

Supporting treatments are imperative to the safe operation of an at-grade pedestrian crossing, regardless of which type, and are often more effective at improving safety. The different treatments and their applicable location as well as the detailed information on their benefits, implications, parameters, and design considerations are described below.

Mid-Block	Unsignalised Side Roads	Roundabouts
<ul style="list-style-type: none"> • Median • Blister Island • Kerb Extension • Raised Platform • Approach Road Humps • Alternate Pavement Material/Colour 	<ul style="list-style-type: none"> • Splitter Island with Compliant Pedestrian Island Refuge • Kerb Extension • Raised Platform • Approach Road Humps* • Approach Speed Cushions* • Continuous Footpath • Reduced Corner Radius • Alternate Pavement Material/Colour 	<ul style="list-style-type: none"> • Splitter Island with Compliant Pedestrian Island Refuge • Kerb Extension • Raised Platform • Approach Road Humps* • Approach Speed Cushions* • Reduced Corner Radius • Alternate Pavement Material/Colour

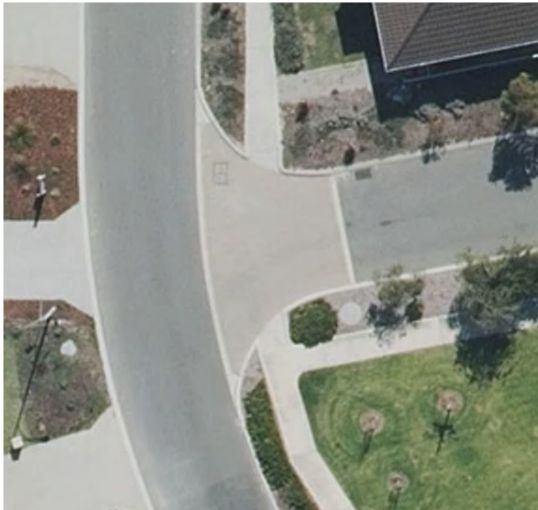
*Typically, only appropriate on the approach side to the unsignalized intersection/roundabout.

Commented [MB107]: This may lead infrastructure managers to abandon the provision of any pedestrian crossing, as either grade-separated crossings and/or pedestrian signals may be very difficult to implement due to cost. This is not an acceptable outcome.

Commented [MB108]: Please add speed limit reduction as an applicable treatment to support pedestrian crossings. This is an inexpensive and effective treatment in combination with a pedestrian priority crossing to support the development of safe, comfortable, and connected pedestrian networks.

➤ **Kerb Crossings**

Non-priority crossings refer to designated locations along a carriageway where kerb ramps are provided for pedestrians on both sides of the carriageway, but no formal marked crossing on the road is provided.



Benefits	Implications
<ul style="list-style-type: none">Indicate that the location is a safe place to cross,Provides a smooth transition from the footpath to the street,Provide an accessible path of travel that can be used by all pedestrians,Alerts drivers that pedestrians could be looking to cross, causing vehicles to potentially slow down,Inexpensive to install, andReduce the trip hazard associated with kerbs.	<ul style="list-style-type: none">Does not give pedestrians priority so can be unsuitable for some pedestrians,Does not assist pedestrians to safely cross wide streets,Pedestrians may have to wait significantly longer for a gap in vehicle traffic to safely cross,To safely cross, a pedestrian must have good judgement of vehicle speeds and gaps in traffic, andCan create ponding if drainage is not addressed.

Commented [MB109]: This seems tenuous. I'm not sure that many drivers really notice kerb cuts.

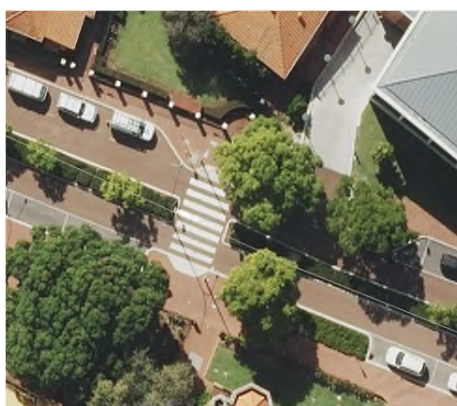
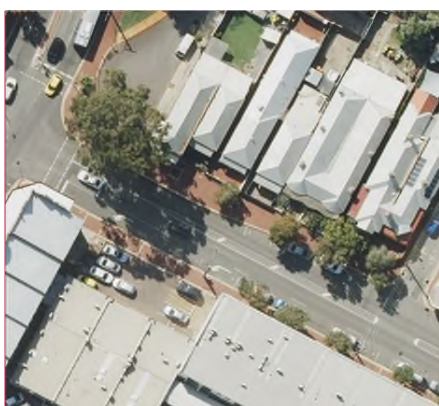
Recommended parameters
<ul style="list-style-type: none">Recommended where the operating speed is 50km/h or less,Appropriated for low traffic volume environment,Appropriated for low pedestrian demands,Appropriated where crossing distance is 9m or less.

Commented [MB110]: This is a very wide road. I would argue a tighter crossing distance would be more appropriate, say, 7m.

➤ Kerb Extensions

Kerb extensions involve local widening of the footpath into the carriageway by using an adjacent shoulder or parking lane. The intention is to shorten the crossing distance and make pedestrians more visible to approaching drivers, as well as make vehicles more visible to pedestrians.

Kerb extensions can be constructed at intersections or mid-block locations and be on their own or in conjunction with other treatments, such as zebra crossings, medians, and signalised intersections. Should be installed within the kerb extension at the crossing point, and it is important to ensure sufficient width for safe cycling.



Commented [MB111]: Not sure what this means.

Commented [MB112]: I'm struggling to see the kerb extension in the photo on the left.

Benefits

- Reduces crossing distance and crossing time, which permits pedestrians to select a smaller gap,
- Improves pedestrian safety as they are more visible to oncoming drivers and have a better view of approaching traffic,
- Creates space for pedestrians to wait without blocking others walking past,
- Physically prevents drivers from parking and blocking the crossing point,
- May reduce the speed environment by narrowing the road,
- Increases available space for street furniture and vegetation.

Implications

- Does not in and of itself give pedestrians priority, so can be unsuitable for some pedestrians,
- Can expose cyclists to traffic on narrower roads,
- Reduce on-street parking,
- Can create an obstruction that may be struck by cyclists and vehicles,
- Where the kerb alignment is being altered, they can create drainage issues and places where rubbish can accumulate.

Recommended parameters

- Primary Safe System treatment if operating speeds are below 30km/h. Supporting treatment if operating speeds above 30km/h,
- Should be a supporting treatment for other crossing types and aids to reduce the crossing distance,
- Operating speed 50km/h or less,
- Only appropriate on their own for low pedestrian demands and low traffic volumes.

- Appropriated in sites with restricted sight distances,
- Appropriated in shopping areas and other locations where there is high pedestrian demand and the kerbside lane is used for parking and is not required as a traffic lane,
- Appropriated in combination with local area traffic management treatments such as road humps and slow points,
- Shouldn't be used on roads where the kerbside lane is needed by moving traffic during peak periods,
- Shouldn't be used on locations where the numbers of pedestrians and vehicles justify a higher level of pedestrian crossing,
- Shouldn't be used on bicycle routes where there is inadequate space for cycle lanes alongside the kerb extension.

Commented [MB113]: I would disagree with this one. Designing roads for one hour out of 24 leads to massive overbuilding of infrastructure. It's also common in WA (particularly Perth) to have vehicles parked in the outside lane at all times of the day, which is essentially the same thing.

Design Considerations

- Must not narrow or remove bicycle lane or otherwise reduce width available to cyclists.

Commented [MB114]: I agree with this, but there are design solutions to solve this problem

➤ Medians

Medians separate the road into two separate carriageways which enable pedestrians to cross the road as two short one-way roads using the median as a refuge, providing a place for pedestrians to wait before crossing the next part of the road. They are longer than pedestrian islands and may be continuous or intermittent.



Benefits

- Reduces crossing distance for pedestrians,
- Simplifies the crossing task into one direction of traffic at a time.
- Can considerably reduce pedestrian delays on non-priority (kerb ramp) crossings,
- Can often be retrofitted to existing roads,
- Are particularly helpful to pedestrians unable to judge distances accurately or who have slower walking speeds,
- Improves pedestrian safety as they are more visible to oncoming drivers and have a better view of approaching traffic,
- Can reduce vehicle speeds through crossing point by narrowing traffic lanes,
- Provides a stopping/resting point for mobility impaired pedestrians.

Implications

- Typically, not wide enough to stagger the pedestrian crossing as opposed to a median,
- Need a wide roadway to ensure adequate space after installation,
- May reduce on-street parking,
- Island may be struck by vehicles and may give pedestrians a false sense of security,
- May restrict vehicle access to adjacent driveways, leading to more U-turns at intersections,
- Can expose cyclists to traffic on narrower roads,
- Are often very narrow and uncomfortable for pedestrians, particularly pedestrians walking bicycles or pushing prams.

Recommended parameters

- Desirable at all Distributor non-priority (kerb ramp) crossings undivided 2-way roads where space permits,
- Minimum treatment when pedestrian delays exceed target and higher-order pedestrian crossings are not viable,
- Typically, not used on Access Roads,
- Appropriated oin existing roads where the pavement width is wider than necessary,
- Appropriated oin existing roads with wide road reservations where road widening is feasible,
- Appropriated o on roads with four or more lanes,

Commented [MB115]: Would this be implemented on a six-lane road? Seems particularly unsafe

- Appropriated where there is a heavy pedestrian movement which is not necessarily concentrated at any particular location,
- Appropriated where minimal vehicular access is required to frontage properties,
- Not appropriated on narrow roads which cannot be widened,
- Not appropriated along cycle routes with inadequate space to retain cycle lanes alongside a raised median,
- Not appropriated where there are high concentrations of pedestrians crossing the road and more secure pedestrian crossing treatments should be examined.

Design Considerations

- Designed in accordance with Main Roads' Standard Drawings 20331-0139 and 200331-0140,
- Desirable width $\geq 2.0\text{m}$,
- Minimum width $\geq 1.8\text{m}$,
- The following minimum widths should be provided:

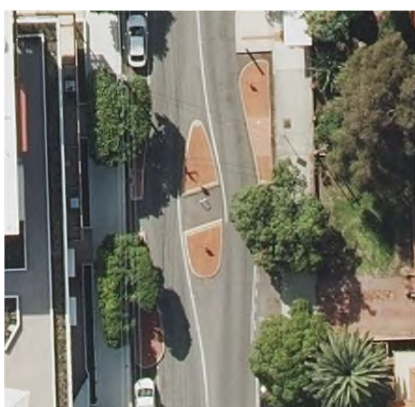
Local road (not a bus or cycle route and where significant numbers of child and/or inexperienced cyclists are unlikely to occur)	3.0m
Bus route but not a cycle route	3.7m
Cycle route but not a bus route	3.7m
Bus and cycle route	4.2m

- Must not narrow or remove bicycle lane or otherwise reduce width available to cyclists.

➤ Pedestrian Refuge Islands

Pedestrian refuge islands are isolated concrete islands located centrally in the road to enable pedestrians to cross one direction of traffic at a time, similarly to Medians. This is relatively low cost and it is one of the most effective treatments to assist pedestrians to cross the road. They are suitable for roads with wide lanes; that ~~is-are~~ difficult to cross ~~the full road~~ in one stage and where pedestrian crossing movements are concentrated.

The spacing of the islands is normally at 200m to 300m apart which provides an acceptable separation for pedestrians and avoids a wide painted median being used by drivers as an overtaking lane.



Blister



Splitter

Benefits	Implications
<ul style="list-style-type: none"> Reduces crossing distance for pedestrians, Simplifies the crossing task into one direction of traffic at a time. Can considerably reduce pedestrian delays on non-priority (kerb ramp) crossings, Can often be retrofitted to existing roads, Are particularly helpful to pedestrians unable to judge distances accurately or who have slower walking speeds, Improves pedestrian safety as they are more visible to oncoming drivers and have a better view of approaching traffic, Can reduce vehicle speeds through <u>a</u> crossing point by narrowing traffic lanes, Provides a stopping/resting point for mobility impaired <u>and other</u> pedestrians. 	<ul style="list-style-type: none"> May require minor road widening in certain situations Need a wide roadway to ensure adequate space after installation. May reduce on-street parking, May restrict vehicle access to adjacent driveways, leading to more U-turns at intersections, Can expose cyclists to traffic on narrower roads, <p><u>Blister:</u></p> <ul style="list-style-type: none"> Requires more land than a conventional pedestrian refuge. Causes safety concerns for on-road cyclists as drivers tend to cut corners while cyclists are unlikely to follow kerb line. <p>May reduce footpath width or otherwise brings vehicles closer to the footpath.</p> <p><u>Splitter:</u></p> <ul style="list-style-type: none"> May increase the kerb radius at the intersection and create a wider total crossing to allow for large vehicles.

- May limit the size of vehicles which can access the side road.
- Can cause safety concerns for on-road cyclists if lanes (normal lanes and bicycle lanes) are narrowed or removed.

Recommended parameters

- Appropriate on roads with wide lanes or where short sections of road widening is feasible,
- Appropriate where pedestrian crossing movements are concentrated,
- Should be avoided on roads with high traffic speeds and restricted visibility,
- Should be avoided on locations where the numbers of pedestrians and vehicles justify a higher level of pedestrian crossing,
- Should be avoided on narrow roads, or cycle routes with inadequate space for cycle lanes.

Blister:

- Only on two-lane two-way roads,
- Where there is a need to break long straight lines of sight,
- Speed limit $\leq 50\text{km/h}$,
- Local Distributors and Access Roads,
- Not appropriate on narrow carriageways where substantial islands cannot be fitted,
- Not appropriate on District Distributor roads where the geometry will likely result in a transference of traffic to adjacent routes,
- Not appropriate on Primary Distributor roads.

Splitter:

- At roundabouts for undivided roads,
- Where a side road is a lower classification of road than the through road,
- Where the side road pedestrian crossing distance is long.

Commented [MB116]: Again, this is one of the most basic supporting treatments. What else can an infrastructure manager do on high speed roads to support safe pedestrian crossings? I would remove this caveat.

Commented [MB117]: This is dangerous ground as higher levels of pedestrian crossing may be very difficult to implement or very expensive, both of which may lead to no pedestrian crossing being implemented. This is not an acceptable outcome.

Commented [MB118]: This treatment has the potential to slow traffic. Why would it not be an option on district distributors?

Design Considerations

Blister:

- Designed in accordance with Main Roads' Standard Drawing 20331-0135,
- Pedestrian cut-through is required,
- Designed such that the resultant speed of traffic past the pedestrian crossing point is 30km/h or less,
- Refer to Main Roads' Local Area Traffic Management Guidelines Section 8.2.

Splitter:

- Designed in accordance with Main Roads' Standard Drawings 200331-0184, 200331-0191, and 201031-0004,
- Desirable width $\geq 2.0\text{m}$,
- Minimum width $\geq 1.8\text{m}$,
- Must not narrow or remove bicycle lane or otherwise reduce width available to cyclists.

Commented [MB119]: Based on experience, this seems like it is rarely achieved. I would, as mentioned before, suggest using a higher speed as a benchmark in order to allow some treatments to be implemented. The 30 km/h stipulation is essentially a barrier to implementing these treatments.

➤ Raised Platform

This treatment is a raised surface that aims to reduce the operational speed of vehicles and improve the visibility of the crossing, however, should not be used on routes leading to emergency facilities.



Benefits	Implications
<ul style="list-style-type: none"> Relatively low cost to install and maintain, Reduces or helps reinforce slower vehicle speeds, Reduces both the likelihood and severity of potential crashes, Eliminates grade changes for pedestrians, a particular benefit for mobility impaired pedestrians, Enhances the visibility of the location where pedestrians are crossing. 	<ul style="list-style-type: none"> Pedestrians can assume they have right of way at non-priority crossing points, May increase traffic noise, Implications to drainage, May cause traffic delays if pedestrian volumes are high, May be have adverse impacts for bus passengers and ambulances, Good visibility and lighting required.

Recommended parameters

- Preferred at zebra crossings (wombat crossings),
- May be suitable at Pedestrian Operated Signals where reducing vehicle speeds to 30km/h is practicable,
- Should generally only be used with non-priority crossings on side roads, i.e. should not be used with non-priority crossings on main roads, because pedestrians may inadvertently believe they have right of way (this has happened on Hay Street where it has been necessary to install signs advising pedestrian that cars have right of way).

Commented [MB120]: Hasn't this problem been solved by the use of the different markings (shark's teeth rather than piano keys)?

Design Considerations

- Should be designed for vehicle speeds below 30km/h
- Wombat crossings designed in accordance with Main Roads' Standard Drawing 200631-0001

Commented [MB121]: This is, as mentioned, a big barrier to these being implemented.

➤ Approach Road Humps

Road humps are used to moderate vehicle speeds by the introduction of vertical displacement either in the form of a raised curved section constructed across the line of a carriageway or a raised plateau structure.



Benefits

- Slows some vehicles to about 20-25km/h at the location of the hump
- Can reduce the speed of vehicles over the length of a road, not just at a crossing
- May discourage through traffic from using route,
- Can be designed ~~to~~ not to restrict or discomfort cyclists

Implications

- May increase vehicles noise
- May ~~be~~ have adverse impacts for bus passengers and ambulances
- May shift through traffic onto other less desirable routes

Commented [MB122]: Increasingly, large 4x4 vehicles maintain speed over these

Recommended parameters

- Only used on roads with a speed limit of $\leq 50\text{km/h}$
- Normally located on access roads, which are residential in nature and have only very limited use on Distributor status roads
- Frequently they are used in series along a street to maintain low vehicle speeds
- Longitudinal grade of road is $\leq 10\%$
- Typically, only used for non-priority (kerb-ramp) crossings (i.e. not zebra crossings or Pedestrian Operated Signals)
- Should be avoided on buses and emergency routes
- Typically, not used on the departure side of unsignalized side roads and roundabouts
- Not appropriated on bends or crests
- Not appropriated on roads with more than 4,000 Vpd, or on Distributor or higher classification roads
- Not appropriated on streets with a high commercial traffic content

Commented [MB123]: Does this mean heavy vehicles?

Design Considerations

- Typically, Flat Top Plateau road humps designed in accordance with Main Roads' Standard Drawing 200331-0129 are preferred over Watts Profile road humps designed in accordance with 200331-0128 as they tend to be quieter.
- Ideally located approximately 6m of both sides of the non-priority (kerb ramp) crossing.
- Should allow a 1m gap between the kerb line and the edge of the hump. This:
 - Allows cyclists to bypass the hump, and
 - Reduces the risk of the hump being confused for a priority crossing.

➤ Approach Speed Cushions

This treatment is a raised surface that aims to reduce the operational speed of vehicles and improve the visibility of the crossing. However, it should not be used on routes leading to emergency facilities.

Commented [MB124]: Images would be helpful here

Benefits	Implications
<ul style="list-style-type: none"> • Can reduce car speeds in the vicinity of the cushion • Can reduce the speed of vehicles over the length of a road, not just at a crossing • May discourage through traffic from using route • They do not restrict or discomfort cyclists and can be designed so they do not inconvenience buses or commercial vehicles • Inexpensive to install • May be used as a short-term/temporary measure 	<ul style="list-style-type: none"> • May increase vehicle noise • Less effective at slowing wide vehicles and motorcyclists • May shift through traffic onto other less desirable routes

Recommended parameters

- Only used on roads with a speed limit of $\leq 50\text{km/h}$
- Typically, only used for non-priority (kerb-ramp) crossings (i.e. not zebra crossings or Pedestrian Operated Signals)
- Typically, not used on the departure side of unsignalized side roads and roundabouts
- On bus routes where a road hump would otherwise be warranted

Design Considerations

- Designed in accordance with Main Roads' Standard Drawings 200931-0004 to 200931-0007.
 - Ideally located approximately 6m of both sides of the non-priority (kerb ramp) crossing.

➤ Continuous Footpaths

This treatment is a raised surface that aims to reduce the operational speed of vehicles and improve the visibility of the crossing. ~~however, This treatment~~ should not be used on routes leading to emergency facilities.



Benefits

- Eliminates grade changes for pedestrians, a particular benefit for mobility impaired pedestrians
- The vertical deflection for vehicles reduces their speed
- Provides a visual reminder to drivers on the through road that they need to give way when turning

Implications

- Pedestrians may falsely believe they have right-of-way over vehicles on the side road approaching the intersection, however, their speed should be low
- Implications to drainage due to raise platform
- May ~~be have~~ adverse impacts for bus passengers and ambulances

Recommended parameters

- Used on non-priority side road crossings only (i.e. not used with ~~zebra crossings~~, ~~Pedestrian Operated Signals~~ or Warden-Controlled Children's Crossings).
- Typically, only ~~implemented on across~~ Access Roads.
- Most suitable in high pedestrian volume areas, such as Activity Centres.

Commented [MB125]: These should have pedestrian priority. I would suggest considering their use with zebra crossings.

Design Considerations

- Material across non-priority crossing shall be the same as the longitudinal footpath.
- Ramps may require "Piano Key" or "Shark Teeth" markings in accordance with AS1742.13 Clause 4.6.6 and Main Roads' Standard Drawing 202131-0030 respectively.
 - ~~Mountable kerb may need to be extended across the side road.~~

Commented [MB126]: I'm not sure how this relates

➤ Reduced Corner Radius

This treatment is a raised surface that aims to reduce the operational speed of vehicles and improve the visibility of the crossing. ~~however, This treatment~~ should not be used on routes leading to emergency facilities.

Commented [MB127]: Images would be helpful here

Benefits	Implications
<ul style="list-style-type: none">Reduces the vehicle turning speed, hence reducing the likelihood and severity of crashes with pedestrians.Reduces the total crossing distance for pedestrians.Reduces the land requirement for the intersection.	<ul style="list-style-type: none">May increase the likelihood of rear-end crashes on the through road.May limit the size of the design vehicle.May increase the risk of vehicles running over the inside kerb.

Recommended parameters

- Minimum corner radius that permits the design vehicle "lane-correct" should be adopted.

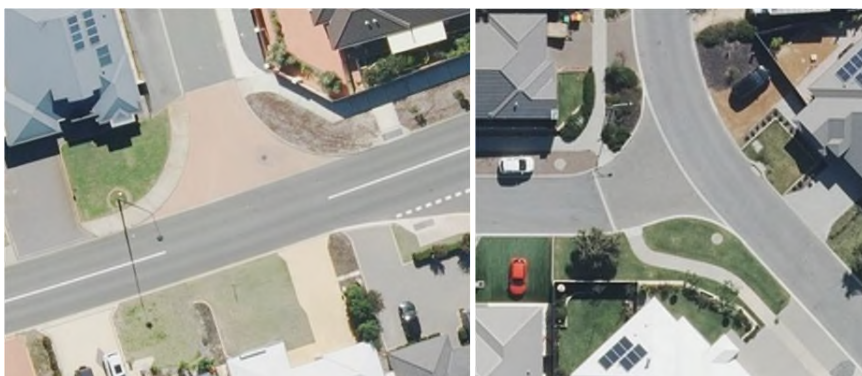
Commented [MB128]: If the road is low volume and the largest vehicle (often a rubbish truck) only makes a turning movement infrequently, I think the "lane-correct" assumption here should be relaxed.

Design Considerations

- NA

➤ Alternative Pavement Material/Colour

This treatment refers to pavement with different colour and/or material that aims to provide visual and tactile clues to drivers, alerting them that they ~~are entering a driving environment that is different from the one they have just left~~ should be more aware of the conflict with other modes of transport.



Benefits

- Heightens a driver's awareness that there may be pedestrians crossing
- Heightens a driver's awareness that they are entering a different road environment when used as a threshold treatment
- Can reduce speed as drivers are more cautious about driving on a different material

Implications

- May have reduced skid resistance
- May lead to some confusion about whom must give way

Recommended parameters

- At boundaries between different land uses
- At boundaries between different classifications of streets
- At boundaries of local area speed limits
- Should not be used at the junction of two Access roads, unless one of the access roads has a markedly different speed environment
- Should not be used on wide carriageways unless road narrowing is provided
- Should not be used on roads with more than 4,000 VPD

Design Considerations

- As per with Main Roads' Local Area Traffic Management Guidelines Section 3.2
- Designed in accordance with Main Roads' Standard Drawings 200331-0126 and 200331-0127

➤ Wigwags

Wig Wags are used to alert drivers to the presence of a pedestrian crossing and potential pedestrians on or crossing a carriageway where the conflict between vehicles and pedestrians may be unexpected, or of higher-than-normal potential risk. In Western Australia, typical locations for Wig Wags include:

- Zebra/Wombat crossings
- In advance of signalised pedestrian crossings (mid-block), ~~and~~
- Warden-controlled children's crossings, and
- Non-priority crossings.

The signals take the form of twin two-way, diagonally opposed, alternate flashing yellow displays.



They are situated either at the conflict area between pedestrians and general traffic or in advance of the conflict area to provide additional warning of the potential presence of pedestrians on the road. Overuse of Wig Wags will reduce their impact and effectiveness; hence, they should only be used with Main Roads' prior approval where they are considered necessary or desirable.

Refer to Main Roads Network Operations *Wig Wags Policy and Application Guidelines* for additional information.

10 APPLICABLE DRAWINGS

Drawing Number	Description
0448-3011	MRWA Standard Drawing – Underpass Lighting Layout and Construction Detail
200331-128	MRWA Standard Drawing – Road Humps Watts Profile
200331-129	MRWA Standard Drawing – Road Humps Flat Top Plateau Profile
200331-0135	MRWA Standard Drawing – Blister Islands
200331-0139	MRWA Standard Drawing – Pedestrian Refuge Island (Lane Width \leq 5.5m)
200331-0140	MRWA Standard Drawing – Pedestrian Refuge Island (Lane Width $>$ 5.5m)
200331-0164	MRWA Standard Drawing – Pavement Marking Pedestrian Zebra Crossing
200331-0184	MRWA Standard Drawing – Pavement Marking Splitter Islands (\leq 3.0m wide; \leq 60km/h posted speed)
200331-0191	MRWA Standard Drawing – Pavement Marking Raised Medians ($>$ 3.0m wide)
200431-0116	MRWA Standard Drawing – Pavement Marking PUFFIN and PELICAN Crossings
200531-0038	MRWA Standard Drawing – Pavement Marking Zebra Crossing at Slip Lane
200631-0001	MRWA Standard Drawing – Pavement Marking Road Humps Wombat Crossing
200931-0004	MRWA Standard Drawing – Speed Cushions on Local Roads (Road Widths 5.8m to 7.4m)
200931-0005	MRWA Standard Drawing – Speed Cushions on Local Roads (Road Widths 7.6m to 10.6m)
200931-0089, 200931-0090, 200931-0091	MRWA Standard Drawing – Tactile Ground Surface Indicators
201031-0004	MRWA Standard Drawing – Pavement Marking Splitter Islands (\leq 3.0m wide; \geq 70km/h posted speed)
201031-0171	MRWA Standard Drawing – Pavement Marking Roundabout Metering
202131-0030	MRWA Standard Drawing – Pavement Marking Raised Pavements Shark Teeth
9120-0174	MRWA Standard Drawing – Pavement Marking School Crossing
9531-2169	MRWA Standard Drawing – Pavement Marking Traffic Warden Controlled Children Crossing (Wig Wags)
9831-5649	MRWA Standard Drawing – Ramp and Grab Rail Details

11 REFERENCES AND RELATED DOCUMENTS

Document Number	Description
AGRD04A	Austrorads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections
AGRS01	Austrorads Guide to Road Safety Part 1: Introduction & The Safe System
AGTM03	Austrorads Guide to Traffic Management Part 3: Transport Study and Analysis
AGTM07	Austrorads Guide to Traffic Management Part 7: Activity Centres
AGTM08	Austrorads Guide to Traffic Management Part 8: Local Street Management
AS1158.4	Australian Standard – Lighting for Roads and Public Spaces
AS1158.5	Australian Standard – Tunnels and Underpasses.
AS1428.1	Australian Standard – Design for Access and Mobility – New Building Work
AS1428.4.1	Australian Standard – Design for Access and Mobility – Tactile Ground Surface Indicators
AS1742.10	Australian Standard 1742 Manual of Uniform Traffic Control Devices Part 10: Pedestrian Control and Protection
AS1742.13	Australian Standard 1742 Manual of Uniform Traffic Control Devices Part 13: Local Area Traffic Management
	Highway Capacity Manual 2010
D19#532308	MRWA Guidelines on Pedestrians Crossing Facilities at Traffic Signals
	MRWA Local Area Traffic Management Policy
D20#211505	MRWA Operational Modelling Guidelines
	MRWA Speed Zones Policy
D19#846517	MRWA Speed Zoning: Application and Guidelines Policy
	MRWA Traffic Warden-controlled Children's Crossing Guideline
	MRWA Vehicular Signals Policy
	New Zealand Transport Agency Guidelines for the Selection of Pedestrian Facilities
	Road Traffic Code 2000
	SIDRA Intersection User Guide
	Western Australia Police Force Children's Crossings

WALGA Submission to Main Roads WA on the Pedestrian Crossing Facilities Guidelines

Date: 11 August 2023

The Guidelines provide advice on appropriate types, locations, and treatments for pedestrian crossing facilities and outline the warrants for implementing pedestrian crossing facilities. The stated intent of the Guidelines is to support the provision of facilities for safer, accessible, and convenient pedestrian movements.

WALGA identified elements of the Guidelines that limit the capacity for Local Governments to manage the safe, comfortable, and connected movement of pedestrians, which are outlined in the bullet points below.

- **Planning Documents/Sound Planning:** Local Governments are often responsible for active mobility infrastructure, including the provision of footpaths. The implementation of the pedestrian network of infrastructure elements is often guided by an Integrated Transport Plan, Walk and Ride Plan, or other strategic planning document. No mention is made of Local Government's plans in planning for pedestrians in the Guidelines.
- **Vehicle Volumes/Speed:** The Guidelines, as written, make implementing high-quality pedestrian priority crossing facilities very difficult on roads with higher speeds/higher traffic volumes. However, it is precisely on these roads that such crossing facilities are fundamental to the creation of a safe, comfortable, and connected pedestrian network.
- **Pedestrian Priority:** A cornerstone of delivering a safe, comfortable, and connected pedestrian network is providing crossings with pedestrian priority, i.e. where motorists give way to pedestrians. The Guidelines make it very difficult to implement pedestrian-priority crossings, e.g. zebra/wombat crossings or pedestrian signals, and clearly state that vehicle delay is more important than pedestrian delay.
- **Cost:** Particularly on higher speed or higher volume roads, the Guidelines recommend treatments that are often prohibitively expensive for Local Governments to implement (pedestrian bridges or pedestrian signals). If the Local Government cannot afford the treatment, then pedestrians are not accommodated to cross at all.
- **Retrospective Approach:** Pedestrian demand is a key determinant of the type of crossing that would be proposed or considered. However, without a crossing in place, it is unlikely that pedestrian demand can be demonstrated.
- **Speed Reduction Stipulation:** In order to implement an at-grade pedestrian priority crossing, vehicle speeds must be reduced to 30 km/h or below at that location. This is exceedingly difficult to achieve without substantial cost implications for Local Governments and is particularly difficult to achieve on higher speed roads, making this well-intentioned stipulation a barrier to implementing pedestrian crossings. In addition, Local Governments do not have authority to set speed limits.
- **Crossings at Intersections:** Roundabouts are particularly unfriendly to pedestrians in that vehicles are not required to stop. This guide reinforces vehicular priority at roundabouts. Designs do exist to create roundabouts that are safer and more comfortable for people walking (pedestrian priority), but are not proposed in the Guidelines.

To realise the goals identified in Local Government planning documents (e.g., Integrated Transport Plans, Walk and Ride Plans) of developing a safe, comfortable, and connected pedestrian network, seven principles to inform revisions to the Guidelines are presented below.

These principles align with the following State Strategies/Initiatives:

- Driving Change – Road Safety Strategy for Western Australia – “Community feedback shows widespread support for **traffic calming measures in busy areas** that will prevent collisions with pedestrians and cyclists and **make local communities more people-friendly.**”
- Foundations for a Stronger Tomorrow: State Infrastructure Strategy – Under Tomorrow 2042 - “Fully integrated planning and delivery results in more efficient and flexible connections between transport modes and stimulates and supports greater infill housing development, with **a modal shift towards greater public transport use and active transport.**”
- WA Active Mobility Strategy – “The WA Active Mobility Strategy (AMS) will be an overarching strategic document that outlines **a coordinated approach to increase active mobility in Western Australia.**”
- Your Move: More Ways to Get There – “Your Move is a Department of Transport program that helps **people find alternative, active ways** to get to and from work, school and around their local community.”

Pedestrian Crossing Principles

1. Planning at the Local Government Level

Local Governments have a nuanced understanding of their modal networks. The State Government does not share this micro-level understanding of the local context. These guidelines should acknowledge this expertise and allow sound planning at the Local Government level to inform where and which pedestrian crossing types are implemented.

2. Pedestrian Crossings are Essential

High-speed, high-volume roads are the barrier most likely to be encountered by people completing trips on foot across WA. The guidelines should acknowledge that pedestrian crossings are essential regardless of vehicle speed and volume and that not providing a safe crossing is an unacceptable outcome.

3. Pedestrian Priority

The Guidelines identify non-priority crossings as the crossings to consider first. However, this type of crossing provides the lowest level of safety and comfort for pedestrians. The guidelines should recommend starting with high-quality, cost-effective, pedestrian-priority crossings in the first instance and recommend only implementing non-priority crossings as a last resort. Pedestrian travel should be given equal weight to vehicular travel. Pedestrian Crossings on roads with heavy vehicles should also be given higher priority toward the implementation of a safe, pedestrian- priority crossings in the Guidelines, based on the risk to the pedestrian.

4. Cost

Local Governments are responsible in most instances for the installation and maintenance of active mobility facilities within their jurisdictions. The Guidelines recommend installing pedestrian signals or grade-separated pedestrian crossings under certain circumstances. However, these are often very expensive to construct and maintain. The guidelines should recommend the implementation of lower-cost pedestrian-priority crossings first, rather than high-cost facilities. The Guidelines should also provide guidance on the cost of installing pedestrian crossing facilities and general information on which party may bear the costs.

5. Proactive Approach

As vulnerable road users, pedestrians are unlikely to cross in large numbers in areas that are unsafe. The Guidelines should adopt a more proactive approach and acknowledge the value

of network planning, instead of responding to pedestrian demand, which will not be present in areas with no crossing facilities. Additionally, a suite of appropriate design options should be provided to fit every situation.

6. Speed

The Guidelines mandate an operating speed reduction to 30 km/h at pedestrian crossings. Most roads in WA are speed zoned at 50 km/h or higher. While this reduction in operating speed is laudable from a safety perspective, this requirement effectively acts as a barrier to implementing pedestrian crossings, due to the difficulty in achieving this reduction without very costly infrastructure improvements and the prevailing high speeds on most roads in WA. Local Governments also do not have the authority to set speed limits.

7. Intersections

Certain infrastructure types, while safer for vehicles, can be very difficult to navigate for pedestrians, particularly roundabouts. The Guidelines should provide designs that accommodate pedestrians with priority at roundabouts to support the creation of a safe, comfortable, and connected pedestrian network.

Detailed Comments

Detailed comments on the guidelines have been compiled based on the above principles and can be found as tracked changes and comments in the body of the draft Pedestrian Crossing Facilities Guidelines document, attached to this submission.

Consultation Process

To ensure broad support for these principles and detailed comments within the Local Government sector, this item was considered and endorsed by the WALGA State Council.