

**Road Planning and Design Manual
Edition 2: Volume 3**

**Supplement to Austroads Guide to Road Design
Part 4: Intersections and Crossings - General**

October 2024



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Relationship with Austroads Guide to Road Design – Part 4 (2023)

The Department of Transport and Main Roads has, in principle, agreed to adopt the standards published in the Austroads *Guide to Road Design (2023) Part 4: Intersections and Crossings: General*.

When reference is made to other parts of the Austroads *Guide to Road Design*, Austroads *Guide to Traffic Management*, Austroads *Guide to Road Safety* or Australian Standard AS 1742 *Manual of Uniform Traffic Control Devices*, the reader should also refer to Transport and Main Roads related manuals:

- *Road Planning and Design Manual (RPDM)*
- *Queensland Guide to Traffic Management (QGTM)*
- *Queensland Guide to Road Safety (QGRS)*
- *Queensland Manual of Uniform Traffic Control Devices (MUTCD)*, and
- *Traffic and Road Use Management (TRUM) manual*.

Where a section does not appear in the body of this supplement, the Austroads *Guide to Road Design – Part 4* criteria is accepted unamended.

This supplement:

1. has precedence over the Austroads *Guide to Road Design – Part 4* when applied in Queensland
2. details additional requirements, including *accepted with amendments* (additions or differences), *new* or *not accepted*.
3. has the same structure (section numbering, headings and contents) as Austroads *Guide to Road Design – Part 4*.

The following table summarises the relationship between the Austroads *Guide to Road Design – Part 4* and this supplement using the following criteria:

Accepted	Where a section does not appear in the body of this supplement, the Austroads <i>Guide to Road Design – Part 4</i> is accepted.
Accepted with amendments	Part or all of the section has been accepted with additions and/or differences.
New	There is no equivalent section in the Austroads Guide.
Not accepted	The section of the Austroads Guide is not accepted.

Relationship table

Section	Title	Queensland application	Department contact	
1	Introduction			
	1.1	Purpose	Accepted	Road Design
	1.2	Scope of this Part	Accepted	Road Design
	1.3	Road Safety	Accepted	Road Design
	1.4	Design Criteria in Part 4	Accepted	Road Design
2	Types of Intersection			
	2	Types of Intersection	Accepted	Road Design
	2.1	Basic Forms of Intersection	Accepted	Road Design
	2.2	Types of Turn Treatments	Accepted	Road Design
	2.3	Intersection Selection	Accepted	Road Design
3	Road Design Considerations for Intersections			
	3.1	Road User	Accepted	Road Design
	3.2	Provision for Large / Special Vehicles	Accepted	Road Design
	3.3	Topography and Land Availability	Accepted	Road Design
	3.4	Environment and Heritage	Accepted	Road Design
	3.5	Physical Constraints	Accepted	Road Design
	3.6	Decision Making	Accepted	Road Design
	3.7	Work Health and Safety	Accepted	Road Design
	3.8	Other Considerations	Accepted with amendments	Road Design
	3.9	Consistency Considerations	New	Road Design
	3.10	On-road Parking	New	Road Design
4	Design Process			
	4.1	General	Accepted	Road Design
	4.2	Basic Data for Design	Accepted	Road Design
	4.3	Location of Intersections	Accepted	Road Design
	4.4	Design Speed	Accepted	Road Design
	4.5	Road Cross-section	Accepted with amendments	Road Design
5	Design Vehicle			
	5.1	General	Accepted	Road Design
	5.2	Selection of Design Vehicle	Accepted with amendments	Road Design
	5.3	Checking Vehicles	Accepted with amendments	Road Design
	5.4	Restricted Access Vehicles	Accepted	Road Design
	5.5	Visibility from Vehicles	Accepted	Road Design

Section	Title	Queensland application	Department contact
5.6	Design Vehicle Swept Path	Accepted with amendments	Road Design
6	Public Transport at Intersections		
6.1	General	Accepted	Road Design
6.2	Design Vehicle	Accepted	Road Design
6.3	Bus Facilities	Accepted with amendments	Road Design
7	Property Access and Median Openings		
7.1	General	Accepted	Road Design
7.2	Property Access	Accepted with amendments	Road Design
7.3	Median Openings	Accepted with amendments	Road Design
8	Pedestrian Crossings		
8.1	Introduction	Accepted with amendments	Road Design
8.2	Mid-block Crossings on Roads	Accepted with amendments	Road Design
8.3	Signalised Intersection Crossings	Accepted	Road Design
9	Cyclist Crossings		
9.1	Introduction	Accepted with amendments	Road Design
9.2	Kerb Ramps for Cycling	Accepted	Road Design
9.3	Unsignalised Crossings	Accepted	Road Design
9.4	Signalised Intersection Crossings	Accepted	Road Design
9.5	Signalised Mid-block Crossings	Accepted	Road Design
9.6	Path Terminals	Accepted	Road Design
9.7	Intersections between Off-road Paths	Accepted	Road Design
10	Rail Crossings		
10.1	General	Accepted with amendments	Road Design
10.2	Sight Distance	Accepted with amendments	Road Design
10.3	Horizontal Alignment	Accepted	Road Design
10.4	Vertical Alignment	Accepted	Road Design
10.5	Cross-section	Accepted	Road Design
10.6	Pedestrians and Cyclists	Accepted	Road Design
	References		
	References	Accepted	Road Design

Section	Title	Queensland application	Department contact
Appendices			
A	Crash Types at Unsignalised Intersections	Accepted	Road Design
B	Access Spacing	Accepted	Road Design
C	Derivation of Sight Distance Requirements at Railway Level Crossings	Accepted	Road Design
D	Extended Design Domain for Two Stage Mid-block Crossing	New	Road Design
Commentaries			
1		Accepted	Road Design
2		Accepted	Road Design
3		Accepted	Road Design
4		Accepted	Road Design
5		Accepted	Road Design
6		Accepted	Road Design

Departmental contacts

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3 Road design considerations for intersections

3.8 Other considerations

3.8.1 Pavement markings and signs

Addition

Practitioners should refer to Queensland MUTCD for pavement markings and signage in Queensland.

3.8.2 Road lighting

Addition

RPDM Volume 6 *Lighting* describes Queensland specific requirements and information on lighting at intersections.

3.8.3 Streetscaping

Addition

The Transport and Main Roads *Road Landscape Manual* describes Queensland specific requirements and information on landscaping at intersections.

3.9 Consistency considerations

There is no equivalent Section 3.8 in Austroads *Guide to Road Design – Part 4*.

New

The uniform application of intersection control devices is an essential factor in the safe and efficient operation of the road system as drivers tend to establish expectancy with regard to the type of devices being used.

To achieve consistency, the following guidelines are important:

- Through lane(s), especially the rightmost lane(s) next to the median, should preferably not become exclusive turn lane(s). Where this situation cannot be avoided clear diagrammatic signposting, sited well before the intersection, should be provided.
- Right to left merges should generally not be used. They must not be used on motorways. Where such a merge cannot be avoided, appropriate signage is to be provided and the location of the merge must not be at the same location as a merge on the opposite side of the same carriageway. In undertaking such a right to left merge, truck drivers rely solely on mirrors to view vehicles in the adjacent lane. Preferred practice at intersection is to provide a dedicated lane for a right-turn movement which is required to run simultaneously with a through movement. Where this requires a lane drop, consideration should be given to merging the kerb side lane(s) depending on traffic volumes.
- Short merge lanes and merge lanes without adequate run-out areas should be avoided.
- The appearance of intersection types and forms of traffic control should be consistently applied.
- The forms of traffic control are to be appropriate to the site.
- Advertising signage should be in accordance with Transport and Main Roads *Roadside Advertising Manual*.

- Adequate recovery areas should be provided for drivers who 'make mistakes' in accordance with the 'Safe Systems' principle.
- Intersections should be monitored to identify unusual movements, or where 'decision overload' situations are occurring, and
- The priority of each intersecting stream should be obvious to drivers and other users.

3.10 On-road parking

There is no equivalent Section 3.9 in Austroads *Guide to Road Design – Part 4*.

New

On-road parking in close proximity to an intersection can cause the following:

- reduction in the numbers of effective lanes on an approach or departure
- misleading activations of the traffic detectors
- obstruction of signal displays and other control devices
- reduced sight distances for vehicle, cyclist or pedestrian traffic
- undesirable interaction between road users, and
- delays as vehicles manoeuvre into parking spaces.

Statutory parking restrictions near intersections are outlined in the Queensland Government *Transport Operations (Road Use Management – Road Rules) Regulation 2009*. These restrictions identify where parking is prohibited in the absence of any signed or lined parking restrictions.

Parking should be designed so as not to interfere with sight distance or impede the flow of traffic turning at an intersection. This may require signed restrictions in excess of the statutory restrictions. In addition to these requirements, parking on major roads should preferably be prohibited within 100 m of signalised intersections.

For sight distance requirements at property entrances, refer to RPDM Volume 3, Part 4A *Unsignalised and Signalised Intersections*.

4 Design process

4.5 Road cross-section

4.5.2 Traffic lanes

Difference

In Queensland, the design lane width shall exclude any channel component. Design lane widths are to be measured as shown in Figure 4.2.4 of RPDM Volume 3, Part 3 *Geometric Design*.

5 Design vehicle

5.2 Selection of design vehicles

Addition

Additional information regarding heavy vehicle route maps and restrictions can be obtained from <https://www.tmr.qld.gov.au/business-industry/Heavy-vehicles/Heavy-vehicle-route-maps-and-restrictions>.

Difference

Notes 1 to 3 of Table 5.1 in Austroads *Guide to Road Design – Part 4* are replaced with the following:

Notes:

1. The restricted access vehicle to be used in the design of these intersections in Queensland is determined from the approved heavy vehicle route maps. Where the route is not approved for particular heavy vehicles, the single articulated (19 m) design vehicle applies.
2. The maximum permissible length for a B-double in Queensland is 26 m.
3. Road Train dimensions applicable in Queensland are outlined in the Transport and Main Roads [Route Assessment for Multi-Combination Vehicles \(MCV\) and Performance Based Standards \(PBS\) Vehicles in Queensland Guideline](#).

5.3 Checking vehicles

Addition

In certain instances, it will not be necessary to design for check vehicles. For example, in urban areas where the design vehicle is a B-double and it is unlikely that a vehicle larger than a B-double will ever use the road / intersection, the swept path of larger vehicles do not need to be provided for. The design vehicle should still be provided for with appropriate clearances.

5.6 Design vehicle swept path

5.6.2 Radius of turn

Addition

Representative steering path

When any turning movement is assessed in Vehicle Path (VPath), it is first necessary to determine a representative steering path for the turn. Variations in steering radius are accommodated by the clearances that must be provided when a swept path is used to check a vehicle movement.

In the case of complex turning manoeuvres, the scope for variations in steering path is greater than for simple circular turns.

To accommodate the transition from one segment of the steering path to the next, either transition curves are to be used, or a sufficient length of straight should be introduced between the curves. A minimum length of straight of about 3 m should be provided if both of the curves are less than about 40 m in radius. If both of the curves are less than about 20 m in radius, it is desirable that the minimum length of straight be increased to about 5 m (Cox 1987).

VPath calculates and plots swept path details for turning vehicles. It may be used for the production of standard templates or the design or checking of the turning requirements for vehicles in operation on specific road segments, (e.g. turning paths at intersections, roundabouts and so on).

VPath is the preferred program for use in Queensland. AutoTURN and AutoTrack are acceptable but are not as accurate for large MCVs.

6 Public transport at intersections

6.3 Bus facilities

Addition

The information in this section should be considered for information only. The TransLink *Public Transport Infrastructure Manual (PTIM)* describes Queensland specific requirements for bus facilities.

7 Property access and median openings

7.2 Property access

7.2.2 Urban roads

Addition

In commercial zones, access points should be consolidated to minimise conflict points.

The following additional items are to be considered for urban divided arterial roads in Table 7.2 of *Austroads Guide to Road Design – Part 4*.

On arterial routes, accesses should be consolidated where possible. Depending on the circumstances, consideration should be given to providing access to property through some of the following methods:

- Grade separation: Major commercial developments, such as shopping centres with mid-block access, may require grade separated right-turn movements, deceleration and acceleration lanes or signalised intersections. Intersection analysis will inform the layout.
- In conjunction with left in, left out access facilities, typical sheltered U-turn facilities for passenger vehicles and articulated vehicles are shown in Figure 9.1 of *Austroads Guide to Road Design – Part 4A*, and
- Direct access: Right-turn direct access should be limited to situations where the road network layout precludes those measures mentioned above. A separate right-turn bay for such an access should be located so that the right-turn is a minimum five seconds travel distance from the nearest street intersection. An ideal site for this is preceding a signalised intersection where the turning vehicle can take advantage of the gap caused by the inter-green.

7.3 Median openings

7.3.2 Location

Differences

Practice in Queensland requires that a driver wishing to use a crossover should be able to recognise that the crossover exists from at least 10 seconds of travel in either direction. This replaces the requirement in the last paragraph of Section 7.3.2 of *Austroads Guide to Road Design – Part 4* which requires at least 300 m.

Addition

Emergency services access requires a median crossover facility between all interchanges on motorways. This requirement should be confirmed through consultation with local emergency service agencies.

8 Pedestrian crossings

8.1 Introduction

8.1.2 Types of crossings

Addition

In Queensland, the selection of traffic control devices to be used in the control and protection of pedestrian traffic on roads is described in QGTM. Further information can also be found via <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Cycling-guidelines>.

8.2 Mid-block crossings on roads

8.2.1 General considerations for design

Addition

The following is to be added to Table 8.1 of Austroads *Guide to Road Design – Part 4*.

Feature	Considerations
Mid-block pedestrian crossings location	Signalised mid-block pedestrian crossing must be located a minimum of 30 m from any side streets. This is to avoid side street traffic misinterpreting the traffic signals as controlling their movement. It also prevents the situation where a vehicle enters the main roads just as the signals change to the pedestrian phase and the driver of the entering vehicle is unaware of the change or unable to react in time.
Mid-block pedestrian crossings – Two stage crossings	Where two stage crossings are 2.4 m wide or less, the crossing point must be flush with the adjacent pavement surfaces. The kerbside pedestrian lanterns must be aimed so that they are not visible to pedestrians on the opposite side of the road. A physical barrier of suitable fencing should be provided on the median to prevent pedestrians from 'short cutting' between the crossings (refer to Austroads <i>Guide to Road Design – Part 4A</i> and Austroads <i>Guide to Road Design – Part 6</i>). Fences should be aligned so pedestrians face oncoming traffic as they leave the median. The fences should commence at the signal post and not encroach past the push button position. Parking for motorcycles does not inhibit crossing sight distance as much as general parking and may be appropriate for the first parking bays abutting a pedestrian crossing or refuge.

8.2.2 General crossing treatments

Addition

The Transport and Main Roads QGTM takes precedence on crossing selection guidance.

Transport and Main Roads Guideline, *Including provisions for bicycles in road pavement rehabilitation and resurfacing projects*, provides further guidance on layout considerations.

Practitioners should refer to Transport and Main Roads Queensland MUTCD for pavement markings and signage in Queensland.

Refer to Transport and Main Roads Technical Guideline, *Raised priority crossings for pedestrians and cycle paths*, for guidance on raised crossings.

Refer to Transport and Main Roads QGTM for guidance and Standard Drawings for construction details on Tactile Ground Surface Indicators (TGSI).

Refer to Transport and Main Roads Standard Drawings for ramped and cut-through treatment for pedestrian facilities.

An EDD design for a staged crossing of a median is detailed in Appendix D.

Where a crossing is staggered, checks must be undertaken to ensure it is accessible for people with a disability i.e. it can be readily negotiated using a wheelchair or mobility scooter.

8.2.3 Kerb ramps for pedestrians

Addition

Refer to the Transport and Main Roads QGTM for guidance and Standard Drawings for construction details on Tactile Ground Surface Indicators (TGSi) on ramped kerb crossings.

8.2.4 Pedestrian (zebra) crossing

Addition

The second and third paragraph is replaced with “Refer to Transport and Main Roads QGTM Part 6 and Queensland MUTCD Part 10 for crossing treatment selection and mandatory requirements.”

Refer to Transport and Main Roads QGTM, Queensland MUTCD and Standard Drawings for guidance for Queensland specific zebra crossing design elements.

8.2.5 Raised pedestrian (wombat) crossing

Addition

Transport and Main Roads Guideline *Including provisions for bicycles in road pavement rehabilitation and resurfacing projects* provides further guidance on layout considerations.

The ramp gradient in Table 8.8 is replaced with criteria from Table 2.5 of Transport and Main Roads Technical Guideline *Raised priority crossing for pedestrians and cycle paths*.

The guidance in RTS 14 is for information only.

8.2.7 Signalised crossings

Difference

Pelican crossings are not an accepted treatment in Queensland.

For Figure 8.9 and Figure 8.10, replace “d = hold line setback (typically 3 m; refer to jurisdictional standards)” with “d = stop lines at intersections and mid-block pedestrian signals should be located in accordance with AS 1742.14.”

Addition

The puffin crossing treatment incorporates only nearside pedestrian lanterns, which are not currently used in Queensland. The Queensland equivalent of a puffin crossing is known as a smart pedestrian crossing (refer to Transport and Main Roads QGTM Part 9 for guidance).

8.3.1 Pedestrian crossings

Addition

The Transport and Main Roads QGTM takes precedence on slip lane crossing selection guidance.

Difference

Figure 8.14 is a raised priority crossing, not a wombat crossing, as the preceding paragraph states.

9 Cyclist crossings

9.1 Introduction

Addition

For more information in relation to cyclist crossings, refer to Transport and Main Roads QGTM and website via <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Cycling-guidelines>.

10 Rail crossings

10.1 General

Addition

ALCAM is not mandated for application at rail level crossings in Queensland but is used almost exclusively by the major rail operators. It is used to prioritise upgrades to existing level crossings and to determine the crossing treatments to be applied at new crossings. It is therefore generally the rail authority who is responsible for determining whether passive or active control is used or if the crossing is grade separated.

10.2 Sight distance

Addition

Where a crossing is located on a side road only a short distance from the through road, the vehicle speeds at the crossing location will be relatively low and therefore the sight distance requirements will be reduced. In this case, the operating speed at the crossing location should be determined by applying the vehicle acceleration / deceleration models respectively on the two approaches to the crossing.

Motorists who drive slower than the 85th percentile speed will be closer to the railway line at the time they need to detect an approaching train. It follows that the visibility angle for slower drivers will therefore be increased. It is therefore necessary to check that for the 15th percentile (taken as 0.75 times the 85th percentile speed) road speed, visibility angles are within the prescribed limits.

References

Transport and Main Roads publication references refer to the latest published document on the departmental website (<https://www.tmr.qld.gov.au/business-industry/technical-standards-publications>).

Addition

Arndt O.K and Troutbeck R.J. (2001). *Relationship between unsignalised intersection geometry and accident rates – A literature review*, Road and Transport Research, Volume 10, No. 3, ARRB Transport Research Ltd, Victoria.

Austroads *Guide to Road Design – Part 3 – Geometric Design*, Sydney, NSW

Austroads *Guide to Road Design – Part 4, Intersections and Crossings - General*, Austroads, Sydney, NSW

Austroads *Guide to Road Design – Part 4A – Unsignalised and Signalised Intersections*, Sydney, NSW

Austroads *Guide to Road Design – Part 6 – Roadside Design, Safety and Barriers*, Sydney, NSW

Austroads *Guide to Traffic Management – Part 6 – Intersections, Interchanges and Crossings*, Austroads, Sydney, NSW

Cox, R.L. (1987). *Swept Paths of Vehicles for Complex Turns*, 20th Divisional Draftman's Conference Minutes, Main Roads Department, Brisbane

Queensland Government *Transport Operations (Road Use Management—Road Rules) Regulation* 2009, Brisbane, QLD

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Transport and Main Roads *Guidelines for Cyclists and Pedestrians*

<https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Cycling-guidelines>

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Transport and Main Roads *Queensland Road Rules*, Brisbane, QLD

Transport and Main Roads *Road Landscape Manual*, Brisbane, QLD

Transport and Main Roads *Road Planning and Design Manual (RPDM)*, Brisbane, QLD

Transport and Main Roads *Roadside Advertising Manual*, Brisbane, QLD

Transport and Main Roads *Route Assessment for Multi-Combination Vehicles (MCV) and Performance Based Standards (PBS) Vehicles in Queensland* Guideline, Brisbane, QLD

Transport and Main Roads *Standard Drawings*, Brisbane, QLD

Transport and Main Roads *Traffic and Road Use Management Manual (TRUM)*, Brisbane, QLD

Appendix B – Signalised intersections

Addition

See also Section 9 of Transport and Main Roads RPDM supplement to Austroads *Guide to Road Design – Part 4A Unsignalised and Signalised Intersections*.

B.2 Signal operation considerations

B.2.1 Traffic operation at an intersection

Addition

Complex intersections, such as fast diamonds, require additional consideration to ensure safe operation is maintained. Additional signal aspect redundancy ensures that drivers can see multiple operational traffic signals. The safety consequences may be high at these types of intersections when individual traffic signal aspects fail.

B.3 Intersection layouts

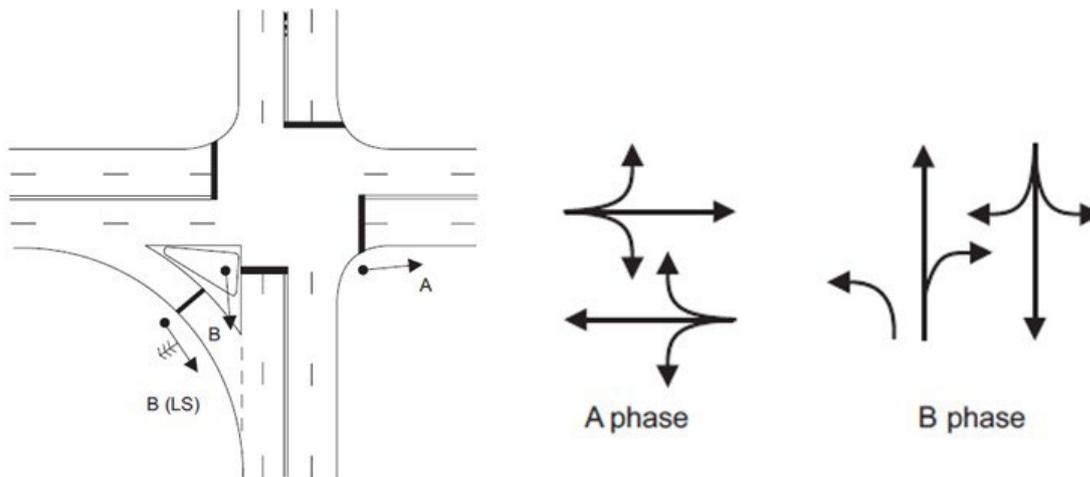
B.3.1 General

Addition

The following guidance applies to signalised intersections:

- The layout of the intersection should provide for the optimum location of traffic signal hardware and appropriate clearance to this hardware. Median widths must be large enough to store traffic signal equipment.
- While appropriately balancing the needs of other geometric parameters, the distance that vehicle and pedestrian movements need to travel from the stop line to clear the intersection should be minimised. Longer distances require longer inter-green times to safely allow these movements to clear the intersection and thereby reduce the intersection capacity.
- Where it is desirable to use diamond phasing, appropriate clearance should be provided between right-turning movements (refer to Austroads *Guide to Traffic Management – Part 6*).
- A late start interval may be used to delay the introduction of a green signal group at a controlled left-turn slip lane where there is a large corner island (instead of increasing the clearance interval for the entire signal group). This allows vehicles to clear the conflict area before the left-turn is introduced (refer to Figure 4-B 1 below).

Figure 4-B 1 – Late start for large corner islands



- Medians and islands
 - Refer to Table 4-B 1 below. The absolute minimum width of raised medians for two stage pedestrian mid-block crossings of 2.5 m is needed to store pedestrians (refer to Section 8.2.2 of this document), and
 - The use of wide medians reduces intersection capability because of increased clearance times for vehicle and pedestrian movements. For intersections with wide medians, consider staging pedestrian movements. Also, wide medians may cause the problem of interlocking opposing right-turn vehicles and therefore should be avoided.

Table 4-B 1 – Minimum widths of raised medians

Situation	Desirable (m)	Absolute (m)
No posts	1.2	0.9
Post with single 200 mm lanterns	2.4	1.2
Post with dual 200 mm lanterns	2.4	1.5
Two stage mid-block pedestrian crossing	4.0	2.5

B.3.2 Service road treatments

Addition

As an alternative to the treatments shown in Figure B.3 of the Austroads *Guide to Road Design – Part 4*, if space is available, the service road can be ‘bulbed’ to intersect the cross road at a distance from the intersection sufficient to form a separate intersection. This distance should be longer than the expected queue at the intersection or a minimum of 20 m (allows a semi-trailer to do a U-turn between inside lanes).

Appendix D – Extended design domain for two stage mid-block crossing

There is no equivalent Appendix D in Austroads *Guide to Road Design – Part 4*.

New

Staggered pedestrian crossings of a road can be accommodated with medians as narrow as 2 m. In these circumstances, the sight distance parameters, road design and nearby intersections shall all meet NDD design criteria.

Figure 4-D.1 – Two stage mid-block crossing (left hand offset)

