Relationship with Austroads Guide to Road Design – Part 4 (2009)

The Department of Transport and Main Roads has, in principle, agreed to adopt the standards published in the **Austroads Guide to Road Design (2009) Part 4: Intersections and Crossing General**

When reference is made to other parts of the Austroads Guide to Road Design or the Austroads Guide to Traffic Management, the reader should also refer to Transport and Main Roads related manuals:

- *Road Planning and Design Manual*
- *Traffic and Road Use Management 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 Guide to Road Design – Part 4** 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. |

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Accepted

9.8 Intersections between off-road shared use paths
Accepted

10 Rail crossings

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Accepted with amendments

10.2 Sight distance
Accepted with amendments

10.3 Horizontal alignment
Accepted

10.4 Vertical alignment
Accepted with amendments

10.5 Cross-section
Accepted

10.6 Pedestrians and cyclists
Accepted

References

References
Accepted with amendments

Appendices

Appendix A Access spacing
Accepted

Appendix B Determination of sight distance requirements at railway level crossings
Accepted

Appendix C Extended design domain for two stage mid-block crossing
New

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Accepted

Commentary 2
Accepted

Commentary 3
Accepted

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Accepted

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Accepted

Commentary 6
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1 Introduction

1.2 Scope of this part

Additions

In undertaking intersection design, practitioners are reminded that the full intersection design process spans the Austroads Guide to Traffic Management - Part 6: Intersections, Interchanges and Crossings and the Austroads Guide to Road Design - Part 4 series. For application in Queensland, the intersection design process also spans the related Transport and Main Roads Traffic and Road Use Management (TRUM) Manual and this Road Planning and Design Manual (RPDM). The design of intersections in accordance with this RPDM must consider all of the planning and operational issues outlined within the TRUM Manual and Austroads Guide to Traffic Management.

1.4 Road design criteria in part 4

Additions

Guidance on the use of values outside of the design domain (Normal and Extended) should be undertaken in accordance with this document and the Transport and Main Roads Guidelines for Road Design on Brownfield Sites.

1.6.1 Pavement markings and signs

Additions

Practitioners should refer to the Transport and Main Roads Manual of Uniform Traffic Control Devices as the Queensland jurisdictional guide on pavement markings and signage.

1.6.2 Road lighting

Additions

Volume 6 of this Road Planning and Design Manual describes Queensland specific requirements and information on lighting at intersections. This information will be transferred in the near future to the Transport and Main Roads TRUM Manual.

1.6.3 Landscaping

Additions

Practitioners should refer to the Transport and Main Roads Road Landscape Manual for information on landscaping around intersections.
3 Road design considerations for intersections

3.8 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 and not disobeyed with impunity.

- Advertising signage should be in accordance with Transport and Main Roads *Roadside Advertising Guide*. Advertising signage which imitates traffic control devices, give direction to traffic or distracts drivers should not be permitted.

- Adequate recovery areas should be provided for drivers who ‘get it wrong’ in accordance with the “Safe Systems” principle.

- Intersections should be monitored to identify unusual movements, or where ‘decision overload’ situations are occurring.

- The priority of each intersecting stream should be obvious to drivers and other users.

3.9 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
• 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.

4 Design process

4.5.2 Traffic lanes

*Difference*

In Queensland, the design lane width shall exclude any channel component, and shall not be measured to the line of the kerb as shown in Figure 4.2 of *Austroads Guide to Road Design – Part 4*.

5 Design vehicle

5.2 Design vehicles

*Additions*

Maps and guidelines designating approved routes for multi-combination vehicles are available from the Transport and Main Roads website (search for “multi-combination vehicles”). Where a specific class of vehicle is permitted to use roads on both the approach and departure legs of an intersection, that vehicle shall be the design vehicle for the relevant intersection movements.

*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 multi-combination vehicle maps. Where the route is not approved for multi-combination vehicles, the single articulated (19.0 m) design vehicle applies.
2. The maximum permissible length for a B-double in Queensland is 25.0 m.
3. Road Train dimensions applicable in Queensland are outlined in the Transport and Main Roads *Guideline for Multi-combination vehicles*.

5.3 Checking vehicles

*Additions*

The appropriate checking vehicle should be determined from one of the following criteria typically determined by the road asset owner:

1. None – 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.
2. Checking vehicle at least the next larger vehicle to the design vehicle. This checking vehicle is in accordance with Clause 5.3 of *Austroads Guide to Road Design – Part 4*.

3. Restricted Access and Permit vehicles. These vehicles are considered in accordance with Clause 5.4 of *Austroads Guide to Road Design – Part 4*.

### 5.4 Restricted access vehicles

**Difference**

Replace the last sentence of the first paragraph with "In this case, the largest type (e.g. a Conventional Type 2 Road Train) is likely to be the design vehicle for that route".

#### 5.6.1 General

**Additions**

In addition, tangential turns should always be used for the design of intersection turns and turns from the roadway into a property access. In practice, drivers may sometimes execute turns after applying some initial lock while the vehicle is stopped. This is due to factors such as driver error or constraints imposed by low standard geometry, disabled vehicles or obstacles on the road.

Initial lock turns require shorter arcs of turn but involve maximum off-tracking for more of the turn and greater out swing of the rear of the vehicle at the start of the turn (Figure 4-1). Initial lock turns are relevant for off-street manoeuvres (including roadside parking manoeuvres) and, in constrained situations, for entering and leaving parking spaces. Initial lock turns are not to be used for circulating roadways within a parking facility, on roads or at intersections.

**Figure 4-1 – Swept path comparison between initial lock and tangential turns**

![Initial Lock Turn and Tangential Turn](image)

#### 5.6.2 Radius of turn

**Additions**

**Representative steering path**

When any turning movement is assessed in 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.

5.6.3 Clearances to swept paths of turning vehicles

Additions

Edge of pavement/kerb/centreline

In addition to the minimum offset to a kerb, pavement edge or centreline, the swept path for design vehicles should also have a minimum offset of 0.5 m to an edge line or safety barrier (median or kerbside).

Check vehicles may intrude into the 0.5 m clearance and in other areas specifically designed for the occasional vehicle to mount.

Between swept paths – turns in the same direction

At ports and major industrial areas, double turns must allow for 1 m clearance between heavy vehicles turning two abreast.

7 Property access and median openings

7.2.2 Urban roads

Additions

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

The following additional items are to be considered for urban divided arterial roads in Table 7.1 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 dictate the treatment.
- 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 4.
- 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.
7.3.2 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.

Additions

Emergency services access requires a median crossover facility between all interchanges on motorways. Details of the treatment of medians with safety barrier to allow for emergency crossover are shown in Figure 4-2.
Figure 4-2 – Narrow medians with safety barrier – median crossovers for emergency purposes

6-10m WIDE MEDIAN WITH WIRE ROPE SAFETY BARRIER

NARROW MEDIAN WITH WIRE ROPE SAFETY BARRIER

NARROW MEDIAN REQUIRING RIGID / SEMI RIGID BARRIER

Notes:

The widened areas should be denoted as "No Stopping" to prevent the widened pavement being used as a breakdown area.
8 Pedestrian crossings

8.1.2 Types of crossings

*Additions*

In Queensland, the selection of traffic control devices to be used in the control and protection of pedestrian traffic on roads is described in the Transport and Main Roads TRUM Manual.

8.2.1 General considerations for design

*Additions*

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

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<td>Mid-block pedestrian crossings location</td>
<td>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.</td>
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<tr>
<td>Mid-block pedestrian crossings – Two stage crossings</td>
<td>At sites where long pedestrian crossings occur, a two stage crossing assists traffic signal coordination under STREAMS and reduces traffic delays. 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 <em>Austroads Guide to Road Design – Part 4A and Austroads Guide to Road Design – Part 6</em>). 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.</td>
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8.2.2 General crossing treatments

*Additions*

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

8.2.3 Time separated (controlled traffic) facilities

*Additions*

Pelican crossings are not permitted in Queensland.

Puffin crossings are typically not used in Queensland.

8.2.4 Kerb ramps for pedestrians

*Additions*

Requirements of compliant kerb ramps and TGSI installation are set out in the drawings within the Transport and Main Roads *Standard Drawings Roads*.
10 Rail crossings

10.1 Introduction

Additions

In addition, special precautions are required to ensure that green traffic signal aspects are not visible across the level crossing at the same time as the flashing red rail signals, commonly referred to as the ‘see-through’ effect. Similarly, the positioning, screening and aiming of the vehicle lanterns must be arranged to ensure that traffic signals do not cause confusion to train drivers.

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

Additions

Add the following to the end of the 3rd paragraph “Where the minimum sight distance requirements for passive control by give way signs or stop signs cannot be met, consideration can be given to methods for reducing vehicle speeds on the approach to the crossing. This approach should only be considered where the additional safety risk associated with reducing vehicle speeds is acceptable in comparison to the costs to upgrade the crossing”.

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.

10.4.1 Road grading

Additions

Add the following to the end of the 2nd last paragraph “It is also desirable in such cases to reduce the alignment standard of the road as a means of reducing the design speed over the crossing. This measure will require both speed reduction measures and adequate signage to warn approaching drivers”.
References

Transport and Main Roads publication references refer to the latest published document on the departmental website (www.tmr.qld.gov.au).

Additions


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

Transport and Main Roads Guideline for Multi-combination Vehicles in Queensland, Brisbane, QLD

Transport and Main Roads Guidelines for Road Design on Brownfields Sites, Brisbane, QLD

Transport and Main Roads Manual of Uniform Traffic Control Devices, Brisbane, QLD

Transport and Main Roads Road Landscape Manual, Brisbane, QLD

Transport and Main Roads Roadside Advertising Guide, Brisbane, QLD

Transport and Main Roads Standard Drawings Roads, Brisbane, QLD

Transport and Main Roads Traffic and Road Use Management Manual (TRUM), Brisbane, QLD
Appendix C – Extended design domain for two stage mid-block crossing

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

**New**

Staged pedestrian crossings of a road can be accommodated with medians as narrow as 2.0 m. In these circumstances the sight distance parameters, road design and nearby intersections shall all meet NDD design criteria.

*Figure 4-C 1 – Two stage mid-block crossing (LH Offset)*