Relationship with Austroads *Guide to Road Design – Part 4B (2015)*

The Department of Transport and Main Roads has, in principle, agreed to adopt the standards published in the Austroads *Guide to Road Design - Part 4B: Roundabouts*.

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 4B* criteria is accepted unamended.

This supplement:

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

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

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### Commentaries

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1 Introduction

1.2 Scope of this part

Differences

Lighting of roundabouts was removed from the 2015 edition of Austroads Guide to Road Design – Part 4B. The third dot point in this section is rewritten as follows:

- specific information relating to the accommodation of cyclists and pedestrians, landscaping, and road marking.

1.6 Safety performance of roundabouts

Differences

The first sentence in Section 1.6 of Austroads Guide to Road Design – Part 4B is replaced with the following.

“A well designed roundabout can be a safe form of intersection control for motor vehicles but can lead to additional safety issues for pedestrians and cyclists.”

2 Design principles and procedure

2.2 Design procedure

Differences

The fourth dot point in this section of Austroads Guide to Road Design – Part 4B is rewritten as follows:

“It is essential that appropriate measures are used to limit the entry speed. There are a number of means discussed in Section 4 to reduce speeds on the roundabout approach. The entry curvature is a key element in achieving this outcome.”

2.3 Design procedure

Differences

The third sentence in the third paragraph of Austroads Guide to Road Design – Part 4B has an editorial error and is rewritten as follows:

“For example, the design of a roundabout involving two local residential streets may be a relatively simple exercise where traffic analysis is unnecessary and where the existing corner radii are used as controls for the location of the circulating carriageway.”

Step 1 in Table 2.1 and Figure 2.2 of Austroads Guide to Road Design – Part 4B both detail the need to assemble the queue lengths on the approaches, however this information is not discussed further in the design process. Step 10 in Table 2.1 is modified to read the following in the Consideration Column.

“Complete design by drawing lighting, signs and markings, and landscaping and considering other roadside design and safety issues. Complete the design of the roundabout approaches considering the queue lengths on each approach.”
Step 2 in Table 2.1 and Figure 2.2 of Austroads Guide to Road Design – Part 4B list different site controls / considerations. Both lists are amended to include the following:

- Road users
- Physical constraints
- Topography and land availability
- Environment and heritage constraints (including trees, monuments etc)
- Accesses
- Utilities
- Parking

Step 6 in Table 2.1 of Austroads Guide to Road Design – Part 4B is missing a cross-reference for the use of speed reducing treatments and does not detail any consideration or cross-reference for the design of pedestrians and cyclist facilities as detailed in Figure 2.2. Step 6 in Table 2.1 is amended as follows:

For “Consider use of speed reducing treatments where approach speed is ≥ 80 km/h” a reference to Section 4.5.2 is added in the final column.

Add new sentence to Considerations – “Design facilities for pedestrians and cyclists”. Add a reference to Section 5.2 and 5.3 in the final column.

Steps 7 and 8 in Table 2.1 of Austroads Guide to Road Design – Part 4B are presented in the incorrect order and are inconsistent with Figure 2.2. The correct order for these steps in the design procedure is as follows:

- Step 7, Check swept paths of the design vehicle for all traffic movements including the circulating carriageway.
- Step 8, Check that the maximum entry path radii have been achieved.

Additions

A note is added to Figure 2.2 as follows:

**Note**: Where the design at steps 7, 8 or 9 generates an unsatisfactory design, it is recommended that alternative trial entry and exit leg geometry be assessed (Step 6). Where alterations to the entry and exit leg geometry do not yield a satisfactory result, an alternative trial central island diameter should be assessed (Step 4).

3 Sight distance

3.2.3 Criterion 3

Additions

The absolute minimum sight distance for Criterion 3 is measured as the approach sight distance detailed in Table 3.1 of Austroads Guide to Road Design – Part 4A and applying a Reaction Time (RT) of 1.5 seconds.
Difference

Clause 3.2.3 of Austroads Guide to Road Design – Part 4A implies that Criterion 3 is desirable. On Queensland State controlled roads, compliance with the calculated Criterion 3 is a preferred design requirement.

3.3 Stopping sight distance for trucks

Additions

Roundabouts should also cater for truck sight distance as follows:

- Criterion 1 sight distance – ensure that truck approach sight distance is provided to the roundabout from each leg, measured from a 2.4 m eye height to a 0 m object height (refer Section 3.2.1).
- Criterion 2 sight distance – ensure that a truck driver with a 2.4 m eye height at location ‘A’ on Figure 3.1 has sufficient sight distance according to the criteria in Section 3.2.2.
- Criterion 3 sight distance – ensure that a truck driver approaching the roundabout with a 2.4 m eye height can see other entering vehicles before the truck driver reaches the holding line, according to the criteria in Section 3.2.3.

4 Geometric design

4.3.5 Left-turn slip lanes

Difference

High entry angle left-turn lanes are not preferred practice at roundabouts on Queensland State controlled roads.

4.4.2 Factors affecting central island size

Addition

Additional item added to list of dot points in 1st paragraph

- Physical site constraints such as topography, environment, property boundaries, utilities and other hazards.

Difference

The 2nd paragraph is written as follows:

The central island needs to be large enough to:

- Enable entry geometry to slow entering vehicles
- Minimise the relative speed between entering and circulating vehicles to minimise the crash rates
- Provide suitable separation between roundabout legs (refer Section 4.9)
- Provide greater separation between adjacent conflict areas and make is easier for entering drivers to determine whether vehicles, already on the circulating carriageway, are exiting or continuing around the circulating carriageway
On major arterial roads the central island radius should be limited to a maximum of 75 m (desirably 50 m). Radii too large will encourage high circulating speeds and may encourage wrong-way movements if drivers do not perceive the circulating carriageway as a roundabout. These larger radii should not be required for the usual design vehicles (e.g. prime mover with semi-trailer; B-double), but may be necessary where a road train is the design vehicle or for roundabouts that are grade-separated.

Difference
The 2nd paragraph from Section 4.4.3 is relocated to this Section 4.4.2

In general, roundabouts in high speed areas need to be larger to enable better entry and approach. Geometry should be designed to reduce the high approach speeds. The design of these roundabouts is more critical than that for roundabouts located in low speed areas.

4.4.3 Central island radius

Difference
The first four paragraphs from Section 4.4.3 are replaced with the following.

Table 4.1 provides a guide for the initial selection of the central island radius for a circular roundabout. The desirable values given in Table 4.1 should be used as a starting point whenever possible, as they generally produce lower overall crash rates than those produced by the minimum values (refer to notes 2 and 3 in Table 4.1).

Addition
The Title of Figure 4.1 to is replaced as follows.

“Table 4.1 - Initial selection of the central island radius for a circular roundabout”.

Addition
The following dot point is added to “The criteria in Table 4.1 are based on the following”: on page 20 of Austroads Guide to Road Design Part 6.

• The maximum entry path radii in Table 4.2 are achieved.

Difference
The following dot point is added to “Generally, the central island radius will need to be increased to allow for the following conditions”:

• Other considerations apply, e.g. a grade separated roundabout forming an overpass or underpass with a highway or motorway.

The last dot point in Section 4.4.3 is deleted.

4.5.2 Approach and entry treatments

Additions

Single entry curve approach

It is recommended that the design of roundabouts on departmental roadways incorporate short horizontal straights between entry and circulating carriageway curves as described in Section 4.5.2 of Austroads Guide to Road Design – Part 4B. To model a roundabout incorporating short horizontal straights with the Transport and Main Roads ARNDT program, leave out the straights.
Approach treatments for high-speed areas

The last dot point in the first paragraph relating to run out areas is removed and a sentence added following the list of dot points

In spite of the above list of possible treatments to encourage a reduction in vehicles speeds, run out areas may still be required where vehicles are not able to correctly negotiate the approach.

Use of approach reverse curves

*Additions*

Any vertical curve used in conjunction with an approach curve will result in a lower perception of downstream approach curves and / or entry curve, particularly if used in combination with superelevation. If a vertical curve cannot be avoided, it may be best to use an alternative treatment (refer Section 4.5.2 of Austroads *Guide to Road Design – Part 4B*) rather than reverse approach curves. This principle is the same as that used on a midblock section of roadway, i.e. a crest curve should never be provided immediately prior to a tight horizontal curve.

The department recommends that the design of the superelevation through the reverse curves incorporate short horizontal straights between each curve as described in Section 4.5.2 of Austroads *Guide to Road Design – Part 4B*. To model a roundabout incorporating short horizontal straights with the Transport and Main Roads ARNDT program, leave out the straights.

Applying superelevation on reverse approach curves may produce poor perception of downstream horizontal curves (including other approach curves and the entry curve). An alternative is to use adverse crossfall on one (or more) of the reverse approach curves and keep the crossfall in the same direction through the approach curves and entry curve.

In the paragraph following Figure 4.4, references to Appendix E of AGRD Part 3 should refer to Appendix I of AGRD Part 3.

In the second last paragraph of this section “closest” should be “closest”

*Blisters*

*Additions*

Last sentence is replaced with:

They are typically used on wide approaches that have on-road parking and involve the extension of the kerb and linemarking to create entry curvature. Figure 4.16 demonstrates the use of these blisters with kerb extensions shown on the left edge of all approaches to the roundabout.

4.5.3 Maximum entry path radius

*Differences*

The 1st two paragraphs are replaced with:

Maximum entry path radii to be used at one and two-lane roundabouts are given in Table 4.2. The values given in the table should be used wherever possible as they will generally produce lower overall crash rates than larger entry path radii.
The maximum entry path radii should be used in conjunction with the minimum central island radii from Table 4.1. Avoid the use of excessively small corner kerb radii when using the values in Table 4.2.

4.6.3 Encroachment areas

Addition

The following sentence is added to the end of the 2nd paragraph.

The Type B encroachment area should not be used where high centre of gravity vehicles are using the roundabout and there is adverse crossfall on the circulating carriageway.

Differences

The 2nd dot point in the 5th paragraph is replaced with the following

- Have semi-mountable or fully mountable kerbs, except where these areas are used by high centre of gravity vehicles are using the roundabout and there is adverse crossfall on the circulating carriageway, in which case fully mountable kerbs should be used.

4.7 Exit curves

Additions

It is recommended that the design of roundabouts on departmental roadways incorporate these short horizontal straights between circulating carriageway and exit curves. To model a roundabout incorporating short horizontal straights with the AGRD program, leave out the straights.

Where it is desirable to limit the exit speed from a roundabout due to pedestrian or parking activity on the road beyond the exit, use an exit curve radius similar to the circulating curve radius. This will reduce the need for motorists to decrease speed as they exit the roundabout.

4.8 Entry and exit widths

Difference

The first sentence in the second paragraph of Austroads Guide to Road Design – Part 4B has an editorial error and is rewritten as follows:

“On arterial roads the swept path of the design vehicle must be able to be accommodated within the appropriate traffic lane on the entry with adequate clearance to the kerbs.”

4.10.4 Pavement conditions

There is no equivalent Section 4.10.4 in Austroads Guide to Road Design – Part 4B.

New

Drivers generally use high values of side friction on all geometric elements of a roundabout. This is particularly the case in higher speed environments and particularly on the entry curve and the circulating carriageway. To ensure that high values of side friction can be delivered by the pavement to minimise single vehicle accident rates, the pavement surfacing selected should possess high friction and skid resistance properties, and should be maintained in good condition.
In addition, the torque generated by the tyres of turning vehicles on the pavement surfacing can cause problems (for example, stripping of aggregate from bitumen seals). This is particularly the case for tighter curves and smaller roundabouts. Specialist advice on surfacing at roundabouts should be sought.

5 Pedestrian and cyclist treatments

5.1 Introduction

Additions

In addition to the information in Austroads Guide to Road Design – Part 4B, designers should also refer to the following departmental publications with regards to designing for cyclists:

- Transport and Main Roads Technical Note 128 Selection and Design of Cycle Tracks
- Transport and Main Roads Technical Note 136 Providing for Cyclists at Roundabouts

6 Pavement markings and signing

6.1 Introduction

Additions

Wherever a reference to AS 1742.2 – Manual of Uniform Traffic Control Devices occurs, the Transport and Main Roads Manual of Uniform Traffic Control Devices must be used. Designers should also refer to Transport and Main Roads Traffic and Road Use Management Manual and particularly Volume 3, Part 2 Chapter 4.

6.2 Single-lane local street roundabout

Additions

Hazard marker signs should be used on both the outside curves and central island of the roundabout where visibility of the islands and kerbs may be unclear or where there is a history of vehicles not correctly negotiating the roundabout.

6.3 Multi-lane arterial roundabout

Additions

Where the approaches are line marked with non-standard lane usage, for example a double left turn or a double right turn, the line marking within the roundabout needs to be adapted. In particular, where an approach allows vehicles in two lanes to make a right turn, the pavement marking, between the double right turn entry and the next exit, must ensure that the centre lane is not used to exit by circulating vehicles. In this case spiral lane marking and alterations to the geometric design of the roundabout will be required.

Figure 6.2 of Austroads Guide to Road Design – Part 4B only depicts the directional signs and pavement markings at a roundabout. The title of this figure should therefore be “Figure 6.2: An example of directional signs and markings at a multi-lane arterial road roundabout”. For examples of the complete signs and markings for a multi-lane arterial road roundabout, refer to the Transport and Main Roads Manual of Uniform Traffic Control Devices and the Traffic and Road Use Management Manual.
7 Landscape and street furniture

7.1 Introduction

Additions

In addition to the information in Austroads Guide to Road Design – Part 4B, designers should also refer to the following departmental publications with regards to lighting and landscaping at roundabouts:

- Road Planning and Design Manual Volume 6: Lighting
- Transport and Main Roads Road Landscape Manual

8 References

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

Additions

- Transport and Main Roads ARNDT software program
- Transport and Main Roads Manual of Uniform Traffic Control Devices
- Transport and Main Roads Road Landscape Manual
- Transport and Main Roads Technical Note 128 Selection and Design of Cycle Tracks
- Transport and Main Roads Technical Note 136 Provision for Cyclists at Roundabouts
- Transport and Main Roads Traffic and Road Use Management Manual
Appendix B – Roundabout Study and Program

Differences
The correct internet address for downloading the ARNDT program is “www.tmr.qld.gov.au”.

Appendix D – Linemarking of multi-lane roundabouts

Differences
Figure D1 is not accepted as an example of typical marking scheme at a multi-lane roundabout as it shows non-typical approach lane usage for through movements. The correct typical line marking scheme for a multi lane roundabout is depicted in Transport and Main Roads Traffic and Road Use Management Manual, Volume 3: Part 2 Chapter 4.