Queensland Guide to Road Safety

Part 2: Safe Roads (2021)

November 2022

Queensland Government

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Feedback

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About this document

Austroads' *Guide to Road Safety* Part 2: *Safe Roads* is designed to help practitioners minimise the risk of road crashes including run-off-road, intersection and head-on crashes and to implement countermeasures to achieve a safe road system.

It contains practical, hands-on advice to help practitioners investigate and treat locations on the road system which are experiencing crashes, including identifying crash locations, diagnosing the crash problem and its causes, selecting a countermeasure which targets the problem, designing a safe remedial treatment and establishing its cost-effectiveness.

It also provides information on sources of road crash data and how engineering improvements fit into an overall road safety strategy.

How to use this document

The Department of Transport and Main Roads has agreed to adopt the standards published in Austroads Guides as part of national harmonisation. The department seeks to avoid duplicating information addressed in national guidance and has developed documents instead that provide Queensland-specific advice while following the structure established in Austroads Guides.

Queensland-specific advice includes practices which vary from national practice because of local environmental conditions (such as geography, soil types, climate); different funding practices; local research; local legislation requirements; and to expand instruction on particular issues.

As such, this Part of the *Queensland Guide to Road Safety* (QGRS) takes precedence over the Austroads *Guide to Road Safety* Part 2: *Safe Roads* except where the Austroads *Guide* is accepted without changes.

This Part is designed to be read and applied together with Austroads *Guide to Road Safety* Part 2: *Safe Roads*. Readers must have access to the Austroads *Guide* to understand its application in Queensland.

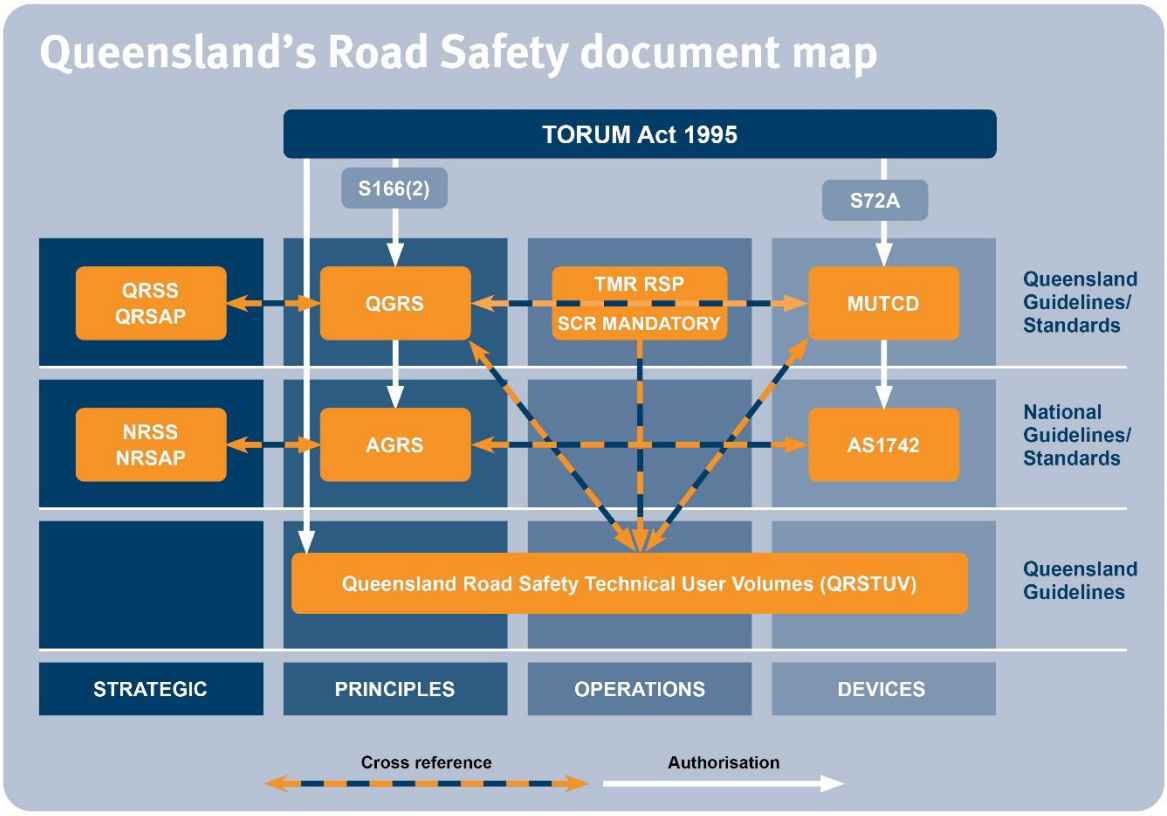
This document:

- sets out how the Austroads *Guide to Road Safety* Part 2: *Safe Roads* applies in Queensland
- has precedence over the Austroads *Guide to Road Safety* Part 2: *Safe Roads* when applied in Queensland, and
- has the same section numbering and headings as the Austroads *Guide to Road Safety* Part 2: *Safe Roads*.

The following table summarises the relationship between the Austroads *Guide to Road Safety* Part 2: *Safe Roads* and this document:

Applicability	Meaning
Accepted	The Austroads *Guide* section is accepted.
Accepted, with amendments	Part or all of the Austroads *Guide* section has been accepted with additions, deletions or differences.
New	There is no equivalent section in the Austroads *Guide*.
Not accepted	The Austroads *Guide* section is not accepted and does not apply in Queensland.

A summary of the documents relevant to road safety in Queensland, and their links follows.



Definitions

The following general amended definitions apply when reading the *Queensland Guide to Road Safety* Part 2: *Safe Roads*.

Term	Definition
AGRS Part 2	Austroads *Guide to Road Safety* Part 2: *Safe Roads*, as amended by this document; for example, a reference to AGRS Part 2 means the reader must refer to the Austroads *Guide to Road Safety* Part 2: *Safe Roads*, and the *Queensland Guide to Road Safety* Part 2: *Safe Roads* (QGRS Part 2). Throughout AGRS Part 2, references are made to other Parts of the AGRS (for example, when reading AGRS Part 2, the reader may be referred to AGRS Part 3 for further information.) In such cases, the reader must refer to the equivalent Part within the *Queensland Guide to Road Safety* first. Check the applicability of the equivalent QGRS Part before referring to the referenced AGRS Part. Similarly, references may be made to other Austroads Guides (for example, when reading AGRS Part 2, the reader may be referred to the *Guide to Traffic Management* Part 3: *Transport studies and analysis methods*). In such cases, the reader must refer to the equivalent Queensland Guide first, where such exist. Check the applicability of the equivalent Queensland Guide before referring to the referenced Austroads Guide Part.
AGRS	Austroads *Guide to Road Safety*
AS 1742	Australian Standard AS 1742 *Manual of Uniform Traffic Control Devices*
NRSS	National Road Safety Strategy

Term	Definition
NRSAP	National Road Safety Action Plan
QGRS	*Queensland Guide to Road Safety*
QRSS	*Queensland Road Safety Strategy*
QRSAP	*Queensland Road Safety Action Plan*
QRSTUV	*Queensland Road Safety Technical User Volumes*
RSP	Queensland Department of Transport and Main Roads *Road Safety Policy*
TORUM Act 1995	*Transport Operations (Road Use Management) Act 1995* (Qld)
TRUM	Volume 2 of the *Traffic and Road Use Management* manual preceded this Part of the Queensland Guide to Road Safety and was withdrawn on publication of the corresponding QGRS Part.

References

QGRS section	Reference
All	www.legislation.qld.gov.au

Relationship table

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1.	**Introduction**		Accepted with amendments	Safer Roads
	1.1	Purpose of the Guide	Accepted	Safer Roads
	1.2	Road Safety in the Road System Management Process	Accepted	Safer Roads
	1.3	Network and Corridor Planning	Accepted	Safer Roads
	1.4	Program Development	Accepted	Safer Roads
	1.5	Project Scoping and Development	Accepted with amendments	Safer Roads
	1.6	Project Implementation and Review	Accepted with amendments	Safer Roads
	1.7	Network Operation	Accepted	Safer Roads
	1.8	How to Use this Guide	Accepted	Safer Roads
	1.8.1	*Proactive crash prevention*	Accepted	Safer Roads
2.	**Reactive and Proactive Road Safety Approaches**			
	2.1	Risk Assessment and Management: Linking 'Reactive' and 'Proactive' Safety Approaches	Accepted with amendments	Safer Roads
	2.2	Developing a Program to Address High Crash Risk Locations	Accepted	Safer Roads
	2.3	Taking Action to Improve Road Safety		
	2.3.1	*The countermeasure approach and the role of infrastructure*	Accepted	Safer Roads
	2.3.2	*The Safe System approach*	Accepted	Safer Roads
	2.3.3	*Crash risk*	Accepted	Safer Roads
	2.3.4	*What is a crash location?*	Accepted	Safer Roads
	2.3.5	*Treating crash locations*	Accepted	Safer Roads
	2.3.6	*Who should investigate crash locations and develop solutions?*	Accepted with amendments	Safer Roads
	2.3.7	*What are road safety engineering skills?*	Accepted	Safer Roads
	2.4	Steps in the Crash Location Treatment Process	Accepted	Safer Roads
	2.4.1	*The steps*	Accepted	Safer Roads
3.	**Road Crash Data**		Accepted	Safer Roads
	3.1	Data Sources and Codes	Accepted with amendments	Safer Roads
	3.2	Sources of Crash Data	Accepted	Safer Roads

Section		Title	Queensland application	Dept contact*
	3.2.1	*Primary data sources for crash reduction programs*	Accepted with amendments	Safer Roads
	3.2.2	*Other data sources*	Accepted	Safer Roads
	3.3	Technology Available for Data Collection	Accepted	Safer Roads
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	3.4.1	*Coding of crash types – DCAs, RUMs and VMCs*	Accepted with amendments	Safer Roads
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	4.1.2	*Criteria for selecting locations to investigate for countermeasures*	Accepted	Safer Roads
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	5.1.5	*Writing the preliminary report*	Accepted	Safer Roads
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	9.1	Determinants of Injury at Intersections	Accepted with amendments	Safer Roads
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	12.1.6.1	Criteria for use	New	Safer Roads
	12.1.6.2	Typical uses	New	Safer Roads
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	12.1.6.4	Mounting details	New	Safer Roads
	12.1.7	*Funding*	New	Safer Roads
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Section		Title	Queensland application	Dept contact*
References				
Appendices				
A	Crash Codes for Australian Jurisdictions		Accepted	Safer Roads
B	Example Blank Factor Matrix Form		Accepted	Safer Roads
C	Examples		Accepted	Safer Roads
	C.1	Practical Example 1: Investigation of High Crash Locations	Accepted	Safer Roads
	C.1.1	*Example 1A*	Accepted	Safer Roads
	C.1.2	*Example 1B*	Accepted	Safer Roads
	C.1.3	*Example 1C*	Accepted	Safer Roads
	C.1.4	*Example 1D*	Accepted	Safer Roads
	C.2	Practical Example 2: Chance Variation	Accepted	Safer Roads
	C.3	Practical Example 3: Writing a Preliminary Report	Accepted	Safer Roads
	C.4	Practical Example 4: Applying Crash Modification Factors	Accepted	Safer Roads
	C.4.1	*Example 4A*	Accepted	Safer Roads
	C.4.2	*Example 4B*	Accepted	Safer Roads
	C.5	Practical Example 5: Road Safety Audit of a Remedial Treatment	Accepted	Safer Roads
	C.6	Practical Example 6: Selecting the Countermeasures	Accepted	Safer Roads
	C.7	Practical Example 7: Economic Appraisal		
	C.7.1	*Example 7A: (based on Ogden 1996)*	Accepted	Safer Roads
	C.7.2	*Example 7B: (based on Andreassen 1992A, P.5)*	Accepted	Safer Roads
	C.8	Practical Example 8: Monitoring	Accepted	Safer Roads
D	Detailed Case Study		Accepted	
	D.1	Step-by-step Process in the Investigation and Treatment Process		
	D.1.1	*Background*	Accepted	Safer Roads
	D.1.2	*Deciding which road sections and intersections are to be included*	Accepted	Safer Roads
	D.1.3	*Deciding on the time period*	Accepted	Safer Roads
	D.2	Obtaining all the Relevant Information	Accepted	Safer Roads
	D.2.1	*Data discrepancies*	Accepted	Safer Roads
	D.3	Constructing a Factor Matrix and Identifying Common Factors and Clustering of Crashes	Accepted	Safer Roads

Section		Title	Queensland application	Dept contact*
	D.4	Drawing a Collision Diagram and Identifying Clusters of Crash types at Locations	Accepted	Safer Roads
	D.5	Summarising the Factors Identified from the Crash Listings, Factor Matrix and Collision Diagram		
	D.5.1	*Intersections*	Accepted	Safer Roads
	D.5.2	*Road sections*	Accepted	Safer Roads
	D.5.3	*Summary of factors*	Accepted	Safer Roads
	D.6	Inspecting the Site	Accepted	Safer Roads
	D.6.1	*Observations from driving the site*	Accepted	Safer Roads
	D.6.2	*Observations from inspecting the site on foot*	Accepted	Safer Roads
	D.6.3	*Observed driver behaviour*	Accepted	Safer Roads
	D.6.4	*Confirm speed limit*	Accepted	Safer Roads
	D.6.5	*Discussion*	Accepted	Safer Roads
	D.7	Selecting the Countermeasures	Accepted	Safer Roads
	D.7.1	*Loss of control and head-on crashes*	Accepted	Safer Roads
	D.7.2	*Fixed objects crashes*	Accepted	Safer Roads
	D.7.3	*Other intersection crashes*	Accepted	Safer Roads
	D.7.4	*Other issues*	Accepted	Safer Roads
	D.8	Designing	Accepted	Safer Roads
	D.9	Economic Appraisal	Accepted	Safer Roads
E	Crash Modification Factors		Accepted	Safer Roads
F	Confidence Limits and Changes in Critical Mean		Accepted	Safer Roads
G	Monitoring Techniques and Allowing for Regression-to-the-mean		Accepted	Safer Roads
	G.1	Monitoring Techniques		
	G.1.1	*Experimental design*	Accepted	Safer Roads
	G.1.2	*Before and after studies*	Accepted	Safer Roads
	G.1.3	*Comparisons using control sites*	Accepted	Safer Roads
	G.2	Regression-to-the-mean	Accepted	Safer Roads
	G.2.1	*A worked example of correction for regression-to-the-mean (from Ogden 1996, p 458)*	Accepted	Safer Roads

Departmental contacts:

- Safer Roads: Safer Roads Infrastructure, Engineering and Technology, Transport and Main Roads email SaferRoads@tmr.qld.gov.au.
- Road Design: Hydraulics, Design and Spatial, Engineering and Technology, Transport and Main Roads email ET_HDS_RD_Design_Services@tmr.qld.gov.au.

- Traffic Engineering: Traffic Engineering Practice, Traffic Engineering Technology & Systems, Engineering and Technology, Transport and Main Roads email TrafficEngineering.Support@tmr.qld.gov.au.

Contents

Tables

Figures

1 Introduction

Difference

Replace Table 1.1 with:

Table 1.1 – Parts of the Guide to Road Safety

Part	Title	Content
Part 1	Introduction and The Safe System	An overview of the Austroads *Guide to Road Safety* and the Safe System philosophy.
Part 2	**Safe Roads**	**Guidance on assessing and treating roads to reduce the risk of fatal or serious injury crashes.**
Part 3	Safe Speed	Guidance on the management of vehicle speeds for improved road safety.
Part 4	Safe People	Guidance on influencing behaviours for safe people and communities.
Part 5	Safe Vehicles	Guidance on safe vehicles and vehicle safety features.
Part 6	Road Safety Audit	Practical guidance on the procurement, management and implementation of road safety audits.
Part 7	Road Safety Strategy and Management	Guidance on road safety strategies and road safety management.

1.5 Project Scoping and Development

Difference

Replace the reference to '*Guide to Road Safety Part 6: Managing Road Safety Audits* (Austroads 2019a) and *Part 6A: Implementing Road Safety Audits* (Austroads 2019b)' with '*Guide to Road Safety Part 6: Road Safety Audit'.*

1.6 Project Implementation and Review

Difference

Replace the first sentence:

> In 2019 Austroads published Edition 1.0 of the Guide to Temporary Traffic Management (AGTTM)

with

> In 2021, Austroads published Edition 1.1 of the *Guide to Temporary Traffic Management* (AGTTM).

2 Reactive and Proactive Road Safety Approaches

2.1 Risk Assessment and Management: Linking 'Reactive' and 'Proactive' Safety Approaches

Difference

Replace the reference to '*Guide to Road Safety Part 6: Managing Road Safety Audits* (Austroads 2019a) and *Part 6A: Implementing Road Safety Audits* (Austroads 2019b)' with '*Guide to Road Safety Part 6: Road Safety Audit'.*

2.3.6 Who should investigate crash location and develop solutions?

Difference

Replace the wording:

> However, the following steps will require the inclusion of someone who also has road safety engineering skills and experience:
>
> - inspecting the crash location (Section 5.3)
> - drawing conclusions from the crash data and site inspection (Section 5.4)
> - selecting countermeasures which address the factors leading to the types of crashes which are happening (Section 5.5).

with

> However, the following steps will require the inclusion of someone who also has road safety engineering skills and experience.
>
> - drawing conclusions from the crash data and site inspection (Section 5.4)
> - selecting countermeasures which address the factors leading to the types of crashes which are happening (Section 5.5).
>
> These tasks are considered to be a professional engineering service which are to be undertaken by a person who is Registered Professional Engineer of Queensland (RPEQ), under the *Professional Engineers Act 2002* (Queensland) with the Board of Professional Engineers of Queensland.
>
> A professional engineering service is an engineering service that requires or is based on the application of engineering principles and data to a design or to a construction, production, operation, or maintenance activity relating to engineering and does not include .an engineering service that is provided only in accordance with a prescriptive standard.
>
> The *Professional Engineers Act 2002* provides that a person who is not a Registered Professional Engineer of Queensland (RPEQ) must not carry out professional engineering services, except that a person who is not an RPEQ may carry out professional engineering services while under the direct supervision of an RPEQ who is responsible for the engineering services being undertaken.

3 Road Crash Data

3.1 Data Sources and Codes

Addition

Add the following paragraph:

In Queensland there are four levels of crash severity:

- Fatal crash – A road traffic crash which resulted in at least one fatality.
- Hospitalisation crash – A road traffic crash which resulted in the most severe casualty outcome, being a person hospitalised.
- Medical treatment crash – A road traffic crash which resulted in the most severe casualty outcome, being a medically treated casualty.
- Minor injury crash – A road traffic crash which resulted in the most severe casualty outcome, being a minor injury.

3.2 Sources of Crash Data

3.2.1 Primary data sources for crash reduction programs

Addition

In Queensland the primary source of crash data is the Crash Analytics Reporting System (CARS) which is maintained by the Department of Transport and Main Roads.

3.4 Limitations and Accuracy of Crash Data

3.4.1 Coding of crash types – DCAs, RUMs and VMCs

Addition

At the end of the second paragraph, add:

Please refer to Appendix A3 for the coding of crash types used in Queensland.

4 Identifying Crash Locations

Difference

Replace the reference to '*Guide to Road Safety Part 6: Managing Road Safety Audits* (Austroads 2019a)' with '*Guide to Road Safety Part 6: Road Safety Audit*'.

5 Diagnosing the Crash Problem and Selecting Treatments

5.7 Implementing the Treatment

5.7.1 Designing a safe remedial treatment

Difference

Replace the reference to '*Guide to Road Safety Part 6: Managing Road Safety Audits* (Austroads 2019a)' with '*Guide to Road Safety Part 6: Road Safety Audit*'.

6 Economic Appraisal

6.1 Cost of Crashes and Remedial Treatment Options

6.1.2 Cost of crashes

Difference

Replace Table 6.4 with:

Table 6.4 – Queensland Crash Cost by Crash Type

DCA code group	DCA codes	Description	Low speed < 80 km/h $	High speed 80 km/h + $
Two vehicle crashes				
1	100–109	Intersection, from adjacent approaches	406,110	940,679
2	201, 501	Head-on	872,526	2,853,798
3	202–206	Opposing vehicles, turning	464,858	919,571
4	301–303	Rear-end	257,612	422,811
5	305–307, 504	Lane change	327,196	489,557
6	308, 309	Parallel lanes, turning	318,466	631,072
7	207, 304	U-turn	479,415	761,918
8	401, 406–408	Entering roadway	333,608	1,033,140
9	503, 505, 506	Overtaking, same direction	501,164	1,051,260
10	402, 404, 601, 602, 604, 608	Hit parked vehicle	380,988	959,588
11	903	Hit train	1,631,612	3,369,591
Single vehicle crashes				
12	001–009	Pedestrian	657,489	2,443,285
13	605	Permanent obstruction on carriageway	257,552	388,818
14	609, 905	Hit animal	422,540	568,148
15	502, 701, 702, 706, 707	Off carriageway, on straight	561,018	814,220
16	703, 704, 708, 904	Off carriageway, on straight, hit object	567,961	802,602
17	705	Out of control, on straight	416,622	798,016
18	801, 802	Off carriageway, on curve	629,819	711,011
19	803, 804, 808	Off carriageway, on curve, hit object	687,420	1,136,759
20	805, 806, 807	Out of control, on curve	627,859	784,003
Exceptions				
21	000, 200, 300, 400, 500, 600, 700, 800, 900, 901, 906, 907, 403, 405, 606, 607, 610	Crashes which are unlikely to be attributable to any road environment factor, and which are therefore unlikely to be addressed by any road-based remedial treatment. Crashes in this DCA code group will not be used in crash rates or BCR calculations or reports.		

Notes:

- Crash cost for Queenland in 2022 dollars, estimated per crash type.

- 2015 National Guidelines for Transport System Management in Australia, Transport and Infrastructure Council. Inclusive WTP June 2013 $ value. Released by ARRB May 2015.

6.3 Ranking the Treatment of Crash Locations

Deletion

The first two sentences of the paragraph before Table 6.7 are not applicable in Queensland.

9 Harm Minimisation at Intersections

9.1 Determinants of Injury at Intersections

Deletion

Delete the following dot point which does not apply in Queensland:

- **≥100 km/h** – where there is not possible side or frontal impact between vehicles or impacts with vulnerable road user impacts.

10 Harm Minimisation with High Speed Lane Departures

Addition

The information in this section is to be considered informative. Refer to Transport and Main Roads' *Road Design and Planning and Design Manual, Volume 3, Part 6: Roadside Design, Safety and Barriers* for design guidance.

10.6 Safe Rural Road Stereotypes

Not accepted

This section is not accepted and does not apply in Queensland. Please refer to the Austroads *Road Cross-section Design for Road Stereotypes (including Network Safety Plans) and a Safe System* and the Austroads *Network Design for Road Safety (Stereotypes for Cross-sections and Intersections): User Guide*.

11 Road Safety for Regional and Remote Areas

11.2 Driver fatigue – guidelines for road-based driver fatigue in rural areas

11.2.1 Introduction

New

This section provides guidance on road-based countermeasures to reduce fatigue-related crashes in rural areas.

11.2.2 Queensland statistics

New

Fatigue is recognised as one of the 'Fatal Five' and is one of the leading factors contributing to road crashes on Queensland roads. In Queensland between 2015 and 2019, 4.6% of all reported casualty crashes were fatigue-related, with 11.8% of fatal crashes and 6.7% of hospitalisation crashes being fatigue-related.

11.2.3 What can be done to combat driver fatigue?

New

If fatigued drivers are given a warning before their vehicles run off the carriageway, corrective action could be possible. Further, drivers need to be able to recognise the onset of fatigue and to be encouraged to take rest breaks before continuing their driving.

The best way to combat driver fatigue is for drivers not to become fatigued or to stop driving once onset of fatigue occurs.

11.2.3.1 Educating drivers

New

Transport and Main Roads has used fatigue messages and campaigns to educate the motoring public of the dangers of driving while fatigued in order to reduce the incidence of fatigue-related crashes.

Despite education campaigns, people continue to drive while fatigued, seriously increasing their risk of being involved in a crash.

11.2.4 Queensland-specific fatigue countermeasures

New

Road based countermeasures that are specifically targeted at reducing fatigue-related crashes are as follows:

1. roadside signs
2. driver reviver program
3. wide centre lines
4. audio-tactile edge lines, and
5. rest areas and associated signing.

These are addressed in the following sections.

11.2.4.1 Roadside signs

New

A number of roadside signs are used to warn road users of presence of fatigue zones or otherwise as part of a fatigue zone management plan. Trivia signs, for example, may be deployed as part of a fatigue management plan to encourage drivers to exercise their mind. Practitioners are advised to check the Traffic Control (TC) signs database for the latest TC sign diagrams.

11.2.4.2 Driver reviver program

New

Queensland's driver reviver sites are supported by a dedicated group of volunteers from a wide variety of community organisations and are set up at rest areas to supply free tea or coffee for travellers.

A suite of roadside signs is available for signing driver reviver sites. Hinged signs requiring manual operation are not preferred. Practitioners are advised to check the TC signs database for the latest TC sign diagrams.

11.2.4.3 Wide centre line treatment

New

Wide centre line treatment (WCLT) is the widening of the centre line markings to provide increased lateral separation between opposing directions of travel. This increased separation improves safety by reducing head-on crash risk.

Refer to Department of Transport and Main Roads *Road Planning and Design Manual, Volume 3, Part 3: Geometric Design* for information pertaining to wide centre line treatment.

11.2.4.4 Audio-tactile line marking

New

Audio-tactile line marking (ATLM) is a fatigue countermeasure to reduce the frequency of run-off-road crashes on rural roads.

ATLM comprises a series of raised ribs spaced at regular intervals in association with longitudinal line marking which give an audible sound and vibration when traversed by a vehicle, alerting drivers that they are leaving the trafficked way.

11.2.4.4.1 Use

New

ATLM should be installed as part of both edge line and centre line installation.

Rural roads with AADT greater than 4000 vehicles per day should have a wide centre line and ATLM abutting longitudinal line marking.

ATLM shall be installed on or adjacent to the painted portion of the marked lines of edge lines and centre lines on all rural roads with sealed shoulder preferably greater than 0.5 metres.

These are default requirements unless justification is documented in a planning report (documenting, for example, where ATLM is not being deployed for reasons explained in Sections 11.2.4.4.2 to 11.2.4.4.6 following) or design exception.

ATLM edge lines and ATLM centre lines may be installed on any sealed rural road, even where the stated criteria are not met.

Where deployed, edge line ATLM and centre line ATLM shall be used together in combination, except where the conventional line marking is not required / deployed.

ATLM may be installed where width of the sealed roadside shoulder is less than 0.5 metres (with adequate pavement support) outside the existing edge line. Exceptions to this minimum width requirement may be documented in a planning report or design exception; however, the effectiveness of ATLM is expected to diminish with narrower shoulder widths.

- See also Section 11.2.4.4.6 *Provision for cyclists*.

11.2.4.4.2 Limitations on use of ATLM

New

The following are specific features, or areas along the roadway, where ATLM should not be deployed:

- on or adjacent to centre lines and edge lines of winding routes where motorcycle use is elevated (for example on known recreational motorcycle routes), or
- on edge lines where left-turn auxiliary lanes are provided at intersections on a curve due to potentially confusing delineation cues, or
- at locations where a conventional painted edge line or centre line is not warranted.

11.2.4.4.3 Other deployment considerations

New

ATLM is not expected to be an effective treatment on winding roads with frequent tight curves where fatigue should not be a contributing factor (due to the elevated demands of the driving task).

New ATLM should generally not be installed where pavement resealing works are expected or programmed to occur within one year.

11.2.4.4.4 Noise

New

ATLM proximity to nearby residential housing should be considered before implementation. ATLM should not be installed on or adjacent to either the centre line or the edge line where there is a high frequency of vehicles traversing the ATLM **AND** where residences are within 200 metres of the application.

11.2.4.4.5 Construction

New

ATLM shall be formed in accordance with the relevant provisions of the department's Technical Specification MRTS45 *Road Surface Delineation*.

Practitioners should be cognisant that issues may arise in forming a bond between different line marking products.

11.2.4.4.6 Provision for cyclists

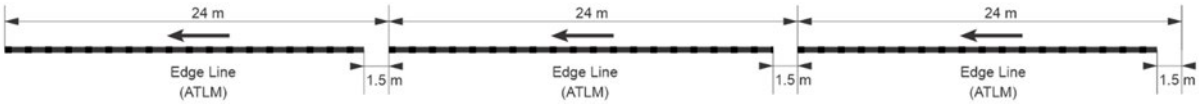
New

Any shoulder width provision for cyclists shall not include the width of the ATLM.

ATLM should not be applied on edge lines within the 10 metres immediately prior to longitudinal roadside objects (such as bridge rail, guard rail and culverts) where effective shoulder width is less than one mere. This is because it is likely that cyclists will need to enter the traffic lane to move past and stay clear of the object. In these circumstances, continuation of ATLM application shall not occur until 10 metres beyond the end of the object.

Provision for cyclists to cross between the shoulder and the general-purpose traffic lane shall be provided in ATLM edge lines by means of a 1.5 m long gap in the line spaced every 24 metres. The 24 m spacing shall be inclusive of the 1.5 m gap as shown in Figure 11.2.4.4.6.

Figure 11.2.4.4.6 – Longitudinal placement of gaps in ATLM for people riding bicycles



11.2.4.4.7 Colour

New

Use of non-white ATLM is not accepted, except by design exception.

11.2.5 Rest areas and associated signing

New

Rest areas play an important role in fatigue management for both general motorists and heavy vehicle drivers as they provide places for drivers to take rest breaks; however, in order to encourage drivers to use them, it is necessary to ensure that sufficiently attractive and suitably-equipped stopping places are provided, particularly in areas where fatigue-related crashes are known to be a problem.

The frequency of use of a rest area depends on many factors, including its location along a route, the features and facilities that it provides, and personal safety and comfort. Drivers should normally expect to find the following features at a rest area:

- sheltered tables and seats
- potable water
- rubbish bins, and
- toilets.

11.2.5.1 Guidance on the provision of rest areas

New

The following Transport and Main Roads documents provide guidance for the provision of rest areas in Queensland:

- *Roadside Amenities Strategy*
- *Policy on the Provision of Roadside Amenities*, and
- Austroads *Guide to Road Design*.

11.2.5.2 Signing of rest areas

New

Signing of rest areas is a positive way to increase their use; however, to be effective, signs need to be conspicuous and placed at locations that give motorists sufficient notice of the facilities ahead.

The signs used for rest areas are shown following and comprise:

1. advance service signs containing the rest area symbol and the legend, such as '300 m ON LEFT' or '300 m ON RIGHT', for example, Sign G7-1-1 / G7-2-1
2. position service signs containing the rest area symbol and a left or right arrow pointing to the location of the rest area, for example, Sign G7-3-1, and
3. next service sign indicating the distance to the next rest area, for example, 'NEXT (rest area) 50 km' – G7-9-1.

Figure 11.2.5.2 – Rest area signing

G7-2-1

G7-3-1

G7-9-1

When associated with fatigue, signing for rest areas can include fatigue safety messages. The messages have been designed to alert motorists of the danger of driving while fatigued. Examples of approved fatigue (service) signs and their typical placements are described following.

To minimise their use by motorists and tourist traffic, signs for heavy vehicle rest areas should not show the facilities available. These additional users may restrict the space available for trucks and create unnecessary disturbance to resting truck drivers.

11.2.5.3 Advance signing

New

The first advance service sign is generally located two to 10 kilometres in advance of the rest area to give drivers sufficient time to decide on a course of action and indicates the type of facility available and the distance ahead. It also contains a fatigue-related safety message, to maximise the effectiveness of these signs, and rumble strips should be used in advance of these signs to better alert the drivers.

When the first advance service sign is placed 10 kilometres or more in advance of the rest area, it is desirable to place additional advance service signs (using different fatigue messages) in advance of the rest area (for example, at 20 km, 10 km and 5 km).

A second advance service sign is generally placed 300 metres to two kilometres in advance of the rest area and indicates the type of facility available and its location (for example, '2 km ON RIGHT'). These signs (for example, G7-1-4) are described in Part 1 and Part 6 of the Queensland *Manual of Uniform Traffic Control Devices* (Queensland MUTCD) and the TC Signs database.

11.2.5.4 Position sign

New

The position service sign is placed at, and opposite to, the rest area entrance. This sign indicates the type of facility provided as in the advance signings. These signs (for example, G7-3-1 (L or R)) are also described in the Queensland MUTCD.

11.2.5.5 Next service sign

New

This sign is normally placed on the departure from the rest area to inform motorists of the distance to the next rest area in either direction. This sign may also be placed just before the entrance or turn-off to a rest area to inform motorists of the distance from the next rest area to help them decide whether to stop now or later.

11.2.5.6 Fasten seat belts sign

New

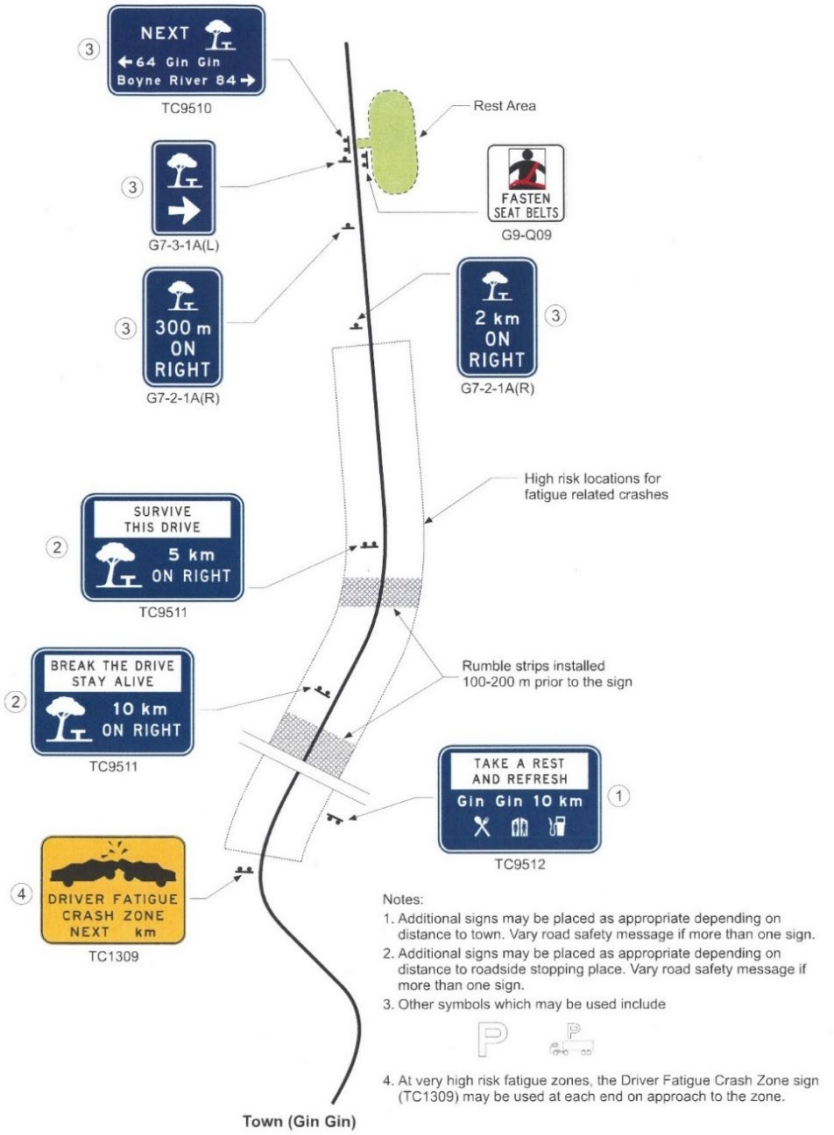
The 'Fasten Seat Belts' sign (G9-Q09) should be placed adjacent to the exit points of all rest areas. See Figure 11.2.5.7 for sign design details.

11.2.5.7 Fatigue signing layout

New

Figure 11.2.5.7 shows a typical signing layout for a rest area.

Figure 11.2.5.7 – Fatigue signing layout



11.2.5.8 Fasten seat belts sign

New

At very high-risk driver fatigue zones where there has been a large number of fatigue-related crashes, the 'DRIVER FATIGUE / CRASH ZONE / NEXT x km' sign may be used to alert motorists about the seriousness of driver fatigue. This sign should be erected at each approach to the fatigue zone and be located about 200 m to 300 m before the first advance rest area sign. See TC Signs database for sign design details.

Ensure that this sign is only used at very high-risk fatigue zones as its overuse could erode its effectiveness.

12 Local Government and Community Road Safety

12.1 Convex mirrors

12.1.1 Introduction

New

This section provides guidance on the use and installation of convex mirrors functioning as a traffic safety device on Queensland roads. This section is not relevant to convex mirrors when used for parking stations and parking areas.

The purpose of the convex mirror is to indicate to the road user the presence or absence of a moving or stationary vehicle and/or pedestrian.

The convex shape of the mirror results in distortion of the image, speed and distance of any object. The degree of distortion depends on the radius of curvature and size of the convex mirror – the larger the radius of curvature, the less the distortion and vice versa.

12.1.2 Considerations

New

Consideration of mirror shape is essential to ensure the road user has adequate time in a particular situation to understand and interpret the information provided by the convex mirror.

The image appears to be smaller, further away and travelling at a slower speed in a mirror with a smaller radius of curvature. A convex mirror with a small radius of curvature could potentially provide too much detail in a small area, which will hamper a road user's ability to discriminate detail.

The larger the radius of curvature, the less the distortion of the oncoming vehicle. Larger diameter mirrors are more easily seen by road users. These large diameter mirrors also provide a larger field of view, enabling the oncoming traffic to be seen more clearly than would be the case if smaller mirrors were used.

In addition to distortion effects, the image of a vehicle in a convex mirror appears to be on the wrong side of the road due to the 'mirror image' effect, where left appears to be right and vice versa. This 'mirror image' effect can result in road users misinterpreting the images. This can be potentially dangerous, especially in the case of vehicles approaching the intersection from a one-way street. This is seen as a serious limitation.

Consideration should also be given to potential problems resulting from headlight glare at night and the effect of glare from the sun, particularly at dawn and dusk.

Dark blue, black and other dark colours are difficult to detect in these mirrors in the early morning or late afternoon as these colours appear to be absorbed by the road surface.

12.1.3 Road safety inspection

New

A road safety inspection should be conducted prior to a decision to install a convex mirror on a Queensland road. Considering the problems inherent in the design and use of convex mirrors, the road safety inspection must indicate that the solution provides both safety and traffic management benefits.

The road safety inspection outcomes and consequent decision to install the convex mirror must be fully documented in accordance with Australian Standard AS/NZS ISO 3100 *Risk Management*.

12.1.4 Limitations on Queensland roads

New

Convex mirrors should not be installed:

- on Queensland roads where alternative traffic management measures or engineering measures, such as improvements to sight distance and road realignment, are available in the short term
- within the carriageway, including shoulders, islands and medians
- to enhance pedestrian crossing movements (in this instance, other solutions should be considered, such as relocation of the crossing point or the provision of strategically-located pedestrian refuges), and
- without appropriate signs.

Convex mirrors may be used on Queensland roads as an interim measure until appropriate traffic management / engineering solutions are implemented.

12.1.5 Legal issues

New

When considering the installation of convex mirrors, a risk assessment shall be carried out in accordance with Australian Standard AS/NZS ISO 31000 *Risk Management*, the purpose of which is to document that the benefits of installing a convex mirror provide a safer solution than doing nothing. To ensure the department is not compromised in the event of a crash, the following three-step process shall be adopted:

1. use and documentation of road safety inspection procedure to assess the road safety benefits relative to the risk of crash(es) in installing a convex mirror at a particular location
2. make a decision based on the assessment of the road safety benefits and the risk of crash(es) arising from the installation, and
3. take all necessary steps to ensure safe and proper installation, operation and use of the mirror; for example, if the installing road authority is aware of some potential danger arising from a road user's reliance on a convex mirror at a particular location, failure to provide adequate warning of the deficiency of the mirror could increase the level of risk carried by the road authority at that location.
4. Where property owners or developers believe that a convex mirror on the Queensland road will assist safe access from concealed private driveways or private roads, they should approach the road authority for approval.

Convex mirrors should be installed and maintained by the road authority responsible for the care and control of the particular road. See Section 12.1.7 *Funding*.

To ensure safe installation and community acceptance, each convex mirror proposal on a state-controlled road should be in accordance with this section. Local and regional councils should seek advice from the local Traffic Advisory Committee prior to considering installation.

Road authorities are advised that all necessary precautions should be taken to securely install a convex mirror at the appropriate location and height to ensure safety of all road users, including pedestrians, and to prevent vandalism. See Section 12.1.6.4 *Mounting details*.

Convex mirrors shall be regularly inspected by the road authority to ensure that the mirror is adequately maintained, in a serviceable condition, and that the mirror is correctly aligned and not damaged.

Adequate records of these inspections are required.

12.1.6 Installation

12.1.6.1 Criteria for use

New

Convex mirrors are not for general use. They should only be installed as a traffic safety device in situations where lateral visibility / sight distance is critical, but considered severely limited and there are no other immediate viable options available, such as turn restrictions, where alternative routes are available.

Convex mirrors should only be used in low-volume and low-speed road environments. They should only be used to determine the presence of road users and not to be used for judging speed or distance.

The following conditions should generally apply:

- 85^{th} percentile speed on the road(s) is 60 km/h or less, and
- traffic volume on the road(s) is less than 300 vehicles / peak three-hour period.

12.1.6.2 Typical uses

New

Convex mirrors may be installed at the following locations where the lateral visibility / sight distance is critical, but considered to be limited:

- obscured T-junctions
- concealed driveways
- acute bends of a narrow road, such as hairpin bends in mountain passes
- parking areas with acute exit driveways, and/or
- approaches to skewed railway level crossings.

12.1.6.3 Types and selection of convex mirrors

New

Convex mirrors must be suitable for outdoor use. They should be very durable, vandal-resistant, require nil or low minimal maintenance, and be of weatherproof material and construction.

Acrylic, highly-polished stainless steel or polycarbonate convex mirrors should be used.

The acceptable sizes are 600, 800, 1000 and 1200 mm diameter or rectangular size 600 mm x 450 mm.

While field trials may be necessary to determine the preferred range of curvature and size for a particular use, generally convex mirrors with diameters of 800 mm and 1000 mm are appropriate for installation on Queensland roads.

12.1.6.4 Mounting details

New

Convex mirrors must be securely mounted to a pole, wall or other suitable high point to deter vandalism. Appropriate signs shall be used in conjunction.

The convex mirror shall be fitted with a visor at its top. This will reduce the accumulation of dust on the mirror surface. The fitting of a brightly-coloured protective outer band (target board) will assist in improving the conspicuity of the mirror, which could be of assistance to road users who do not visit the area regularly.

The convex mirror should be installed at a location that provides the best view of the road and the oncoming vehicles concerned. It may be necessary to use two mirrors when one mirror does not give a complete view of the road scene.

12.1.7 Funding

New

The road authority undertaking the installation and maintenance of convex mirrors is responsible for funding.

Where the installation of a convex mirror on a Queensland road is requested by the property owner or developer, the road authority may require the property owner or developer to contribute to the installation and ongoing maintenance of the mirror.

12.2 Guideline on domestic waste collection on state-controlled roads

12.2.1 Introduction

New

The purpose of this section is to provide guidance to local governments for implementation of domestic waste collection schemes using wheelie bins on state-controlled rural roads in Queensland.

Throughout Queensland, local governments have introduced domestic waste collection services using wheelie bins. This has resulted in wheelie bins being placed on, or adjacent to, state-controlled and local government roads.

The major concern in relation to these collection services is the potential conflict in high-speed environments between the constantly-stopping collection vehicles and other road users.

Waste collection, particularly on roads with a high speed limit and high traffic volume, can have adverse effects on road safety due to the speed differential between road users and collection vehicles – this can also have the following flow-on effects:

- inadequate pull-over width on road shoulders for waste collection vehicles, resulting in roads being partially blocked – this is especially hazardous where the road alignment is poor or in adverse weather conditions: there is a potential hazard when a collection vehicle stops in a no overtaking zone and the lane is not wide enough for following vehicles to pass without crossing the barrier lines

- waste collection vehicles constantly stopping and starting and obscuring vision of other drivers
- the presence of wheelie bins as potential roadside obstructions / hazards, and
- unsealed shoulders that may become unstable in wet conditions for waste collection vehicles to travel.

12.2.2 Considerations

12.2.2.1 Role of local government

New

Local government has a duty of care to road users to manage associated risks. Any third party employed to provide the domestic waste collection service has the same duty of care.

To ensure the collection system is not introducing any unnecessary risks, local government should conduct a risk assessment, in accordance with AS/NZS ISO 31000 *Risk Management*, of the waste collection method and route (new or existing), taking into consideration the type / size of waste collection vehicles to be used and factors affecting the route – for example, road width and local environmental conditions – and nominate mitigation factors to reduce these risks.

12.2.2.2 Wheelie bin placement

New

Driveways are likely to provide a relatively flat and stable area for waste collection vehicles to pull off the carriageway, either completely or by straddling the carriageway. Driveways are also less likely to be susceptible to instability in poor weather conditions. Areas where vehicles can pull over may need to be provided where there is insufficient hard shoulder and poor visibility. As such, information provided to residents for wheelie bin placement, issued by local government, should include that wheelie bins be placed on driveways on collection days only.

Where possible, the wheelie bin should be placed on the departure side of the driveway with adjacent property wheelie bins grouped together (Figure 12.2.2.2) to give waste collection vehicles space to manoeuvre and possibly pull off the carriageway: therefore, the driveway effectively becomes the pick-up area.

Figure 12.2.2.2 – Wheelie bin placement on residential driveway

12.2.2.3 Waste collection vehicle operation

New

During waste collection activity, waste collection vehicles are to be manoeuvred out of the traffic flow, that is,, on the hard shoulder or as far away from the through traffic lane as practicable (Figure 12.2.2.3(a)).

Figure 12.2.2.3(a) – Waste collection activity

During the collection activity, the wheelie bin should be replaced on the ground in an upright position (Figure 12.2.2.3(b)) or at least off the carriageway with the lid closed so that the wheelie bin does not become a hazard for other road users.

Figure 12.2.2.3(b) – Wheelie bin following collection

12.2.2.4 Time of collection

New

To minimise conflict with other road users, early morning daylight collections or a time that avoids the heaviest traffic flows on a route should be considered when scheduling domestic waste collection services.

12.2.2.5 Road rule exemptions

New

The Transport Operations (Road Use Management – Road Rules) Regulation 2009 made under the TORUM Act ('the Road Rules Regulation') contains a provision that specifically deals with the operation of waste collection vehicles on roads. Section 313A exempts the driver of a waste collection vehicle from a number of listed provisions of the Road Rules Regulation on certain conditions.

12.2.2.6 Signing of waste collection vehicles

New

In addition to the requirement for vehicles with a GMV of 12 tonnes or more to have Rear Marker Plates (National Heavy Vehicle Regulator, *National Heavy Vehicle Inspection Manual*), waste collection vehicles should display a sign both on the front and rear of the vehicle stating 'Vehicle Frequently Stopping' (Figure 12.2.2.6 (example only)). Refer to TC Signs database.

Figure 12.2.2.6 – Signing of waste collection vehicle (example only)