

Roads

Master Specification

RG-GM-D1 Road Design

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Contents

Contents	3
RD-GM-D1 Road Design	4
1 General	4
2 Extended Design Domain (EDD) / Design Departures	4
3 Over Dimensional Vehicles - Ravnet	5
4 Performance Based Standards & Over Dimensional Vehicles	5
5 Over Weight Vehicles	5
6 Department Safe System Assessment	5
7 Design Elements	6
8 Intersections	7
9 Design Vehicles and Checking Vehicles	8
10 Overtaking Lanes	8
11 Hold Points	9

RD-GM-D1 Road Design

1 General

1.1 This Part defines the Requirements for the geometric Design of Roads.

Austrroads Guide to Road Design

1.2 Austrroads has released the Guide to Road Design (AGRD). All road agencies across Australasia have agreed to adopt the Austrroads guides to provide a level of consistency and harmonisation across all jurisdictions.

1.3 This agreement means that the new Austrroads guides and the Australian Standards, which are referenced in them, will become the primary technical references for use within South Australia.

1.4 This document is issued to clarify, add to, or modify the Austrroads Guides.

Department Code of Technical Requirements

1.5 The Commissioner of Highways' Code of Technical Requirements sets out the mandatory requirements for variations from the Australian Standards and Austrroads Guides for the use of traffic Control devices in South Australia.

1.6 The Roads design shall comply with the Code of Technical Requirements including:

- a) Part 1 – Legal Responsibilities;
- b) Part 2 – Manual of Legal Responsibilities and Technical Requirements for Traffic Control Devices.

1.7 The design of all pavement markings shall comply with the Department's Pavement Marking Manual.

1.8 The Code of Technical Requirements and supporting information is available on the internet at the following <https://www.dpti.sa.gov.au/standards/tass>.

Department Standards and Guidelines

1.9 The following documents provide additional detail of Department best practice.

1.10 It is necessary to comply with complementary material. These documents can be located <https://www.dpti.sa.gov.au/standards>.

1.11 Unless specified otherwise, all design must be undertaken in accordance with the following:

- a) Department Road Design Standards and Guidelines.
- b) Department Pavement Marking Manual (Refer <https://www.dpti.sa.gov.au/standards/tass>).
- c) AS 1428 Design for Access and Mobility.
- d) Department Guidelines for Disability Access in the Pedestrian Environment (Refer: <https://www.dpti.sa.gov.au/standards/tass>).

1.12 Where the road design incorporates traffic control devices, (e.g. traffic signs, traffic signals) they shall comply with the provisions of RD-LM-D1 "Traffic Control Device Design".

Road Maintenance Agreement

1.13 The standards management and maintenance agreements between the Department and Councils is detailed in Operational Instruction 20.1 "Care, Control and Management of Roads by the Commissioner of Highways" available on the internet at <https://www.dpti.sa.gov.au/standards/tass>.

2 Extended Design Domain (EDD) / Design Departures

2.1 The Austrroads Guide to Road design provides Normal Design Domain (NDD).

- 2.2 The use of design parameters outside NDD is classified as a design departure and requires approval by the Engineering Authority for the Commissioner of Highways.
- 2.3 The Extended Design Domain (EDD) / design departures guideline should be read in conjunction with Brownfield / Greenfield Austroads Supplement Guide.
- 2.4 The EDD / design departure procedure / supplement guide are located at https://www.dpti.sa.gov.au/standards/road_design_outputs.

3 Over Dimensional Vehicles - Ravnet

- 3.1 Vehicles operating under a mass or dimension exemption (notice or permit) in South Australia must travel within stated areas and on stated routes. Prior to any design work being undertaken, Ravnet should be utilised to display heavy vehicle route networks. <http://maps.sa.gov.au/ravnet/>.
- 3.2 The over dimensional route must consider safety and operational impact on adjacent road users.
- 3.3 The over dimensional route must not include any requirements for temporary traffic closures or contra flow of over dimensional vehicles on the existing or new bridge or adjacent roadways.
- 3.4 Where the over dimensional route requires the temporary adjustment of road furniture (e.g. road signs) the signs must enable safe, practical and fast and vandal proof adjustment and replacement (e.g. canting sign posts, etc.).

4 Performance Based Standards & Over Dimensional Vehicles

- 4.1 Vehicles Performance Based Standards (PBS) vehicle routes are located on Ravnet. PBS vehicle lengths are located: <https://www.sa.gov.au/topics/driving-and-transport/heavy-vehicles/operating-a-heavy-vehicle/performance-based-standards>.
- 4.2 The National Heavy Vehicle Regulator administrates the PBS scheme: <https://www.nhvr.gov.au/road-access/performance-based-standards>.
- 4.3 PBS lane widths are located: [https://www.ntc.gov.au/Media/Reports/\(C74A08F0-05E4-18B5-213E-7916576341BA\).pdf](https://www.ntc.gov.au/Media/Reports/(C74A08F0-05E4-18B5-213E-7916576341BA).pdf).
- 4.4 The over dimensional route must not include any requirements for temporary traffic closures, adjustment of road furniture or contra flow of over dimensional vehicles.

5 Over Weight Vehicles

- 5.1 The infrastructure must enable the operation of over-weight vehicles as specified is Austroads and AS5100 the Bridge Design Code.

6 Department Safe System Assessment

- 6.1 The Safe System is a road safety philosophy that is based on the principles that road users are fallible and will make mistakes but that no one should be killed or seriously injured when a crash occurs. To prevent this, the road system must be forgiving so that the forces of collisions do not exceed the limits that a human body can tolerate.
- 6.2 Safe System Assessment is a tool that has been developed to provide a measure of the extent to which a road infrastructure project aligns with Safe System principles and the ultimate objective of eliminating fatal and serious injuries from crashes on the road network.
- 6.3 The Department has developed guidelines which specify when a Safe System Assessment should be conducted and to provide guidance on the assessment process. The Department's safe system guidelines should be used in conjunction with Austroads "Safe System Assessment Framework".
- 6.4 The Department's guide and assessment is located in the following link. https://www.dpti.sa.gov.au/standards/road_design_outputs. Additional information is available in the following guidelines:

- a) Safe System Assessment Guideline (internal use): KNet 13551921.
 - b) Safe System Assessment (internal use): KNet 13551920.
- 6.5 The Safe System Assessment will be required for all projects (except SSAs are optional for projects under <\$2M but require documentation of how the project has considered safe system principles).

7 Design Elements

Reaction time

- 7.1 A driver reaction time of 1.5 sec is not normally adopted within South Australia.
- 7.2 The EDD / departure approval process should be used to document decisions if design controls warrant an alternative reaction time approach (e.g. tunnel).

Design Speed

- 7.3 For “brownfield” road designs, the design speed shall be determined using a risk-based approach assessment using the operating speed of the road (based on measurement) in accordance with AGRD Part 3 clauses 3.3 & 3.4.
- 7.4 For “greenfield” designs or where the existing operating speed cannot be assessed, the design speed for the main carriageways shall be 10 km/h greater than the proposed posted speed limit.
- 7.5 The design speed for turn movements at intersections shall be determined based on the speed profile.
- 7.6 Design speed for roads not under the care and control of the Commissioner of Highways roads shall be agreed with the relevant Road Authority.
- 7.7 The design report and EDD / departure approval process should be used to document decisions.

Safe Intersection Sight Distance (SISD)

- 7.8 Intersection safety performance is largely dependent upon adequate sight distance in relation to both horizontal and vertical geometry for all drivers approaching and entering the intersection.
- 7.9 It is the Department’s preference to use SISD rather than Minimum Gap Sight Distance (MGSD) at all intersection and property accesses.
- 7.10 The EDD / departure approval process should be used to document decisions if design controls warrant an alternative approach.

Deceleration Coefficient

- 7.11 On sealed roads the 90th percentile value for wet braking on sealed road for vehicles (0.36) is to be adopted, with the following exceptions:
 - a) Comfortable deceleration for vehicles (0.26) is to be adopted for interchange ramps and deceleration lanes on highways with a posted speed limit of 80 kph or greater.
 - b) Mean value for braking on wet roads sealed roads for vehicles (0.46) may be adopted for horizontal curve stopping sight distance where more than one lane is provided and drivers can change lanes or utilise a shoulder to avoid an obstruction.
- 7.12 The EDD / departure approval process should be used to document decisions.

Transitional Spirals & Curves

- 7.13 Spirals are not used within South Australia.
- 7.14 Curves should be separated by a length of straight. The length of straight should conform to Austroads Part 3 Geometric Design.

Merges

- 7.15 The Design of zip merges is to be in accordance with the Pavement Marking Manual (Refer <https://www.dpti.sa.gov.au/documents/tass>).

Interchanges

- 7.16 Exit Ramp Nose.
- a) The preferred option is for an auxiliary lane to be provided based on consistency of approach across the SA road network.
- 7.17 Exit Ramp Terminals on entry.
- a) The use of simple merge as illustrated in Figure 11.6 Austroads Part 4C is not preferred.
 - b) Auxiliary lanes provide lane balance, increased mutual visibility and adequate acceleration distance before the merge.
- 7.18 Entry with Auxiliary Lane (section of parallel lane) are the preferred treatment and should be adopted.

8 Intersections

- 8.1 Traffic modelling of intersections shall be in accordance with RD-GM-D4 Traffic Analysis & Modelling.
- 8.2 Design of Signalised intersection shall comply with the additional requirements within RD-EL-D2 Traffic Signal Design.
- 8.3 At all signalised intersection approaches a minimum of two lanes shall be provided. A left turn slip lane can be counted as one lane of the two lanes where only one left turn lane is required. Shared turning and through lanes are not permitted.
- 8.4 The road design shall accommodate the design vehicle within marked lanes. Swept paths shall include a 0.5m clearance to kerbs, pavement edge lines; and centre of pavement lines on two-way roads.
- 8.5 The minimum turning radii used in the determination of a design vehicle or checking design vehicle shall be not less than the recommended turning radii in Austroads GTRD Part 4 "Intersections and Crossings – General" for those specific types of vehicles.
- 8.6 The design of all roads shall allow for the design vehicle, including accommodation of vehicle swept paths, for all lanes, including turning lanes, auxiliary lanes and intersections including traffic signal phasing and timings.
- 8.7 The design of left turns at un-signalised intersections and high entry angle left turn slip lanes may allow the design vehicle to encroach on the second exit lane of a multi-lane carriageway, where it can be demonstrated that the manoeuvre is a legal movement for the Design Vehicle, and that the current access conditions are maintained.
- 8.8 Depending on the proportion of large vehicles this will detrimentally affect the capacity of the turn and this affect is to be included in traffic analysis and models.
- 8.9 Notwithstanding the requirements of the design vehicle and check vehicle, the design shall provide accommodation for the use of the roads by existing vehicle types, including the use of local roads.
- 8.10 All intersections on bus routes shall assume their use by 19m articulated buses.
- 8.11 The design vehicles adopted for simultaneous movements of a double line of right or left turn vehicles shall include both the design vehicle and an 8.8 m design service vehicle, with the service vehicle following the inner line of vehicles.

Turning Movements at Intersections

- 8.12 The design of single lane turns at intersections into roads with two or more one lane may allow the Design Vehicle to enter the adjacent lane, where it can be demonstrated that the manoeuvre is a legal movement for the Design Vehicle.

9 Design Vehicles and Checking Vehicles

- 9.1 Vehicle dimensions and performance capability of design vehicles are the key design criteria upon which road and intersection design is based.
- 9.2 The selection of the design vehicle must also ensure over dimensional routes and over dimensional vehicles can travel efficiently and safely within the network.
- 9.3 The appropriate design and checking vehicles are defined within Austroads Design Vehicles and Turning Path Templates Guide
- 9.4 All design must include a checking vehicle.
- 9.5 The design of all roads and civil infrastructure shall enable safe and efficient emergency access for ambulance (SAAS), police (SAPOL), fire (SAMFS / CFS) and emergency (SES) vehicles to adjacent buildings and facilities.

10 Overtaking Lanes

- 10.1 Typical Cross section referenced below:

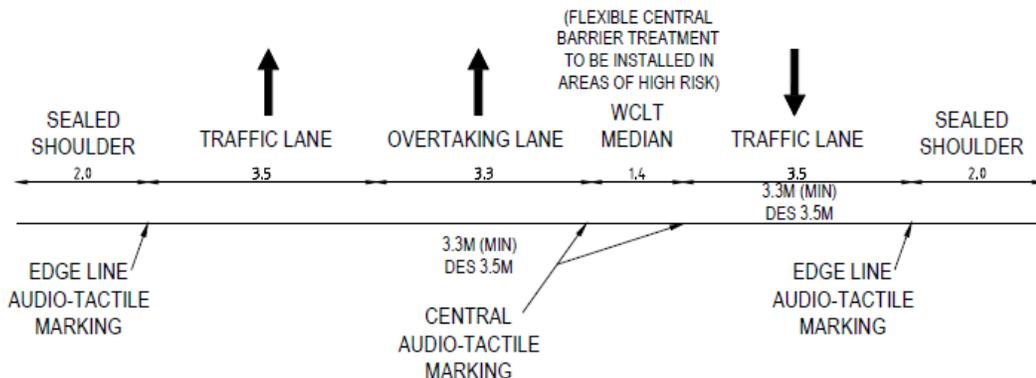


Figure 1 - Overtaking lanes - Typical cross section

- 10.2 At a minimum this treatment shall be considered on all new high-speed rural undivided roads or significant upgrades to create separation between opposing traffic lanes, where there are:
 - a) adequate sight lines,
 - b) Desirable measurements should be used – consultant to inform project manager if this cannot be achieved,
 - c) Preference is not to have an offset crown – consultant will be in the best position to establish the geometry as each site will vary,
 - d) ATLM – Refer to Operational instruction 2.13 for placement of ATLM. Project team to undertake community consultation focussing on informing the residents of the safety benefits of the treatment. This will need to be recorded within the Traffic Impact Statement (TIS). The TIS should also address how future noise complaints of the installation will be managed,
 - e) no grades in excess of 7%, and
 - f) Flexible barrier will be used centrally where there is high risk of head-on crashes. Consultant must assess each site individually, considering the risk rating, traffic volumes and composition and risk rating to determine if barriers are applicable.
- 10.3 Any deviation from the cross section above will require a departure form: [https://www.dpti.sa.gov.au/standards/road_design_outputs/ Design Departure / EDD Form](https://www.dpti.sa.gov.au/standards/road_design_outputs/Design_Departure_EDD_Form)
- 10.4 To be used in conjunction with Operational Instruction 2.15 - Overtaking lanes.

11 Hold Points

11.1 There are no Hold Points referenced in this Part.
