QPRC

QUEANBEYAN PALERANG REGIONAL COUNCIL

DEVELOPMENT DESIGN SPECIFICATION

D1

GEOMETRIC ROAD DESIGN (Urban and Rural)

VERSION 1 – NOVEMBER 2018

TRIM REF: SF130198/01

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
Version 1 QPRC Amendments to AUS-SPEC Document					
1	Street Lighting	D1.34	A	BP	1/06
2	Standards updated	D1.03	M	MC	05/02/13
3	Function of road types, intersection control,	D1.08	M	MC	05/02/13
4	Additional design speeds	D1.09.3	A	MC	05/02/13
5	AUSTROADS reference	D1.11	A	MC	05/02/13
6	AUSTROADS reference	D1.12	A	MC	05/02/13
7	Standard amended	D1.16.4	M	MC	05/02/13
8	Authorities amended	D1.17.2, 3 & 9	M	MC	05/02/13
9	Council referenced	D1.19.1	M	MC	05/02/13
10	AUSTROADS reference	D1.19.2	M	MC	05/02/13
11	DCP reference	D1.20.2	M	MC	05/02/13
12	Large Lot Residential reference	D1.22.1	M	MC	05/02/13
13	AUSTROADS reference	D1.22.2	M	MC	05/02/13
14	AUSTROADS and RTA reference added.	D1.23	M	MC	05/02/13
15	AUSTROADS reference	D1.24.1	M	MC	05/02/13
16	Property Access requirements added	D1.27	A	MC	05/02/13

17	AUSTROADS reference	D1.229	M	MC	05/02/13
18	Urban areas referenced	D1.31	M	MC	05/02/13
19	Council reference updated	D1.33	A	MC	05/02/13
20	Hold Point added, standards included	D1.35	M	MC	05/02/13
21	Standard drawings added	D1-A	A	MC	05/02/13
22	Council DCP references updated	D1.03	M	CS	14/08/18
23	Addition of AS5100	D09.04	A	CS	16/08/18
24	Standards Updated	D1.03	M/A	CS	16/08/18
25	D1.14.01 Road Reserve Characteristics Merged with D1.07 Road Hierarchy	D1.14	O	CS	16/08/18
26	Table D1.5 Merged into Figures D1.2 to D1.8	TD1.5	O	CS	16/08/18
27	7m Min. intersection radius added	D1.17.10	A	CS	16/8/18
28	Min width for traffic calming of two lanes amended to 6.0m	D.19.2(f)	M	CS	16/08/18
29	Bus route to be agreed with bus operator added	D1.21.1	A	CS	16/08/18
30	Reference to Office of Water Approval added	D1.22.06	A	CS	16/08/18
31	Cul-de-sac head radius amended to 15m	D1.30.1	A	CS	16/08/18
32	Development Control Plan reference amended	D1.31.1	M	CS	16/08/18
33	Council group reference amended	D1.31.1	M	CS	16/08/18
34	Deemed to comply & Table D1.8 removed	D1.33	O	CS	16/08/18
35	Traffic generation rates added	D1.07.04	A	CS	16/08/18
36	Design Traffic Loads from Former Palerang DCP added to Figures D1.2 to D1.8	As stated	A	CS	16/08/18
37	Road width amended, bus stop indentation amended to 2.5m	Table D1.6	M	CS	16/08/18
38	Table Updated with Former QCC & Palerang values	Table D1.7	M	CS	16/08/18

39	Note 1 amended to 7 vpd	Table D1.7	M	CS	16/08/18
40	Drainage requirements added	D1.14.16	A	CS	16/08/18
41	Table D1.7 expanded and updated with Palerang standards	Table D1.7	A/M	AP	17/08/18
42	Note 2 married with Palerang standards	Table D1.7	A/M	AP	17/08/18
43	Note 7 married with Palerang standards	Table D1.7	A/M	AP	17/08/18
44	Additional notes 9 to 11 from Palerang DCP Table 4	Table D1.7	A	AP	17/08/18
45	Typical rural road cross section added	Table D1.7	A	AP	17/08/18
46	85th percentile or adopted rates added	D1.20.1	A	CS	1/11/18
47	Reference to RTA guide added	D1.20.2	A	CS	1/11/18
48	Stock Proof Fencing requirement added	D1.22.8	A	CS	1/11/18
49	RFS Requirements added	D1.22.19	A	CS	1/11/18
50	Erosion control incorporated into design & use of non-erodible gravels added	D1.29.3	A	CS	1/11/18
51	Threshold Treatment Materials	D1.19b	A	DJ	5/11/18

APPROVED FOR USE:

PROGRAM COORDINATOR
SUBDIVISION
13/11/ 2018

DEVELOPMENT DESIGN SPECIFICATION D1 - GEOMETRIC ROAD DESIGN

CONTENTS

DEVELOPMENT DESIGN SPECIFICATION D1
GEOMETRIC ROAD DESIGN (Urban and Rural)

GENERAL

D1.01 SCOPE

1. This section sets out the specifications developed specifically for the design of subdivision roadworks using principles of street design to ensure safety and improved amenity and to reduce pedestrian/vehicular conflicts.

Subdivision Roadworks

2. A fundamental requirement of the design process is for designers to determine the vehicle speed which is deemed acceptable for a particular subdivision or section of road. The concept of designing to regulatory street speeds is contrary to the current principles of subdivision road design.

Acceptable Vehicle Speed

3. All relevant design principles must be integrated in the development of the road network. A careful balance is required between maximising amenity, safety and convenience considerations and those related to the drivers' perception of driving practice.

Integrated Design Principles

4. The words "street" and "road" are interchangeable throughout all parts of this Specification.

5. For the purpose of this Specification the definition of terms used to define the components of the road reserve shall be in accordance with AS 1348.1 and AMCORD.

Road Reserve Component Definitions

AS 1348.1 terms:

Carriageway - That portion of the road or bridge devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes.

Footpath - The paved section of a pathway (verge).

Pathway - A public way reserved for the movement of pedestrians and of manually propelled vehicles (AMCORD verge).

Pavement - That portion of a carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic.

Shoulder - The portion of the carriageway beyond the traffic lanes and contiguous and flush with the surface of the pavement.

AMCORD term:

Verge: - That part of the road reserve between the carriageway and the road reserve boundary. It may accommodate public utilities, footpaths, stormwater flows, street lighting poles and plantings.

D1.02 AIMS

1. The provision of a road system within a subdivision is to be designed so as to achieve the following aims:

- Provide convenient and safe access to all allotments for pedestrians, vehicles and cyclists.

- Provide safe, logical and hierarchical transport linkages with existing street system.
- Provide appropriate access for buses, emergency and service vehicles.
- Provide for a quality product that minimises maintenance costs.
- Provide a convenient way for public utilities.
- Provide an opportunity for street landscaping.
- Provide convenient parking for visitors.
- Have appropriate regard for the climate, geology and topography of the area.

D1.03 REFERENCE AND SOURCE DOCUMENTS

(a) Council Specifications

All Specifications for Design and Construction.
Palerang Development Control Plan 2015
Queanbeyan Development Control Plan 2012

(b) Australian Standards

AS 1348:2002	-	Road and traffic engineering – Glossary of terms, Road design and construction.
AS 2890	-	Parking facilities:
AS/NZS 2890.1:2004	-	Off-street car parking
AS 2890.2:2002	-	Off-street commercial vehicle facilities
AS 2890.5:1993	-	On-street parking
AS/NZS 2890.6:2009	-	Off-street parking for people with disabilities
SAA HB69.14	-	Guide to traffic engineering practice - Bicycles.
AS/NZS 1158	-	Lighting for roads and public spaces.
AS/NZS 3845	-	Road safety barrier systems.
AS 5100	-	Bridge Design

(c) State Authorities

Roads and Maritime Services NSW –

Road Design Guide.
NSW Bicycle Guidelines, 2005
Guide to Traffic Generating Developments – Version 2.2 (Oct 2002)
RMS AUSTROADS *Guide Supplements*
RMS Australian Standard Supplements

Department of Housing - *Road Manual*, 1987.
Department of Urban Affairs (formerly Environment) and Planning (NSW)-
Technical Bulletin 12 (1981), *Residential Road Widths*.

(d) Other

AUSTROADS

AGTM06-2013	Guide to traffic management Part 6: *Intersections, interchanges and crossings*.
AGTM08-2016	Guide to traffic management Part 8: *Local area traffic management.*
AP-G1-2003	Rural road design - *guide to the geometric design of rural roads.*

AUS-SPEC #1

AGRD	Guide to road design
AGRD02-2015	Guide to road design Part 2 – *Design considerations.*
AGRD03-2011	Guide to road design Part 3 – *Geometric Design.*
AGRD04-2009	Guide to road design Part 4 – *Intersections and crossings – general.*
AGRD04A-2010	Guide to road design Part 4A - *Unsignalised and signalised intersections.*
AGRD04B-2015	Guide to road design Part 4B – *Roundabouts.*
AGRD04C-2015	Guide to road design Part 4B – *Interchanges.*
AGRD06-2010	Guide to road design Part 6 – *Roadside design, safety and barriers.*
AGRD06A-2009	Guide to road design Part 6A - *Pedestrian and cyclist paths.*
AGRD07-2008	Guide to road design Part 7 - *Geotechnical investigation and design.*
AP-G34-2013	Design vehicles and turning path templates.
AGTM	Guide to traffic management.
AP-G88-2014	Cycling aspects of AUSTROADS Guides.

Guide to Traffic Engineering Practice: - PART 5: *Intersections at Grade*

Design Single Unit Truck / Bus template.

The Institute of Municipal Engineering Australia, Qld Division - 1993: *Design Guidelines for Subdivisional Streetworks.*

ARRB Special Report No. 33, L E Comerford: A Review of Subdivision Road Design Criteria.

Commonwealth Department of Housing and Regional Development – 1995: *Australian Model Code for Residential Development*. (AMCORD). A National Resource Document for Residential Development.

Stapleton, C 1984: *Streets Where We Live – A Manual for the Design of Safer Residential Estates.*

Stapleton, C 1988, Dept of Transport South Australia: *Planning & Road Design for New Residential Subdivisions.*

Brindle, R 1988, ARRB: *Planning & Design of the Local Distributor*.

Colman, J 1978, ARRB: *Streets for Living*.

Pak-Poy Kneebone – 1989: *Research Study into Road Characteristics for Residential Development.*

D1.04 CONSULTATION

Council, Other Authorities

1. Designers are encouraged to consult with the Council and other relevant authorities prior to or during the preparation of design. Designers should in addition to requirements of this Specification ascertain specific requirements of these authorities as they relate to the designs in hand.

Public Consultation

2. Public consultation on designs shall be provided where such action is required by Council's current policy.

Public Utilities

3. The Designer shall obtain service plans from all relevant public utility authorities and organisations whose services may exist within the area of the proposed development. These services are to be plotted on the relevant drawings including the plan and cross-sectional views.

D1.05 PLANNING CONCEPTS

1. Roads

Road Pathway and Cycleway Hierarchy

In new areas (as distinct from established areas with a pre-existing road pattern) each class of route should reflect its role in the road hierarchy by its visual appearance and related physical design standards. Routes should differ in alignment and design standard according to the volume of traffic they are intended to carry, the desirable traffic speed, and other factors.

Pathways and Cycleways

A network of pedestrian and bicycle routes shall be provided to allow safe and convenient movement of pedestrians and cyclists. The network shall be determined at the Development Application Stage.

2. The road, pathway and cycleway patterns and widths must be in conformity with that shown on any relevant Development Control Plan. In areas not covered by these plans, the pattern and width(s) will be determined by Council on their merits, at the Development Application Stage. Each allotment must have a boundary adjoining a public road.

Conformance with DCP

3. The road network for residential developments should have clear legibility.

Legibility

4. The road network should reinforce legibility by providing sufficient differentiation between the road functions.

Differentiation

5. Distinct landmark features such as watercourses, mature vegetation or ridge lines should be emphasised within the structural layout so as to enhance the legibility.

Landmark Features

6. Whilst legibility can be enhanced by introduced physical features such as pavement and lighting details, the road network should by its inherent design and functional distinction provide the necessary legibility.

Introduced Features

7. The maximum number of turning movements at intersections or junctions that a driver should be required to undertake to reach a particular address within the development should be minimised.

Intersection Turning Movements

8. There will be special constraints and costs associated with the design of roads through or adjacent to land known to be salt affected. Early planning shall consider avoiding detrimental interference with land known to be salt affected. Adjustments in horizontal and vertical line shall be considered to avoid recharge of subsurface water within or adjacent to the road reserve. Consultation with the relevant land and water resource authority shall be mandatory under the above circumstances.

Salinity Prevention, Early Planning, Mandatory Consultation

9. Appropriate native deep-rooted species should be selected for plantings in association with road reserve works. Plantations should be of sufficient size and density, multiple row belts and relatively close spacings are recommended, to be effective in their desired role of lowering the groundwater table.

Landscaping, Salinity Prevention

10. All roads and road intersections, including roundabouts, within the road network shall be provided with street lighting to the appropriate lighting category in accordance with AS/NZS 1158.

Road and Path Lighting

All footpaths, pathways, cycleways and shared paths in parks and reserves shall be provided with lighting to Category P2 in AS/NZS 1158.3.1.

AUS-SPEC #1

D1.06 DRAWING REQUIREMENTS

(a) Reduction Ratios

1. All plans for urban design are to be reduced to 1:500. Rural designs may be reduced to 1:1000.

Longitudinal Sections	Urban	1:500 Horizontal 1:100 Vertical
	Rural	1:1000 Horizontal 1:200 Vertical
Cross Sections	Urban	1:100 Natural
	Rural	1:200 Natural
Intersection and Cul De Sac	Grading Drawings	1:200, with contours at 0.1m intervals

(b) Drawing Sheets

1. Separate sheets should be provided for

   a. Cover sheets
   b. Plan views
   c. Longitudinal sections
   d. Cross sections
   e. Structural details
   f. Standard drawings
   g Intersection Radius and Grading Drawings

(c) Drawing Presentation

1. Drawings are to be presented on A1 sheets and a USB device unless otherwise authorised. They are to be clear and legible and prepared in consistent lettering and style. The Accredited Certifier has the authority to refuse drawings that do not meet these drafting requirements. Drawings copied from other works will not be accepted. All drawings shall be clearly referenced with notations and tables as appropriate. The Designer should always be mindful that apart from being a permanent record and legal document, drawings should be easily read and understood by the Contractor, and others involved in the construction of the Works. Terminology should be kept in 'plain English' where possible.

Clear and Legible, Permanent Record, Legal Document

2. The scope and sequence of drawing sheets shall comply with the example provided in Annexure DQS-B of the Specification for QUALITY ASSURANCE REQUIREMENTS FOR DESIGN.

Compliance

(d) Certification

1. Drawings shall bear the signature of the design consultant and shall be certified as complying with the appropriate design specifications (D1 to D12). The certificate shall be in the format detailed in Annexure DQS-A of the Specification for QUALITY ASSURANCE REQUIREMENTS FOR DESIGN.

Design Consultant

URBAN DESIGN CRITERIA

D1.07 ROAD HIERARCHY & CHARACTERISTICS

Functionality

1. A hierarchical road network is essential to maximise road safety, residential amenity and legibility. Each class of road in the network serves a distinct set of functions and is designed accordingly. The design should convey to motorists the predominant function of the road. A typical hierarchy is shown on Figure D1.1.

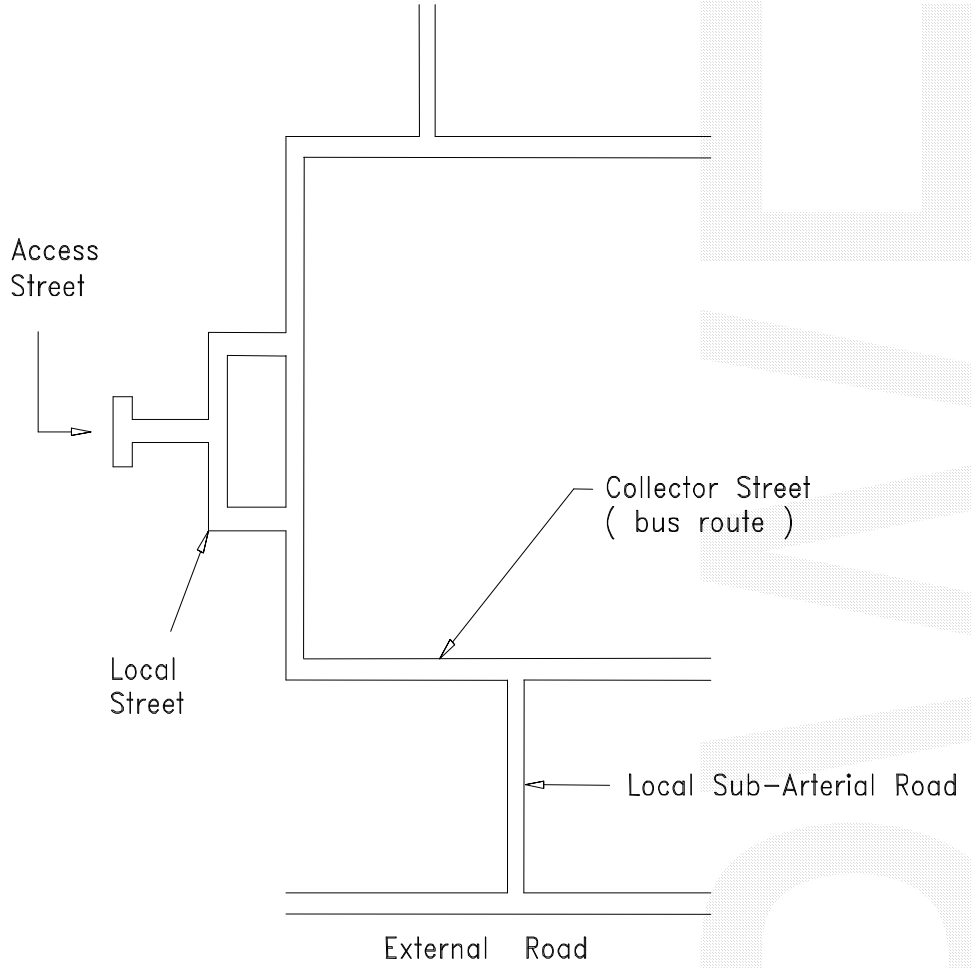


Figure D1.1 - Typical Road Hierarchy

2. Four distinct levels of roads are identified for residential neighbourhoods:

- Access Street
- Local Street
- Collector Street
- Local Sub-Arterial Road.

Cross Section Provisions

3. The cross section of the road reserve must provide for all functions that the road is expected to fulfil, including the safe and efficient movement of all users, provision for parked vehicles, acting as a buffer from traffic nuisance for residents, the provision of public utilities and street scaping. Figures D1.2 to D1.8 detail the characteristics of the road reserve for each road type identified within

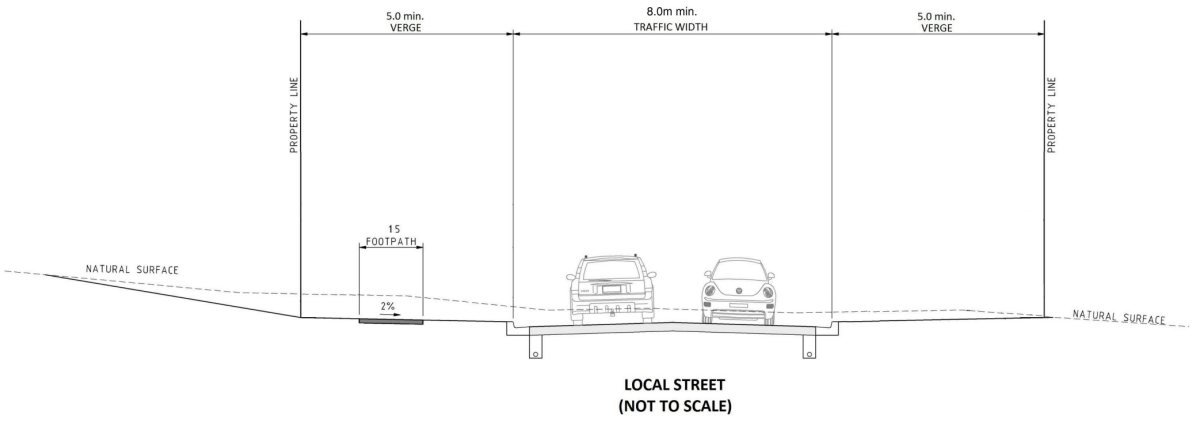
the hierarchy.

Further to requirements set out in Figures D1.2 to D1.8, widening required at bends to allow for wider vehicle paths (using AUSTROADS Turning Templates) may be required as demonstrated by turning paths of check vehicle applicable to each road type. Carriageway widths are measured between nominal kerb lines.

Traffic Generation

4. For single dwelling allotments, traffic generation rate of 10 vehicles per day (vpd) per allotment (equivalent to approximately one vehicle per hour (vph) in the peak hour) unless a lower rate can be demonstrated. Lower rates can be applied to multi-dwellings based on rates provided in the RTA *Guide to Traffic Generating Developments* (factored at the rate of 1.11 to conform to Council's adopted rate of 10 vpd versus the RTA rate of 9 vpd).

Access Street							
Maximum Traffic Volume (vpd)	**Maximum Speed**	**Minimum Traffic Width**	**Minimum Verge Width**	**Kerbing**	**Parking**	**Footpath Requirement**	**Bicycle Path Requirement**
200	25km/hr	8.0m	5.0m	• Modified Layback • Flush	Carriageway	1.5m wide *(one verge only, provision for second path to be allowed for)*	Nil



LOCAL STREET
(NOT TO SCALE)

Access Street

5. The lowest order road (access street) having as its primary function, residential space - amenity features which facilitate pedestrian and cycle movements, and where vehicular traffic is subservient in terms of speed and volume, to those elements of space, amenity, pedestrians and cyclists. The features of a typical access street are shown in Figure D1.2 and D1.3.

Figure D1.2 - Access Street

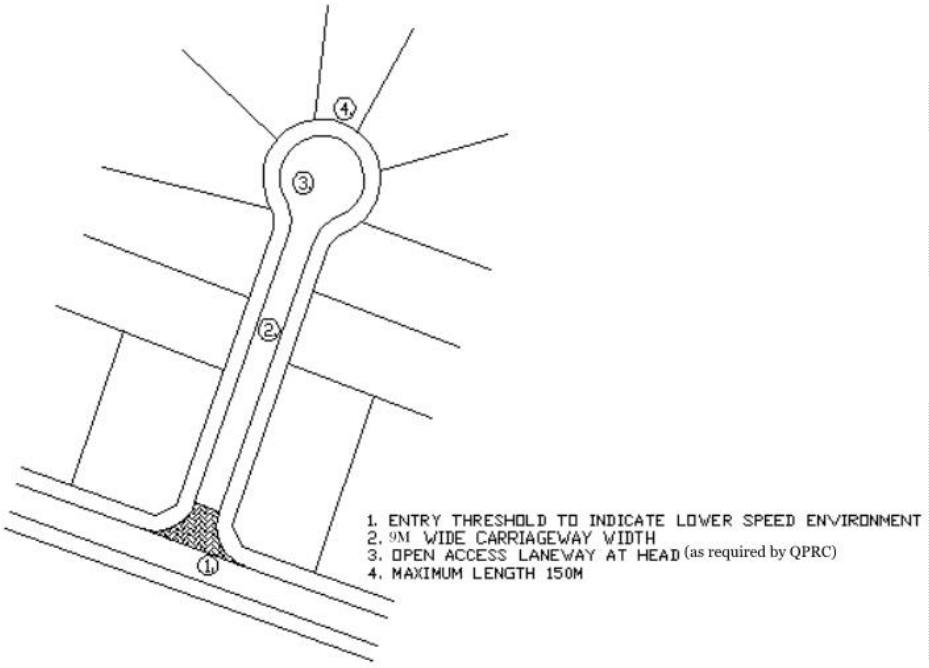


Figure D1.3 - Access Street

Local Street

5. The next level road (local street) as a local residential street should provide a balance between the status of that street in terms of its access and residential amenity functions. Resident safety and amenity are dominant but to a lesser degree than access streets. A typical local street is illustrated in Figure D1.4 and D1.5.

Local Street							
Maximum Traffic Volume (vpd) / Traffic Loading (ESAs)	**Maximum Speed**	**Minimum Traffic Width**	**Minimum Verge Width**	**Kerbing**	**Parking**	**Footpath Requirement**	**Bicycle Path Requirement**
2,000	40km/hr	8.0m	5.0m	• Barrier Kerb • Modified layback	Carriageway	1.5m wide *(one verge only, provision for second path to be allowed for)*	Nil

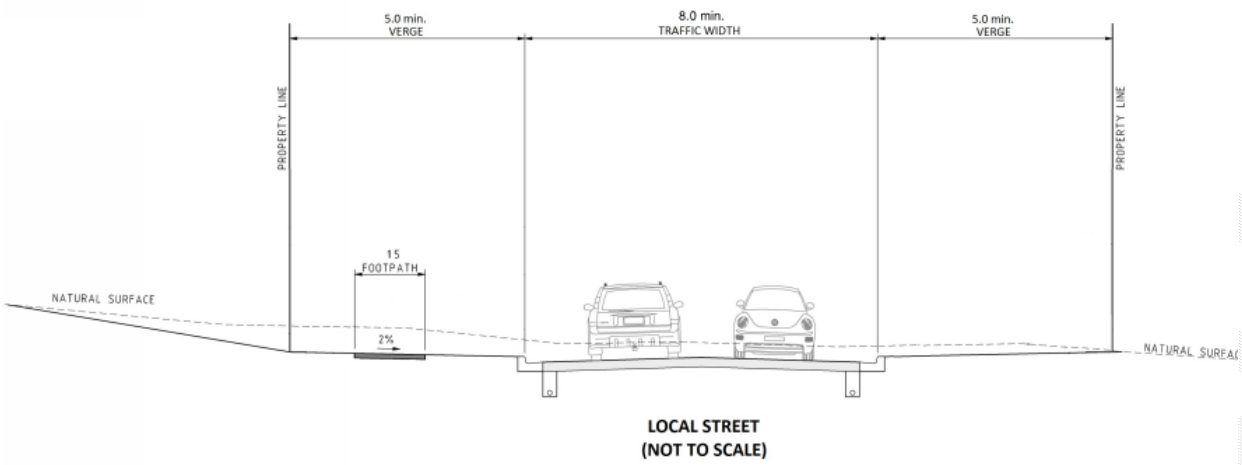


Figure D1.4 - Local Street

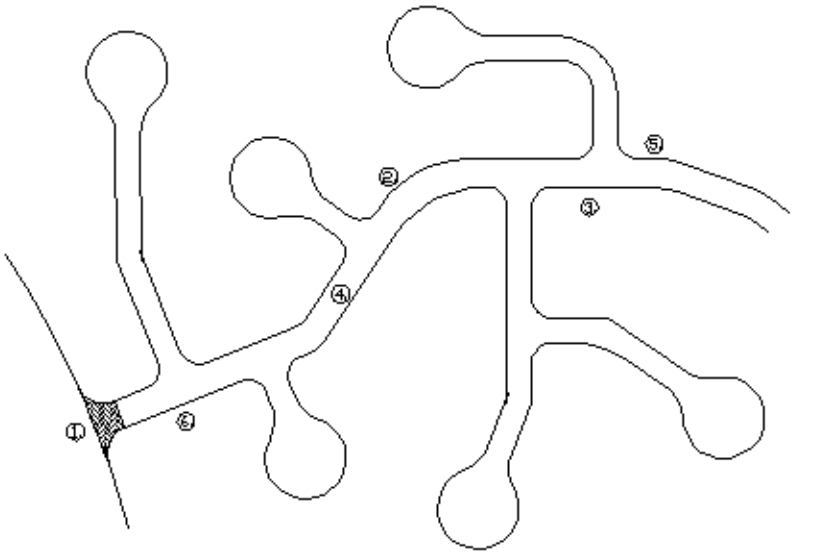


Figure D1.5 - Local Street

Collector Street

6. The second highest order road (collector street) has a residential function but also carries higher volumes of traffic collected from lower order streets. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and speeds, however, amenity and resident safety do not have the same priority as access or local streets. A typical collector street is shown in Figure D1.6.

Collector Street							
Maximum Traffic Volume (vpd) / Traffic Loading (ESAs)	**Maximum Speed**	**Minimum Traffic Width**	**Minimum Verge Width**	**Kerbing**	**Parking**	**Footpath Requirement**	**Bicycle Path Requirement**
3,000	50km/hr *(reduced to 20km/h at pedestrian/ bicycle crossings as outlined within this specification)*	11.2m	5.0m	• Barrier Kerb. • Modified Layback	Carriageway	1.5m wide	Nil

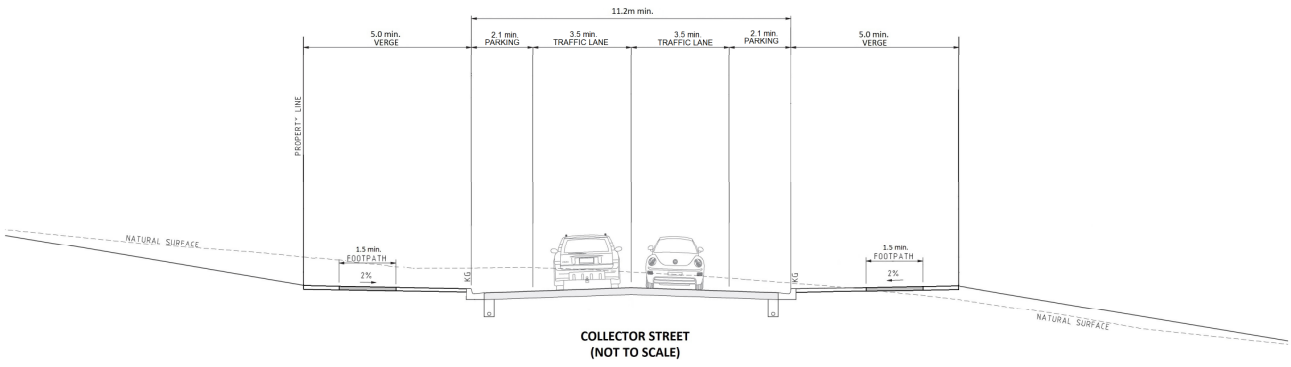
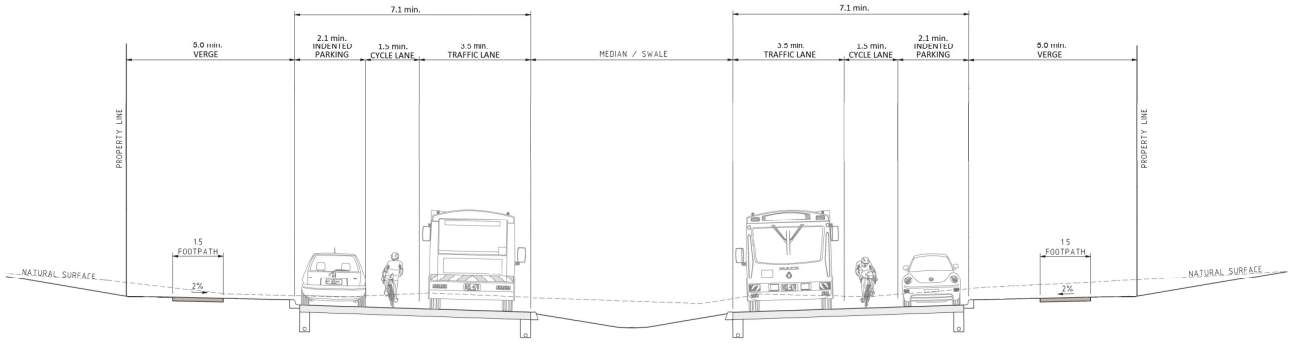


Figure D1.6 - Collector Street

7. The highest order road (local sub-arterial road) within a residential development should have as its main function the convenient and safe distribution of traffic generated by the development. Direct access should not be provided for single dwelling allotments but access can be provided to multi-unit developments and non-residential land uses. The local sub-arterial should serve only the development and should not attract through traffic. Figure D1.7 and D1.8 shows the layout of a local sub-arterial road.

Local Sub-Arterial Road

Local Sub-Arterial Road							
Maximum Traffic Volume (vpd)	**Maximum Speed**	**Minimum Traffic Width**	**Minimum Verge Width**	**Kerbing**	**Parking**	**Footpath Requirement**	**Bicycle Path Requirement**
6,000	60km/hr *(Speed limit of local sub-arterial road not to be exceeded)*	2v7.1m	5.0m	• Barrier Kerb.	Allowable only with indented parking bays *(at Councils Discretion)*	1.5m wide *(one side of carriageway – unless a designate trunk path is specified)*	1.5m wide bicycle lane marked on each side of carriageway *(If part of foot/bicycle path network)*



LOCAL SUB-ARTERIAL ROAD
(NOT TO SCALE)

Figure D1.7 - Collector Street

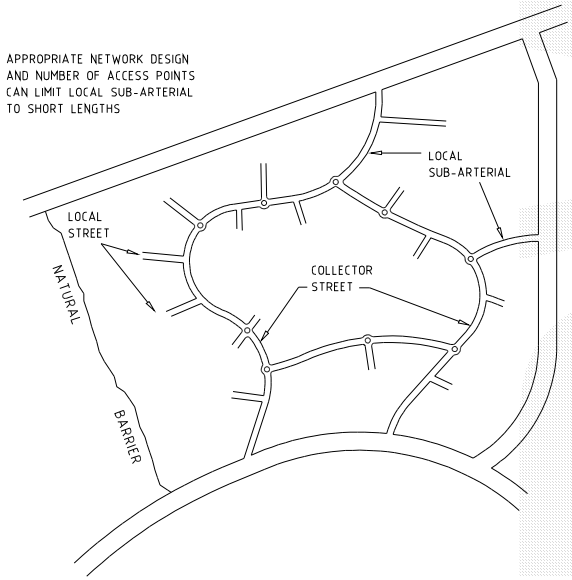


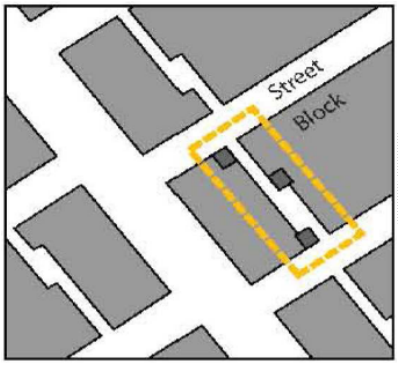
Figure D1.8 - Local Sub-Arterial Road

8. Council shall only consider accepting a Laneway as a public asset when they serve the purpose of providing vehicular access to allotments that front roads of Local Sub-Arterial hierarchy, or above, therefore requiring access via a rear laneway.

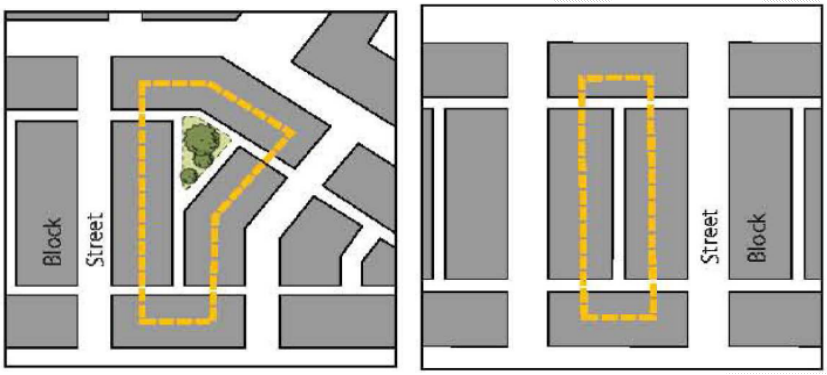
Public Laneways

9. The maximum length of a straight laneway section shall be 65m. Laneways greater in length must be offset to limit straights to this maximum length (see Figure D1.4). Private/Community Title laneways are to be designed in accordance with Council's *Vehicular Access Design Specification D13* and AS2890 Series.

Laneway Design



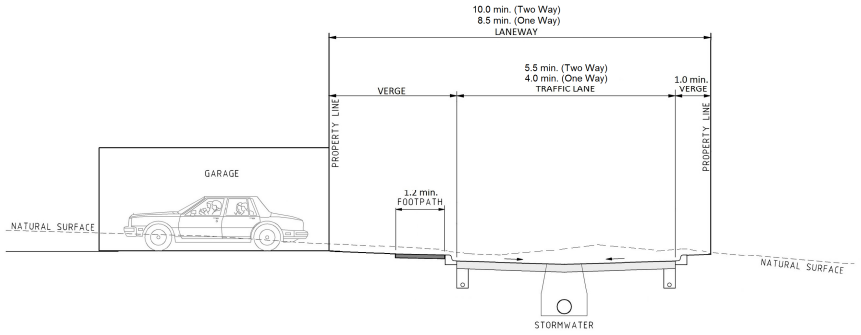
Typical Laneway with offset to eliminate straight line distance to <65m



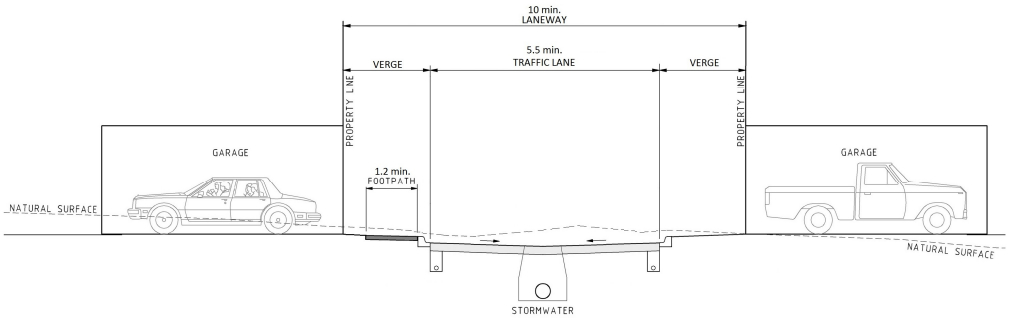
Typical Private Laneways

Figure D1.9 – Typical Laneway Arrangements

Lane							
Maximum Traffic Volume (vpd)	**Maximum Speed**	**Minimum Traffic Width**	**Minimum Verge Width**	**Kerbing**	**Parking**	**Footpath Requirement**	**Bicycle Path Requirement**
100	25km/hr	5.5m	1.0m	• Modified Layback • Flush	N/A	As required	Nil



LANEWAY - ACCESSES ON ONE SIDE
(NOT TO SCALE)



LANEWAY - ACCESSES ON BOTH SIDES
(NOT TO SCALE)

Figure D1.10 - Laneway

D1.08 ROAD NETWORK

1. The design features of each type of road convey to the driver its primary functions and encourage appropriate driver behaviour (refer Figure D1.2 to D1.8).

2. Traffic volumes and speeds on any road should be compatible with the residential functions of that road. ***Compatibility***

3. The maximum length of an access street should ensure its status as a residential place is retained, where the traffic, in terms of speed and volume will enable the integration of pedestrian, bicycle and vehicular movements. This length will also ensure that residential convenience is not unduly impaired as a result of speed restraints. ***Access Street***

4. The length of local sub-arterial within a development should be minimised. ***Local Sub-Arterial***

5. The time required for drivers to travel on all streets within the development should be minimised. ***Travel Time***

6. Where access streets form part of a pedestrian or bicycle network, access links should provide suitable connectivity with adjoining access streets or open space systems so as to ensure such pedestrian and bicycle network are functionally efficient. ***Pedestrian or Bicycle Network***

7. The road network should ensure that no road links with another road which is more than two levels higher or lower in the hierarchy. In exceptional circumstances roads may link with others that are more than two levels apart, however, no access street or ***Road Links***

local street should have access to an access-controlled arterial road.

8. Connections between internal roads shall be T-junctions or controlled by roundabouts or other treatments that slow travel speed and deviate the travel path across the intersection for the lower priority legs of the intersection. ***Internal Road Connections***

9. The road layout should conform to the requirements of the external road network and satisfy the transport provisions of an outline development plan. ***Transport Provisions***

10. The external road network should be designed and located to provide routes which are more convenient for potential through traffic within the network. Major roads should be provided at intervals of no more than 1.5 km and should be complete and of adequate capacity to accommodate through network movements. The internal road system should not provide through routes that are more convenient than the external road network. ***External Road Network***

D1.09 DESIGN SPEED

1. Design speed is generally used as the basic parameter in the specification of design standards, determining the minimum design value for other elements. The NSW Roads and Maritime Services bases its current design standards on a travel speed rather than a design speed. Travel speed identifies a speed/horizontal radius relationship. This approach is intended for roads of a minimum travel speed of 60 km/h. The maximum speed limit in NSW for built-up areas is 60 km/h and this should be used in calculating design values which depend on speed, (e.g. collector and sub-arterial roads) however, in difficult topography, the design speed may be reduced. Vehicular speeds are also limited by road intersections as well as changes in horizontal and vertical alignment. ***RMS Guidelines***

2. Adoption of a low design speed discourages speeding, however, where vertical or horizontal curves of low design speed are located in otherwise high speed sections (tangents) the result is a potentially dangerous section of road. It should be recognised that in low standard roads, operating speeds will tend to be in excess of arbitrary speed standards. Attention should be given to ensuring that potentially hazardous features are visible to the driver and adopting traffic engineering measures which will help a driver avoid errors of judgement. ***Low Speeds*** ***Hazardous Features***

3. Generally the following design speeds should be adopted:

Access Street	25 km/h
Local Street	40 km/h
Collector Street	50 km/h
Local Sub-Arterial Road	60/80 km/h

4. The need for road safety barriers shall be assessed and designed in accordance with AS/NZS 3845 and where applicable AS5100 for bridges and culvert crossings. ***Road Safety Barriers***

D1.10 LONGITUDINAL GRADIENT

1. A general minimum gradient of 0.5% should be adopted. In very flat conditions it may be reduced to 0.3%. Where underground drainage with gully pits or other special works are used it is preferable to allow near level grades rather than reverting to the unsatisfactory device of introducing artificial undulations. Variable crossfall may be necessary to produce the required grade in the gutter. Maximum recommended grades are shown in Table D1.1. ***Flat Terrain***

Table D1.1

	Local and Access	Collector	Local Sub-Arterial	Rural
Desirable maximum percentage*	12	10	8	10
Absolute maximum percentage*	16	12	10	12

* maximum length 150 m on straight alignment.

Intersections

2. Longitudinal grade of the minor street on the approach to an intersection should not exceed 4%, the actual gradient being dependent on the type of terrain. Design of the road alignment and the grades used are interrelated. A steep grade on a minor side street is undesirable if vehicles have to stand waiting for traffic in the major road.

Cul-de-Sacs

3. Turning circles in cul-de-sacs on steep grades should have grades less than 5%.

D1.11 HORIZONTAL CURVES AND TANGENT LENGTHS

Speed/Radius Relation

1. The horizontal alignment of a road is normally in a series of tangents (straights) and curves which may be connected by transition curves. The choice of the horizontal alignment is normally determined from the design speeds for a particular street within the road hierarchy as described in Clause D1.09. Designers should ensure that, for a given design speed, the minimum radius of curvature utilised is such that drivers can safely negotiate the curve. Curves which progressively tighten produce an uncomfortable sense of disorientation and alarm. Sudden reverse curves which drivers cannot anticipate also have a potential to cause similar conditions.

Speed Restriction

2. Where speed restriction is provided by curves in the street alignment the relationship between the radius of the curve and the desired vehicle speed is given in Table D1.2(a).

Tangent Length

3. To determine appropriate lengths for tangents between speed restrictions, which may be curves, narrow sections or other obstructions, Table D1.2(b) is recommended.

4. Sight distance on curves is determined by formula, values of which are tabulated in AUSTROADS.

Table D1.2(a)
Speed/Radius Relationship

Desired Vehicle Speed (km/h)	Curve Radii (m) on Road Centreline	
	Curvilinear Alignment (no tangents)	Isolated Curve Alignment (with tangent sections)
20	15	10
25	20	15
30	30	20
35	50	30
40	90	40
45	105	50
50	120	60
55	140	70
60	160	80

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Table D1.2(b)
Speed/Tangent Length Relationship

Desired Vehicle Speed in Curve (km/h)	Maximum Advisable Tangent Length (m) between Curves or Restrictions Appropriate to a Selected Design Speed. DESIGN SPEED						
	25	30	35	40	45	50	60
20 or less	40	75	100	120	140	155	180
25	-	45	75	100	120	140	165
30	-	-	45	80	100	120	150
35	-	-	-	50	80	100	135
40	-	-	-	-	55	80	120
45	-	-	-	-	-	60	105

NOTE:
Tables D1.2(a) and D1.2(b) are derived from AMCORD.

D1.12 VERTICAL CURVES

Criteria

1. Vertical curves will be simple parabolas and should be used on all changes of grade exceeding 1%. The desirable minimum design speed is 60 km/h. The length of the crest vertical curve for stopping sight distance should conform with RMS Road Design Guide. These standards are based on 1.5 second's reaction time which provides a reasonable safety margin for urban conditions, where drivers' reaction time is usually considered to be lower than in rural conditions.

Riding Comfort

2. For adequate riding comfort, lengths of sag vertical curves should conform to AUSTROADS. As residential roads are usually lit at night, the criterion for designing sag vertical curves is a vertical acceleration of 0.05g for desirable riding comfort, and 0.10g for minimum riding comfort. The minimum length for sag vertical curves are shown in Table D1.3.

Table D1.3 Minimum Length of Sag Vertical Curves

	Local and access (m)	Collector (m)	Local Sub-Arterial (m)
Minimum vertical curve	25	35	50
Absolute minimum vertical curve (to be applied at road junctions only)	6	12	20

Side Road Junctions

3. Junctions of roads should be located at a safe distance from a crest, determined by visibility from the side road. Location of a side road at a crest should only occur if there is no suitable alternative.

Sag Curves

4. Drainage poses a practical limit to the length of sag curves and a maximum length (in metres) of 15 times the algebraic sum of the intersecting vertical grades (expressed as a percentage) has been suggested. This is to avoid water ponding in excessively flat sections of kerb and gutter. A minimum grade of 0.5% should be maintained in the kerb and gutter. This may require some warping of road cross sections at sag points.

Horizontal and

5. The three dimensional coordination of the horizontal and vertical alignment of a

road should be aimed at improved traffic safety and aesthetics. Economic considerations often require a compromise with aesthetic considerations. The following principles should be applied:

Vertical Alignment Coordination

- The design speed of the road in both horizontal and vertical planes should be of the same order.
- Combined horizontal and vertical stopping sight distance and minimum sight distance should be considered three dimensionally.
- Sharp horizontal curves should not be introduced at or near the crest of a vertical curve. A horizontal curve should lead the vertical curve and be longer than the vertical curve.
- A short vertical curve on a long horizontal curve or a short tangent in the gradeline between sag curves may adversely affect the road's symmetry and appearance.

D1.13 SUPERELEVATION

1. The use of superelevation in association with horizontal curves is an essential aspect of geometric design of roads with design speeds in excess of 60 km/h. Local and access roads which are designed for speeds of 40 km/h or less and with curves of 60m radius or less generally have the pavement crowned on a curve instead of superelevation. Design standards for such curves have little meaning as drivers usually cut the corners and rely on friction to hold them on a curved path. As the radius of the curve falls, friction becomes more important than superelevation.

Low Design Speed, Crowned Pavement

2. The maximum superelevation for urban roads of higher design speeds should be 6%. Any increase in the longitudinal grade leading to excessive crossfall at intersections should be considered with caution. While it is desirable to superelevate all curves, negative crossfall should be limited to 3%.

High Design Speed

3. In general, curve radii larger than the minimum and superelevation rates less than the maximum should be used where possible. The minimum radius of curves is determined by the design speed, the minimum superelevation (or maximum adverse crossfall) at any point on the circular portion of the curve, and the maximum coefficient of side friction which allows safe lane changing. This is 0.15 where there is positive superelevation and 0.12 where there is adverse crossfall. The coefficient of side friction depends upon the type and condition of tyres, the pavement, and on speed.

Criteria

4. Recommendations for minimum curve radii (in metres) on major urban roads under varying superelevation/crossfall are shown in Table D1.4.

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Table D1.4 Minimum Radius of Curvature

	Design Speed km/h	60	70	80
Minimum Superelevation (%)	5	145	195	255
	4	150	205	265
	3	160	215	280
	2	170	230	300
	1	180	245	315
Maximum Crossfall (%)	0	190	260	340
	1	260	355	460
	2	285	390	505
	3	315	430	560

(Source: NAASRA (now AUSTROADS), Guide policy for the geometric design of major urban roads.)

5. Plan transitions are desirable on superelevated curves for appearance and to provide a convenient length in which to apply the superelevation. On urban roads, superelevation may be conveniently applied to the road cross section by shifting the crown to 2m from the outer kerb. The axis of rotation of the cross section for urban roads will normally be the kerb grading on either side which best enables access to adjacent properties and intersections. On the outside of superelevation, or where the longitudinal grade of the gutter is less than 0.5%, a crossfall of 63mm in a 450mm wide gutter may be adopted.

Transitions, Offset Crowns

D1.14 ROAD RESERVE CHARACTERISTICS

1. The cross section of the road reserve must provide for all functions that the road is expected to fulfil, including the safe and efficient movement of all users, provision for parked vehicles, acting as a buffer from traffic nuisance for residents, the provision of public utilities and street scaping.

Cross Section Provisions

2. The carriageway width must allow vehicles to proceed safely at the operating speed intended for that level of road in the network and with only minor delays in the peak period. This must take into consideration the restrictions caused by parked vehicles where it is intended or likely that this will occur on the carriageway. Vehicles include trucks, emergency vehicles and, on some roads, buses. (Refer to Clause D1.21 for bus routes.)

Operational Aspects

3. The safety of pedestrians and cyclists where it is intended they use the carriageway must also be assured by providing sufficient width.

Pedestrians, Cyclists

4. The carriageway width should also provide for unobstructed access to individual allotments. Drivers should be able to comfortably enter or reverse from an allotment in a single movement, taking into consideration the possibility of a vehicle being parked on the carriageway opposite the driveway.

Access to Allotments

5. The design of the carriageway should discourage drivers from travelling above the intended speed by reflecting the functions of the road in the network. In particular the width and horizontal and vertical alignment should not be conducive to excessive speeds.

Discourage Speeding

6. Appropriate verge width should be provided to enable the safe location, construction and maintenance of required footpaths and public utility services (above or below ground) and to accommodate the desired level of streetscaping. Wherever possible services should be located in common trenches.

Verge Width

7. The verge when considered in conjunction with the horizontal alignment and permitted fence and property frontage treatments should provide appropriate sight

Sight Distance Across Verge

distances, taking into account expected speeds and pedestrian and cyclist movements.

8. Stopping sight distances and junction or intersection sight distances, provided by the verge, should be based on the intended speeds for each road type. For infill development, stopping sight distances and junction or intersection sight distances shall be based on the higher of the design speed for the road, if known, or the 85th percentile vehicle operating speed. ***Stopping and intersection sight distances***

9. Roads within Industrial subdivisions shall be designed to the road reserve characteristics for Local Sub-Arterial Road. ***Industrial Subdivisions***

10. Cul de sacs shall not exceed 150 metres in length. ***Cul-de-sacs***

11. The verge widths provided in Figures D1.2 to D1.8 are absolute minimums. Additional width may be required to provide for pedestrians, services, drainage, landscape and preservation of existing trees. ***Minimum Verge Widths***

12. Notwithstanding the requirements specified for a road type, roads forming part of the major pedestrian network will require a 2.0 m wide footpath on one side of the street. ***Major Pedestrian Networks***

13. A Level of Service C must be provided in all streets, which may require road types and/or lane widths to be adjusted to accommodate the traffic volumes derived during traffic modelling of a subdivision release. ***Level of Service***

14. Pram crossings must be provided in kerbs at path crossing locations in accordance with ACT TCCS standard drawing DS3-02. Tactile indicators shall be provided in accordance with AS 1428.4.1:2009. ***Pram Crossings***

15. Many elements of the road reserve characteristics are inter-related. Therefore variations from any particular recommended characteristic may require changes to others. (Derived from AMCORD). ***Inter-relationship of Road Reserve Characteristics***

16. All drainage requirements of urban roads shall be designed in accordance with Council's *Subsurface Drainage Design Specification D4 and Stormwater Drainage Design Specification D5.* ***Drainage Design***

D1.15 CROSSFALL

1. Desirably, roads should be crowned in the centre. Typical pavement cross falls on straight roads are:

Pavement Type	*Crossfall*
Bituminous seal coat	3%
Asphalt concrete pavement	2.5%
Cement concrete pavement	2%

(Source: NAASRA (Now AUSTROADS), *Guide policy for geometric design of major urban roads*.)

2. There are many factors affecting levels in urban areas which force departures from these crossfalls. Differences in level between road alignments can be taken up by offsetting crown lines or adopting one way crossfalls. Sustained crossfalls should not exceed 4%, although up to 6% may be used where unavoidable. The rate of change of crossfall should not exceed: 6 % per 30m for through traffic; 8% per 30m for free flowing turning movements; or 12% per 30m for turning movements for which all vehicles are required to stop. ***Offset Crown Lines*** ***Rate of Change***

3. The crossfall on a collector or local sub-arterial road should take precedence over the grade in minor side streets. Standard practice is to maintain the crossfall on the ***Precedence***

major road and adjust the minor side street levels to suit. The crossfall in side streets should be warped quickly either to a crown or a uniform crossfall depending on the configuration of the side street. A rate of change of grade of 2% in the kerb line of the side street relative to the centre line grading is a reasonable level.

D1.16 VERGES AND PROPERTY ACCESS

Criteria

1. A suitable design for the verge will depend on utility services, the width of footpath, access to adjoining properties, likely pedestrian usage and preservation of trees. Low level footpaths are undesirable but may be used if normal crossfalls are impracticable. Crossfalls in footpath paving should not exceed 2.5%, in accordance with AUSTROADS *Guide to Traffic Engineering Practice*, Part 13, *Pedestrians*. Longitudinal grade usually parallels that of the road and this may be steeper than 5%.

Options

2. Differences in level across the road between road reserve boundaries may be accommodated by:

- Cutting at the boundary on the high side and providing the verge at normal level and crossfall. A retaining wall may be constructed at the boundary, and located wholly outside of the road reserve if the extent of batters is excessive. The height of the retaining wall shall not exceed 1.2 metres.

- A uniform crossfall across the carriageway or offsetting the crown of the carriageway.

- The lower verge being provided at normal level and crossfall. A retaining wall may be constructed at the boundary and located wholly outside of the road reserve if the extent of the batters is excessive. The height of the retaining wall shall not exceed 1.2 metres and all retaining walls greater than 0.9 metres shall be provided with a handrail.

3. The above measures can be used singularly or combined. The verge formation should extend with a 0.5m berm beyond the road reserve boundary.

Driveway Profile

4. The Designer shall design a vehicular driveway centreline profile for the property access and check this design using AS/NZS 2890.1:2004, to ensure that vehicles can use the driveway satisfactorily. Gradient requirements are given in Specification for VEHICULAR ACCESS DESIGN.

Batter Slope

5. Batters outside of the road reserve shall not exceed 1 vertical to 4 horizontal in cutting and embankment.

D1.17 INTERSECTIONS

Traffic Volumes

1. The design of intersections or junctions should allow all movements to occur safely without undue delay. Projected traffic volumes should be used in designing all intersections or junctions on local sub-arterial roads.

State Roads, National Highways

2. Intersection design for the junction of subdivision roads with existing state rural or urban roads and national highways should generally be in accordance with AUSTROADS and the NSW RMS AUSTROADS Supplement.

NSW Roads and Maritime Services Concurrence

3. Intersections with state roads or national highways are to be designed, approved and constructed in accordance with the requirements of the NSW Roads and Maritime Services.

Existing Road Pavement

4. Where major intersections are required to serve a development complete reconstruction of the existing road pavements will be necessary where the speed environment and irregularity of the existing road pavement may endanger the safety of traffic in the locality.

5. Intersections should be generally located in such a way that: ***Criteria***

- The streets intersect preferably at right-angles and not less than 70°.
- The landform allows clear sight distance on each of the approach legs of the intersection.
- The minor street intersects the convex side of the major street.
- The vertical grade lines at the intersection do not impose undue driving difficulties.
- The vertical grade lines at the intersection will allow for any direct surface drainage.
- Two minor side streets intersecting a major street shall have a minimum centreline spacing of 50m.
- A right-left manoeuvre between the staggered streets is preferable, avoiding the possibility of queuing in the major street.

6. Adequate stopping and sight distances are to be provided for horizontal and vertical curves at all intersections. Stopping sight distances and junction or intersection sight distances, shall be based on the intended speeds for each road type. For infill development, stopping sight distances and junction or intersection sight distances shall be based on the higher of the design speed for the road, if known, or the 85th percentile vehicle operating speed. ***Sight Distance***

7. Where required, appropriate provision should be made for vehicles to park safely. ***Parking***

8. The drainage function of the carriageway and/or road reserve must be satisfied by the road reserve cross-section profile. ***Drainage***

9. All vehicle turning movements are accommodated utilising AUSTROADS *Design Vehicles and Turning Templates*, as follows: ***Turning Movements***

- For intersection turning movements involving local sub-arterial roads, the "design semi-trailer" with turning path radius 15.0m.
- For intersection turning movements involving local streets or collector streets, but not local sub-arterial roads, the "design single unit" bus with turning path radius 13m.
- For intersection turning movements on access streets but not involving local sub-arterial roads, collector streets or local streets, the garbage collection vehicle used by the local authority.
- For turning movements at the head of cul-de-sac access streets sufficient area is provided for the "design single unit" garbage truck to make a single point U-turn.

10. Turning radii at intersections or driveways on local sub-arterial road accommodate the intended movements without allowing desired speeds to be exceeded. Turning Radius on any intersection should not be less than 7m. ***Turning Radii***

11. On bus routes 3-centred curves with radii 7.0m, 10.0m, 7.0m are used at junctions and intersections. ***Bus Routes***

12. Channelisation shall be provided at all intersections involving Local Sub-Arterial Roads. For infill development and all other cases, channelisation shall be provided where ***Channelisation***

resolved by the Local Traffic Committee, or directed by Council, at the development application stage, to reduce the general area of conflict at intersections.

D1.18 ROUNDABOUTS

1. Roundabouts are to be approved by the Council and NSW Roads and Maritime Services. Roundabouts are to be provided at all four way intersections not controlled by traffic signals. In all other cases roundabouts are to be provided where resolved by the Local Traffic Committee, or directed by Council, at the development application stage. ***Approval***

2. Roundabouts shall be designed in accordance with the current guidelines published by NSW Roads and Maritime Services. Designs adopting alternative criteria will be considered on their merits. Roundabout design should generally comply with the following: ***Criteria***

- entry width to provide adequate capacity
- adequate circulation width, compatible with the entry widths and design vehicles e.g. buses, trucks, cars.
- central islands of diameter sufficient only to give drivers guidance on the manoeuvres expected
- deflection of the traffic to the left on entry to promote gyratory movement
- adequate deflection of crossing movements to ensure low traffic speeds
- a simple, clear and conspicuous layout
- design to ensure that the speed of all vehicles approaching the intersection will be less than 50 km/h.

D1.19 TRAFFIC CALMING

1. Traffic calming devices are to be provided where resolved by the Council at the development application stage. Traffic calming devices are to be approved by the Council. ***Approval***

2. Calming devices such as thresholds, slowpoints, speed humps, chicanes and splitter islands should be designed in accordance with the requirements of the publication AUSTROADS AGTM08-2008 *Guide to Traffic Management Part 8; Local Area Traffic Management.* Devices designs should generally comply with the following: ***Criteria***

(a) Streetscape

- reduce the linearity of the street by segmentation
- avoid continuous long straight lines (e.g. kerb lines)
- enhance existing landscape character
- maximise continuity between existing and new landscape areas

(b) Location of Devices/Changes

- devices other than at intersections should be located to be consistent with streetscape requirements
- existing street lighting, drainage pits, driveways, and services may decide the exact location of devices

- slowing devices are optimally located at spacings of 100-150m.
- Entry thresholds to low speed streets are to be constructed of “Granite Sets”

(c) Design Vehicles

- emergency vehicles must be able to reach all residences and properties
- local streets with a 'feeding' function between arterial roads and minor local streets shall be designed for a AUSTROADS *Design Single Unit Truck/Bus*
- where bus routes are involved, buses should be able to pass without mounting kerbs and with minimised discomfort to passengers
- in newly developing areas where street systems are being developed in line with LATM principles, building construction traffic must be provided for

(d) Control of Vehicle Speeds

- maximum vehicle speeds can only be reduced by deviation of the travelled path. Pavement narrowings have only minor effects on average speeds, and usually little or no effect on maximum speeds
- speed reduction can be achieved using devices which shift vehicle paths laterally (slow points, roundabouts, corners) or vertically (humps, platform intersections, platform pedestrian/school/bicycle crossings)
- speed reduction can be helped by creating a visual environment conducive to lower speeds. This can be achieved by 'segmenting' streets into relatively short lengths (less than 300m), using appropriate devices, streetscapes, or street alignment to create short sight lines

(e) Visibility Requirements (sight distance)

- adequate critical sight distances should be provided such that evasive action may be taken by either party in a potential conflict situation. Sight distances should relate to likely operating speeds
- sight distance to be considered include those of and for pedestrians and cyclists, as well as for drivers
- night time visibility of street features must be adequate. Speed control devices particularly should be located near existing street lighting if practicable, and all street features/furniture should be delineated for night time operation. Additional street lighting shall be provided by the Developer at proposed new speed control devices located away from existing street lighting.

(f) Critical Dimensions

Many devices will be designed for their normal use by cars, but with provision (such as mountable kerbs) for larger vehicles. Some typical dimensions include:

- pavement narrowings
  - single lane 3.50m between kerbs
  - 3.75m between obstructions
  - two lane 6.0m minimum between kerbs
- bicycle lanes (including adjacent to pavement narrowings) - 1.2m absolute

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minimum (1.0m in special circumstances in accordance with AUSTROADS AP-G11.14-1999, *Bicycles*.)

- plateau or platform areas
  - 75 mm to 150 mm height maximum, with 1 in 15 ramp slope
- width of clear sight path through slowing devices
  - 1.0m maximum

  (i.e. the width of the portion of carriageway which does not have its line of sight through the device blocked by streetscape materials, usually vegetation)
- dimensions of mountable areas required for the passage of large vehicles to be determined by appropriate turning templates.

D1.20 PARKING

On-Site

1. The parking requirements for normal levels of activity (typically the 85th percentile) or the Council/RMS adopted rate of parking associated with any land use should be accommodated on-site.

2. All on-site parking should be located and of dimensions that allow convenient and safe access and usage. All on-site parking shall be provided in accordance with The RTA Guide to Traffic Generating Developments, the relevant Development Control Plan (as applicable) and to the requirements of AS 2890.

Obstruction

3. The availability of parking should be adequate to minimise the possibility of driveway access being obstructed by cars parked on the opposite side of the street.

On-street Parking

4. On street parking and verge parking shall be designed in accordance with AS *2890.5 – On-street parking*.

5. Parking spaces provided on the verge or carriageway should be of adequate dimensions, convenient and safe to access. Parallel parking is the preferred method of on-street parking in public roads. Angle parking is generally not supported by Council in public roads. Use of angle should be limited to streets with traffic volumes <2,000 vpd. Angle parking is subject to approval by the Local Traffic Committee and is required to be signposted as angle parking.

D1.21 BUS ROUTES

Criteria

1. Bus routes should be agreed in principle with Bus operator's prior DA lodgement, in some circumstances, they may be identified by Council during application assessment. It is important that the road hierarchy adequately caters for buses. The main criteria in determining the location of bus routes is that *no more than 5% of residents should have to walk in excess of 400 metres* to catch a bus. Normally roads above the local street in the hierarchy are designed as bus routes. Table D1.2 details minimum criteria for bus route design.

Table D1.6 Bus Route Criteria

Road	Carriageway Width (min)	Stops (Spacing)	Bays
Local*	8.0m	400 metre**	2.5m indented bay if carriageway less than 9.0m.

Collector	11.2m	400 metre **	Shelters***
Local Sub-Arterial	13m	400 metre	Shelters***
Arterial	13m	400 metre	Shelters and Bays

* Local roads identified as bus routes to demonstrate manoeuvring of busses and road width amended as required.

** Loop roads with single entry/exit only require stops and bays on one side road.

*** At identified bus stops shelters shall be provided. Shelters are subject to Council's requirements and will include a concrete or paving slab to the floor area.

RURAL DESIGN CRITERIA

D1.22 GENERAL

1. In addition to the foregoing sections this section specifically applies to all those sites identified as being suited to large lot residential developments and rural subdivisions inclusive of rural home sites and hobby farms types of developments.

2. Operating speed is to be generally used as the basic parameter of design standards and the determination of the minimum design value for other elements in rural subdivisions is to be based on the concept of a "speed environment" as outlined in AUSTROADS – AP – G1-2003 – *Rural Road Design*. ***Design Speed***

3. Where appropriate superelevation, widening and centreline shift and their associated transitions are to comply with the AUSTROADS Guide.

4. Where the table drain is likely to scour a RMS Type SH dish drain, or similar structure is to be constructed along the invert. Also for grades of less than 0.8%, the inverts of the drain are to be lined to prevent siltation. ***Table Drain***

5. All rural subdivisions should be designed to restrict access to major roads.

6. All large lot residential and rural residential subdivisions will be required to provide drainage in accordance with the specification for STORMWATER DRAINAGE DESIGN. Watercourses crossing the road shall be conveyed by culverts and may require approval from NSW Office of Water. ***Drainage***

7. Access should be limited to one point on to local, collector, local sub-arterial or arterial road networks. ***Access***

8. Stock proof fencing shall be provided along public rural road reserves ***Fencing***

9. It should be noted that RFS bushfire requirements may increase requirements for access roads in rural areas above those stated herein. ***RFS requirements***

D1.23 SIGHT DISTANCES

1. Sight Distances for all unclassified roads will be determined in accordance with AUSTROADS - AP-G1-2003 - *Rural Road Design*. Sight distance for Classified State and Regional Roads will be determined in accordance with NSW RMS *AUSTROADS Guide Supplements (*Jan 2011*)*. ***Standards applied***

AUS-SPEC #1

2. Minimum sight distance to be provided on all roads will be the Stopping Sight Distance for the appropriate design speed. ***Minimum Sight Distance***

3. Sufficient sight distance shall be provided at the approaches to horizontal curves on Access, Local, Collector, and Sub-arterial Roads to provide Horizontal Curve Perception Distance. ***Horizontal Curve Sight Distance***

4. Overtaking sight distance shall be provided on Rural Collector Roads And Rural Sub-arterial Roads at least once in each 4 kilometres. Alternatively overtaking lanes may be constructed. ***Overtaking Sight Distance***

D1.24 HORIZONTAL AND VERTICAL ALIGNMENT

1. Horizontal and vertical curves are to be designed generally to the requirements of AUSTROADS - AUSTROADS - AP-G1-2003 - Rural Road Design - *Guide to Geometric Design of Rural Roads* for local roads and to NSW RMS *AUSTROADS Guide Supplements* (Jan 2011) for State and Regional Roads. These requirements are essential to satisfy the safety and performance of proper road design. Roads having both horizontal and vertical curvature should be designed to conform with the terrain to achieve desirable aesthetic quality and being in harmony with the landform. ***Criteria***

D1.25 INTERSECTIONS

1. Intersections should generally be designed in accordance with the publication AUSTROADS Guide to Traffic Engineering Practice - Part 5, Intersections at Grade. Generally intersections with existing main and local roads will conform to the layouts shown in Figure D1.11 below. The type of intersection required will depend on existing and planned connecting roads. ***Criteria***

Intersections with State or Regional Roads shall generally meet the requirements of the NSW RMS Road Design Guide and will require the approval of the NSW Roads and Maritime Services.

2. Adequate sight distance should be provided at intersections both horizontally and vertically. Each intersection location shall be examined for conformance with the criteria for Approach Sight Distance (ASD), Entering Sight Distance (ESD) and Safe Intersection Sight Distance (SISD). ***Sight Distance***

ASD relates to the ability of drivers to observe the roadway layout at an anticipated approach speed.

ESD relates to the driver entering the intersection from a minor road and ability to observe the roadway layout and assess traffic gaps.

SISD relates to an overall check that vehicles utilising the intersection have sufficient visibility to allow reaction and deceleration so as to provide adequate stopping distance in potential collision situations.

Tabulated speed/sight distance requirements together with detailed explanations for each of the sight distance criteria are given in Part 5 of the AUSTROADS Guide, *Intersections at Grade*. Repositioning of an intersection may be required to obtain conformance with the sight distance criteria.

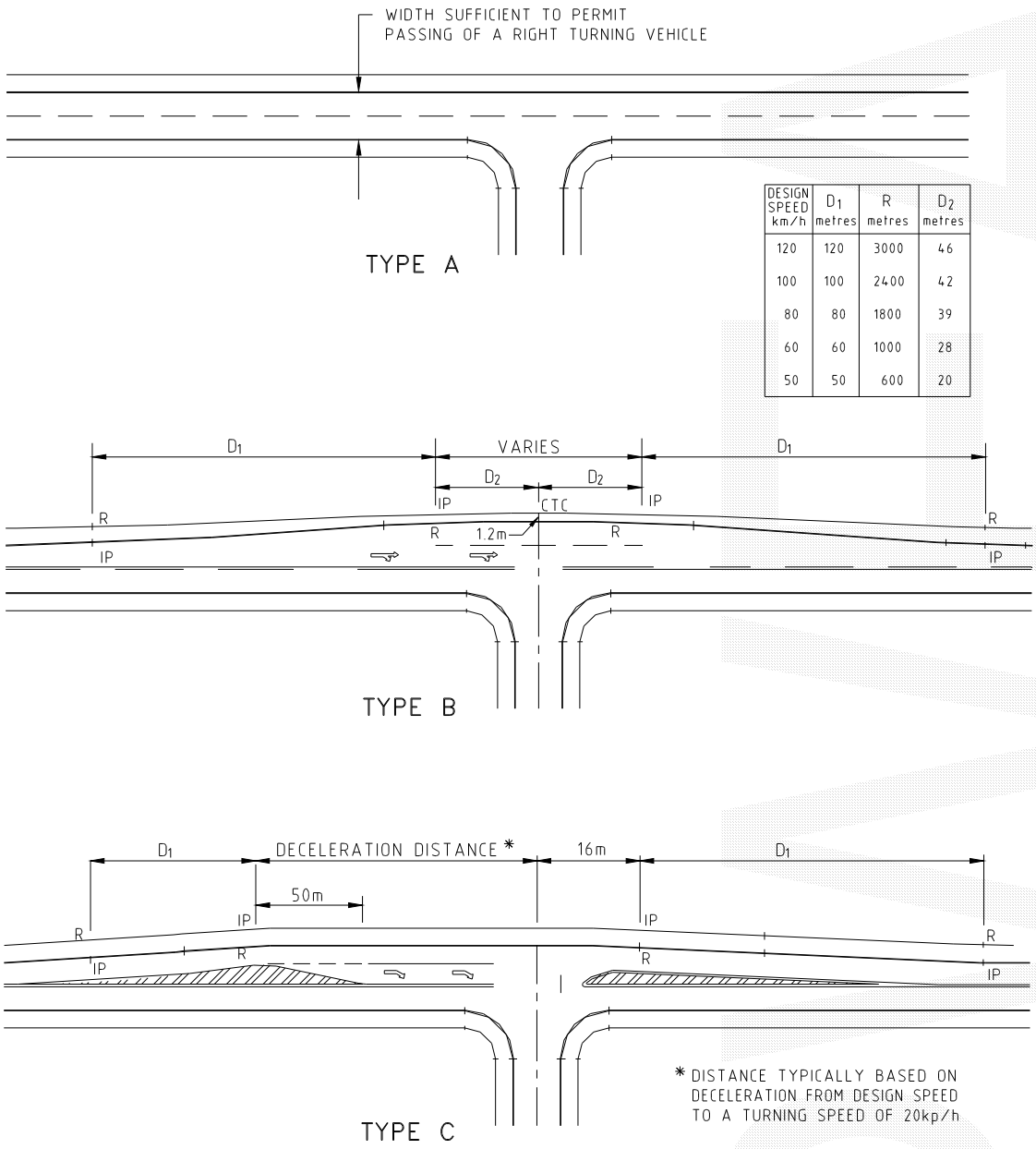


Figure D1.11 Typical Rural Intersection Treatments

Source: AUSTROADS Guide to Traffic Engineering Practice PART 5, Intersections at Grade.

Staggered-T Intersections

3. Staggered-T arrangements proposed for rural cross-intersections should preferably be of the “right to left” type. This arrangement eliminates traffic queuing in the major road, the need for additional pavement for right turn lanes and greater stagger length associated with “left to right” T-intersections. Figures and discussion on staggered-T treatments are given in Part 5 of the AUSTROADS Guide, *Intersections at Grade*.

AUS-SPEC #1

D1.26 PLAN TRANSITIONS

Widening and Shift on Curves

1. A plan transition is the length over which widening and shift is developed from the "tangent-spiral" point to the "spiral-curve" point; i.e., the length between the tangent and the curve. In urban road design it is often impracticable to use plan transitions as kerb lines are fixed in plan and any shift requires carriageway widening. Widening on horizontal curves compensates for differential tracking of front and rear wheels of vehicles; overhang of vehicles; and transition paths. Where proposed roads are curved, the adequacy of carriageway width should be considered.

Crossfall Changes

2. Abrupt changes in crossfall, can cause discomfort in travel and create a visible kink in the kerb line. A rate of change of kerb line of no more than 0.5% relative to the centreline should ensure against this. The wider the pavement the longer the transition. Superelevation transitions should be used at all changes in crossfall, not just for curves. Drainage problems can arise with superelevation transitions which may require extra gully pits and steeper gutter crossfalls. Where crossfalls change at intersections, profiles of the kerb line should be drawn. Calculated points can be adjusted to present a smooth curve.

D1.27 CARRIAGEWAYS

1. Carriageway widths for rural roads shall be designed in accordance with the road characteristics given in Table D.1.7.

Table D.1.7 Characteristics of Roads in Rural Residential Subdivision Road Networks (Areas without Kerb and Gutter)

Rural Road Category	Private Access (7)	Private Access or Right-Of-Way (7)	Minor Rural Road (7)	Access Road	Local Road	Collector Road	Rural Sub-Arterial Road
Maximum Number of Lots Served (1)	1	1-3	1-5	2-21	22-71	72-142	>142
Road Reserve Width (m) (6)	-	-	20	20	30	30	30
Minimum Design Speed (km/h) (2)	-	-	60	60	70	80	100
Minimum Horizontal Curve Radius (m)	-	-	90	90	150	240	240
Minimum Pavement Formation Width (m) (3)	4.0	6.0	9.2	9.2	9.2	11.0	13.0
Minimum Shoulder Width (m) (8)	-	-	1.0	1.0	1.0	2.0	3.0
Minimum Verge Widths (m) (5)							
a. Embankments	-	1.0	1.0	1.0	1.0	1.5	2.0
b. Cuttings	-	1.0	1.5	1.5	1.5	2.0	2.0
Minimum Seal Requirements (m) (10)							
a. Lanes (3)	-	-	-	3.1 (x 2)	3.1 (x 2)	3.5 (x 2)	3.5 (x 2)
b. Shoulders (4)	-	-	-	0.5 (x 2)	0.5 (x 2)	1.0 (x 2)	2.0 (x 2)
c. Total	-	-	-	7.2	7.2	9.0	11.0
Verge Track Width (m) (11)	-	-	1.5 (one side only)	1.5 (one side only)	1.5 (one side only)	2.0 (one side only)	2.0 (one side only)
Maximum Grade %							

Rural Road Category	Private Access (7)	Private Access or Right-Of-Way (7)	Minor Rural Road (7)	Access Road	Local Road	Collector Road	Rural Sub-Arterial Road
a. Unsealed surface using erosion resistant gravels	15	15	12	-	-	-	-
b. Unsealed surface using sandy decomposed granite	7	7	-	-	-	-	-
c. Bitumen sealed surface	20	20	18	14	12	12	12
Overtopping Drainage Design Frequency (% AEP) (11)							
i. Bridge Structure	-	50	5	5	2	1	1
ii. Major Culvert	-	50	10	10	4	2	2
iii. Minor Culvert	-	50	20	20	10	5	5
iv. Catch Drains	-	50	50	50	20	10	10

NOTES:

1. End of design life of road pavement (generally 20 years). For single dwelling allotments apply traffic generation rate of 7 vehicles per day (vpd)/allotment.

2. Lower or higher design speeds may be specified in special circumstances of topographical or environmental conservation constraints. Road alignments shall be designed so as to ensure a consistent or gradually changing speed environment so that each curve is not incongruous with the adjoining curves thereby 'trapping' unwary drivers. In this regard where the terrain or environment dictates a reduction in speed environment, geometric elements connecting the two speed environments should be designed with appropriate design speeds to provide a speed transition between elements of not more than 15-20 km/h.

3. All curves and crests which have a design speed less than the posted speed limit shall be provided with appropriate speed warning signs on each approach. Should be read in conjunction with Clause D1.09.

4. Widening required at curves to allow for wider vehicle paths (using AUSTROADS Turning Templates) and to maintain appropriate sight distances.

5. Shoulder sealing is measured from the edge of the sealed lane. A full width shoulder seal should be provided under the following conditions:

   i. Adjacent to a lined table drain, kerb or dyke, and on floodways;

   ii. Where a safety barrier is provided adjacent to a 1.0m wide shoulder;

   iii. Outer shoulder of a superelevated curve; and

   iv. Where rigid pavement is proposed.

6. Verge width adjacent to carriageway as defined in RMS *Road Design Guide* Section 3. Where not specified, keep to minimum practicable.

7. Minimum width required to provide for road formation, cut and fill batters, drainage, lateral clearances at top and bottom of batters of at least 2.5m, services and necessary horse trails.

8. Private roads and Right of Ways are private roads only, and design speed, horizontal and vertical geometry are therefore not specified for these roads. These roads are to be aligned to minimise impact on, or interference/disturbance of native vegetation, significant trees, water courses, rock outcrops, and items of Aboriginal and European heritage. Vertical geometry is to follow the natural surface and avoid cuts/fills deeper/higher than 0.5 metre as far as practicable. Longitudinal table drains where needed are to be as small as practicable and are to be turned out to level spreaders at 20 metre (maximum) intervals or terminated at cross drainage culverts/causeways at 50 metre (maximum) intervals. Type **Minor Rural** roads shall only be constructed in the **E3 and RU1 land use zones** where existing roads are unsealed and greater than one kilometre in length.

9. Shoulders 3.0 metres wide shall be provided adjacent to all barrier lines and as required at intersections and merge areas.

10. Delineation is required in accordance with AUSTROADS and RMS standards. On public roads where it has been determined sealing is not required, lane and shoulder widths shall be as per the sealing width requirements.

11. Verge tracks are to be provided at a safe location away from vehicle traffic (i.e. not against the shoulder) and have a maximum crossfall of 4%. Refer to Typical Cross Section below.

12. Adequate provision shall be made for overtopping in accordance with AUSTROADS 'Bridge Design Code'.

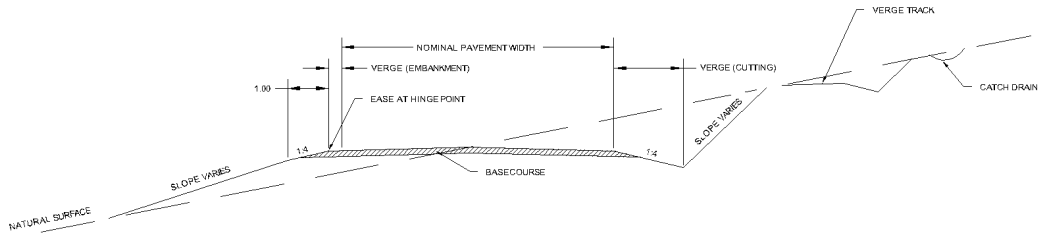
   i. Bridge Structure with effective waterway area >30m^2

   ii. Major Culvert Structure with effective waterway area >3<30m^2

   iii. Minor Culvert Structure with effective waterway area <3m^2

   iv. Catch Drains.

* Many elements are inter-related. Therefore variations from any particular recommended characteristic may require changes to others.



TYPICAL CROSS SECTION
NOT TO SCALE

D1.28 SUPERELEVATION

Design Speed

1. Use of maximum superelevation will be considered where the radius of the curve in approaching the minimum speed environment. Reference should be made to AUSTROADS AP-G1-2003 – *Guide to Geometric Design of Rural Roads* for superelevation calculation. At low and intermediate ranges of design speed (i.e. below 80 km/h) it is desirable to superelevate all curves at least to a value equal the normal crossfall of straights.

D1.29 SCOUR PROTECTION

Roadside Drainage and Table Drains

1. Scour protection of roadside drainage and table drains is required. The level of protection will depend on the nature of the soils, road gradients and volume of stormwater runoff. Protection works may involve concrete lined channels, turfing, rock pitching, grass seeding, individually or any combination of these. Geotechnical investigations should be carried out of determine the level and extent of any protection works prior to proceeding to final design stage.

2. For rural roads with longitudinal gradients greater than 5%, the roadside drainage and table drains will be stabilised in accordance with NSW RMS *Road Design Guide*.

3. Permanent erosion protection, sediment control and revegetation shall be designed and constructed to protect disturbed surfaces along and adjacent to roadsides, table drains and drainage structures in accordance with sound drainage design and environmental principles. For gravel roads, a small increase in maximum grade may be accepted if the road is over a steeper section is finished with a non-erodible gravel or bitumen sealed pavement. V-shaped table drains are not acceptable.

SPECIAL REQUIREMENTS

D1.30 CUL DE SACS

1. A cul de sac head shall be provided at all road terminations. The kerb line radius of the cul de sac head shall not be less than 15 metres radius centrally located in the roadway.

2. In sloping terrain, consideration may be given to the provision of an offset cul de sac with the head radius being tangential to the left hand or right hand kerbline. **Sloping Terrain**

3. Where the roadway is serving allotments which have been approved for Courtyard Housing Development, the cul de sac head treatment may be designed in accordance with Figure D1.12 **Courtyard Housing**

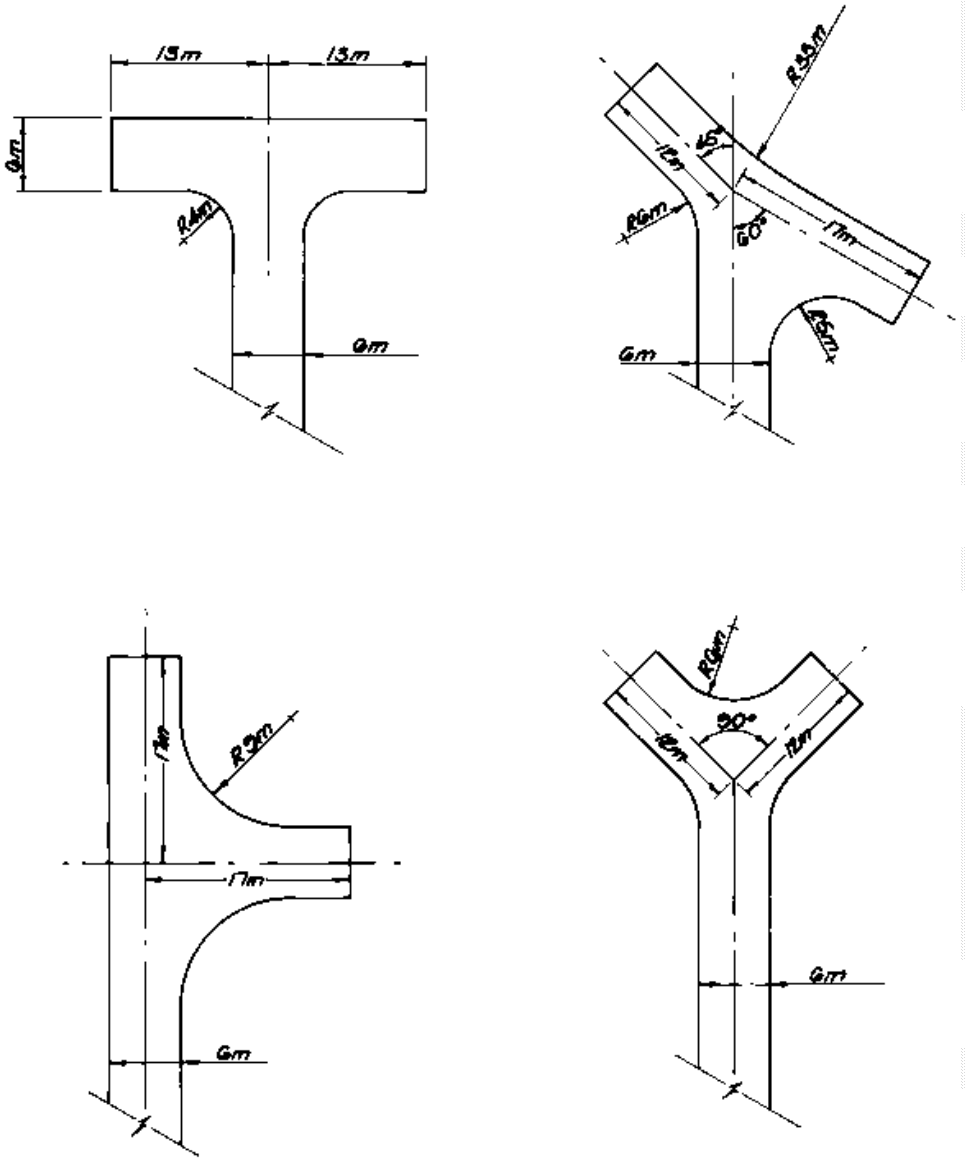


Figure D1.12
Cul de Sac Head Design for Courtyard Housing Development

D1.31 PUBLIC PATHWAYS AND LANEWAYS

Open Access Lane

1. An open access lane shall be provided between the closed end of Cul de sacs and a public road or public reserve where directed by Council at the development application stage. The width of the access lane shall provide for a useable open space which is able to be cater for a variety of future needs, and have multiple uses such as pedestrian access and service provision. The requirements of the relevant Development Control Plan for *Safe Design* shall be taken into account in designing the lane.

2. The access lane shall be cleared and formed with a minimum 1.2m metre wide concrete path, designed and located in accordance with design specification CYCLEWAY AND PATHWAY DESIGN. Provision shall be made for drainage within the access lane connected to the trunk drainage system.

Landscaping

3. The area between the concrete path and reserve boundaries shall be suitable landscaped in accordance with construction specification LANDSCAPING.

D1.32 SIGNS AND PAVEMENT MARKINGS

AS 1742

1. Signs and pavement markings shall be designed in accordance with AS 1742 and current guidelines published by NSW Roads and Maritime Services. All traffic control signs and pavement markings require the approval of the Local Traffic Committee prior to their installation.

Street Signs

2. Street name signs are to be cream reflectorised aluminium blades. Beaded top and bottom, with upper case wineberry letters 100mm high and shall be erected at all intersections. Where the signs are erected in footways, the minimum and maximum heights shall be 2.7 m and 3.0 m respectively, measured to the underside of the sign. The street name is to be obtained from Council's Natural and Built Character Group.

D1.33 OMITTED

D1.34 STREET LIGHTING

Street Lighting

1. Street lighting proposals are to be submitted to Council for concurrence prior to implementation. This action constitutes a **HOLD POINT.**

(HP)

2. Street lighting proposals shall specify the types of luminaries and columns to be utilised.
3. Street lighting shall be provided in accordance with AS/NZS 1158 and shall utilise best practice energy efficient globes approved by Essential Energy.

4. Street lighting columns shall be frangible.

ANNEXURE D1-A

STANDARD DRAWINGS

The following ACT Territory & Municipal Services (TAMS) standard drawings, as amended by Queanbeyan Palerang Regional Council (QPRC) are deemed to comply for the purposes of this specification.

Design Standards for Urban Infrastructure: Standard Drawings

DRAWING NUMBER	DATE / REVISION	TITLE	QPRC AMENDMENT / COMMENT
DS3 ROAD DESIGN			
DS3-01	Aug 02	Kerb & Gutter Standard Details – Sheet 1	Adopted by QPRC.
DS3-02	Aug 02	Kerb & Gutter Standard Details – Sheet 2	Adopted by QPRC.
DS4 ROAD VERGES			
DS4-01	Aug 02	Service Modules – Sheet 1 of 2	Adopted by QPRC.
DS4-02	Aug 02	Service Modules – Sheet 2 of 2	Adopted by QPRC.
DS4-03	Aug 02	Verge Gradients	Adopted by QPRC
DS4-04	Aug 02	Footpaths Service Modules	Adopted by QPRC.
DS5 DRIVEWAYS			
DS5-01	Oct 09	Domestic Driveways	Driveways shall be provided with both edges perpendicular to the property boundary from the lot frontage to the kerb unless otherwise approved by QPRC. Grade across footway shall be 4% unless otherwise approved by QPRC

DS5-02	Oct 09	Heavy Duty Driveways	Driveway Type HD1 shall be provided with both edges perpendicular to the property boundary from the lot frontage to the kerb unless otherwise approved by QPRC. Driveway Type HDR not used. Driveway Type HD2 used for commercial and industrial driveways only
DS5-03	Oct 09	Driveway Levels for 1 and 2 Metre Vertical Curves	Adopted by QPRC.
DS9 TRAFFIC CONTROL DEVICES			
DS9 Series not used by QPRC. Refer to AUSTROADS and RMS *AUSTROADS Guide Supplements* (2011) for details.			
DS11 FENCES, GUARDRAILS AND BARRIERS			
DS11-01	Aug 02	Standard Ranger Gate	Adopted by QPRC.
DS11-02	Aug 02	Vehicle Access Gate (Heavy Duty)	Adopted by QPRC.
DS13 PEDESTRIANS AND CYCLE FACILITIES			
DS13 Series not used by QPRC. Refer to AUSTROADS and RMS *AUSTROADS Guide Supplements* (Jan 2011) for details.			