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DEVELOPMENT DESIGN SPECIFICATION

D1

GEOMETRIC ROAD DESIGN (Urban and Rural)

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 requirement 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
1	IPWEA Mid North Coast Working Party Review of D2 15/9/2000	D01	AMO	HC	16/1/01
1	Complete the wording CI 4 and include missing page D1-10 P D1-9, D1-10	4	A, O	GS	June 2003
1	Note (4) P D1-30	Table D1-8	M	GS	June 2003
2	Concrete Paving PD1-20	D1-16 Point 6	M	JC	Jan 2005
2	Changes to carriageway and road reserve widths	Table D1-5	M	JC	Jan 2005
2	Street lighting P1-32 Change "North Power" to "The Electricity Authority"	D1-33	M	JC	Jan 2005
2	Added " <i>sites with a grade of</i> "	D1-06	A	NB	Jan 2006

2	Added text for footpaths off road reserve	D1-16	A	NB	Jan 2006
2	Survey extension limits adjusted.	Table D1.0	A	AS	Jan 2006
2	Battle Axe handle adjusted.	D1.31 Clause 3	A	AS	Feb 2006
2	Battle Axe handle adjusted.	D1.31 Clause 4	A	AS	Feb 2006

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DEVELOPMENT DESIGN SPECIFICATION D1 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. These specifications may also be used as a guide for the design of other Council related road infrastructure.
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 street speeds alone is contrary to the current principles of subdivision road design.
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.

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, flora, fauna and topography of the area.

D1.03 REFERENCE AND SOURCE DOCUMENTS**(a) Council Specifications**

All Specifications for Design and Construction.

(b) Australian Standards

.All relevant Australian Standards

(c) State Authorities

Roads and Traffic Authority NSW - Road Design Guide.
Department of Housing - Road Manual, 1987.

(d) Other

AUSTROADS Guide to the Geometric Design of Rural Roads.
 Guide Policy for the Geometric Design of Major Urban Roads.
 Guide to Traffic Engineering Practice:

- Part 1 Traffic Flow
- Part 2 Roadway Capacity
- Part 3 Traffic Studies
- Part 4 Road Crashes
- Part 5 Intersections at Grade
- Part 6 Roundabouts
- Part 7 Traffic Signals
- Part 8 Traffic Control Devices
- Part 9 Arterial Road Traffic Management
- Part 10 Local Area Traffic Management
- Part 11 Parking
- Part 12 Roadway Lighting
- Part 13 Pedestrians
- Part 14 Bicycles
- Part 15 Motorcycle Safety

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.

Joint Venture for More Affordable Housing - 1989: Australian Model Code 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.

Streets Opening Conference 2002, Guide to Codes & Practice for Streets Opening

D1.04 CONSULTATION

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.

D1.05 PLANNING CONCEPTS

1. 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 and type of traffic they are intended to carry, the desirable traffic speed, and other factors.

Road Hierarchy

2. The road pattern and width must be in conformity with that shown on any relevant area Development Control Plan. In areas not covered by these plans, the pattern and width(s) will be determined by Council on their merits.

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

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

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

Legibility

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.

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

D1.06 PLAN REQUIREMENTS**(a) Reduction Ratios**

1. All plans for urban and rural designs may be reduced to:

<i>Urban and Rural Residential</i>	
Plans	1:500
Longitudinal Section (Roads & Drainage)	1:500 horizontal 1:100 vertical
Kerb return profiles	1:200 horizontal 1:100 vertical
Cross Section	1:100 natural
Intersection Details Plans	1:200
Drainage Catchment Plans	1:1000
<i>Rural</i>	
Plans	1:1000 or 1:500
Longitudinal Section	1:1000 or 1:500 1:100 vertical
Cross Sections	1:100 natural

Complex plans and locations of service congestion may require large scale plans.

(b) Plan Sheets

1. Design plans shall comprise as separate sheets the following as a minimum;

- a. Cover sheets
- b. Plan views with existing and proposed contours
- c. Longitudinal sections
- d. Cross sections (including typical)
- e. Kerb return profiles and intersection detail plans (including contours)
- f. Specialised detail (including slip roads, special access, property adjustments etc)
- g. Structural details
- h. Standard drawings
- i. Contoured catchment plan
- j. Hydraulic and Hydrological calculations
- k. Sediment and Erosion Control Plan
- l. Landscaping
- m. Signage and Line Marking
- n. Water Reticulation
- o. Sewerage Reticulation

(c) Plan Presentation

- 1. Plans are to be presented on A1 sheets unless otherwise authorised. They are to be clear and legible and prepared in consistent lettering and style. Council has the authority to refuse plans that do not meet these drafting requirements. Plans copied from other works will not be accepted. All plans 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, plans 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. *Permanent Record*
- 2. Hand tracing will be accepted if it is of a professional standard prepared by a qualified and experienced drafts person. *Hand Tracing*
- 3. For uniformity of plan preparation and to facilitate filing and microfilming, all plan sizes, lettering, line work and symbols are to conform to the relevant part of the current Australian Standard – Technical Drawing (AS 1100).

(d) Certification

- 1. Plans shall bear the signature of the design consultant and shall where required by the Council be certified as complying with the appropriate design specifications (D1 to D12). The certificate shall be in the format detailed by Design Specification DQS Annexure A and DQS 4.01. *Design Consultant*

(e) Plan Views – Information to be Shown

- 1. All relevant design and topographical features must be shown. Contours are to be provided with maximum 1 m interval for sites with a grade > 15% and 0.5 m interval for sites with a grade of <15% *Contours*
- 2. All recovery pegs and description of bench marks with the reduced level thereof. (Temporary bench marks shall be established clear of any works at a maximum spacing of 200 metres with a minimum of one per project). *Bench Marks*
- 3. The pegged/design centre line chainages of the proposed drains and roads. *Centreline Chainages*
- 4. Any site regrading and/or filling. *Regrading/filling*
- 5. Details of proposed subsoil drainage lines. *Subsoil Drainage*
- 6. Information such as property boundaries, easements, rights-of-carriageway, lot numbers, deposited plan numbers and house numbers. *Property Detail*
- 7. Road names and Main Road numbers if applicable. *Road Names*
- 8. Proposed kerb and gutter alignment. *Kerb Alignment*

9. Where minor adjustment or extension to existing drainage structures is proposed, a note detailing the proposed work and the pit/bend hydraulic information may be considered adequate. A drainage longitudinal section would therefore not be necessary. *Minor Drainage Works*
10. The location of proposed drainage structures with pit or bend numbers corresponding with those shown on the stormwater drainage calculations and drainage longitudinal sections. *Drainage Structures*
11. Existing drainage structures including culvert sizes. *Existing Drainage*
12. Construction notes relating to adjustments of accesses, public utilities or other physical features or improvements. *Construction Notes*
13. Soil and water management control details. *Soil & Water Management*
14. North Point to define drawing orientation. *North Point*
15. Existing edges of the bitumen road surface and existing kerb and gutter. *Existing Roadworks*
16. All access crossing locations, approximate width and surface material type. *Access Crossings*
17. Utility Service conduits, cables, riser plant, pits, manholes and poles etc. *Utility Services*
18. Sewer reticulation mains, rising mains, pumping stations, manholes, lampholes and where relevant house junction locations. *Sewer Reticulation*
19. Water mains, including size and material type, location of bends, tees, hydrants, stop valves, etc, relevant to proposed works. *Water Reticulation*
20. Dimension and provide coordinates to MGA (where available) for all work to be carried out so that it may be set out and constructed without the need for scaling from the plan or for field assumptions. Preferably dimension to the centre line of carriageways and pipelines rather than to outer edges. Where possible, dimensions shall be from objects which are visible in the field, particularly if the object is actually a constraint, (eg a gully pit from an existing driveway, a pipeline from a property boundary peg etc). *Set Out Coordinates*
21. A "Sediment & Erosion Control Plan" showing location and details of erosion and sediment control devices.

(f) Longitudinal Sections – Information to be Shown

1. The details to be shown should include: *Roadworks*
- chainage
 - existing level on pegged centre line
 - design level on proposed centre line
 - vertical alignment on proposed centre line
 - Datum RL of longitudinal section
 - services
2. Where the survey is for only a section of road the longitudinal section shall be extended sufficient distance (at least 60 metres) in each direction to enable the design of grades at either end together with any vertical curves as per Table D1.0

Table D1.0: Survey Limits

Vehicle Speed	Survey Extension Past Existing
<50	60
50-75	90
75-90	120
>90	150

3. Longitudinal sections shall be provided for sufficient distance (at least 60 metres) along intersecting side roads to provide details of the proposed alignment and levels necessary to allow a satisfactory tie-in to the existing road carriageway.
4. The longitudinal section of a cul-de-sac shall be carried clear of any construction to the recovery peg on the prolongation of the centre line.
5. The longitudinal section of an offset cul-de-sac shall be curved to the centre of the turning circle and not a straight line with an offset to the centre.
6. The details to be shown for stormwater drainage will vary depending upon the location of the pipeline but should generally include:
- chainage and corresponding road centre line chainage if applicable;
 - pipe/drain invert level
 - existing surface level (also existing drain bed level if applicable)
 - finished surface level (may alternatively be described as future kerb level if in a street)
 - Pipe size, length, class plus material, joint type and type of bedding
 - Datum RL of longitudinal section
 - Pit/bend reference number
 - Design flow through the outlet pipe(s)
 - Recurrence interval of design flow (eg Q10)
 - Flow velocity (V)
 - Type of pit or bend proposed (eg junction pit, inlet pit, letterbox inlet pit, 45° mitre bend) together with the length of any kerb inlet (KI).
7. The hydraulic grade line (HGL) of the pipe and pit network shall also be plotted on the drainage longitudinal section. Where the HGL calculated is below the pipe obvert level the upstream pressure head change (Hp) shall be measured from the outlet pipe obvert level.
8. At the downstream end of the pipeline network the HGL shall commence at the highest level of either:
- the pipe obvert level
 - the water surface level in the outlet channel resulting from the design storm event

*Stormwater
Drainage***(g) Cross Sections – Information to be Shown**

1. The following information shall be shown:
- Offset distance from pegged/design centre line
 - Existing surface RL
 - Design Surface RL
 - Design water surface RL
 - Batter slopes (ratio)
 - Location of existing utilities/fences, etc
 - Typical Section (pavement detail)
 - Boundaries
2. In urban roads cross sections shall be at 15 metre maximum spacing on straight sections with chainages in multiples of 15 metres and 10 metres maximum on curves.
3. Extra cross sections shall be provided at the tangent points of curves.
4. For non-urban roads the spacing of cross sections shall be 30 metres on straight sections, 15 metres on curves and 10 metres on transitions.
5. Half sections shall be provided along the centre line of difficult accesses, (ie any access which requires adjustment to conform with Council's standard profile) to determine the extent of adjustments necessary. The access grades must be determined for the existing and proposed profile.
6. Extra cross sections are required at each transverse culvert location along the centre line of the proposed road.

Roadworks

7. Cross sections shall be provided for sufficient distance (at least 60 metres) along intersecting side roads to provide details of the proposed alignment and levels necessary to allow a satisfactory tie-in to the existing side road carriageway.

8. The above spacings are maximum and where necessary, extra sections should be provided at sudden changes of grade of the centre line to enable earthwork quantities to be calculated with reasonable accuracy.

9. Cross sections shall be provided in certain circumstances on pipelines outside the road pavement (eg in very steep country where there is a drop adjacent to the pipeline) or where the pipes are to be laid adjacent to a natural watercourse.

Drainage

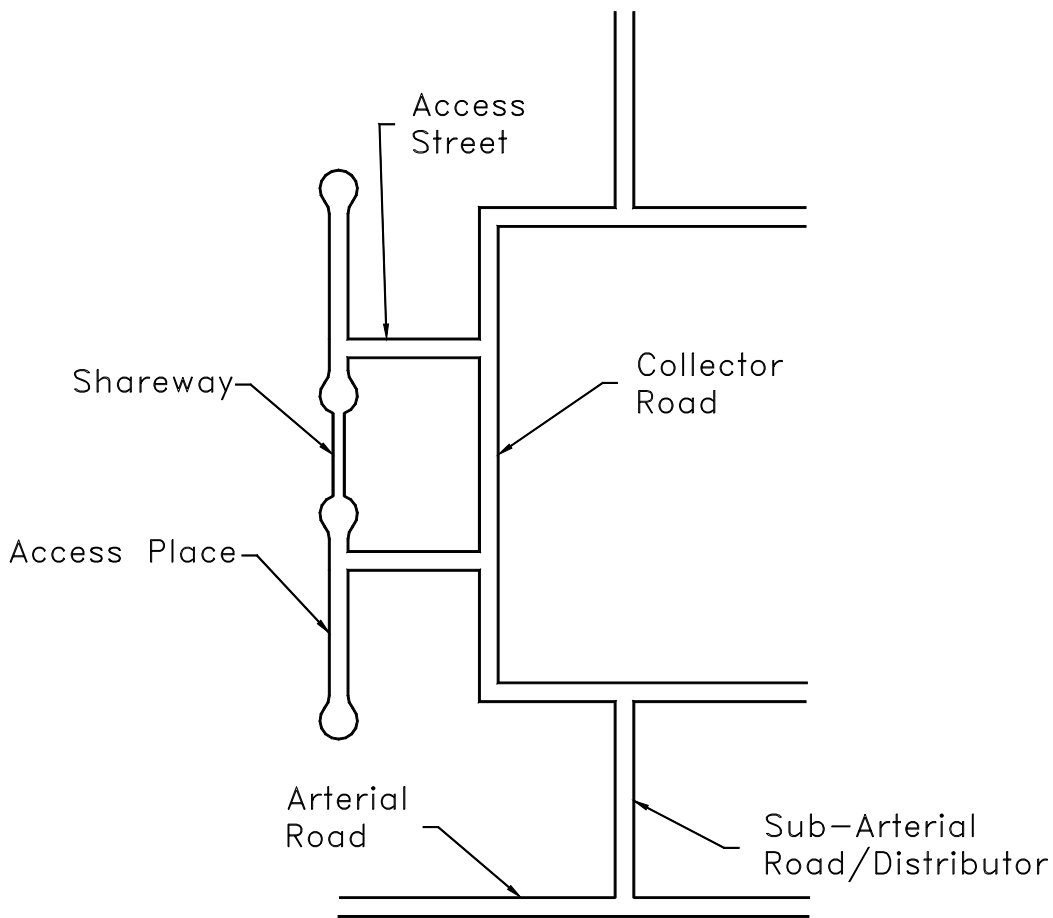
10. Cross sections will be provided at 20 metre intervals and at critical locations for major open channels.

11. Typical sections shall be provided for overland flow paths.

URBAN DESIGN CRITERIA

D1.07 ROAD HIERARCHY

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. Six distinct levels of roads are:

- Shareway
- Access Place or Cul-de-sac
- Access Street or local road
- Collector Road
- Sub-arterial/Distributor
- Arterial

3. **Shareway:** a minor road which carries the lowest volume of traffic, providing driveway access to no more than 3 lots on each side and forming a link between two access places. Vehicles, pedestrian and recreation use is shared, with design to encourage priority for pedestrians. The features of a typical shareway are shown in Figure D1.2.

Shareway

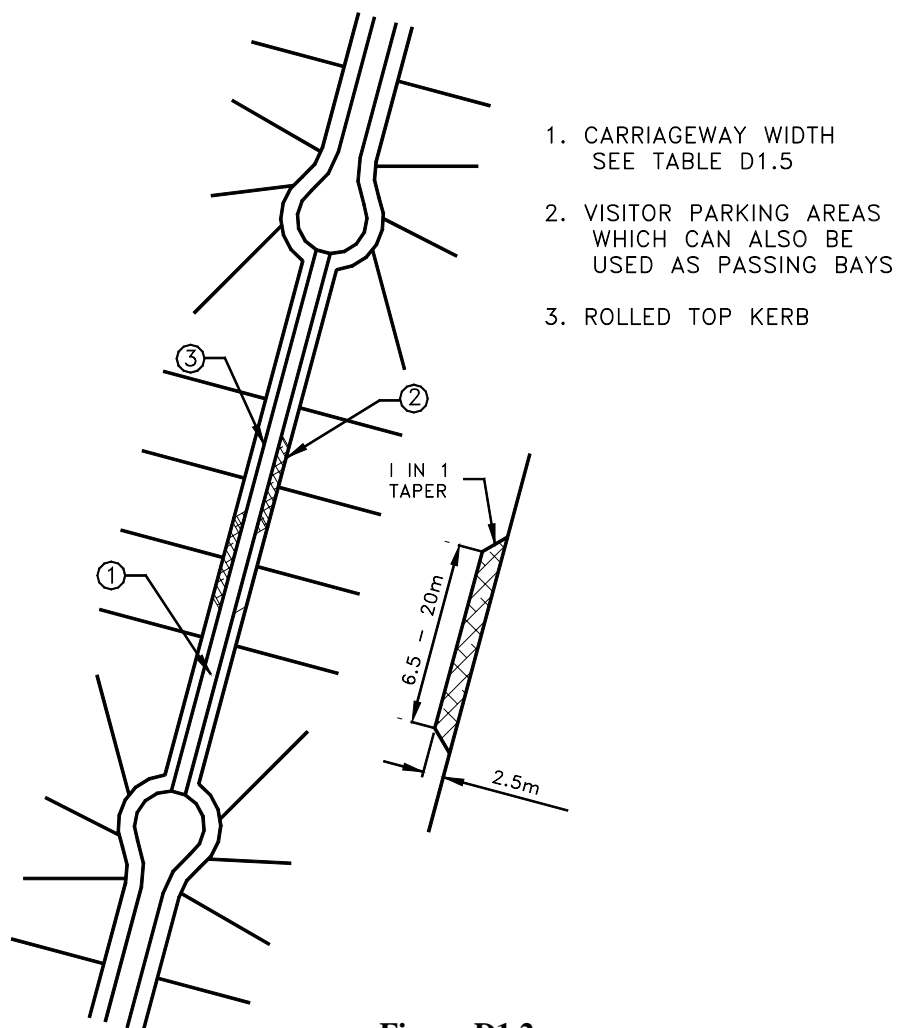
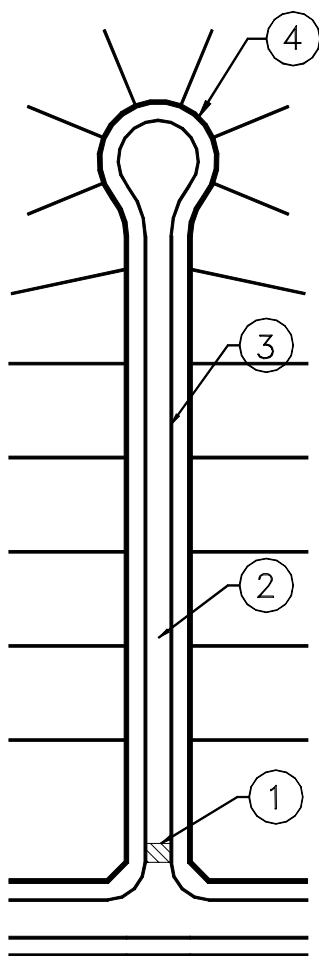


Figure D1.2
Shareway

4. **Access place or cul-de-sac;** a minor road which carries a low volume of traffic, providing direct access to a limited number of allotments. Vehicle, pedestrian and recreation use is shared, with pedestrians having priority. The features of a typical access place are shown in Figure D1.3.

**Access Place
or
Cul-de-sac**



- 1 Entry threshold to indicate lower speed environment
- 2 Carriageway width see Table D1.5
- 3 Roll top or layback kerb
- 4 For turning head configurations see standard drawings

Figure D1.3

Access Place / Cul-de-Sac

5. **Access street or local road;** a minor road which carries a higher volume of traffic and provides direct access to lots. Vehicles, pedestrian and recreation use is shared, with traffic access having priority. A typical local street is illustrated in Figure D1.4

Access or Local Road

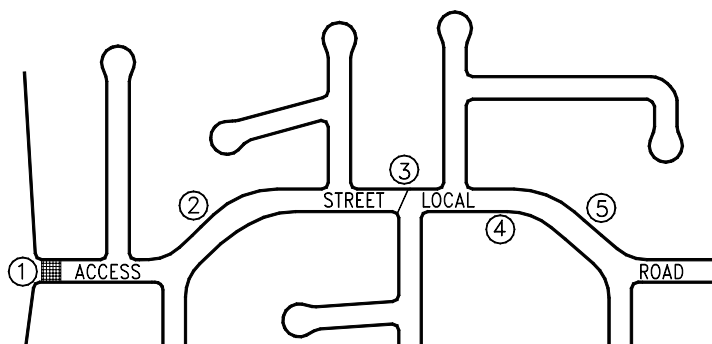


Figure D1.4

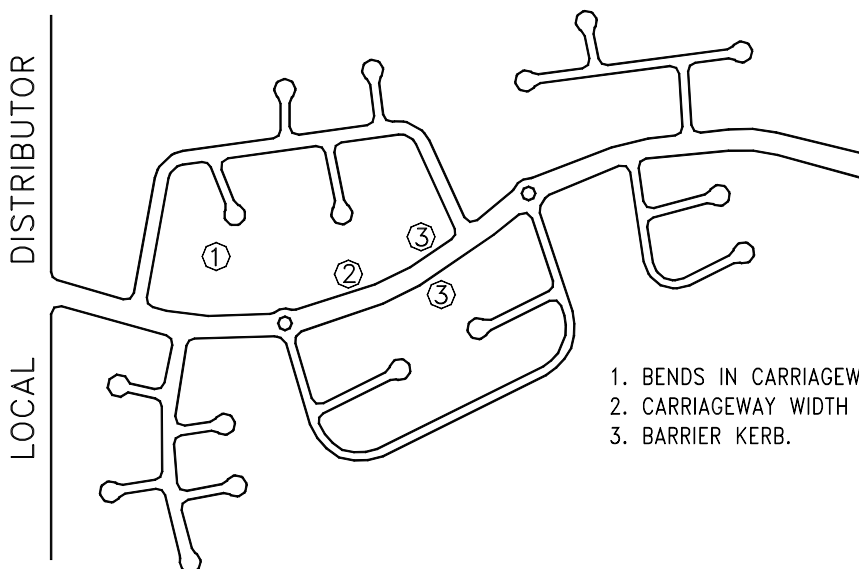
- 1 Entry threshold to indicate lower speed environment.
- 2 Bends in carriageway control speed.
- 3 Short sections of straight carriageway control speed

Access Street / Local Road

6. **Collector road:** a road linking access streets to major roads, possibly providing bus routes and giving restricted access to lots. A typical collector road is illustrated in Figure D1.5.

Collector Road

- * MAXIMUM VOLUME 6000 V.P.D.
- * MAXIMUM SPEED 60 KPH.
- * CARRIAGEWAY SHARED BY VEHICLES AND CYCLISTS.
- * AS A CUL-DE-SAC ARRANGEMENT SERVES APPROXIMATELY 16 Ha.



- 1. BENDS IN CARRIAGEWAY CONTROL SPEED.
- 2. CARRIAGEWAY WIDTH SEE TABLE D1.5
- 3. BARRIER KERB.

**Figure D1.5
Collector Road**

7. A **sub-arterial road/distributor** within a development should have as its main function the conveyance 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 distributor should serve only the development and should not attract through traffic. Figure D1.6 shows the layout of a sub-arterial road.

Sub-Arterial Road/Distributor

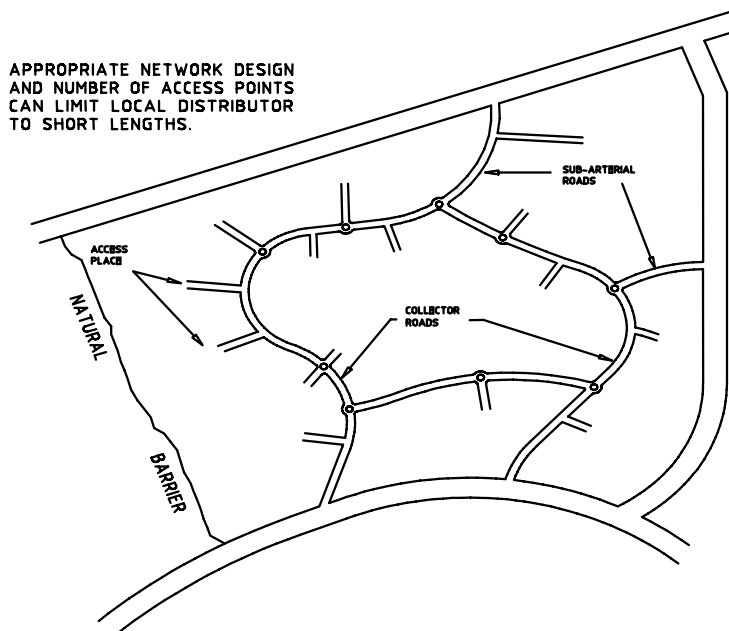


Figure D1.6 Sub-Arterial Road

D1.08 ROAD NETWORK

1. The design features of each type of road convey to the motorist its primary functions and encourage appropriate driver behaviour (refer Figure D1.2 to D1.6).
2. Traffic volumes and speeds on any road should be compatible with the residential functions of that road.
3. The maximum length of an access street should ensure that its status as a residential place is retained. The design speed and volume should enable the integration of pedestrian, cycle and vehicular movements. This length should also ensure that residential convenience is not unduly impaired as a result of speed restraints.
4. The length of sub-arterial roads within a development should be minimised.
5. The time required for motorists to travel on all streets within the development should be minimised.
6. Where access streets form part of a pedestrian or cycle network, access links should provide suitable connectivity with adjoining access streets or open space systems so as to ensure such pedestrian and cycle network are functionally efficient.
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 local street should have access to an access-controlled arterial road.

Cycleway

Road Links

8. Connections between internal roads should be T-junctions or controlled by roundabouts.

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

10. The external road network should be designed and located to provide routes which are more convenient for potential through traffic. Local distributor 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, see Table D1.5 for design speed

**Design
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

D1.10 LONGITUDINAL GRADIENT

1. A minimum gradient of 0.5 per cent should be adopted. The designer is required on the basis of hydraulic and geotechnical information to substantiate a lesser grade. Where underground drainage with gully pits or other special works are, variable crossfall may be necessary to produce the required grade in the gutter. Maximum recommended grades are shown in Table D1.5.

Flat Terrain

2. Design of the road alignment and the grades used through intersections are interrelated. A steep grade on a side street is undesirable if vehicles have to stand waiting for traffic in the priority road. Turning circles in cul-de-sacs on steep grades should have grades less than 5 per cent.

D1.11 HORIZONTAL CURVES AND TANGENT LENGTHS

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.
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).
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 RTA Road Design Guide.

Speed/Radius Relation

**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

**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	40	45	75	100	120	140	165
30	40	45	45	80	100	120	150
35	40	45	45	50	80	100	135
40	40	45	45	45	55	80	120
45	40	45	45	45	45	60	105

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

D1.12 VERTICAL CURVES

1. Vertical curves will be simple parabolas and should be used on all changes of grade exceeding 1 per cent. The length of the crest vertical curve for stopping sight distance should conform with RTA Road Design Guide. These standards are based on 1.5 seconds 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.

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

Riding Comfort

**Table D1.3
Minimum Length of Vertical Curves**

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

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.

Side Road

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 1.0 per cent should be maintained in the kerb and gutter. This may require some warping of road cross sections at sag points.

Sag Curve

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:

- 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 leave 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. Superelevation will generally be required for Arterial and Sub Arterial/Distributor Roads. 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 access roads which are designed for speeds of 40 km/h or less and with curves of 60 m 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.

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

Negative Crossfall

4. Recommendations for minimum curve radii (in metres) on Sub-arterial/Distributor and Arterial roads under varying superelevation/crossfall are shown in Table D1.4.

**Table D1.4
Minimum Curve Radii**

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

(Source: AUSTRROADS, 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

D1.14 CARRIAGEWAY WIDTH

- | | |
|--|---------------------|
| <p>1. The cross section of the road reserve must cater 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 streetscaping. Table D1.5 details carriageways and verge widths and road reserve widths.</p> | Functions |
| <p>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 including trucks, emergency vehicles and, on some roads, buses. (Refer to Clause D1.21 for bus routes.)</p> | Vehicles |
| <p>3. The safety of pedestrians and cyclists where it is intended they use the carriageway must also be assured by providing sufficient width.</p> | |
| <p>4. The carriageway width should also provide for unobstructed access to individual allotments. Motorists 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.</p> | Reversing |
| <p>5. The design of the carriageway should discourage motorists 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.</p> | |
| <p>6. Appropriate road reserve width should be provided to enable the safe location, construction and maintenance of required paths and public utility services (above or below ground) and to accommodate the desired level of streetscaping.</p> | Road Reserve |
| <p>7. The verge when considered in conjunction with the horizontal alignment and permitted fence and property frontage treatments should provide appropriate sight distances, taking into account expected speeds and pedestrian and cyclist movements.</p> | Verge |
| <p>8. Stopping sight distances and junction or intersection sight distances should be based on the intended speeds for each road type.</p> | |

**Table D1.5
Characteristics of Roads in Residential Subdivision Road Networks**

Category/ Characteristics	Shareway	Access Place	Local Street	Collector Road	Commercial	Industrial	Distributor	Sub Arterial	2 Lane Arterial	4 Lane Arterial
Maximum No of potential tenements or vehicles/day (vpd)	6 ET 60	30 ET 300	100 ET 2000	1000 ET 6000	NA 10000	NA 10000	NA 10000	NA 20000	NA >20000	NA >20000
Carriageway Width (m)	5	5.5 to 7	8	11	13	13	15	16	16	25(15)
Verge Width (m)	variable	4	4	4.5	5	5	4.5(min)	4.5(min)	4.5(min)	4.5(min)
Road Reserve Width (m)	8.5 (min)	13.5 to 15	16	20	23	23	24	25	25	34-(min 32)
Lanes (m)			4,4	2.5, 3,3,2.5 (17)	3,3.5,3.5,3	3,3.5,3.5,3	4,3.5,3.5,4	4.5, 3.5,3.5,4.5	3,1.5,3.5,3.5,1.5, 3	3,1.5,3,3.5,3.3.5,3.1.5,3
Lane Type (16)				P,L,L,P	P,L,L,P	P,L,L,P	P,L,L,P	PC,L,L,PC	P,C,L,L,P,C	P,C,L,L,M,L,L,C,P
Line Marking Required	Optional	Optional	Intersections Only (Traffic Calming)	Intersections Only Optional elsewhere (Traffic Calming)	Y	Y	Y	Y	Y	Y
Kerb Type	Optional (8)	Roll Top or (9) SE	Roll Top or (9) SE	Barrier/ SA	Barrier/ SA	Barrier/ SA	Barrier /SA	Barrier /SA		
Footpath	-	Optional	Optional	Y	CBD Paving	Y	Optional	Optional	N	N
Design Speed (km/hr)	15 max	25 max	40 max	50 max	50 max	50 max	60	80	100	110
Minimum Distance between	-	-	150	200	150	150	200	500	500	500

Intersection (m)										
Longitudinal Grading										
Max	20%	16% (10)	16%	12%	5%	10%	10%	10%	10%	10%
Min	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Crossfall	One-Way 3%	3% to 4%	3%	3%	3%	3%	3%	3%	3%	3%
Superelevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A if 60 km/hr	Required	Required	Required
Pavement Surface	Reinf. conc or (14) 40 mm thick AC	AC (11) or (14)	AC (11)	AC (13) 40 mm thick	AC 40 mm thick	Reinf. conc. or 40 mm thick AC	AC 40 mm thick	AC 40 mm thick	AC 40 mm thick	AC 40 mm thick
Pavement Design	5×10^4	7×10^4	5×10^5	1×10^6	10^7	10^7	3×10^6	10^7	10^7	By Traffic Analysis
Traffic ESA's	ESA	ESA	ESA	ESA	ESA	ESA	ESA	ESA	ESA	ESA

Notes:

- 1 One way daily volumes for interrupted traffic flow. To be calculated at 70% of design life
- 2 Other design criteria to be in accordance with RTA and AUSTRROADS Road Design Guidelines
- 3 ESA - Equivalent Standard Axles
- 4 Traffic Volumes to be estimated using RTA Guide to Traffic Generating Developments
- 5 ET – Equivalent Tenements (maximum number of tenements per street)
- 6 VPD includes total catchment of vehicles ie all lower road categories to be included
- 7 Roundabouts pavement design to be 5×10^7 ESA's
- 8 Edge restraints are required each side if pavement is AC
- 9 Roll kerb SE & SA – refer to Standard Drawing
- 10 >16% and <20% to be constructed in R. Conc. (to prevent shoving)
- 11 Prime coat (single coat 7 mm seal) + 25A.C. or 40 mm A.C without seal
- 12 If 9m then must have 1m indented bus bays
- 13 Including 7 mm prime seal
- 14 Concrete pavers
- 15 Upgrade of existing 2 lane to a 4 lane can have a carriageway width of 22.5 m by reducing the median width to 0.5
- 16 Lane Type: P-Parking C-Cycleway L-Travel Lane
- 17 P-2.3 min Aust Roads Standard

D1.15 CROSSFALLS

1. Desirably, roads should be crowned in the centre. Typical pavement crossfalls on straight roads are show in Table D1.5.
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 cross falls. Sustained crossfalls should not exceed 4 per cent. The rate of change of crossfall should not exceed: 6 per cent per 30 m for through traffic; 8 per cent per 30 m for free flowing turning movements; or 12 per cent per 30 m for turning movements for which all vehicles are required to stop.
3. The crossfall on a collector or distributor road should take precedence over the grade in side streets. Standard practice is to maintain the crossfall on the priority road and adjust the side road 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 difference of change of grade of two per cent in the kerb line of the side street relative to the centre line grading is a reasonable level.
4. Crossfalls on roundabouts should generally be in the range of $\pm 3\%$ to ensure rider comfort.

Offset Crown Changes**Priority Road****D1.16 FOOTWAY AREAS**

1. A suitable design for the footway will depend on utility services, the width of pathways, access to adjoining properties, likely pedestrian usage and preservation of trees. Low level paths are undesirable but may be used if normal crossfalls are impracticable. Crossfalls in footway paving should not exceed 2.5 per cent, as above this paving can be slippery. Longitudinal grade usually parallels that of the road and this may be steeper than 5 per cent. Refer to Austroads Part 13 Pedestrians. For utility service allocations refer to guide to Street Openings.
2. Desirable cut and fill batter slopes are 1 in 6, with an absolute maximum of 1 in 4. Any variation to this to avoid excessive batter width in private property or excess excavation in road shall be site specific at the discretion of Council.
3. Differences in level across the road between property boundaries at the discretion of Council may be accommodated by:
 - Cutting at the property boundaries on the high side and providing the footway at normal level and crossfall.
 - Battering at the property boundary over half the footway width with the half against the kerb constructed at standard crossfall.
 - A uniform (one-way) crossfall across the carriageway.
 - The lower footway being depressed below the gutter level.
4. The above measures can be used singularly or combined. The footway formation should extend with a 0.5 m berm beyond the road boundary if site conditions warrant..

Utility Services**Batter Slopes****Options**

5. Concrete paths 1.2 m minimum width must be provided if warranted by pedestrian traffic or identified by Council's strategic plan. Paving is to extend to kerb line and is to be provided with a standard disabled persons access ramp. For location and detail refer to standard drawings. Conduits for property stormwater drainage are to be installed prior to the construction of concrete paths.

Path Width

6. Location of the foot paving shall be 1.2 m minimum from the back of kerb line. Concrete paving to be 100 mm thick unreinforced or 125mm thick reinforced with SL72 fabric minimum. Paving shall be thickened to 150 mm and reinforced with SL72 at residential driveways minimum. Transverse joints to be placed at 2.0 metre spacing and expansion joints at 6.0 metre spacing. Bedding is to be 25 mm of crusher dust. Alternative paving thicknesses in excess of those specified will be required at points of ingress or egress at commercial or industrial areas.

Path Thickness

7. For foot paths that fall outside the road reserve refer to D9.10.

**Off Road
reserve
Footpaths**

D1.17 INTERSECTIONS AND TURNING AREAS

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 sub-arterial roads.

Traffic Volumes

2. Intersection design for the junction of subdivision roads with existing main rural, main urban and state highways should generally be designed in accordance with the publication AUSTRROADS Guide to Traffic Engineering Practice, PART 5, Intersections at Grade.

Main Roads

3. Intersections with main roads, tourist roads or state highways are to be designed and constructed in accordance with the requirements of the Roads and Traffic Authority.

**Tourist Roads
State Highways**

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 direct surface drainage.
- Two side streets intersecting a major street in a staggered pattern should have a minimum centre-line spacing of 40 m where a left turn/right turn manoeuvre between the streets is likely to occur frequently.
- At no closer than 200 metres to the next intersection to allow for future planning of traffic lights, roundabouts, or alternative traffic flow treatments.

6. Adequate stopping and sight distances are to be provided for horizontal and vertical curves at all intersections.

- 7. Where required, appropriate provision should be made for vehicles to park safely.
- 8. In cul-de-sac streets adequate provision should be made at the end of the road for vehicle types which frequently use the streets to turn around. The likelihood of parked vehicles obstructing turns should be minimal.
- 9. The drainage function of the carriageway and/or road reserve must be satisfied by the road reserve cross-section profile.

10. Verge width at intersections is the highest value of the following minimum:

Verge Widths

- The minimum width necessary to accommodate services, 1.2 m wide footpaths verge parking and the desired level of landscaping.
or
 - The minimum width necessary to satisfy acceptable noise levels.
or
 - The minimum verge width necessary to provide an acceptable level of safety for pedestrians and vehicles reversing from driveways onto roads with frontage access as specified below for the various speeds.
- | | |
|-------------------|-------|
| 10 km/h | 2.5 m |
| 20 km/h | 3.5 m |
| 30 km/h or higher | 4.0 m |

11. All vehicle turning movements are accommodated utilising AUSTRROADS Design Vehicles and Turning Templates, as follows:

Turning Movements

- For turning movements involving local distributor roads, the "design semi-trailer" with turning path radius 15.0 m @ 0 to 5 km/h.
- For turning movements involving local streets or collector streets, but not distributor roads, the "design single unit" bus with turning path radius 13.0 m.
- For turning movements on access streets but not involving distributor 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 streets sufficient area is provided for the "design single unit" truck to make a three-point turn.

12. Turning radii at intersections or driveways on a sub-arterial road should accommodate the intended movements without allowing desired speeds to be exceeded.

Turning Radii

13. On bus routes all intersections shall provide for bus turning movement.

Bus Routes Kerb Radius

14. The standard radius of a kerb return is 8 m based on a 4 m by 4 m splay corner and a standard 4 m verge width. Variation of the radius may occur if the dimensions of a splay corner and/or width of verge change.

15. The radius of the cul-de-sac head shall be 8.5 metres minimum. Cul-de-sac head diameter requirements shall be confirmed with the local fire authorities within bushfire prone areas to ensure emergency vehicles can manoeuvre.

Cul-De-Sac Heads

16. The longitudinal profile of the kerb and gutter surround of the cul-de-sac head shall be based on the adoption, as far as practical, of the standard 3% carriageway crossfall at critical points in the arc length with easing of changes in grade by designed vertical curves as required. Off-centre cul-de-sac heads shall be designed by offsetting the road carriageway crown to create symmetrical conditions with the kerb return longitudinal profile being designed accordingly.

17. Downhill cul-de-sacs should be avoided and the length of cul-de-sacs limited to a maximum length of 150 metres or 30 ET's.

18. It may be necessary to give special consideration to the design of kerb longitudinal profiles for cul-de-sacs which drain to the head. Standard procedures are to be followed as a preliminary design to locate the low point in the gutter at the head and this design is to be compared with the layout of the proposed development obtaining access from the paved area.

D1.18 ROUNDABOUTS

1. Roundabouts are to be approved by the Council and the Roads Traffic Authority (if required).

2. Roundabouts should generally be designed in accordance with the requirements of the publication AUSTRoads Guide to Traffic Engineering Practice - PART 6 Roundabouts. Designs adopting alternative criteria will be considered on their merits. Roundabout design should generally comply with the following:

- 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.

***Approach
Speed***

D1.19 TRAFFIC CALMING

1. Traffic calming should be achieved by subdivision layout and geometry. If warranted calming devices such as thresholds, slowpoints, speed humps, chicanes and splitter islands should be designed in accordance with the requirements of the publication AUSTRoads Guide to Traffic Engineering Practice - PART 10, Local Area Traffic Management and are to be approved by Council. Device design should generally comply with the following:

(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 generally consistent with streetscape requirements
- existing street lighting, drainage pits, driveways, and services may decide the exact location of devices
- slowing devices are optionally located at spacings of 100-150m.
- locations should take account of pedestrian desire lines.

(c) Design Vehicles

- emergency vehicles must be able to reach all residences and properties
- access streets with a 'feeding' function between arterial roads and minor access streets might 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 Local Area Traffic Management (LATM) principles, building construction traffic must be catered for.
- cycleways must be accommodated in all devices on planned cycleway routes.

Design Vehicles**(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

Vehicle Speeds

(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 distances 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.

Visibility**(f) Critical Dimensions**

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

pavement narrowings

- single lane 3.0 m between kerbs
- 3.25 m between obstructions
- two lane 5.0 m minimum between kerbs

- bicycle lanes width shall be 1.5 m minimum width. Adjacent to pavement narrowings 1.0 m minimum
- 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
 - 1.0 m maximum

Bicycle Lanes

(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

1. The parking requirements for normal levels of activity associated with any land use should be accommodated on-site.
2. All on-site parking should be so located and of such dimensions that allow convenient and safe access and usage.
3. Adequate parking should be provided within the road reserve for visitors, service vehicles and any excess resident parking since a particular dwelling may generate a high demand for parking. Such parking is to be convenient to dwellings.
4. 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.
5. On single lane access streets parking spaces should be provided within the verge.

Resident Parking

Such parking should be well defined and an all-weather surface provided.

6. Parking spaces provided on the verge or carriageway should be of adequate dimensions and provide safe access.

7. For non-residential land uses the opportunity for joint use of parking should be maximised by being shared by a number of complementing uses. **Joint Use**

8. All verge spaces and indented parking areas are constructed of concrete, interlocking pavers, lawn pavers, bitumen with crushed rock or other suitable material and are designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces, including garbage trucks. **Verge Spaces**

9. Right-angled parking is provided only on access streets and local streets where speeds do not exceed 40 km/h.

10. The number of on-site parking spaces for non-residential land uses conforms to parking standards as determined by Council.

11. The layout and access arrangements for parking areas for non-residential land uses should conform to Australian Standard 2890.1 and Council's Parking Code

D1.21 BUS ROUTES

1. Bus routes will normally be identified by Council. It is important that the road hierarchy adequately caters for buses. The main criteria in determining the location of bus routes is that *no residents should have to walk in excess of 400 metres* to catch a bus. Normally roads above the access street in the hierarchy are designed as bus routes. **Buses**

**Table D1.6
Bus Route Criteria**

Road	Carriageway Width (min)	Stops (Spacing)	Bays
Collector	11m	400 metre	Indented
Sub-Arterial	13m	400 metre	Shelters*
Arterial	13m	400 metre	Shelters and Bays

* Shelters are subject to Council's requirements.

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 rural subdivisions inclusive of rural homesites and hobby farms types of developments. Rural subdivisions that are required to have kerb and gutter, inground stormwater drainage, etc are to be designed to urban criteria.

2. Design 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 AUSTRROADS Guide to the Geometric Design of Rural Roads.

Design Speed

3. Where appropriate, superelevation, widening and centreline shift and their associated transitions are to comply with the RTA Road Design Guide or AUSTRROADS Guide.

4. All rural subdivisions should be designed to deny access to major roads.

5. Access should be limited to one point onto local, arterial or main road networks.

Access

6. In rural residential subdivisions suitable measures must be placed to ensure no scouring occurs. Such measures may include concrete dish drains, kerb and gutter and turfing. The measures required will be determined on the basis of geotechnical assessment. Reference is made to Standard Drawing SD 48. Sealed shoulders are required adjacent to concrete dish drains.

Rural Residential Table Drains

D1.23 SIGHT DISTANCES

1. Stopping and minimum sight distance requirements are to comply with the RTA Road Design Guide or Austroads Guide to the Geometric Design of Rural Roads.

Stopping and Sight Distance

D1.24 HORIZONTAL AND VERTICAL ALIGNMENT

1. Horizontal and vertical curves are to be designed generally to the requirements of AUSTRROADS - Guide to Geometric Design of Rural 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.

D1.25 INTERSECTIONS

1. Intersections should generally be designed in accordance with the publication AUSTRROADS 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 D1.7 below. The type of intersection required will depend on existing and planned connecting roads.

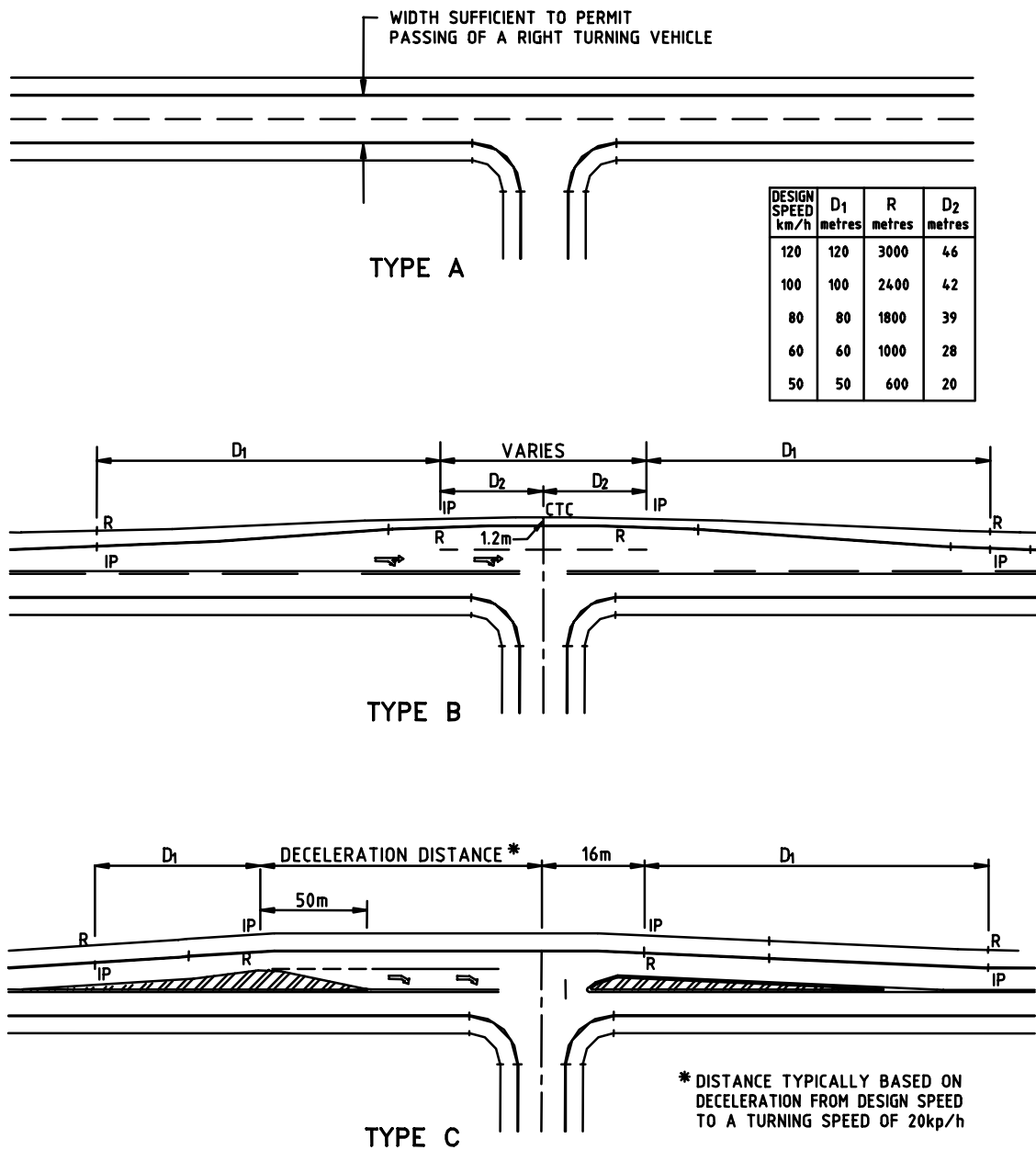


Figure D1.7
Typical Rural Intersection Treatments
 Source: AUSTRoads Part 5 – Intersection at Grade

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). 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 the 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 AUSTRROADS Guide Intersections at Grade. Repositioning of an intersection may be required to obtain conformance with the sight distance criteria.

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-intersection. Figures and discussion on staggered-T treatments are given in Part 5 of the AUSTRROADS Guide, Intersections at Grade.

***Staggered T
Intersections***

4. Roundabouts where approved by Council are to be designed in accordance with Part 6 of the Austroads Guide – Roundabouts

Roundabouts

D1.26 PLAN TRANSITIONS

1. A plan transition is the length over which widening and shift is developed from the "tangent-spiral" point to the "spiral-curve" point; ie, 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 (refer to Austroads Guide to the Geometric Design of Rural Roads).

***Widening of
Curves***

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 per cent relative to the centre line 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.

***Crossfall
Changes***

D1.27 CARRIAGEWAYS

1. Carriageway widths for rural roads should generally be in accordance with Table D1.8.

2. In the case of a rural residential subdivision, the provision of a sealed access road connection with at least a six metres wide seal on an eight metres wide formation may be required between the proposed subdivision and nearest existing sealed public road.

***Access Road
Connection***

3. Road shoulders shall be constructed as an extension of the road pavement and with similar road pavement material.

Road Shoulder

D1.28 SUPERELEVATION

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 AUSTRROADS Guide to Geometric Design of Rural Roads for superelevation calculation. At low and intermediate ranges of design speed (ie below 80 km/h) it is desirable to superelevate all curves at least to a value equal to the normal crossfall of straights.

Design Speed

D1.29 SCOUR PROTECTION

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, or any combination of these. Geotechnical investigations should be carried out to determine the level and extent of any protection works prior to proceeding to final design stage.

Table D1.8
Characteristics of Roads in Rural Residential and Rural Subdivision Roads

Category Characteristics	1 Rural (1) Laneway	2 Local Minor	3 Local Major	4 Collector	5 Arterial	6 Rural/ Residential
Maximum No of potential Tenements	12ET	50 ET	150 ET	150 to 500 ET	NA	100ET
Vehicles/Day (vpd)	0 to50	51 to 200	Over 200	>2000		400
Carriageway width & seal type	4 (gravel) (A)	6 (sealed) (D)(4)	6 (sealed) (D)	9 (sealed) (D) (7 m carriageway edge marked)	9 (sealed) (D) (7 m carriageway edge marked)	6 (sealed) (D)
Shoulder (C)	1	1	1(E)	1 (sealed)	1.2 (1.0 sealed)	1 (E)
Road Reserve	Existing	20	20	20	30	20
<i>Design Speed (km/h).</i>						
Min	20	40	60	60	80	40
Desirable	40	60	80	80	100	60
Longitudinal Max	16%	16%	12%	12%	12%	16%
Grading Min	1%	1%	1%	1%	1%	1%
Crossfalls - Normal	3%	3%	3%	3%	3%	3%
Superevaluation Max	N/A	Required	Required	7%	Required	NA
Pavement Design ESA's	5 x 10 ⁴	10 ⁵	5 x 10 ⁵	5 x 10 ⁵	10 ⁷	5 x 10 ⁵

Notes:

- A These roads to be widened locally at blind crests and curves and provide passing bays (6 metres wide) within sight distance of each point and not greater than 300 m apart.
- C Passing and auxiliary lanes and all other criteria as per the RTA Road Design Guidelines and AUSTRROADS - Intersections at Grade
- D Minimum requirements for sealing of rural road pavements shall be:
14 mm/10 mm two coat flush seal
- E Scour protection in table drains –see spec D1
- ET Equivalent Tenements
- VPD Vehicles per day
- ESA Equivalent Standards Axles

- (1) For existing road reserves – if there is potential for further properties then classification will be local minor
- (2) All roads >16% to be sealed
- (3) The width of the road formation includes carriageway, shoulder and table drains
- (4) Where the new road is an extension of or intersects with an existing sealed road

SPECIAL REQUIREMENTS

D1.30 RURAL ROAD DRAINAGE REQUIREMENTS

- | | |
|--|---|
| <p>1. The road formation shall be kept free of all stormwater by provision of crossfall on straights and superelevation on curves, and the construction of table drains of adequate capacity.</p> | <p>General</p> |
| <p>2. Water is to be removed by mitre drains from the road table drains at frequent intervals, particularly on steep grades and suitable discharged into adjoining properties at points of natural flow.</p> | <p><i>Table Drains and Mitre Drains</i></p> |
| <p>3. In rural residential subdivisions where road drainage would discharge onto land other than a defined natural watercourse an easement shall be provided. Such easements will generally be 3 metres wide (minimum) and extend to the defined natural watercourse. Pipes should extend a minimum of 30 metres into the lots and the remainder of the open drain suitably formed to ensure flow to the natural watercourse. Treatments to prevent scouring and erosion of the open drain shall also be undertaken.</p> | <p><i>Drainage Easements</i></p> |

D1.31 PROPERTY ACCESS

- | | |
|---|---|
| <p>1. Driveways are to be constructed to each property according to the following specification:</p> <ul style="list-style-type: none"> - 3 metres wide at the property boundary; - 5 metres wide at the edge of the bitumen; - 150 mm thick approved gravel; - minimum 375 mm diameter RCP and headwalls through the table drain with these increased to minimum 450 mm diameter RCP in treed areas. | <p><i>Property Access Rural Lots</i></p> |
| <p>2. To ensure safe and practical access to dwellings on rural lots, the maximum desirable longitudinal grade for accesses is 12%. Accesses with longitudinal grade greater than 15% are to be sealed. The maximum permissible grade is 25%.</p> | <p><i>Driveways on Rural and Rural Residential Lots</i></p> |
| <p>3. Road design must ensure that access to all properties is achievable. The desirable maximum grade for driveways is 12%, with a maximum permissible grade for a sealed driveway being 20%.</p> | <p><i>Property Access to Urban Lots</i></p> |
| <p>4. All rights of way and access corridors for battle axe blocks shall have a concrete driveway constructed to the satisfaction of Council in conjunction with civil works required for subdivision. The driveway shall be a minimum 3 metres wide, and is not to service more than 3 lots.</p> | <p><i>Combined Rights of Way and Access Corridors to Urban and Rural Residential Lots</i></p> |

D1.32 STREET FURNITURE

- | | |
|--|---------------------------|
| <p>1. The position of street name signs shall be detailed on the plans generally as shown on Standard Drawing SD 54.</p> | <p>Signs</p> |
| <p>2. Guideposts shall be required on all rural roads and where required by Council on urban roads. Posts shall be supplied and placed in accordance with the Roads and Traffic Authority Road Design Guide.</p> | <p>Guide Posts</p> |
| <p>3. Guard rail shall be required in all rural and urban roads where warrant is established according to the Roads and Traffic Authority road Design Guide.</p> | <p>Guard Rail</p> |

D1.33 STREET LIGHTING

1. All urban subdivisions shall provide lighting in accordance with the Electricity Authority and relevant Australian Standards. Consideration will be given to alternative decorative lighting to be approved by Council. All intersection shall have lighting to the appropriate standards. *Street Lighting*

D1.34 LINEMARKING AND SIGNAGE

1. Linemarking of paved surfaces in rural roads, car parks, driveways and some urban roads will be required. Rural road line marking will be on centre line and edges in accordance with the Roads and Traffic Authority standards. *Linemarking*

2. Traffic control and advisory/regulatory signs are to be provided in accordance with the appropriate Australian Standards *Signage*

D1.35 LANDSCAPING

1. All subdivisions shall provide landscaping in accordance with Development Design Specification D11 Landscaping *Landscaping*

