NEW SOUTH WALES

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 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
1	Council's standard drawings as stated in Clause D1.30 take precedence over the provisions of this specification		A	IA	Initial
2	Characteristics of Roads in Residential Road Networks. Refer Clause D1.31	D1.14	A	IA	Initial
3	Rural residential – definition by size of lot. Refer Clause D1.32	D1.22	A	IA	Initial
4	Rural Roads – Carriageways. Refer Clause D1.33	D1.27	A	IA	Initial
5	Standards for 4m wide gravel roads and rights-of-way. Refer Clause D1.27 and D1.34	D1.27	A	IA	Initial
6	References to Austroads should refer to the relevant clauses of the 2009 versions of Guide to Road Design and Guide to Traffic Management	Various	M	IA	Jan 2013
7	Standards for carparks and driveway. Refer Clause D1.35	D1.20	A	IA	March 2013
8	Various minor amendments	Various	A & M	IA	Aug 2020

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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 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. On kerbed roads, it is the area between kerbs. On unkerbed roads it is the travelling lanes and excludes the shoulders
Footpath	-	The paved section of a footway (verge).
Pathway	-	A public way reserved for the movement of pedestrians and of manually propelled vehicles (AMCORD verge).
Pavement	-	That thickness of a carriageway and shoulder 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.
Verge or Footway	-	That part of the road reserve between the carriageway plus shoulder 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.

(b) Australian Standards

AS 1348.1	-	Road and traffic engineering – Glossary of terms, Road design and construction.
AS 2890.1	-	Parking facilities: Off-street car parking.
SAA HB69.14	-	Guide to traffic engineering practice - Bicycles.
AS/NZS 3845	-	Road safety barrier systems.

(c) State Authorities

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

(d) Other

AUSTROADS Guide to Road Design and Guide to Traffic Management, Nov 2009

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. ***Council, Other Authorities***

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

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. ***Public Utilities***

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 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 Development Control Plan. In areas not covered by these plans, the pattern and width(s) will be determined by Council on their merits. ***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 species should be selected for plantings in association with road reserve works. ***Landscaping, Salinity Prevention***

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	1:500 H 1:100 V
Cross Sections	1:100 Natural

(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

(c) Drawing Presentation

1. Drawings 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 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 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 in Annexure DQS-A of the Specification for QUALITY ASSURANCE REQUIREMENTS FOR DESIGN. ***Design Consultant***

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. ***Functionality***

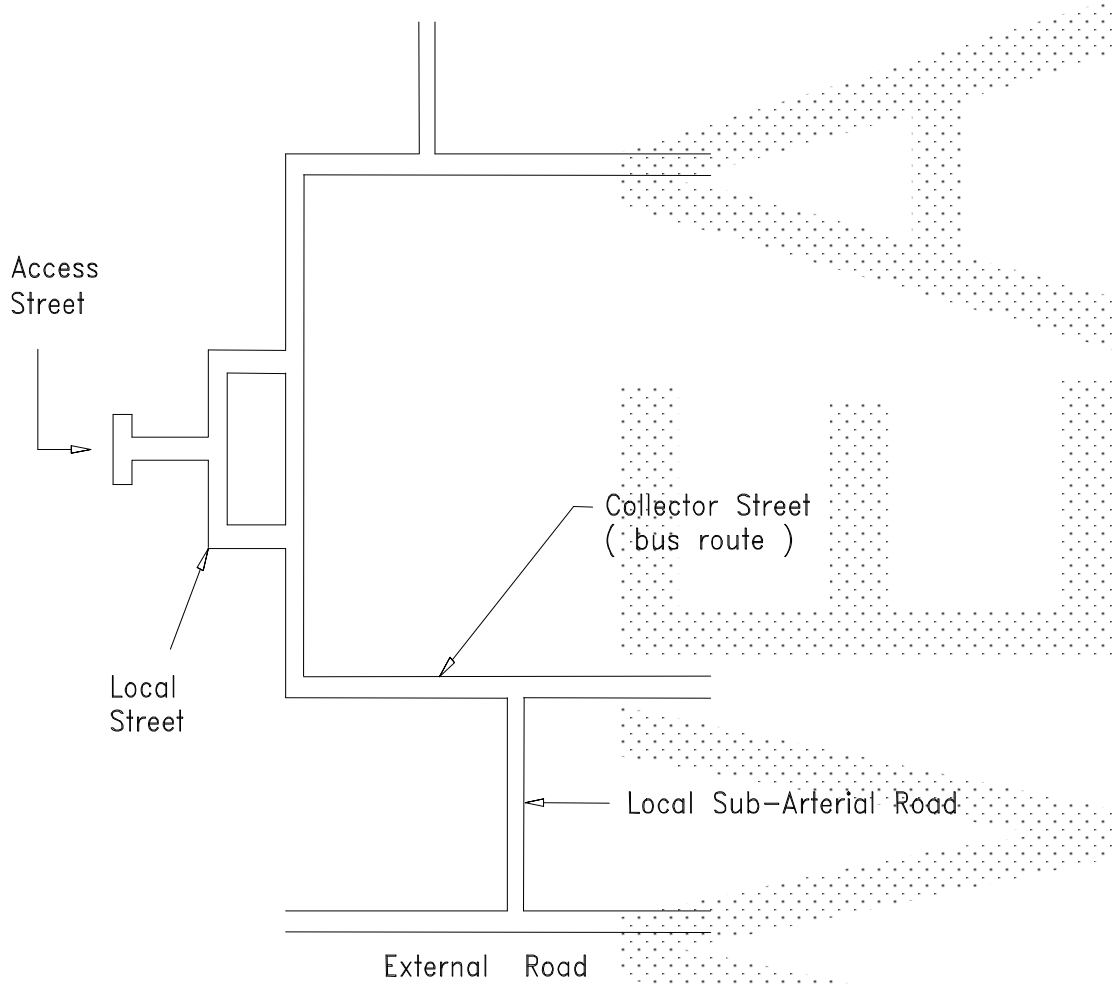

Figure D1.1 - Typical Road Hierarchy

2. Four distinct levels of roads are:

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

Access Street

3. 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.

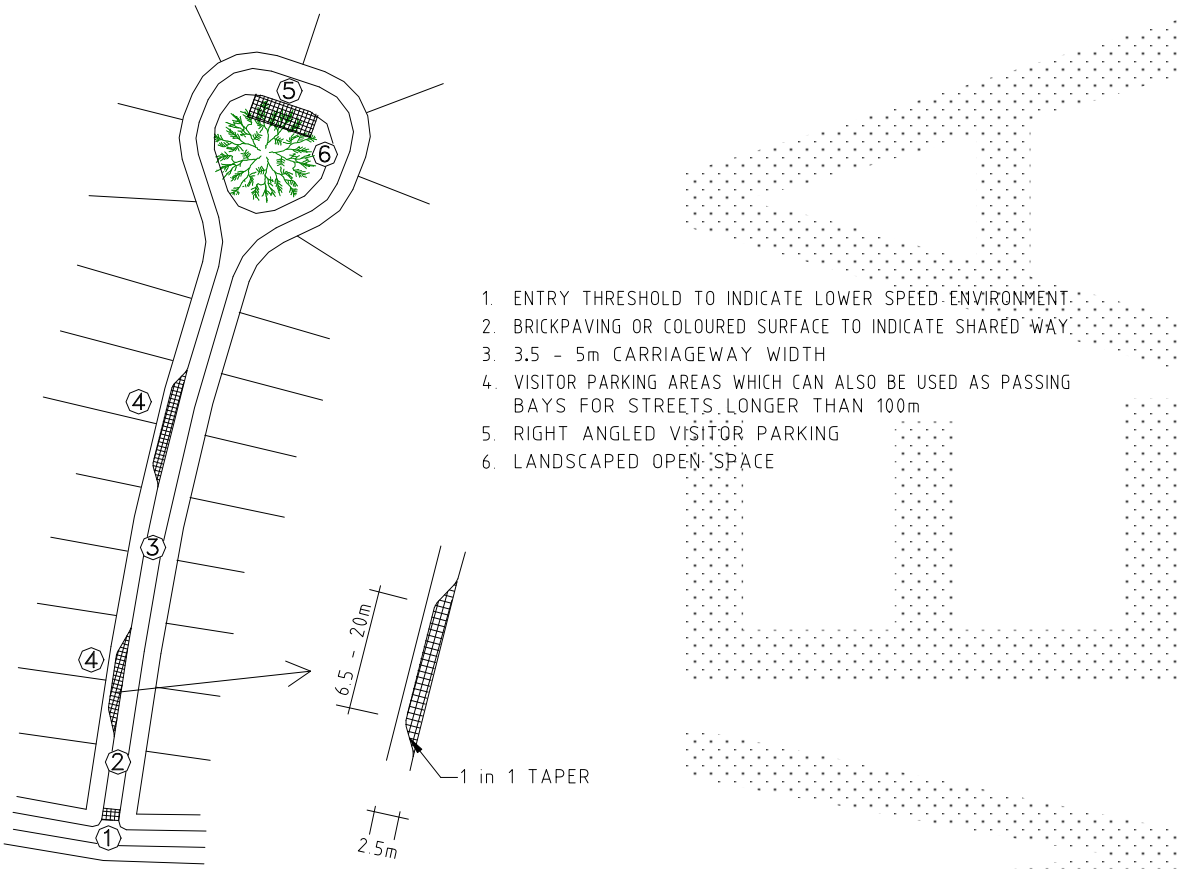

Figure D1.2 - Access Street

Local Street

4. 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 D1.3.

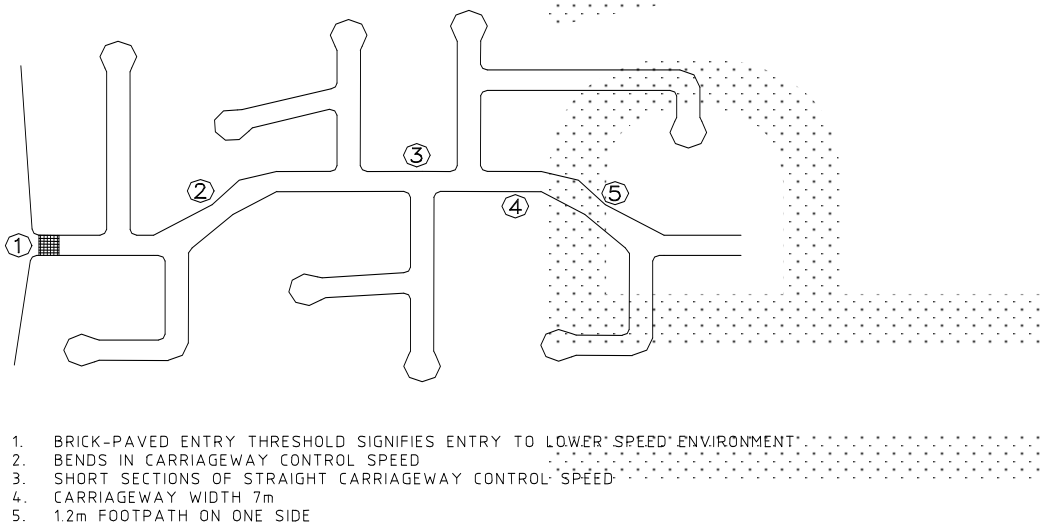

Figure D1.3 - Local Street

5. 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 D1.4.

Collector Street

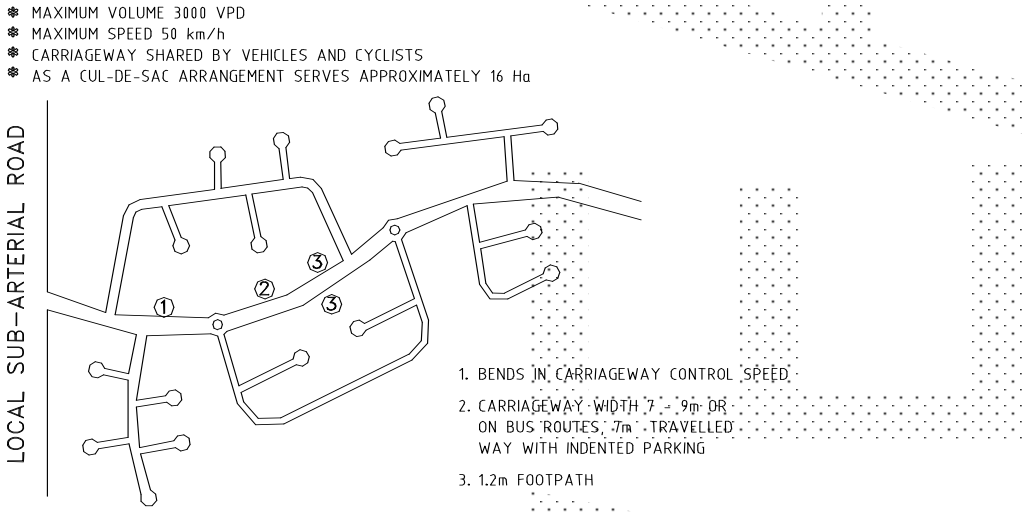

Figure D1.4 - Collector Street

6. 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 D1.5 shows the layout of a local sub-arterial road.

Local Sub-Arterial Road

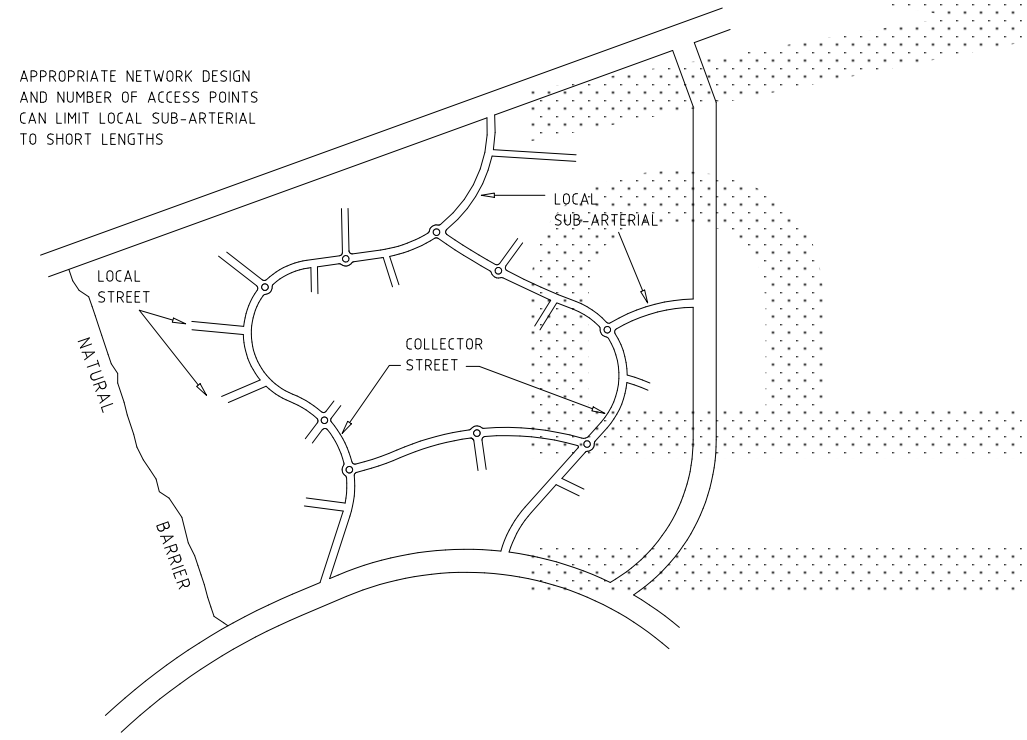

Figure D1.5 - Local Sub-Arterial Road

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 D1.5).

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

8. Connections between internal roads should be T-junctions or controlled by roundabouts. ***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 Traffic Authority 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, (eg 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	60 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. ***Road Safety Barriers***

D1.10 LONGITUDINAL GRADIENT

1. A general minimum gradient of 0.5 per cent should be adopted. In very flat conditions it may be reduced to 0.3 per cent. 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 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.

2. Longitudinal grade of the minor street on the approach to an intersection should not exceed 4 per cent, 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. ***Intersections***

3. Turning circles in cul-de-sacs on steep grades should have grades less than 8 per cent. ***Cul-de-Sacs***

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. ***Speed/Radius Relation***

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). ***Speed Restriction***

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. ***Tangent Length***

4. Sight distance on curves is determined by formula, values of which are tabulated in RTA Road Design Guide.

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	-	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 per cent. The desirable minimum design speed is 60 km/h. 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 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 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 0.05g 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 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 per cent should be maintained in the kerb and gutter. This may require some warping of road cross sections at sag points.

Horizontal and Vertical Alignment Coordination

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

Low Design Speed, Crowned Pavement

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 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.

High Design Speed

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 all curves, negative crossfall should be limited to 3 per cent.

Criteria

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.

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

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.)

Transitions, Offset Crowns

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 per cent, a crossfall of 63mm in a 450mm wide gutter may be adopted.

D1.14 ROAD RESERVE CHARACTERISTICS

Cross Section Provisions

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 streetscaping. Table D1.5 details characteristics of the road reserve.

Table D.1.5A Characteristics of Driveways / Roads in Residential Road Networks

Road Type	No. of lots or dwellings (whichever is greater)	Carriageway Width (m)	Road Reserve Width (m)	Kerb Type	Footpath Requirement	Verge Width	Turn Head Requirement (for roads longer than 30m)
Internal Driveway for Multi-Unit Development (Private Road)	Undefined	5m, plus adequate turning areas. (3.5m for less than 40m long or one-way)	N/A		Nil		Adequate turning area
Urban Right of Way (Private Road)	Maximum 3 in addition to road frontage lot	As above. (5m width may be reduced where only 2 dwellings)	N/A		Nil		As above
Cul-de-sac Access Lane (max length 100m)	8	6	15	Rollover or layback	One side	4.5 each side	Cul-de-sac head of 10m radius at kerb line
Access Street (including cul-de-sacs greater that 100m)	Up to 20, in each direction	11	18	Rollover or layback	One side	3.5m each side	Cul-de-sac head of 10m radius at kerb line.
Local Street	More than 20 in each direction	11	20	Rollover or layback or barrier	Both sides	4.5m each side	Cul-de-sac head of 10m radius at kerb line.
Collector Street		11	20	Barrier	Both sides	4.5m each side	Cul-de-sac head of 10m radius at kerb
Industrial Street		11 - 13	20	Barrier	Both sides	Minimum 3.5m each side	12m radius at kerb line

Notes:

1. Private roads are the owner's responsibility to maintain and cannot be named. Construction standards as per clause D1.35.
2. Kerb return radius to be 6m for residential roads, and 12m for Industrial roads.
3. Turning heads are not required on straight roads less than 30m long, measured from kerb face of the intersecting road.
4. Three point turn turning head to be designed for 12.5m single unit truck. If T-shaped, to have top of T length of 26m kerb to kerb. Extra distance required to property boundary as appropriate.

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

Sight Distance Across Verge

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.

D1.15 CROSSFALL

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

Pavement Type	*Crossfall*
Bituminous seal coat	3 per cent
Bituminous concrete pavement	2.5 per cent
Cement concrete pavement	2 per cent

(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 per cent, although up to 6 per cent may be used where unavoidable. The rate of change of crossfall should not exceed: 6 per cent per 30m for through traffic; 8 per cent per 30m for free flowing turning movements; or 12 per cent per 30m for turning movements for which all vehicles are required to stop.

Offset Crown Lines

Rate of Change

D1.16 VERGES AND PROPERTY ACCESS

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 5 per cent, in accordance with AUSTROADS. Longitudinal grade usually parallels that of the road and this may be steeper than 5 per cent. ***Criteria***

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

- Cutting at the boundary on the high side and providing the verge at normal level and crossfall.
- Battering at the boundary over half the verge width with the half against the kerb constructed at standard crossfall.
- A uniform crossfall across the carriageway.
- The lower verge being depressed below the gutter level.

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.

4. The Designer shall design a vehicular driveway centreline profile for the property access and check this design using critical car templates, available from Council, to ensure that vehicles can use the driveway satisfactorily. ***Driveway Profile***

D1.17 INTERSECTIONS

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. ***Traffic Volumes***

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 the publication AUSTROADS. ***State Roads, National Highways***

3. Intersections with state roads or national highways are to be designed, approved and constructed in accordance with the requirements of the State Road Authority. ***Approval of State Road Authority***

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. ***Existing Road Pavement***

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 in a left-right staggered pattern should have a minimum centreline spacing of 50m to provide for a possible right-turn auxiliary lane on the major street..

- 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. ***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.

10. Turning radii at intersections or driveways on local sub-arterial road accommodate the intended movements without allowing desired speeds to be exceeded. ***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***

D1.18 ROUNDABOUTS

1. Roundabouts are to be approved by the Council and the Roads Traffic Authority. ***Approval***

2. Roundabouts should generally be designed in accordance with the requirements of the publication AUSTROADS. 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 eg. 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 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. Devices designs should generally comply with the following: ***Criteria***

(a) Streetscape

- reduce the linearity of the street by segmentation
- avoid continuous long straight lines (eg. 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.

(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 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 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 5.50m minimum between kerbs

- bicycle lanes (including adjacent to pavement narrowings) - 1.2m absolute minimum (1.0m in special circumstances in accordance with AUSTROADS Guide to Traffic Engineering Practice – PART 14, 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

  (ie. 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. ***On-Site***

2. All on-site parking should be located and of 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. ***Road Reserve Parking***

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. ***Obstruction***

5. On single lane access streets parking spaces should be provided within the verge. Such parking shall be well defined with traffic control devices and an all-weather surface provided. Such parking shall not restrict the safe passage of vehicular and pedestrian traffic. ***Appropriate Verge Parking***

6. Parking spaces provided on the verge or carriageway shall comply with the requirements of 5 above and be of adequate dimensions, convenient and safe to 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. Two car parking spaces (which may be in tandem) are provided on-site for each single dwelling allotment. ***2 Spaces***

9. Three spaces are provided on-site for each two dwelling units for multi-unit residential developments. ***3 Spaces***

10. Of the on-site parking one space for each residential unit is provided within the allowable building area and has a minimum dimension of 5.0m by 3.0m. ***On-Site Space Dimension***

11. On single lane carriageways one space for each two allotments is constructed on the verge (to comply with 5 above) within 25m of each allotment, with scope to provide one additional space for single dwelling allotments or for each two units in a multi-unit development if required at a future time. ***Future Spaces***

12. On single lane carriageways a number of verge spaces (to comply with 5 above) are combined to provide for short term truck parking within 40m of any allotment. ***Short Term Truck Parking***

13. A single (car) space is 6.5m by 2.5m and combined spaces are 13.0m by 2.5m (for two cars) and 20m by 2.5m (for truck parking) with adequate tapers at both ends to allow the necessary parking manoeuvres determined by using AUSTROADS Turning Templates. ***Road Reserve Space Dimensions***

14. All verge spaces and indented parking areas are constructed of concrete, interlocking pavers, lawn pavers, bitumen with crushed rock or other suitable base material with traffic control devices and are designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces. ***Verge Spaces, Indented Parking***

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

16. The number of on-site parking spaces for non-residential land uses conforms to parking standards as determined by the relevant authority.

17. The layout and access arrangements for parking areas for non-residential land uses should conform to Australian Standard 2890.1.

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 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 D1.6 details minimum criteria for bus route design. ***Criteria***

Table D1.6 Bus Route Criteria

Road	Carriageway Width (min)	Stops (Spacing)	Bays
Collector*	9m	400 metre **	Single

Local Sub-Arterial	11m	400 metre	Shelters***
Arterial	13m	400 metre	Shelters and Bays

* Collector roads not identified as bus routes may have 7m carriageways (see Table D1.5)

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

*** 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 home sites and hobby farms types of developments.

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 AUSTROADS. ***Design Speed***

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

4. Where the table drain is likely to scour a RTA 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 rural residential subdivisions will be required to provide kerb and gutter on both sides of roads and piped drainage will generally be required. ***Kerb and Gutter***

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

D1.23 SIGHT DISTANCES

1. Stopping and minimum sight distances. Stopping sight distance should be provided at all points on the road. The stopping distance is measured from an eye height of 1.15m to an object height of 0.20m, using a reaction time of 1.5 seconds. A minimum sight distance measured from a height of 1.15m to a height of 1.15m is preferable for speeds of 60 km/h and over. Tables are provided in the RTA Road Design Guide. ***Stopping Distance*** ***Sight Distance***

2. Stopping distance is the sum of the braking distance and the distance the vehicle travels during a reaction time of 1.5 seconds, and may be calculated using the following formula: ***Braking Distance***

$$d = 0.42V + \frac{V^2}{254f}$$

Where d = stopping distance (m)
V = speed of vehicle (km/h)

f = coefficient of longitudinal friction

(Source: AUSTROADS Guide to the Geometric Design of Rural Roads,)

3. Recommended sight distances (based on the RTA Road Design Guide and adjusted to include lower speeds and minimum sight distances using the above formula) are shown in Table D1.7.

Table D1.7 Stopping Sight Distance

Travel Speed km/h	Coefficient of * longitudinal friction	Stopping sight distance (m)	Minimum sight distances (m)
40	0.52	33	**
50	0.50	46	**
60	0.47	60	180
70	0.45	80	220
80	0.43	100	260

* bituminous or concrete surfaces
** not applicable at lower speeds

4. These figures may apply on crest vertical curves only where there are straight alignments. Adjustments should be calculated for steep grades.

D1.24 HORIZONTAL AND VERTICAL ALIGNMENT

Criteria

1. Horizontal and vertical curves are to be designed generally to the requirements of AUSTROADS - 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

Criteria

1. Intersections should generally be designed in accordance with the publication AUSTROADS. Generally intersections with existing main and local roads will conform to the layouts shown in Figure D1.6 below. The type of intersection required will depend on existing and planned connecting roads.

Sight Distance

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 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.

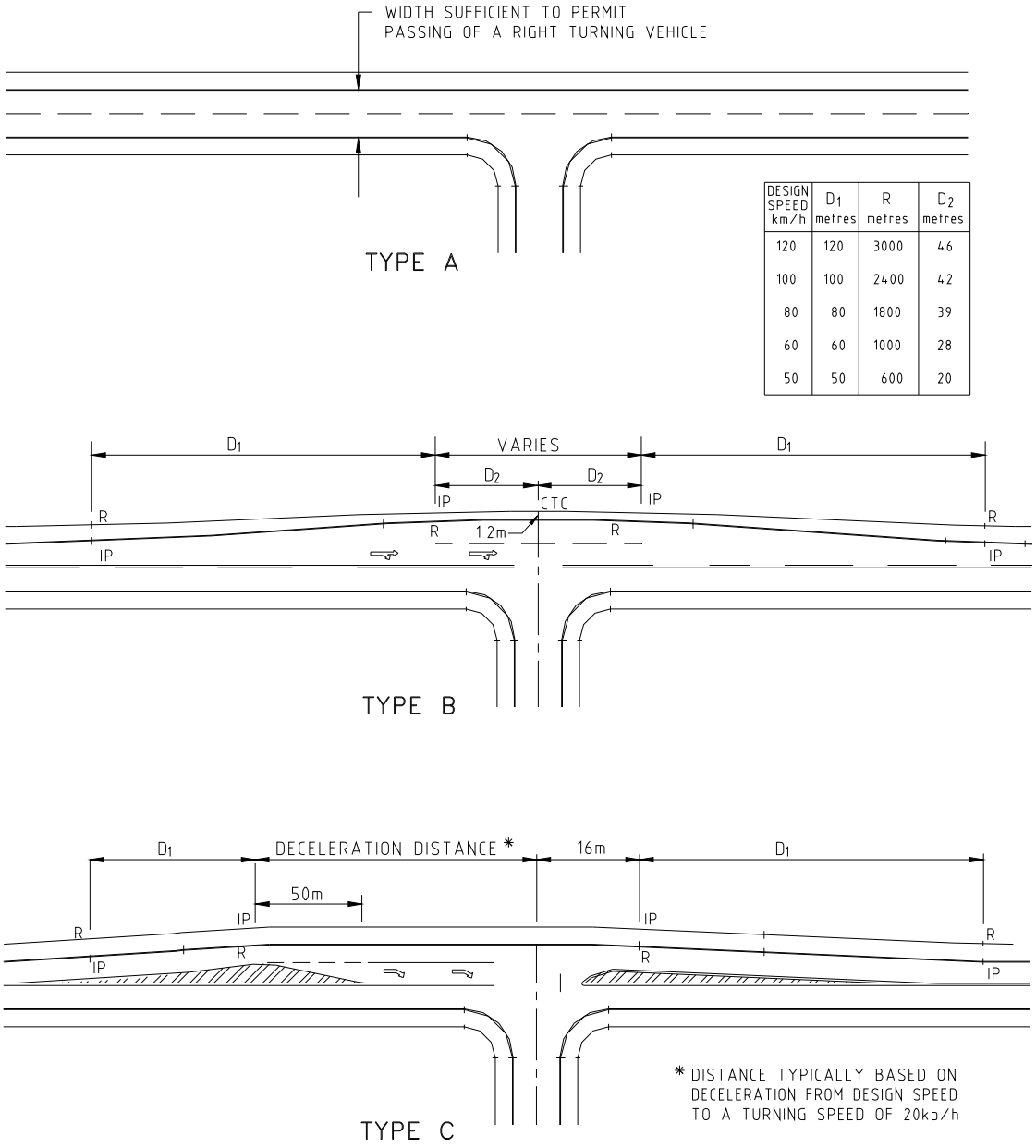

Figure D1.6 Typical Rural Intersection Treatments

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.

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; 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.

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 per cent 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 as follows:

Table D1.8

Lots Serviced[1]	Seal Width[2] (m)	Shoulder Width	Design Speed (km/h)
Up to 2	4m gravel[3]	2 x 1.5m (unformed)	N/A
Up to 10	5[4]	2 x 1m	60
Up to 50	6	2 x 1m	80
Over 50	7	2 x 1m	100

Notes:

1. If development is for a use other than rural lots, then substitute 9 trips for 1 lot.
2. Road widths shall be uniform along the length of a road. Changes of width are only permissible at intersections
3. Refer to Clause D1.34 for design and construction standards for 4m wide gravel roads, including rural rights-of-way.
4. If this road commences from a road of substantial length of unsealed road, then sealing may be omitted.
5. Road reserve width shall be minimum 20m in all cases.
6. Cul-de-sac turning heads to be 12m radius plus shoulders
7. Rural residential subdivisions with lot sizes up to 2,000sqm shall have roads with kerb and gutter and shall comply with the requirements of Table D1.5A.
8. Bridges shall have a width of seal width plus shoulder width

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 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 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.

SPECIAL REQUIREMENTS

D1.30 STANDARD DRAWINGS

The latest version of Council's standard drawings take precedence over the provisions of this specification.

D1.31 CHARACTERISTICS OF ROADS IN RESIDENTIAL ROAD NETWORKS

Replace Table D1.5 and its notes with table D1.5A and its notes. (Table D1.5 and its notes has been removed from this document and replaced by Table D1.5A for clarity).

D1.32 RURAL RESIDENTIAL – DEFINITION BY LOT SIZE

Further to clause D1.22 (6) rural residential subdivisions have a maximum size of 2,000sqm for the purposes of requiring kerb and gutter.

D1.33 RURAL ROADS – RESERVES AND CARRIAGEWAYS

Add to Clause D1.27 "Road reserves for rural roads shall be a minimum of 20m wide".

Replace the widths given in Clause D1.27 with Table D1.8. (The widths given in D1.27 have been removed from this document and replaced by Table D1.8 for clarity).

D1.34 STANDARDS FOR 4M WIDE GRAVEL ROADS AND RURAL RIGHTS OF WAY

For very minor roads, being the 4m wide gravel roads, as indicated in Table D1.8, the standards below apply in lieu of the standards otherwise provided for in this specification.

- 4m wide gravel carriageway
- Shoulders of 1.5m wide each side (can be unformed)
- Curves to have a minimum inner radius of 6m
- Maximum longitudinal gradient 12%
- Passing bay every 200m with dimensions of 20m x 1.5m plus 1.5m shoulder
- Minimum vertical clearance to overhanging obstructions, including tree branches of 4m
- Guide posts to RMS Delineation Manual Section 16 – Guide Posts & Delineation of Safety Barriers
- Roadbase - a minimum of 150mm thick, with 20-50 mm maximum gravel size
- Crowned or single graded cross section to shed water. Maximum crossfall of 12%

- Table drains or other measures to prevent stormwater over the road
- Concrete culverts with headwalls at watercourse crossings. The culvert size to be determined by design for 5yr ARI or, if not, a minimum of 375mm.
- If public road, then public road fencing to both sides
- Construction standards to industrial quality
- Engineering drawings are not required

D1.35 STANDARDS FOR CARPARKS, DRIVEWAYS AND URBAN RIGHTS OF WAY

1 REFERENCES

Documents referenced in this standard are the current versions of the below:

RMS Guide to Traffic Generating DevelopmentsGoulburn Mulwaree Council, Standards for Engineering Works (this document)
Austroads, Guide to Traffic Management, Part 11, Parking

2 URBAN DRIVEWAYS

2.1 Application

This clause applies to urban driveways for single dwellings, battle-axe handles, dual occupancies, multi-unit developments, and rights-of-way.

2.2 Footway Crossing and Profiles

Driveway and vehicle footway crossing profiles shall be in accordance with Standard drawings SD-R-06 and SD-R-08 of Ref 2.The rate of change in a driveway gradient shall be a maximum of 1 in 8 slope (12.5%) for a minimum length of 1m.

Driveways shall have a minimum fall of 1% away from the adjacent building.

2.3 Widths

Minimum dimensions for a residential driveway for a single dwelling shall be a carriageway of 2.5m within a space of 3.5m.

A driveway servicing more than one property or establishment, shall have a minimum formation width of 5m. This may be reduced to 3.5m for driveways less than 40m long, provided curves are appropriately widened.

Commercial and industrial driveways shall be in accordance with Ref 1.

2.4 Turning Area

An adequate turning area shall be provided at the end of a driveway for multi-unit or similar premises.

2.5 Existing Footpaths

Existing footpaths shall be removed and replaced as part of the footway crossing. The footway crossing profile shall be modified to suit the footpath.

2.6 Distance from Intersection

For corner properties, vehicle footway crossings shall be located a minimum of 12m from the kerb of the intersecting road at its tangent.

3 RURAL ENTRANCES

Entrance gateways off rural roads shall be installed in accordance with Council's engineering standard drawing SD-R-12.

Rural entrances should have a sight distance in both directions of 150m. In the case of the entrance being used by heavy vehicles on a frequent basis, then sight distance shall comply with Austroads Guide to Road Design Part 4A, clause 3.4.

4 CARPARKS

4.1 Layout
The layout of off-street carparks shall be in accordance with AS2890.

4.2 Surface Gradients
Parking areas shall be constructed in accordance with ASA 2890

4.3 Fencing
Where a parking area is adjacent to a public road, a fence or kerb shall be constructed along the property alignment to prevent vehicles from being driven across the footpath other than at the footway vehicular crossing.

5 RETAINING WALLS

Where the finished surface level of the parking area or driveway is above or below the level of adjacent land, the

higher ground shall be supported by a professionally designed and constructed retaining wall or equivalent.

6 DRAINAGE

6.1 Discharge Control Parking areas and driveways shall be constructed with falls to drainage inlet structures or to concrete kerb and gutter to service the 5 year ARI.
Residential driveways may drain to internal pervious areas provided overland flow to adjacent properties is prevented.

6.2 Adjoining Properties
Precautions shall be taken to prevent stormwater runoff from parking areas or driveways from being discharged onto an adjoining property or onto the footway. If the fall of the pavement is towards an adjacent property, a concrete kerb or similar barrier not less than 150mm high shall be constructed to control the flow of water.

6.3 Grated Drains
If the fall of the parking area or driveway is towards the footway vehicular crossing, a heavy-duty grated drain not less than 200mm wide shall be installed across the vehicular entrance just inside the property alignment.

6.4 Pollution Control
For carparks, a minimum of 90% of the pollutants, including litter, oil and grease, in the stormwater collected on site, shall be trapped in an approved on-site trap prior to being discharged. Such trap shall be easily accessible for cleaning by the occupiers. The exception to this is where requirements of WaterNSW shall prevail.

7 MATERIALS AND THICKNESSES

The following minimum standards are offered as guides:

Concrete Pavements
- Thickness - refer Std Dwg SD-R-08 of Ref 2 as a guide
- Concrete strength - 25 Mpa

Flexible Pavements (with asphalt or bitumen surface)
- Subbase thickness - 100mm, plus
- Base thickness – 100mm
- Surface: either 25mm asphalt or two coat bitumen seal

Clay or Concrete Unit Pavers
- Unit pavers suitable for traffic loading
- Base: 100mm of 7 Mpa concrete

For single dwellings and where stormwater disposal is difficult, concrete driveway strips may be permissible. The strips shall be a minimum of 900mm wide each.

Other non-sealed materials such as decomposed granite, porous paving and gravel are generally not permitted.

8 LINEMARKING AND SIGNPOSTING

Where appropriate, linemarking and signposting shall be carried out in accordance with Council's engineering standards, Austroads and RMS specifications.

D1.36 HORIZONTAL CURVES – MINIMUM RADIUS

Table D1.2(a) is modified in that for urban residential subdivision roads of carriageway widths of 9m and less, a minimum curve radius at the centreline of 30m applies. If a lesser radius is proposed it shall be demonstrated that a garbage truck (turn radius 10m) on the inside of the curve and a car on the outside of the curve may pass at the curve with a minimum clearance of 1m, which may require widening.