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.	Add new subclause 11 relating to Traffic Generation (urban).	D1.08	A	GA	Aug 00
2.	Add new subclause 9 relating to Standard Kerb and Gutter.	D1.14	A	GA	Aug 00
3.	Add new subclause 10 relating to Gully Pit Grates.	D1.14	A	GA	Aug 00
4.	Add new subclause 11 relating to Concrete Footpaths.	D1.14	A	GA	Aug 00
5.	Add new subclause 12 relating to Standards for roads in Industrial and Commercial Subdivisions.	D1.14	A	GA	Aug 00
6.	Add new subclause 5 relating to Standard Drawing for vehicular footpath crossings.	D1.16	A	GA	Aug 00
7.	Add new subclause relating to Perambulator ramps.	D1.17	A	GA	Aug 00
8.	Subclause 8 – Add reference to DCP25 – "Off Street Parking".	D1.20	A	GA	Aug 00
9.	Subclause 9 – Delete sentence relating to spaces for multi-unit dwellings. Add new sentence.	D1.20	M	GA	Aug 00
10.	Subclause 10 – Replace dimensions "5.0m by 3.0m" with "5.4m by 2.6m"	D1.20	M	GA	Aug 00
11.	Subclause 13 – Replace dimensions: "6.5m by 2.5m" with "5.4m by 2.6m" "13.0m by 2.5m" with "13.0m by 2.6m"	D1.20	A	GA	Aug 00
12.	Subclause 16 – relating to non-residential use. Replace "by the relevant authority " with "Cooma-Monaro Development Control Plan 25 – Off Street Parking"	D1.20	M	GA	Aug 00
13.	Sentence 2 relating to Bus Routes. Replace "location of bus routes" with "location of bus stops and/or bus bays"	D1.21	M	GA	Aug 00

14.	Remove subclause 6 relating to Kerb and gutter (rural).	D1.22	O	GA	Aug 00
15.	Add new subclause 8 relating to Traffic Generation (rural)	D1.22	A	GA	Aug 00
16.	Add new subclause 9 relating to Allotment Access	D1.22	A	GA	Aug 00
17.	Add new subclause 10 relating to Wearing course	D1.22	A	GA	Aug 00
18.	Modify formula (calculation of sight distance) to allow for different values of reaction time.	D1.22	M	GA	Aug 00
19.	Subclause 1 – Add new note relating to sight distances	D1.23	A	GA	Aug 00
20.	Subclause 3, Table D1.7 – Modify table. Add new column for values of overtaking sight distances	D1.23	M	GA	Aug 00
21.	Subclause 4 – Add Note relating to sight distances on unsealed roads.	D1.23	A	GA	Aug 00
22.	Subclause 1 – Modify last sentence to read "The type of intersection (Type A,B,C) required will depend on traffic volumes on existing and planned connecting roads. It will also depend on the horizontal and vertical alignment of the through road".	D1.25	M	GA	Aug 00
23.	Add new table (Table D1.8 – Intersection Sight Distance)	D1.25	A	GA	Aug 00
24.	Add new table (Table D1.9 – Grade Correction to ASD & SISD)	D1.25	A	GA	Aug 00
25.	Add new Figure D1.7 – Entering Sight Distance and Safe Intersection Sight Distance	D1.25	A	GA	Aug 00
26.	Add new sentence (4) – Intersection with Main Roads	D1.25	A	GA	Aug 00
27.	Add new sentence (5) – Splay requirements.	D1.25	A	GA	Aug 00
28.	Remove (1) – Carriageway Widths	D1.27	0	GA	Aug 00
29.	Add (2) – Carriageway Widths	D1.27	A	GA	Aug 00
30.	Add new Clause – Cross Sections	D1.30	A	GA	Aug 00
31.	Add new Clause – Roadway Reserves	D1.31	A	GA	Aug 00
32.	Add new Clause - Traffic Control Devices	D1.32	A	GA	Aug 00
33.	Replace Plan Number B238 with amended Drawing B238 (Amendment dated 15 July 2003)	Appendix D1 Item 3	M	GA	July 03

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

GENERAL

D1.01 SCOPE

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

Subdivision Roadworks

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

Acceptable Vehicle Speed

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

Integrated Design Principles

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

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

Road Reserve Component Definitions

AS 1348.1 terms:

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

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

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

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

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

AMCORD term:

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

D1.02 AIMS

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

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

D1.03 REFERENCE AND SOURCE DOCUMENTS

(a) Council Specifications

All Specifications for Engineering Works (Design and Construction).

(b) Australian Standards

AS 1348.1 - *Road and traffic engineering – Glossary of terms, Road design and construction. (1)*
AS 2890.1 - *Parking facilities: Off-street car parking.(2)*
AS/NZS 3845 - *Road safety barrier systems. (3)*

(c) State Authorities

Roads and Traffic Authority NSW – Road Design Guide. (4)
Department of Housing - Road Manual, 1987. (5)
Department of Urban Affairs (formerly Environment) and Planning – Technical Bulletin 12 (1981), Residential Road Widths.(6)

(d) Other

AUSTROADS RURAL ROAD DESIGN, Guide to the Geometric Design of Rural Roads.(7)
Guide Policy for the Geometric Design of Major Urban Roads. (8)
Guide to Traffic Engineering Practice
PART 5, Intersections at Grade(9)
PART 6, Roundabouts(10)
PART 10, Local Area Traffic Management (11)
PART 13, Pedestrians (12)
PART 14 Bicycles (13)

The Institute of Municipal Engineering Australia, Qld Division – 1993: Design Guidelines for Subdivisional Streetworks. (14)

ARRB Special Report No. 33, L E Comerford: A Review of Subdivision Road Design Criteria. (15)

Commonwealth Department of Housing and Regional Development – 1995: Australian

Model Code for Residential Development. (AMCORD). A National Resource Document for Residential Development. (16)

Stapleton, C 1984: Streets Where We Live – A Manual for the Design of Safer Residential Estates. (17)

Stapleton, C 1988, Dept of Transport South Australia: Planning & Road Design for New Residential Subdivisions (18).

Brindle, R 1988, ARRB: Planning & Design of the Local Distributor. (19)

Colman, J 1978, ARRB: Streets for Living. (20)

Pak-Poy Kneebone – 1989: Research Study into Road Characteristics for Residential Development. (21)

D1.04 CONSULTATION

Council, Other Authorities

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

Public Consultation

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

Public Utilities

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

D1.05 PLANNING CONCEPTS

Road Hierarchy

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.

Conformance with DCP

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.

Legibility

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

Differentiation

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

Landmark Features

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.

Introduced 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.

Intersection Turning Movements

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.

D1.06 DRAWING REQUIREMENTS

(a) Reduction Ratios

Drawing Scales

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

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

Clear and Legible, Permanent Record, Legal Document

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.

Compliance

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.

(d) Certification

Design Consultant

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.

URBAN DESIGN CRITERIA

D1.07 ROAD HIERARCHY

Functionality

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

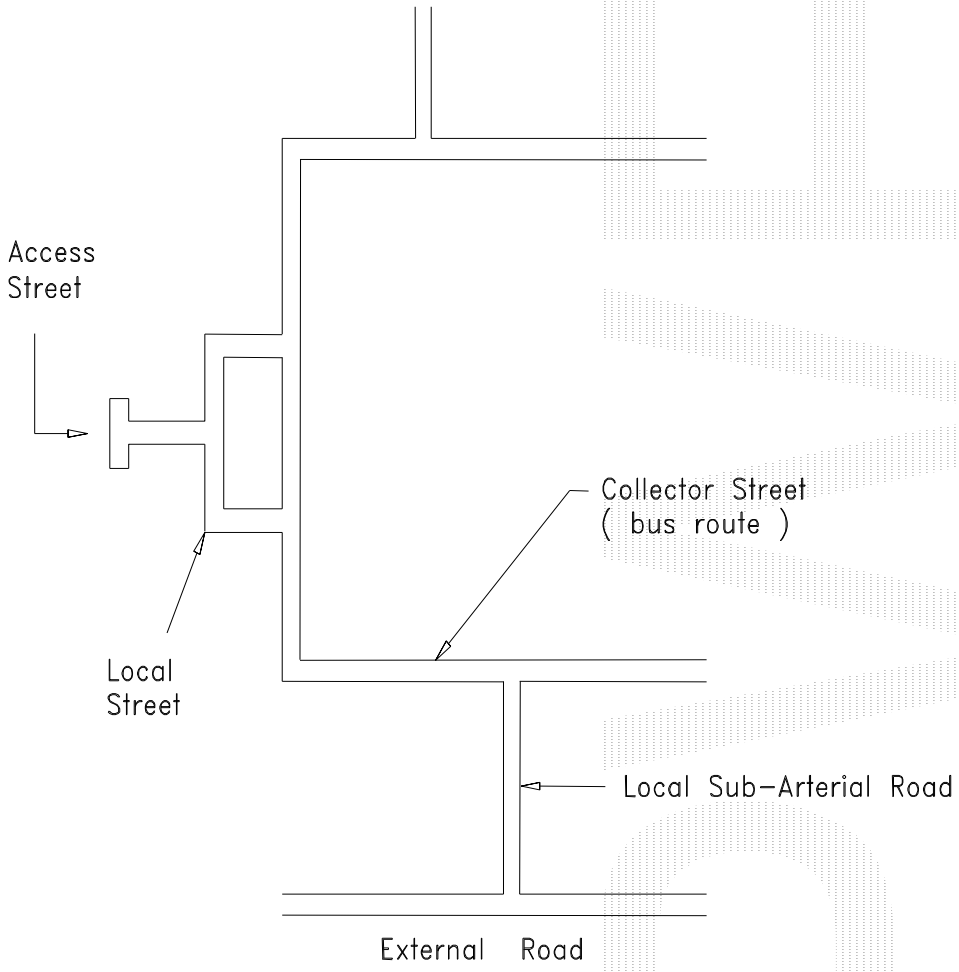


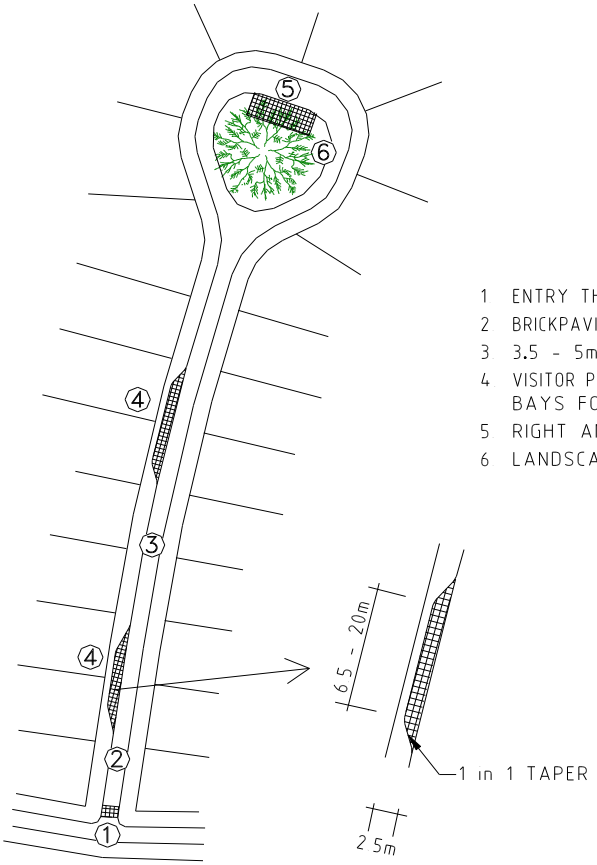
Fig.D1.1 Typical Road Hierarchy

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.

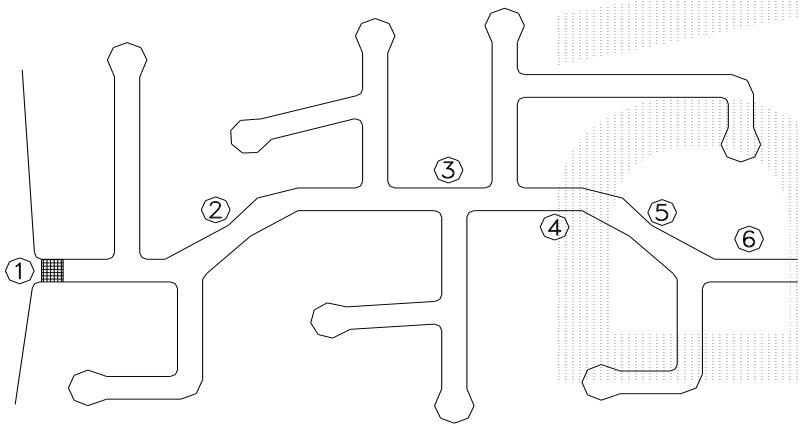


1 ENTRY THRESHOLD TO INDICATE LOWER SPEED ENVIRONMENT
2 BRICKPAVING OR COLOURED SURFACE TO INDICATE SHARED WAY
3 3.5 - 5m CARRIAGEWAY WIDTH
4 VISITOR PARKING AREAS WHICH CAN ALSO BE USED AS PASSING BAYS FOR STREETS LONGER THAN 100m
5 RIGHT ANGLED VISITOR PARKING
6 LANDSCAPED OPEN SPACE

Fig.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.



1 BRICK-PAVED ENTRY THRESHOLD SIGNIFIES ENTRY TO LOWER SPEED ENVIRONMENT
2 BENDS IN CARRIAGEWAY CONTROL SPEED
3 SHORT SECTIONS OF STRAIGHT CARRIAGEWAY CONTROL SPEED
4 CARRIAGEWAY WIDTH 7m
5 12m FOOTPATH ON ONE SIDE
6 ROLLOVER OR FLUSH KERBING

Fig. D1.3 Local Street

Collector 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.

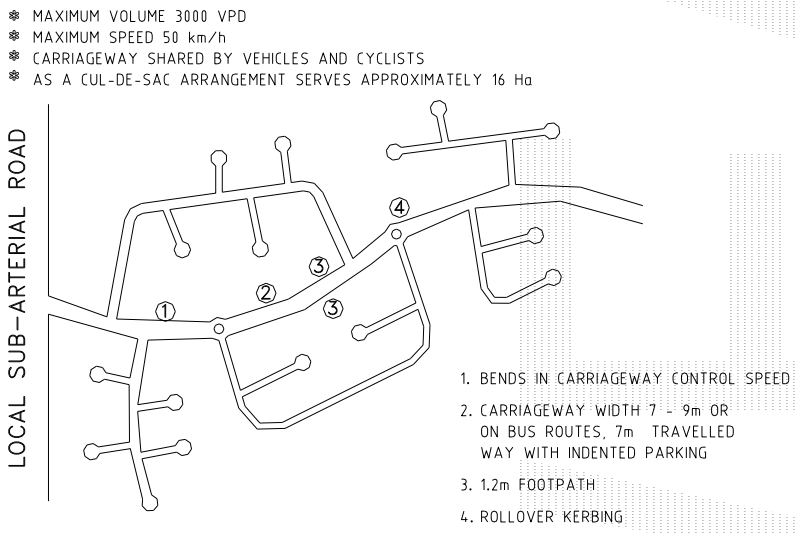


Fig. D1.4 Collector Road

Local Sub-Arterial Road

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.

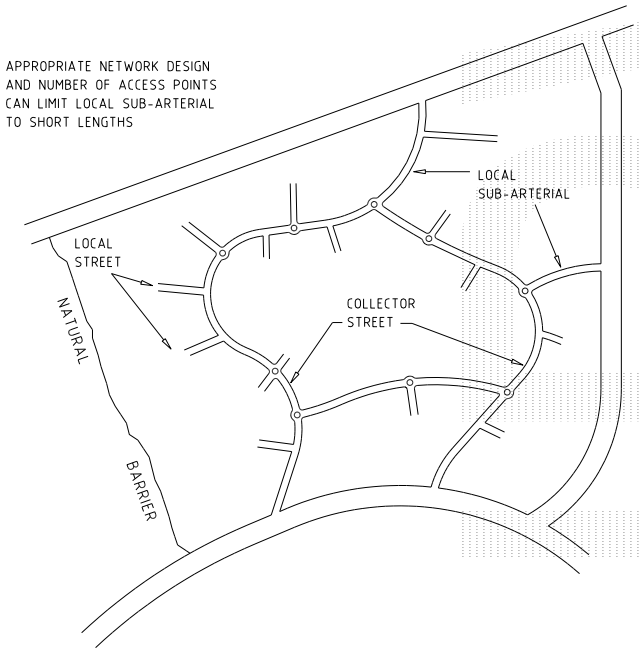


Fig. D1.5 Local Sub-arterial Road

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***

11. The Australian Model Code for Residential Development (AMCORD) gives a vehicle generation rate of 10 vehicle trips per dwelling. This can be adopted for purposes of determining Design Traffic volumes unless a lower rate can be demonstrated. ***Traffic generation***

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 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. ***RTA 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 ***Low Speeds***

(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.

Hazardous Features

3. Generally the following design speeds should be adopted:

Access Street	40 km/h
Local Street	50 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 –Maximum Recommended Grades

	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 5 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.

5. Cul-de-sacs in residential subdivisions shall be provided with a constructed pavement with a minimum radius of eight (8) metres.

Cul-de sac Radius

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

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.

Criteria

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.

Riding Comfort

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

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 Junctions***

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. ***Sag Curves***

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: ***Horizontal and Vertical Alignment Coordination***

- The design speed of the road in both horizontal and vertical planes should be of the same order.
- Combined horizontal and vertical stopping sight distance and minimum sight distance should be considered three dimensionally.
- Sharp horizontal curves should not be introduced at or near the crest of a vertical curve. A horizontal curve should 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. 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. ***Low Design Speed, Crowned Pavement***

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. ***High Design Speed***

3. In general, curve radii larger than the minimum and superelevation rates less than the maximum should be used where possible. The minimum radius of curves is determined by the design speed, the minimum superelevation (or maximum adverse crossfall) at any point on the circular portion of the curve, and the maximum coefficient of ***Criteria***

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.

Operational Aspects

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.)

Pedestrians, Cyclists

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

Access to Allotments

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.

Discourage Speeding

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.

Verge Width

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

Public Utility Space Allocations

The allocation of space in footways for public utility mains recommended by the New South Wales Streets Opening Conference has been indicated in Fig.D1.6. The minimum space between the water main and other utility underground mains shall be 600mm.

Sight Distance Across Verge

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.

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.

Standard Kerb and Gutter

9. Figure 3.9.2 from the RTA Road Design Guide (Ref.4) has been reproduced in Appendix D1 and shows standard shapes, dimensions, and applications of kerbs and gutters used by Council

Gully Pit Grates

10. All gully pit grates that are located adjacent to sealed shoulders or bicycle lanes shall be bicycle safe in accordance with Australian Standard AS3996 – Metal access covers, road grates and frames

Concrete Footpaths

11. Concrete footpaths 1.2m wide, 80mm thick shall be provided where there is a requirement as indicated in Table D1.5. Perambulator ramps shall be provided at all gutter crossings.

Standards for Roads in Industrial and Commercial Subdivision

12. The minimum widths of elements of cross section for roads in Industrial and Commercial Subdivisions shall be as for Sub-Arterial Roads given in Table D1.5 with a minimum width of 12m. Indented parking bays shall be provided as required. See specification D2 for pavement design requirements.

NOTE: Industrial and Commercial Roads should not contain cul-de sacs.

Table D.1.5 Widths of Elements of Road Cross Section in Urban Residential Subdivision Road Network

Road Type	Maximum Traffic Volume (vpd) [1]	Maximum Speed [2] (km/h)	Carriageway Width (m)[3]		Parking Provisions Within Road Reserve	Kerbing [4]	Footpath Requirement	Bicycle path Requirement	Verge Width (each side)	Minimum Street Reserve width (m)
			Minimum	Maximum						
Minor Access (Right of Way)	<25	20	5.0	-	-	-	-	-	1.0	5.0
Access Street	200	40	Single Lane: [5] 3.5	3.7	1 verge space per 2 allotments[5]	Rollover/ Flush	No	No	3.0m[6]	10
			Two Lane:5.0	6.0	Carriageway	As Above	No	No	3.0m[6]	12
Local Street	600	50	7.0 (up to 1,000 vpd)	7.5	Carriageway	As Above	1.2m wide [7] footpath(s)	No	Minimum 4.0m	15
Collector Street	2,000 (with access to residential allotments)	60 [8]	8.0 On bus routes 10.0 [10])	10.0	Carriageway Or Indented parking.	Rollover [9]	1.2m wide footpath both sides.	No 1.0m gap in pro-tuberances required for cyclists [10]	Minimum 4.0m[14]	20
Local Sub-Arterial Road	5,000 (no access to single dwelling residential allotments	60 / 80[11]	10.0 On bus routes 12.0[10].	12.0	Parking permitted on carriageway [12]	Barrier	If required 1.2m wide footpath, and/or 2.0m bicycle path one side only[13]	If required 2.0m bicycle path one side only in the verge or two 1.5m wide bicycle lanes marked on carriageway [13].	Minimum 4.5m.	30

NOTES TO TABLE D1.5:

1. *For single dwelling allotments apply traffic generation rate of 10 vehicles per day (vpd)/allotment (equivalent to approximately one vehicle per hour (vph) in the peak hour) unless a lower rate can be demonstrated. Lower rates can be applied to multi-unit dwellings based on locally derived rates.*

2. *See Clauses D1.09 and D1.11 on designing for specific operating speeds.*

3. *Widening required at bends to allow for wider vehicle paths (using AUSTROADS Turning Templates).*

4. *Where kerbing is not required a flush pavement edge treatment can be used. Maximum carriageway widths required if barrier kerbing used.*

5. *Requires:*
   (i) Provision for widening to 6.0m if necessary in the future.
   (ii) Verge parking as noted with scope for additional spaces.

6. *Minimum width required to provide for pedestrians, services, drainage, landscape and preservation of existing trees. Add additional width on one side for future widening of carriageway to 6.0m if required. For two lane carriageway design, no provision for widening required.*

7. *A minimum of one footpath on one side of the street to be constructed initially with provision to construct a second footpath if required by residents in the future.*

8. *Reduced speeds are required at designated pedestrian/bicycle crossing. A speed of 20 km/h is desirable, achieved by the road design principles outlined in this Specification.*

9. *Barrier kerbing may be used if required for drainage purposes without reducing the carriageway width.*

10. *On bus routes, 8.0m travelled way with 2.0m wide indented parking and bus bays defined by kerbed protuberances. Where bicycle way can be anticipated, a bicycle lane is required along the kerb.*

11. *Speed on local sub-arterial road not to exceed legal limit.*

12. *Parallel parking shall be permitted. Some areas may be designated with time restricted parking or no parking zones.*

13. *Required only if part of a pedestrian/bicycle network.*

14. *Provide adequate road reserve width for widening of carriageway for future bus route if required.*

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

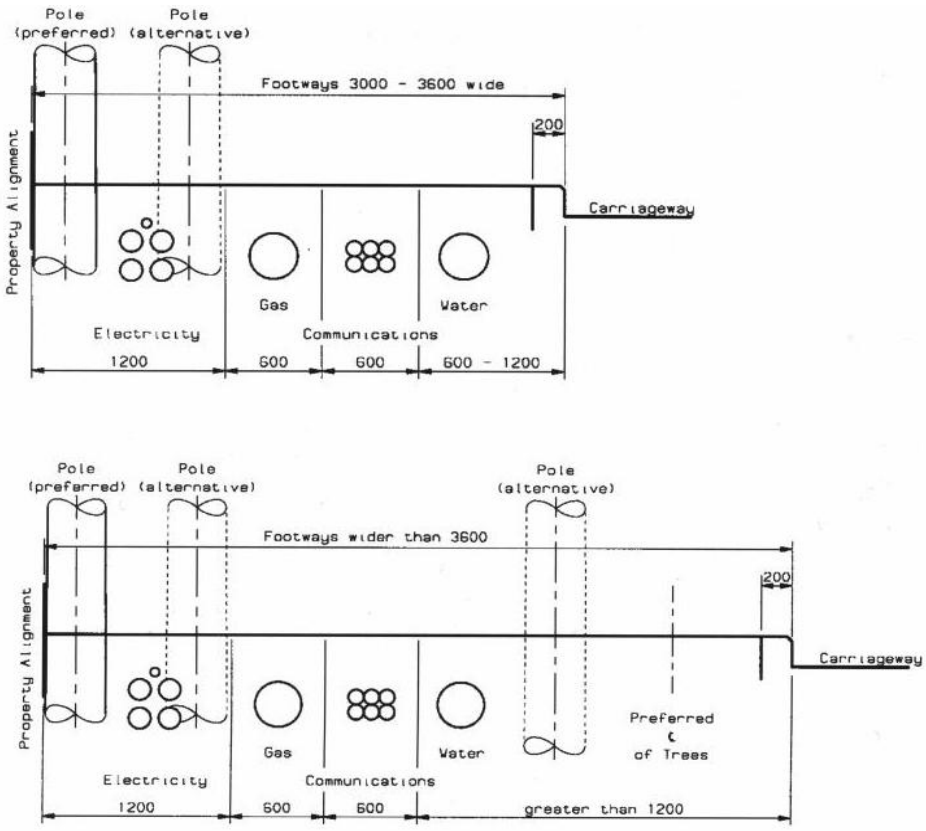


Fig. D1.6 Public Utility Mains. Allocation of space in footways.

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.)

Offset Crown Lines

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.

Rate of Change

Precedence

3. The crossfall on a collector or local sub-arterial road should take precedence over the grade in minor side streets. Standard practice is to maintain the crossfall on the major road and adjust the minor side street levels to suit. The crossfall in side streets should be warped quickly either to a crown or a uniform crossfall depending on the configuration of the side street. A rate of change of grade of two per cent in the kerb line of the side street relative to the centre line grading is a reasonable level.

D1.16 VERGES AND PROPERTY ACCESS

Criteria

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

Options

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

- Cutting at the boundary on the high side and providing the verge at normal level and crossfall.
- 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.

Driveway Profile

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.

Standard Drawing

5. Council's Standard Drawing (Drawing numbers B-163 & D-243), in Appendix D1 gives details of standard vehicular footpath crossing for urban areas.

D1.17 INTERSECTIONS

Traffic Volumes

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

State Roads, National Highways

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

Approval of State Road Authority

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.

Existing Road Pavement

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

Location Criteria

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

- 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.
- 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 turn 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.
- For turning movements at the head of cul-de-sac access streets sufficient area is provided for the "design single unit" truck to make a three-point turn or, where the length of the cul-de-sac is less than 60m for the "design car" to make a three-point turn. Where driveway entrances are to be used for turning movements, the required area is to be designed and constructed to withstand the relevant loads.

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***

12. Perambulator ramps must be provided at all road intersections and located at tangent points if standard kerb and gutter is laid. ***Perambulator Ramps***

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 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: ***Design 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 Guide to Traffic Engineering Practice – PART 10, Local Area Traffic Management, (LATM). 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
- 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 should be well defined and an all-weather surface provided. Such parking shall not restrict the safe passage of vehicular and pedestrian traffic. ***Verge Parking***

6. Parking spaces provided on the verge or carriageway should 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. Also refer to Council's DCP No. 25 – "Off Street Parking". ***2 Spaces***

9. For multi unit residential developments, parking requirements shall be determined in accordance with Council's Development Control Plan No. 25 – "Off Street Parking" ***Multi-unit Residential Developments***

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 5.4m by 2.6m. ***On-Site Space Dimension***

11. On single lane carriageways one space for each two allotments is constructed on the verge 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 are combined to provide for short term truck parking within 40m of any allotment. ***Short Term Truck Parking***

13. A single (car) space is 5.4m by 2.6m and combined spaces are 13.0m by 2.6m (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 and are designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces. ***Verge Spaces, Indented Parking – Construction***

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 shall conform to parking standards as determined by Cooma-Monaro Development Control Plan No.25 "Off Street Parking". ***No Residential Use***

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

Reference to AS 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 stops and/or bus bays 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*	10m	400 metre **	Single
Local Sub-Arterial	12m	400 metre	Shelters***
Arterial	13m	400 metre	Shelters and Bays

* Collector roads not identified as bus routes may have 8m 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.

Design Speed

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 Guide to the Geometric Design of Rural Roads.

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

Table Drain

4. Where the table drain is likely to scour a RTA Type SK / SO 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.

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

6. (deleted)

Access

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

Traffic Generation

8. The evaluation of a new road or road system and the impact of additional traffic on the existing road system both require an estimation of the traffic generated by the proposed development.

For the purposes of planning and design a vehicle generation rate of 6.7 vehicle trips per day per dwelling for rural subdivision has been adopted. Alternatively comparison may be drawn with similar developments.

Allotment Access

9. All allotments shall be demonstrated to be accessible from the road as designed. Council may require the construction of vehicular entrances to the external boundary of each allotment. Where possible, dual accessways are encouraged.

Sight distance

The siting of the vehicular entrance should meet the sight distance requirements indicated in table D1-8 (Intersection sight distance for level pavement – RTA Road Design Guide 1991) which summarises typical minimum requirements for passenger cars on level pavements. Variations to these values will have to be made where pavements intersect at grade (See table D1-9)

Vehicle Access Standard Drawing

Standard drawing B 238 (Appendix D1) details typical requirements for vehicle access to rural allotments. A culvert will generally be required where entrances cross formed, relatively deep table drains.

Wearing course

10. For requirements of wearing courses on rural roads refer to Clause D2.22 in Design Specifications D2-Pavement Design.

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 Sight Distance

NOTE:

a. The minimum sight distance is the Intermediate sight distance which enables a driver to travel a road in comfort with reasonably safe overtaking opportunities

b. Overtaking sight distance is the distance measured along the line of travel between 2 points each 1.15m above the road pavement. It is equal in length to the minimum distance between 2 opposing vehicles, which will permit a safe overtaking manoeuvre.

Minimum Sight Distance, Overtaking Sight Distance

c. Where overtaking sight distance cannot be provided due to the prohibitive cost of construction the minimum sight distance shall apply.

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

Braking Distance

$$d = \frac{R_T V}{3.6} + \frac{V^2}{254f}$$

Where d = stopping distance (m)
V = speed of vehicle (km/h)
f = coefficient of longitudinal friction
R_T = reaction time (secs)

(R_T = 1.5 secs to 2 secs for speeds <100km/hr and 2.5 secs for speeds >100km/hr)
(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 Summary of Sight Distance on level surface (For Reaction time of 1.5 seconds)

Travel Speed Km/h	Coefficient of * longitudinal friction	Stopping sight distance (m) [1.15m – 0.2m]	Minimum sight distance (m) [1.15m – 1.15m]	Overtaking sight distance (m) [1.15m – 1.15m]
40	0.52	33	**	**
50	0.50	45	140	250
60	0.47	60	180	300
70	0.45	80	220	350
80	0.43	100	260	450

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

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

Steep grades Unsealed Roads

NOTE: For unsealed roads, these distances shall be increased by 30%.

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 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 (types A, B, C) required will depend on traffic volumes on existing and planned connecting roads. It will also depend on the horizontal and vertical alignment of the through road.

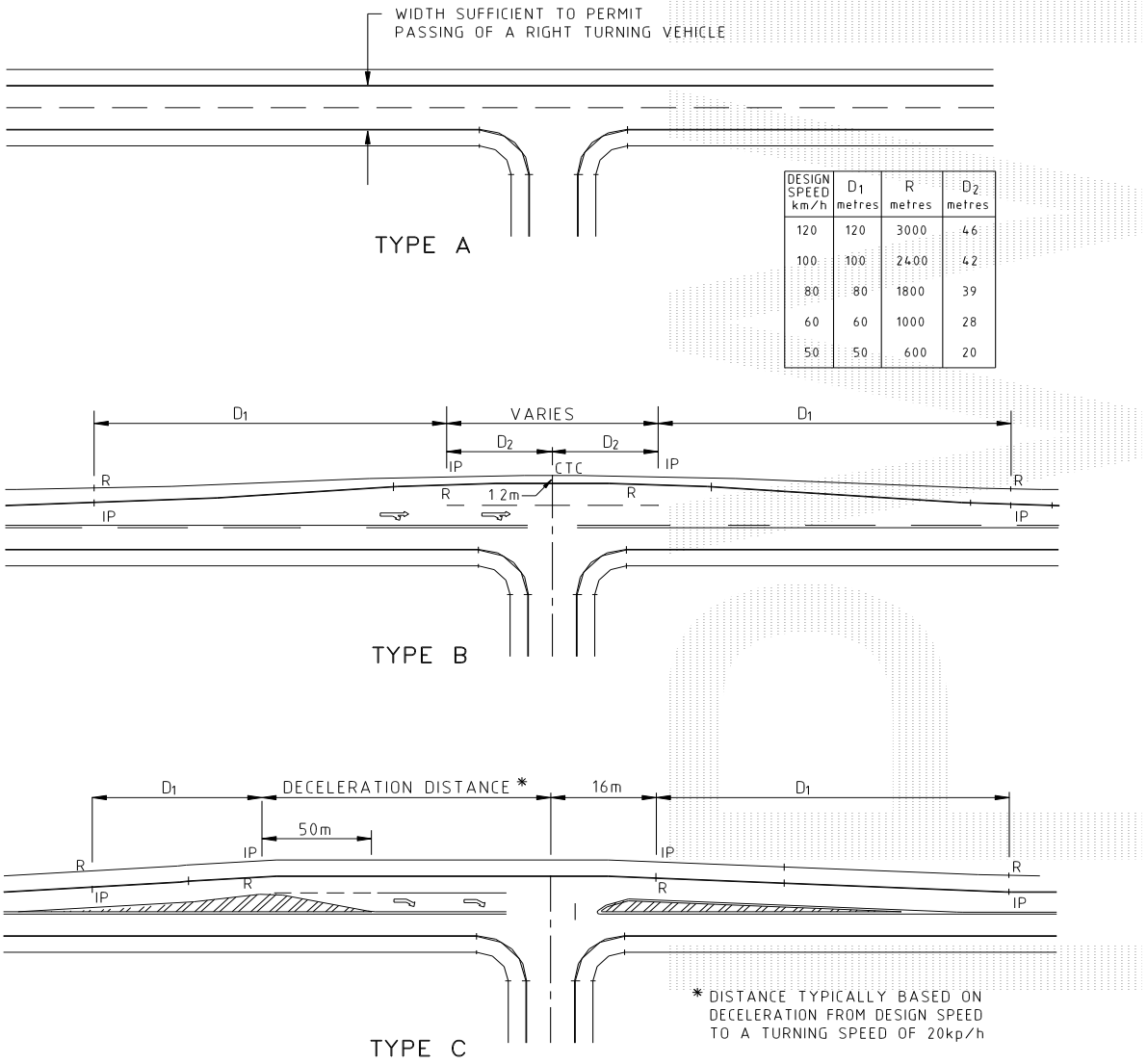


Fig. D1.7 Typical Rural Intersection Treatments
Source: AUSTROADS Guide to Traffic Engineering Practice PART 5, Intersections at Grade.(Ref.10)

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 (Ref.10) and in the RTA Road Design Guide (Ref.5). Repositioning of an intersection may be required to obtain conformance with the sight distance criteria.

Tables and figures from the RTA Road Design Guide are reproduced in Tables D1.8, TableD1.9 and Figure D1.8.

Table D1.8 – Intersection Sight distance for level pavement

Design Speed (Km/hr)	d[1] (g)	ASD Approach Sight Distance (1.15m to 0.0m)				SISD Safe Intersection Sight Distance (1.15m to 0.6m)			
		1.5 sec		2.5 sec		1.5 sec		2.5 sec	
		m[2]	min K	m[2]	min K	m[2]	min K	M[2]	min K
40	0.54	35	5			60	4		
50	0.50	45	9			80	7		
60	0.47	60	16			105	12		
70	0.45	80	28			130	18		
80	0.43	100	44			160	28		
90	0.41	120	63			190	39		
100	0.39	150	98	175	133	225	55	255	71
110	0.37			210	190			265	95
120	0.35			250	270			330	118

NOTES
1. Average deceleration adopted, given as in terms of acceleration due to gravity (g)
2. For grade corrections to ASD and SISD see Table D1-9 below
3. K is a measure of vertical curvature

Table D1.9 – Grade Corrections to ASD and SISD

Design Speed (Km/hr)	Correction (m)					
	Upgrade			Downgrade		
	4%	8%	12%	4%	8%	12%
40	-	-	-	-	-	+5
50	-	-3	-5	-	+5	+5
60	-	-5	-10	-	+5	+10
70	-	-10	-10	+5	+10	+15
80	-5	-10	-15	+5	+10	+25
90	-10	-15	-20	+10	+20	+30
100	-10	-20	-25	+10	+25	+45
110	-15	-25	-30	+15	+35	+60
120	-20	-30	-40	+20	+50	+85

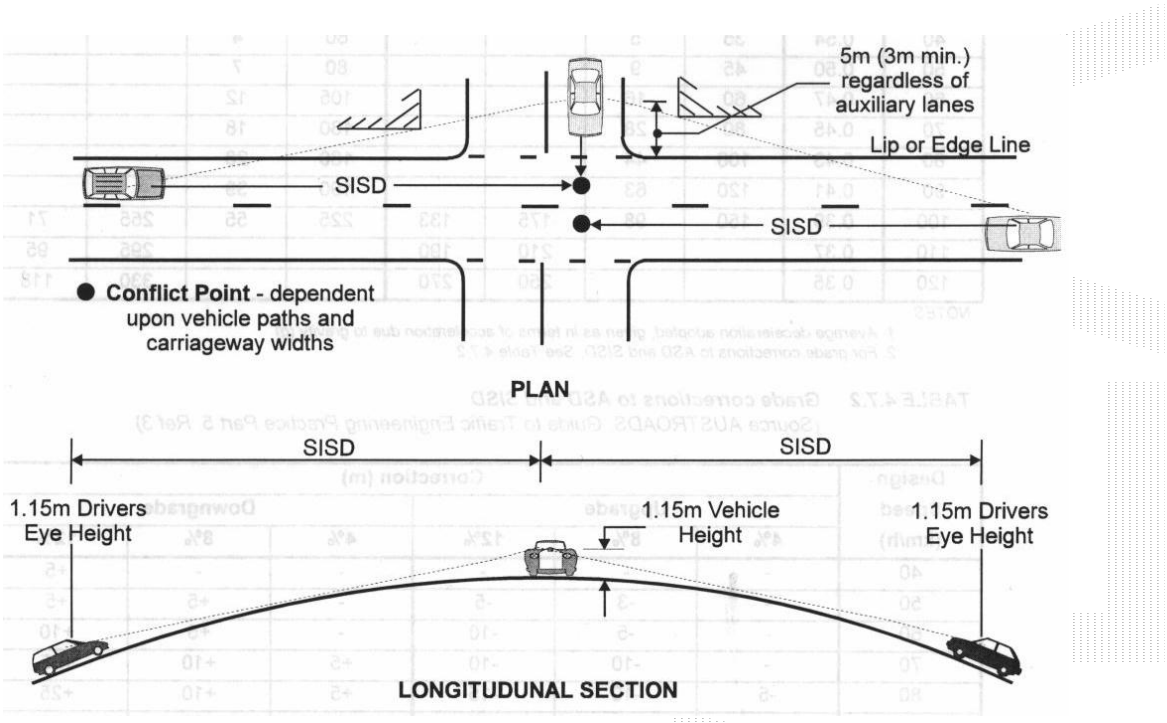


Fig.D1.8 Sketch showing Measurement of Safe Intersection Sight Distance
(Source – RTA Road Design Guide)

Staggered-T Intersections

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

Intersections with Main Roads

4 Where the intersection is with a Classified Main Road, the developer shall comply with any conditions imposed by the Roads and Traffic Authority of NSW and agreed to by Council. Council’s Traffic Committee may also require consideration.

Splay requirements

5. Corner lots adjacent intersections in rural areas are to be provided with a minimum splay corner of 10m by 10m.

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. (deleted)

2. For characteristics of rural roads and carriageway widths refer to Table D1.10. Fig. D1.9 reproduced from Austroads Rural Road Design (Ref.7) illustrates typical elements of cross sections

Carriageway widths

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 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.

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, 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.

Roadside Drainage and Table Drains

Table D1.10 – Widths of Elements of Road Cross Section in Rural Residential Subdivision Road Network

Road Type	Traffic Volume (Veh/day)	No. of Allotments (No.)	Carriageway width (m)	Pavement Width (m)	Shoulder Width (m) (Each side)	Road Reserve Width (m)
Right of way[1]	-	1	5.0	3	1.0	10.0
(Single lane)	<40	2-5	5.5	3.5	1.0	10.0
Access road[2]						
(Single Lane)	40-100	6-15				
Sealed			7.0	3.5	1.75	20.0
Unsealed			6.0	3.5	1.25	20.0
Local Road (Two Lane)	100-200	16-30	8.0	6.0	1.0	20.0
Collector Road (Two Lane)	200-500	>30	9.0	6.0 6.6(seal width)[3]	1.5	20.0
Sub-Arterial Road (Two Lane)	500-1000	-	10.0 – 12.0	7.0	1.5[4] – 2.5[5]	30.0

NOTES:

1. These roads serve less than 5 allotments and are constructed for the sole purpose of providing access to abutting allotments. They do not fall under the care and control of the Council.

2. On low volume roads with traffic less than 150 veh/day and open terrain, single lane carriageways may be used

3. Extra seal width to extend to shoulder area (0.3m each side of shoulders) to reduce edge wears.

4. A shoulder width of 1.5m will allow a vehicle to stop with only partial obstruction of the traffic lane. Provided volumes are not high, commercial vehicles are infrequent and sight distances are sufficiently long, this will not present an undue hazard to traffic.

5. A shoulder width of 2.5m allows a passenger vehicle to stop clear of the traffic lane. Where the route carries a high volume of commercial vehicles and the incidence of trucks stopping is high, 3.0m shoulders should be considered.

D1.30 ELEMENTS OF CROSS SECTIONS

D1.30.1 General

General

"Rural road design" Austroads, 1989 (7) and "Road Design Guide" RTA (4) outline general requirements for road cross sections. Typical cross section details are illustrated in Fig D1.9. For details of widths of elements of cross-section refer to Table D1.10

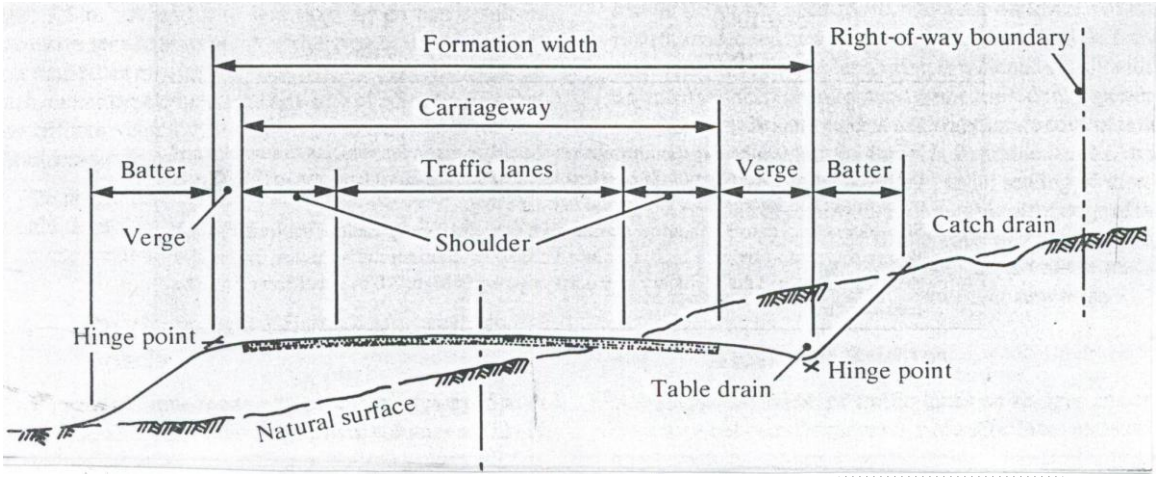


Fig.D1.9 Elements of Road Cross Section
(Source – AUSTROADS Guide to the Geometric Design of Rural Roads)

D1.30.2 Traffic Lanes

Traffic Lanes

"The traffic Lane is that part of the roadway set aside for the normal movement of a single stream of vehicles" (Ref.5). Table D1.10 details different lane widths for single lane and two lane carriageways for different types of roads.

D1.30.3 Shoulders

Shoulders

The width of shoulder is measured from the edge of the traffic lane to the verge. All safety barriers, signs, guide posts, drains and kerbs are to be outside the shoulder and contained within the verge. Increased shoulder width should be provided as required at intersection or T-junction layouts and merging areas. Tapering between different width shoulders should appear even; a taper of 1:50 is recommended. Care should be used to ensure the taper's appearance is satisfactory.

Where road pavements are required to be sealed, the seal shall extend the full width of the shoulder under the following circumstances:

Shoulder sealing

- Adjacent to a lined table drain, kerb or dyke.
- Where a safety barrier is provided adjacent to a 1.0m wide shoulder.
- Outer shoulder of a superelevated curve
- On floodways.
- Where a rigid pavement is proposed.

D1.30.4 Verges

Verges

"The area between the shoulder and batter hinge point is termed the verge. It is used for drainage, safety barriers, and batter slope rounding. The recommended minimum verge width on an embankment with guideposts is 0.5 m and with a non-rigid safety barrier, 1.0 m. At difficult sites the verge may be narrowed to 0.75 m for safety barrier placement, however special foundation treatment will be required to ensure that the material behind the safety barrier provides adequate support for the system. "(Ref.4). Table D1.11 gives the recommended verge widths and Figure D1.10 shows typical sections through verges.

Table D1.11 Recommended Verge Widths
(Source RTA Road Design Guide)

Formation Configuration	Verge Widths (m)	Function
Embankment	0.5	Minimum rounding with space for guide posts
	0.75	Minimum verge for non-rigid safety barrier (special cases only)
	1.0	Desirable rounding, minimum verge for safety barrier
	1.0 – 3.0	Safety barrier flare and anchorage
Cutting	2.0min 1.5min	Table drain Concrete lined drain

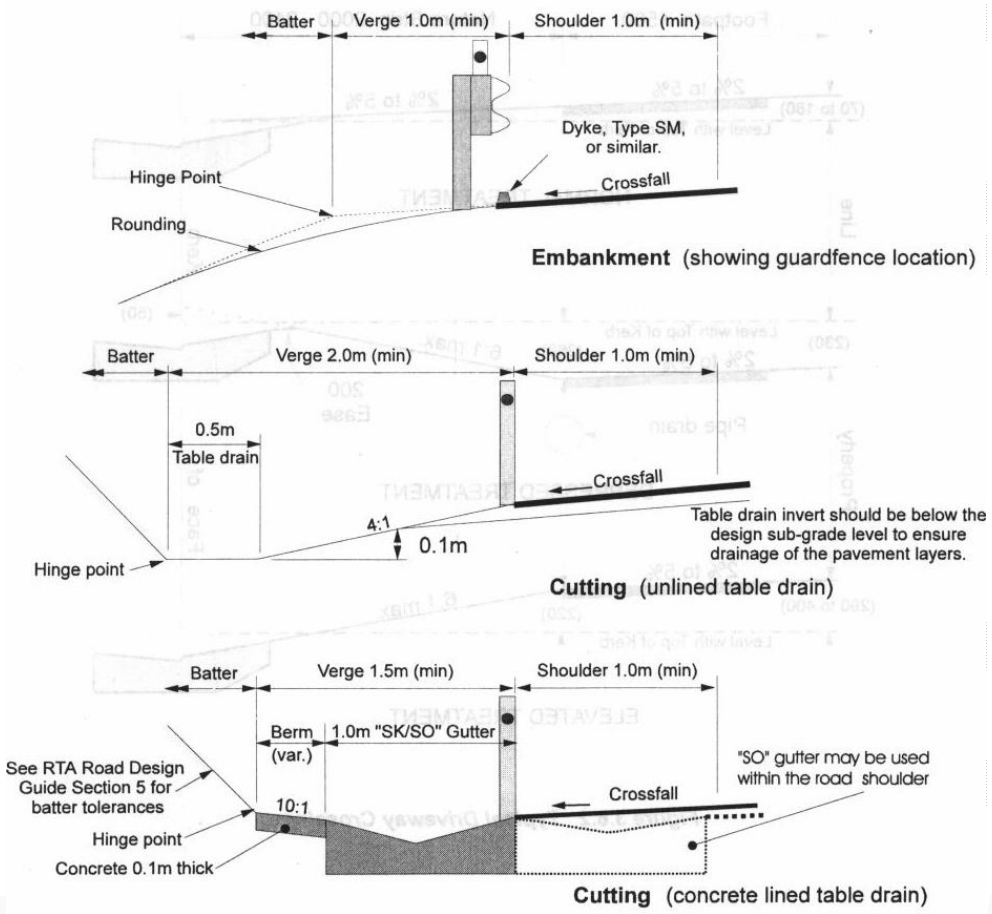


Fig. D1.10 Typical Section Detailing Verge
(Source RTA Road Design Guide)

D1.30.5 Clear Zone

"The Clear Zone is the width of the roadside, beginning at the edge of the travelled way that is available for the driver of an errant vehicle to take corrective action in an emergency". (Ref.5). See fig. D1.11 – Typical Clear Zone and Table D1.12.

Provision for Clear Zone

The design of the shoulders, verges and batters must make provision for a clear zone which will allow a vehicle to traverse this area with a minimum of damage to itself and occupants.

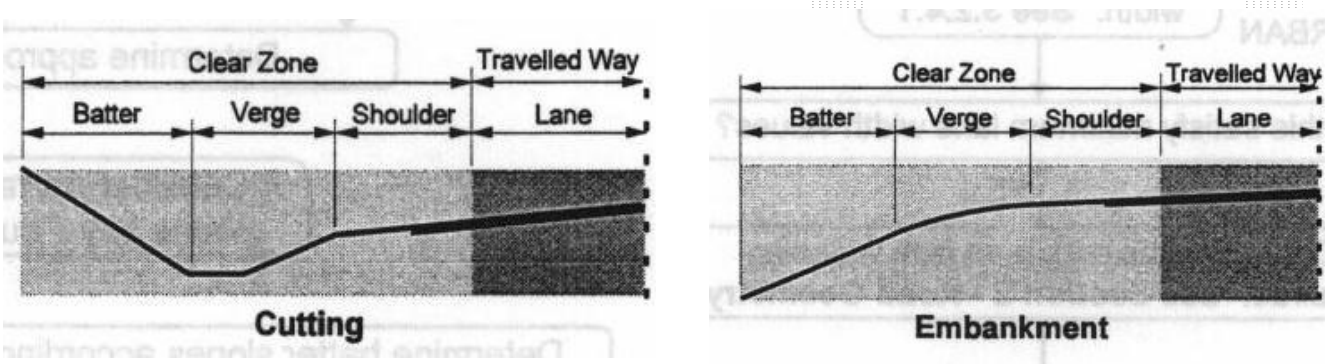


Fig. D1.11 Typical Clear Zone
(Source RTA Road Design Guide)

Clear Zone requirements

"To be regarded as part of the clear zone:

- The area should be relatively flat, with a maximum side slope of 3:1(cutting) and desirably 4:1 (embankment) or flatter less, to be traversable, having slope changes that will keep all wheels of an errant vehicle in contact with the ground (this assists the driver of an errant vehicle to regain control). See figure D1.13 for determining appropriate rounding for traversable batter slopes within clear zones.

- The area should be kept clear of all fixed objects such as trees greater than 200mm base diameter, Structure support piers, culvert headwalls and large solid (i.e. not frangible) sign supports, etc which are of such size that would cause unacceptable rapid deceleration rates to the occupants of an impacting vehicle.

- The desirable width of a clear zone is dependent on predicted traffic volumes, traffic speed and road geometry.

Fig.D1.12 is a nomograph that allows for the appropriate clear zone distance to be determined. These distances represent a reasonable measure of the degree of safety appropriate for a particular road and must be balanced by comparing land use and costs. The widths given are approximate only and the nomograph should not be used to infer a degree of acuracy that does not exist.

Where it is not possible to provide an adequate clear zone free of non-frangible obstacles for the appropriate distance, a safety barrier should be provided in accordance with RTA's Road Design Guide – Section 6, "Safety Barriers for Roads and Bridges".

If a recommended Clear Zone requires in unacceptable capital expenditure (such as in deep rock cutting), then the treatment shown in RTA's Road Design Guide – Section 5 "Design of Earth Structures", should be considered as and option".

Table D1.12 Lateral Clearances to Fixed Objects
(Source RTA Road Design Guide)

85th Percentile Speed (km/hr)	Clear Zone Width (m)	Shy Line* Width (m)	
		Left	Right
≤ 70	3.0 – 3.5	1.5	1.0
80	3.5 – 4.5	2.0	1.0
90	4.0 – 5.0	2.5	1.5
≥100	≥4.5	3.0	2.0

NOTE Clear Zones vary according to traffic volume
*****Shy Line Width is the offset to a hazard that a driver perceives to be adequate for his current travel speed adjacent to that hazard

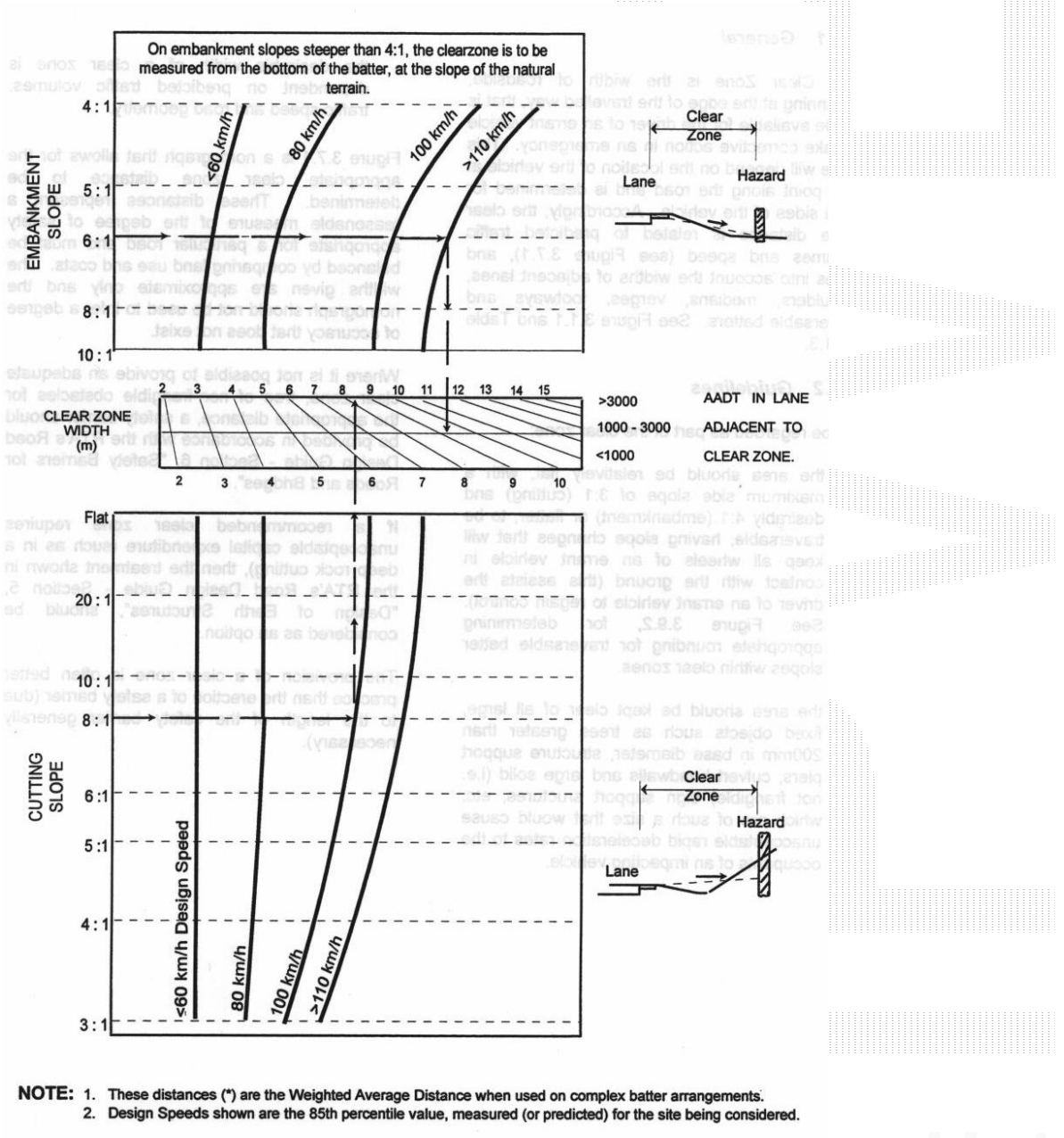


Fig. D1.12 Clear Zone Nomograph
(Source RTA Road Design Guide Amendment 2000)

D1.30.6 Batters

Batters General

"Batters are the side slopes of cuttings and embankments. The slope is expressed as a ratio – the horizontal distance in metres 'X' to one unit of vertical rise and shown as X:1.

The RTA's Road Design Guide – Section 5, "Design of Earth Structures", gives details of typical maximum slopes for various materials. Consideration should be given to the following factors when selecting batter slopes:

- The test results and any recommendations given in the geological report;
- The ease and cost of maintaining the adopted batter slope;
- Traffic safety and economics of eliminating safety barriers;
- Appearance and environmental effects, and
- The overall economy of the project." (Ref.4)

BATTER ROUNDING

Batter Rounding

"Rounding at tops of cuttings and embankments to reduce scouring, remove loose material and improve the appearance of the road. The amount of rounding on the top of cuttings usually depends on the material, the depth of rock (if any) and the natural contours of the ground.

Traversable embankment batters assist by providing an errant vehicle an opportunity to recover and return to the through carriageway, by maintaining all four wheels in contact with the ground.

Traversable embankment batters shall have the following attributes:

- Embankment batter slopes of 4:1 or flatter,
- Cutting batter slopes of 3:1 or flatter,
- Roundings as shown in Figure D1.13 or greater are to be provided at hinge points,
- Gutters with 4:1 slopes or flatter" (Ref 4)
- BATTER SLOPE TREATMENT

Batter Slope treatment

"Variable batter slopes can be used to improve a road's appearance by blending it into the surrounding terrain. They smooth the transition between cutting and embankment, assisting the provision of lay by areas.

Common treatments adopted are constant batter slope or constant offset type. Constant offset batters are preferred because of the improved road's appearance by blending various slope batters into the surrounding terrain (See fig.D1.14 Batter slope treatments)" –Source 'Road Design Guide' – RTA, Ref.4).

Avoid cutting batter slopes between 0.5:1 and 2:1 as stabilisation problems will increase without the introduction of suitable revegetation.

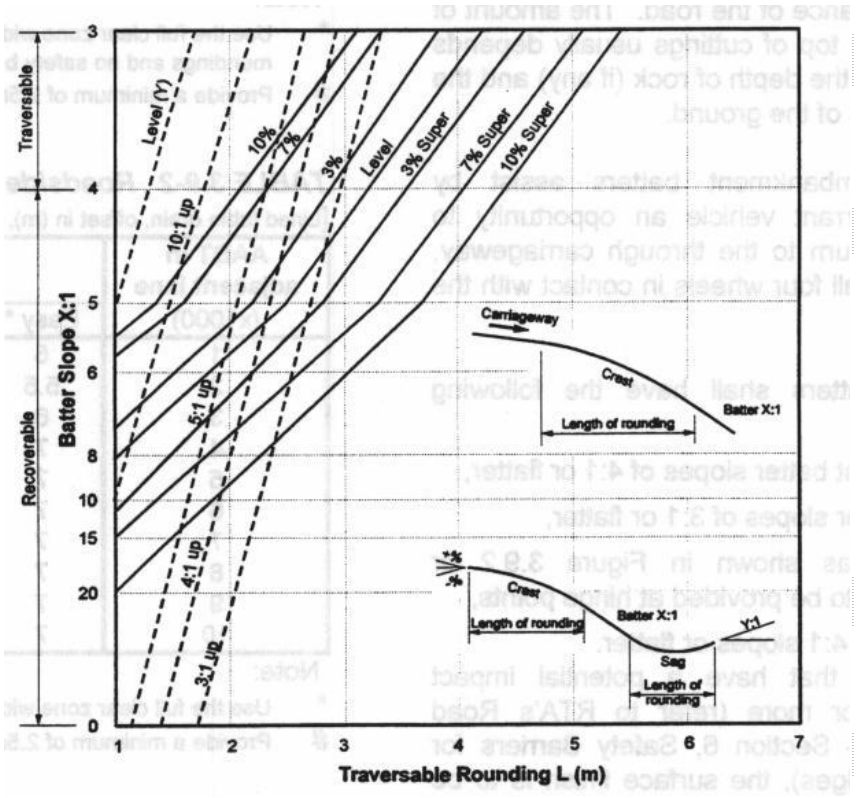


Fig. D1.13 Desirable Crest and Sag Rounding
(Source RTA Road Design Guide)

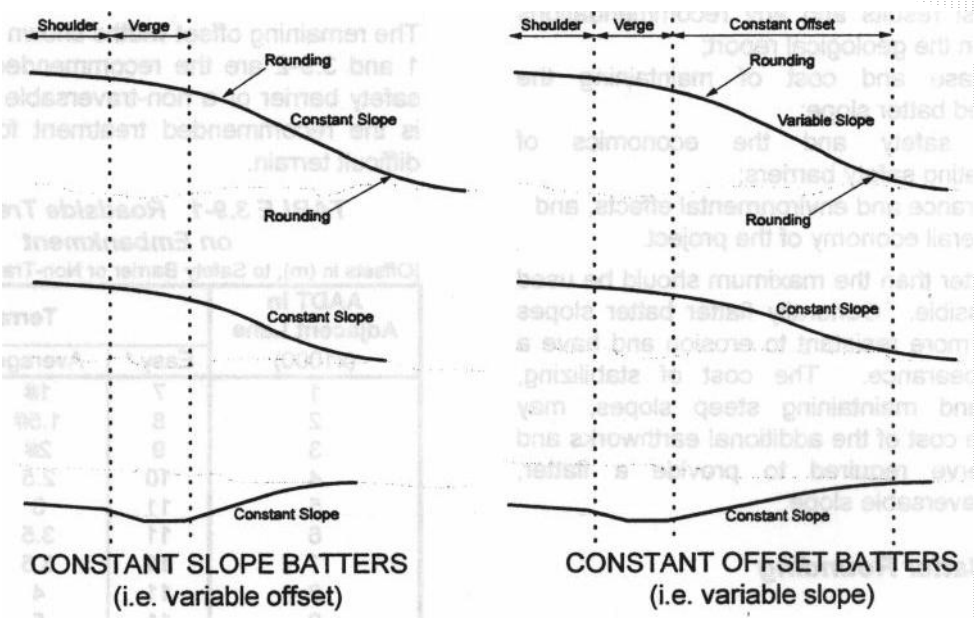


Fig. D1.14 Batter Slope Treatments
(Source RTA Road Design Guide 1988)

- BENCHES

Benches

"A bench is a near horizontal ledge that is constructed on a side slope to provide sight distance, slope stability and to assist with batter drainage

Benches are used on the face of batters:

1. to reduce surface water run-off;

2. where there is a change in the batter slope or batter material;

3. for maintenance access, and

4. to catch falling debris from the batter face.

The normal minimum width of bench is 4.0 m and the edges of which should not be rounded. See Fig. D1.15 – Location of benches in cuttings" (Source Road Design Guide, RTA, 1988).

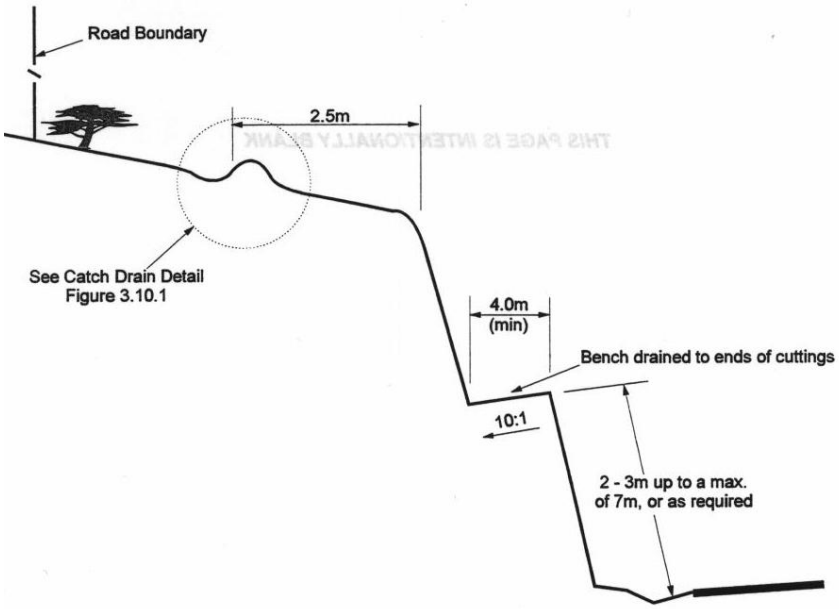


Fig. D1.15 Location of benches in cuttings
(Source RTA Road Design Guide)

D1.30.7 Crossfall

"Crossfall is defined as the slope, normal to the alignment, of the surface of any part of the carriageway. Crossfall is provided primarily to facilitate pavement drainage" (Ref 5)

Crossfall and Drainage

Crossfall has the important function of shedding water from the roadway to reduce the possibility of a vehicle aquaplaning in wet conditions. Details of the relationship between crossfall and pavement drainage are given in Section 3 of the Guide to the Design of Road Surface Drainage NAASRA 1986."

Typical crossfall ranges are shown in Table D1.13 (source RTA Road Design Guide)

Table D1.13 Typical Pavement Crossfalls
(Source RTA Road Design Guide)

ROAD SURFACE	TRAFFIC LANE (%)	SHOULDER (%)
Cement Concrete	2.0- 3.0	2.0 – 4.0
Asphaltic Concrete	2.5 – 3.0	2.5 – 4.0
Sprayed seal	3.0 – 4.0	3.0 – 4.0
Unsealed	3.5 – 4.0	4.0 – 5.0
Within Floodways	1.0 – 2.-0	1.0 – 2.0

D1.30.8 Drainage

- TABLE DRAINS - "Table drains are located within the verges in cuttings. Their purpose is to collect surface water draining off the carriageway and adjacent cut batter, carrying the water to a suitable point of discharge beyond the cutting. The invert of the table drain must be lower than the pavement sub-base to allow efficient drainage of the pavement layers. ***Table Drains***

  If it is necessary to deepen the table drain, the cutting should be widened so that the maximum 4:1 slope is maintained. Desirably the depth should not exceed 1 m.

  The minimum longitudinal grade in an unlined table drain is 0.5%.

  The arris formed by the side of a table drain and the shoulder should be rounded to minimise damage to errant vehicles." (Ref 5).

- CATCH DRAINS - "Catch drains are located on the high side of cutting slopes behind the batter rounding. Their purpose is to intercept the flow of surface and seepage water within the upper soil layer to prevent scouring of the batter face. ***Catch Drains***

  Catch drains as well as table drains, should be constructed to have a rounded or trapezoidal cross-section rather than a 'V' shaped cross-section (which are subject to erosion).

  Depending on the runoff velocity, catch drains should be stabilised immediately by seeding, turfing, jute mesh, bitumen, masonry, rock mattresses or concrete lining" (Ref.5)). – See Fig. D1.16

- LINED DRAINS - Lined table drains should be used in place of unlined drains for grades of less than 0.5% or where the velocities are likely to cause scouring. of run-off are likely to cause scouring. Lined table drains are to be formed in the shape of the type SO gutter as shown in Figure D1.10and Appendix D1. ***Lined drains***

- DYKES - "Dykes are low, longitudinal mound of earth or asphalt, provided near the edge of embankments to protect the batters from erosion, by controlling the water movement off the road pavement surface. They are located under the safety barrier on the lower side of the pavement crossfall". (Ref.5) ***Dykes***

- BATTER DRAINS - Batter drains are provided on embankments to transport water from dykes to the bottom of the batter. They are spaced at intervals that meet the maximum flow width criteria. The location and design treatment of batter drains are detailed in Sections 5 and 7 of 'Road Design Guide', RTA (Ref.5). ***Batter Drains***

D1.30.9 Bridges and clearances

- BRIDGE WIDTHS

Bridge widths

Bridge widths, including causeways, shall be determined from Table D1.14. Cyclists require wider shoulders – see AUSTROADS Guide to Traffic Engineering Practice, Part 14 – Bicycles. Departure from the indicated widths may be required to satisfy particular situations. Such alterations should be referred to the Engineer for concurrence. The provision and design of traffic containment barriers shall conform to the requirements of Austroads "Bridge Design code"

Table D1.14 – Bridge Carriageway Widths
(Source RTA Road Design Guide)

BRIDGE		TWO WAY							
		Single Lane				Two Lane			
Length	AADT	Shldr	Lane	Shldr	Width	Shldr	Lanes	Shldr	Width
<20	<50	0.5	3.0	0.5	4.0 [(a)]	-	-	-	-
Any	<100	0.6	3.0	0.6	4.2[(a)]	1.0	6.0	1.0	8.0
Any	100-500					1.0	6.0	1.0	8.0
Any	500-1000					1.0	6.5	1.0	8.5
<50	1000-2000					2.0	6.5	2.0	10.5
>50	1000-2000					1.0	6.5	1.0	8.5
<50	>2000					2.0	7.0	2.0	11.0
>50	>2000					1.0	7.0	1.0	9.0

NOTES
1. Wherever possible, bridge carriageway widths should equal the approach carriageway widths.
2. Use 3.0m shoulders adjacent to a barrier centreline marking or consider further widening to provide for auxiliary lane/s.
3. Add appropriate lane widths to the two lane configurations to determine multi-lane bridge widths.
4. Generally, Type F barrier to be installed, however, W or Thrie beam may be used when barrier penetration is not catastrophic.

(a) Allowance to be made for barrier posts to be attached to the outside of the bridge deck.

- PEDESTRIAN AND CYCLE BRIDGES

Pedestrian and Cycle Bridges

"The desirable width for an exclusive two way cycle bridge is 3.0m, with a minimum of 2.0m. The minimum clear width of a pedestrian bridge should be 1.8m, which is adequate for the passage of up to 300 people per hour". (Ref 5)

- LATERAL CLEARANCE

Lateral clearances

(i) Road

"The lateral clearance from the edge of the travelled way to bridge piers, abutments, retaining walls and other fixed objects should conform to the requirements for clear zones" (Ref 5). See Table D1.12

If the minimum clearances cannot be achieved and it is not possible to remove the object from the clear zone the object should be made frangible or shielded by the installation of a safety barrier, with attention being paid to the shy line effect and working width. Working width is the lateral distance required from the face of a rigid barrier to an element (such as bridge piers, walls etc.)

Signs and associated structures should be located in accordance with RTA Signs and Markings Manual. In general, the sign face should be placed behind the kerb face by a minimum horizontal clearance of 0.6m

(ii) Boundary

The minimum clearance from the hinge point of the top of a cutting batter, or the toe of an embankment batter to the road boundary is 5 m. Extra clearances may be required in deep cuttings whilst lower values may be necessary in urban areas. The minimum clearance to be adopted is the desirable clear zone.

- VERTICAL CLEARANCE

Vertical Clearances

Signs are to be placed to provide a minimum vertical clearance of 2.0m in urban areas when installed on footways, 1.2m in rural areas and 5.3m minimum for signs that are located over traffic lanes.

SPECIAL REQUIREMENTS

D1.31 ROADWAY RESERVES (RURAL ROADS)

Requirements for provision of roadway reserves

Council will require the provision as reserve for road purposes, of such areas at it may deem necessary for the safety and convenience of traffic, drainage, future maintenance and upgrading, support of the roadway, containment of batters and provision of public utilities.

Minimum widths of reserves to be provided are indicated in Table D1.10. Existing road reserves within or adjacent subdivisions may be required to be widened to meet these requirements.

Re-alignment

Where any existing road is not contained wholly within a roadway reserve so as to provide required lateral clearances, the road formation and/or road reserve shall be created or realigned so as to comply with the requirements of this Code.

Crown roads

Where crown roads are proposed to be utilised, the written consent of the Department of Conservation and Land Management will be required. Approval procedures to be followed by persons proposing to construct Crown Roads are provided in Development Control Plan No. 1 (Section E – Engineering Requirements of the guidelines document). Council may also require the closing of any unused or unnecessary crown reserves within the subdivision.

Public roads

Roads are required to be dedicated as public roads before Council will assume responsibility for the road.

Stock grids

Reserves on Council Roads will be required to be laned unless impractical. Where approved, heavy duty stock grids, with bypass gates may be provided as follows:

- Grids shall comply with Austroads “Bridge Design Code” for vehicle loading.
- Public bypass gates of clear width not less than 3.7m shall be provided.
- Posts on ether side of the grid are painted white and fitted with delineators facing the road in each direction.
- Advanced warning signs W5-16 (“Grid”) and guideposts with delineators are placed on each end of the approaches to the grid.

Construction including signposting to be undertaken in accordance with Council’s Engineering Specifications. Application forms for the erection of a public gate and stock grid can be obtained from the Engineering Division at the Council office.

D1.32 TRAFFIC CONTROL DEVICES

D1.32.1 General

Traffic Control Devices

The developer will be responsible for the provision of all traffic control devices deemed necessary on new and reconstructed roads. These may include:

- Road name signs;
- Guide posts and delineators;
- Safety barriers/fencing;
- Regulatory, warning and guide signs;
- Pavement markings;

- Flood depth indicators and other devices required to regulate, warn, guide or protect traffic.

Fig D1.16 illustrates the typical road sign placement.

Requirements may be determined by reference to the following codes and guidelines:

- Guide to Traffic Engineering Practice - Part 8, Traffic Control Devices, NAASRA, 1988
- Safety Barriers, NAASRA, 1987
- AS1742, Manual of Uniform Traffic Control Devices
- AS1743, Road signs
- Signs and Markings – Interim Guide to Signs and Markings, DMR, 1978

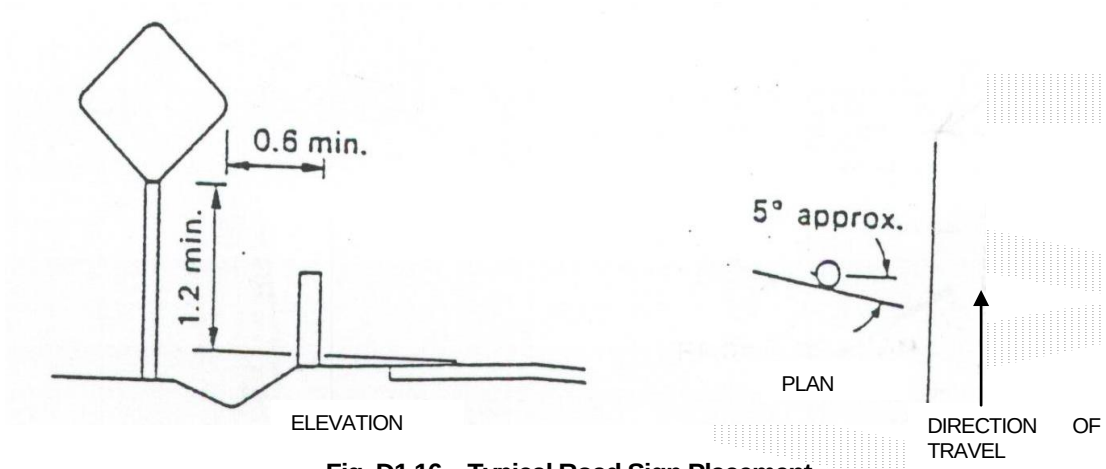


Fig. D1.16 Typical Road Sign Placement

NOTE: In urban areas where the street name signs are erected above footways, mounting heights shall be not less than 2.5m and not more than 3.0m measured from ground level at the signpost to the underside of the lowest sign. Lateral placement on kerbed roads shall be not less than 300mm back from the face of the kerb. Where semi mountable or mountable kerbs are used the minimum clearance should be 500mm.

D1.32.2 Road Name Signs

Road names for newly created public roads may be nominated by the developer for Council approval. Council has adopted the Geographical Names Board Guidelines for the naming of roads. All developers are advised to follow these guidelines. A copy of theses guidelines can be found in Appendix D1.

Guidelines for the Naming of Roads

Signs shall be metallic, consisting of black lettering on a white retro reflective background, in accordance with Australian Standard AS1742 Part 5 – "Street name and community facility name signs. A copy of Council's Standard Drawing B241 – "Street Name Sign Standard" can be found in appendixD1.

Standard Road Name Signs

D1.32.3 Line marking

Where circumstances warrant, linemarking of sealed road surfaces will be required. The developer may undertake this work or arrange for the work to be undertaken by Council at cost.

D1.32.4 Guide Posts

Guidelines for the location, erection and spacing of guide posts are provided in:

1. 'Traffic Control Devices' NAASRA, 1988

2. AS 1742.2 'Traffic Control Devices for General Use.

3. MR Form 253 'Specification for the Erection of Guide Posts.

Flexible (plastic) guide posts will generally not be permitted on roads likely to be subject to stock movements.

Retro reflective delineators, complying with RTA `Signs and Markings Manual are to be attached to guide posts.

Typical arrangements for guide posts and delineators are shown in Standard Drawing SD 106, Appendix D1.

LIST OF FIGURES

LIST OF TABLES

APPENDIX D1

1. Drawing Number B-163 Standard Vehicular Footpath Crossing details

2. Drawing Number D-243 Standard Driveway Long Sections

3. Drawing Number B-238 Standard Vehicular Rural Crossing

4. Drawing Number SD106/1 Guide Posts

5. Drawing Number SD106/2 Delineators

6. Figure 3.10.2 Typical Kerb and / or Gutter Shapes
   (Source RTA Road Design Guide Amendment 2000)

7. Drawing Number B240 – Kerb Ramps. Standard Drawing

8. Drawing Number B241 – Street Name Sign. Standard Drawing

9. Geographical Names Board of New South Wales – Guidelines for the Naming of Roads.

CONTENTS