



GEOMETRIC ROAD DESIGN
(Urban and Rural)

Planning Scheme Policy No. 15.01

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1 Scope and General

1.1 Scope

This section sets out the guidelines developed specifically for the design of roadwork's and street network within Mackay City using principles of street design to ensure safety and improved amenity and to reduce pedestrian/vehicular conflicts.

The framework for any new urban network shall include the land use/road hierarchy relationship and shall generally comply with the performance criteria outlined in Council's Road Hierarchy.

The Designer shall prepare a road hierarchy for the proposed development and determine the vehicle speed that is deemed acceptable for each section of every road, based on Table C1 or Table C2 (as appropriate) of Council's Road Hierarchy, refer to Appendix A. The concept of designing to regulatory street speeds is contrary to the principles of subdivision road design.

The Designer must integrate all relevant design principles into 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.

This Guideline shall be read in conjunction with the reference and source documents listed in Section 1.3.

The works "street" and "road" are interchangeable throughout all parts of this Guideline, unless specifically defined.

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

AS1348.1 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	That 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.

1.2 Objective

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 vehicles, pedestrians and cyclists.

- Provide safe, logical and hierarchical transport linkages with the 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 for a quality residential amenity by landscape design and the planting of appropriate street trees and use of the road reserve as a buffer between different land uses.
- Provide convenient parking for visitors.
- Have appropriate regard for the climate, geology and topography of the area.
- Have appropriate regard for the amenity and built environment of the area.

In the network planning of new residential areas, the Designer shall create a safe and pleasant residential area by considering the following matters:

- Provide for safe pedestrian and cyclist movement by catering separately for the demands of both using footpath or cycle networks or on-street facilities. Any new networks are to link into existing and proposed facilities identified by Council.
- The Designer shall reference Council's Bike Plan and liaise with Council to identify the proposed footpath and cycleway network.

Where demands cross minor collector streets (or higher classified streets), provision must be made to provide safe and appropriate crossing facilities to ensure equitable access.

- The connectivity of local access streets should not provide the opportunity for motorists to be able to 'rat-run' from one trunk road to another through the new residential area.
- The Designer shall liaise with Queensland Transport to identify current and proposed bus routes and bus stops. The Designer shall also refer to Table C1 (from the Road Hierarchy) to identify the form of any bus stop. Bus shelters are to be provided where required.

1.3 Reference and Source Documents

Council Guidelines & Specifications

Mackay Four Level Road Hierarchy (August 2003) – Epell Olsen and Partners

Mackay Four Level Road Hierarchy shown on Infrastructure Maps A & B

Mackay City Council – Development Construction Specification Series

Mackay City Council – Drawing and Documentation Guidelines - D20

Mackay City Council – Landscape Performance and Style Manual for Development Applications

Mackay City Council – Emergency Action Guide

Mackay City Council Standard Drawings

Australian Standards

AS 1348.1 Road and Traffic Engineering – Glossary of terms, Road design and construction

AS 1428 Design for Access and Mobility

AS 2890.1 Parking facilities: Off-street parking

AS 2890.2 Parking facilities: Off street commercial vehicle facilities

AS 2890.5	Parking facilities: On street car parking
AS/NZS 3845	Road safety barrier systems
AS 1158	Road Lighting
AS 4282	Obtrusive Effects of Outdoor Lighting

QLD State Authorities

Department of Local Government and Planning – *Queensland Residential Design Guidelines, 1998*

Queensland State Planning Policy 2/02 – *Planning and Managing Development Involving Acid Sulfate Soils*

Queensland State Planning Policy 1/03 – *Mitigating the Impacts of Flood, Bushfire and Landslide.*

Department of Main Roads – *Road Planning and Design Manual*

Other

AustRoads	RURAL ROAD DESIGN, Guide to Geometric Design of Rural Roads
	Guide Policy for the Geometric Design of Major Urban Roads
	Guide to Traffic Engineering Practice:
	PART 5 Intersections at Grade
	PART 6 Roundabouts
	PART 10 Local Area Traffic Management (2004)
	PART 12 Roadway Lighting
	PART 13 Pedestrians
	PART 14 Bicycles

The Institute of Municipal Engineering Australia, QLD Division

- Design Guidelines for Subdivisional Streetworks, 1995 – ‘Queensland Streets’
- Standard Drawings, 1997

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

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

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

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

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

Colman, J 1978, ARRB: Streets for Living.

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

Florida Department of Environmental Protection – FMRI Technical Report TR-2 (1966)

Understanding, Assessing and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

Blair E Witherington R. Erik Martin

1.4 Consultation

Designers are required to consult with the Council and other relevant Authorities prior to, and during, the preparation of a site layout and design concept. Designers should, in addition to requirements of this Guideline, ascertain specific requirements of the relevant Authority as they relate to the road system layout.

The Designer is required to prepare one overall layout plan (not less than A2 size) of any roadwork's associated with the overall creation of more than 24 new urban lots or 9 rural lots. The plan is to be used in conjunction with the initial consultation with Council and indicate the following aspects of the new estate:

- Road and lot layout – including any proposed traffic calming
- Major drainage lines – including detention basins and outfall
- Footpath and cycleways – including existing paths and crossings of major roads
- Sewer main locations – including connection into existing system
- Parkland – including area of any play equipment/irrigation area.

The Designer shall obtain service plans from all relevant public utility authorities and organisations whose assets 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 consultation on concept designs shall be provided where Council requires such action.

1.5 Planning Concepts

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 road network for residential developments should have clear legibility.

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

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

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

Roads of different classification should differ in alignment and design standard by complying with the Objectives and Desirable Performance Criteria (Council's Road Hierarchy – Table B) for the relevant road function classification.

The road layout and width must be in conformity with Council's Road Hierarchy Plan as shown on Infrastructure Maps A and B of the Planning Scheme.

The Designer shall take specific care when proposing any new estate layout to ensure that property access requirements, as defined in Tables B1 and B2 of Council's Road Hierarchy, are adhered to.

In new areas (as distinct from established areas with a pre-existing road pattern), the form of each new road should reflect its function in the road hierarchy by its visual appearance and related physical design standards.

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.

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.

Appropriate native deep-rooted species should be selected for plantings in association with road reserve works. Plantations should be of sufficient size and density to be effective in their desired role of lowering the groundwater table.

1.6 Carriageway Details

Road Reserve and Carriageway widths for street and roads shall generally conform to those defined in Council's Road Hierarchy.

The cross-section details shown in Council's Road Hierarchy are considered "acceptable solutions" to the form of the various street and road classifications. However, where the Designer is proposing an alternative form of cross-section then discussions are required with Council staff prior to seeking formal approval.

1.7 Drawings and Documentation

All drawings and documentation being submitted to Council for approval shall conform to the requirements of Council's Engineering Design Guideline D20 *Drawings and Documentation Guidelines*.

Failure to comply with Council's Engineering Design Guideline D20 *Drawings and Documentation Guidelines* may result in the drawings and/or documentation being returned to the Designer without consideration by Council.

2 Urban Design Criteria

2.1 Road Network

A suitable qualified and experienced professional engineer (RPEQ) shall oversee aspects of the road design. The design shall comply with relevant requirements of:

- This Guideline
- All Reference and Source Documents listed in Section 1.3
- Any Development Approval conditions relevant to the design, and
- Any specific relevant and reasonable request provided by Council in writing.

The RPEQ shall sign all plans associated with the project, certifying that the design complies with this section.

The design features of each type of road convey to the driver its primary functions and encourage appropriate driver behaviour.

Traffic volumes and speed environment on any road should be compatible with the function of the road as described in Council's Road Hierarchy Plan.

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 because of speed restraints.

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

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

The minimum width of land that provides pedestrian or bicycle linkage is 15m.

The designer shall also take into account the requirements of '*Engineering Design Guideline D9 – Cycleway and Pathway Design*' in any new road design.

The road network should ensure that no road links with another road that 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 place or access street should have access to a major collector street, unless otherwise approved by Council.

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

The creation of any new intersection along a road must provide that the final minimum intersection spacing along the higher-order through road complies with the requirements of Table B1 or B2 in Council's Road Hierarchy.

Where this cannot be met in established built-up areas, then the designer shall seek and obtain separate in-principle approval to the proposed intersection location.

In considering any request for an intersection spacing closer than provided for in Council's Road Hierarchy, the designer must provide documented evidence to Council that demonstrates that the proposal will not reduce the functional performance requirements of either the through or the terminating road.

This will require the designer, as a minimum, to consider and provide evidence with regard to the following issues:

- Existing and predicted traffic volumes on all roads ensuring the function of the higher-road road is not substantially compromised
- Satisfactory operational performance of the proposed intersection(s)
- Access and egress from all properties adjacent to the proposed intersection is not compromised, unless the affected owner(s) agrees in writing
- Existing and proposed road form, including linemarking, road width and traffic islands
- A plan of the area indicating existing property accesses, drainage and other underground services
- Sight distance and turning movements requirements are met
- Pedestrian and cyclist safety is not compromised.

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

The external road network should be designed and located to provide routes that are more convenient for potential through traffic within the network. Major roads should be provided at intervals of no more than 1.0 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.

2.2 Design Speed

Design speed is generally used as the basic parameter in the specification of design standards, determining the minimum design value for other elements. 'Queensland Streets' uses the 85th percentile maximum speed of traffic within the street. This is similar to the 'Speed Environment' used in AustRoads Guide to the Geometric Design of Rural Roads. Road intersections as well as changes in horizontal and vertical alignment also limit vehicle speeds.

Adoption of a low design speed discourages speeding. However, where vertical 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.

The designer must ensure that potentially hazardous features are visible to the driver and adopt traffic engineering measures that will help a driver avoid errors of judgement.

The designer shall ensure that the selected design speed will result in a speed environment that is likely to comply with that specified in Table B of Council's Road Hierarchy under the 'Traffic Speed Environment' criteria. The adoption of a design speed that will result in a speed environment that is outside the desirable range stated in Table B shall require separate Council approval.

The need for road safety barriers shall be assessed and designed in accordance with Chapter 8 of Department of Main Roads (DMR) 'Road Planning and Design Manual'.

2.3 Longitudinal Gradient

Where the street design includes kerb and channel, a general minimum gradient of 0.5 per cent should be adopted. In very flat conditions it may be reduced to 0.2 per cent. Where underground drainage with gully pits or other special works are used it is acceptable to introduce artificial undulations. Variable crossfall may be necessary to produce the required grade in the gutter. Maximum recommended grades for all street types are as shown in 'Queensland Streets'.

Longitudinal grade of the minor street on the approach to an intersection should comply with the AustRoads Guidelines and DMR *Road Planning and Design Guideline*. The actual gradient 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.

Turning areas in culs-de-sac on steep grades should have grades less than 5 percent.

2.4 Horizontal Curves and Tangent Lengths

The horizontal alignment of a road is normally in a series of tangents (straights) and curves that 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 1.9. 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 that 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.

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 'Queensland Streets'.

To determine appropriate lengths for tangents between speed restrictions, which may be curves, narrow sections or other obstructions, refer to 'Queensland Streets'. Sight distance on curves is determined by formula, values of which are tabulated in 'Queensland Streets'.

The Designer should also incorporate the need for curve widening into their curve designs, based on the deflection angle of the curve as referenced in 'Queensland Streets'.

2.5 Vertical Curves

Vertical curves will be simple parabolas and should be used on all changes of grade exceeding 1 percent. The length of the crest vertical curve for stopping sight distance should conform to 'Queensland Streets'.

For adequate riding comfort, lengths of sag vertical curves should conform to 'Queensland Streets'.

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 and then only with agreement of Council during the consultation outlined in Clause 1.4.

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 channel. A minimum grade of 0.2 percent shall be maintained in the kerb and channel. This may require some warping of road cross sections at sag points.

The three dimensional co-ordination 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 shall 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 grade line between sag curves may adversely affect the road's symmetry and appearance.

2.6 Superelevation

The maximum superelevation for urban roads of higher design speeds should be 6 percent. 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 percent.

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 that 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.

Recommendations for minimum curve radii (in metres) on major urban roads under varying superelevation/crossfall are shown in AustRoads, Guide Policy for the Geometric Design of Major Urban Roads.

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 2 m from the outer kerb.

2.7 Road Reserve Characteristics

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 and provision for parked vehicles. The cross section also allows for the provision of a buffer for residents from traffic nuisance, and also to cater for garbage bin collection, public utilities and streetscape.

Generally, the Designer shall provide a cross section and road reserve width that reflects that shown for the relevant road hierarchy cross section as detailed in Appendix D and E of Council's Road Hierarchy Plan and Council's Standard Drawings unless separate approval is obtained from Council. The minimum verge width is to be maintained at intersections, traffic calming and traffic management devices and at the ends of culs-de-sac. However, at intersections sight lines may control the verge width.

The Designer may need to provide a wider road reserve width than indicated in Standard Drawings. This may occur adjacent to traffic calming devices, where a series of various services are laid along a road (and minimum separation clearances has to be maintained) and along some streets where a shared pathway is to be constructed in the verge/footpath.

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 that include trucks, emergency vehicles and on some roads, buses. (Refer to Clause 1.21 for bus routes).

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

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.

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

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

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.

Stopping sight distances and junction or intersection sight distances, provided by the verge, should be based on the intended speeds for each road type.

In streets where there is to be a temporary "dead end", the designer shall make suitable provision for a single unit garbage truck to turn around.

2.8 Crossfall

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

<i>Pavement Type</i>	<i>Crossfall</i>
Bituminous seal coat	3 percent
Asphaltic concrete pavement	3 percent
Concrete pavement	2 percent

The crossfall on a collector street 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 percent in the kerb line of the side street, relative to the centre line grading, is a reasonable level.

The maximum gradient in carparks shall be in accordance with AS2890.1.

2.9 Verge and Property Access

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. Crossfalls in footpath paving shall generally be 2% and shall not exceed 2.5%. Longitudinal grades usually parallel that of the road.

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

- Cutting at the boundary on the high side and providing the verge at normal level and crossfall
- A uniform crossfall across the carriageway.

The above measures can be used singularly or combined. The verge formation should extend with a 1 m berm beyond the road reserve boundary. The designer shall consider options shown on Council's standard drawing.

The Designer shall design a centreline profile for the property access and check this design using critical car templates, to ensure that vehicles can use the property access satisfactorily.

2.10 Intersections

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 major collector streets or sub-arterial roads.

Intersection design for the junction of roads with existing rural or urban roads shall be in accordance with the publication AustRoads Guide to Traffic Engineering Practice, PART 5, Intersections at Grade.

All new intersections shall be three-way intersections, unless otherwise approved.

Intersections with State-controlled roads or national highways are to be designed, approved by and constructed in accordance with the requirements of the Queensland Department of Main Roads.

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.

Intersections should be generally located in such a way that:

- The intersection spacing complies with the requirements of Table B1 or B2 of Council's Road Hierarchy Plan.
- 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 centre-line spacing of 40 m to provide for a possible right-turn auxiliary lane on the major street.
- A right-left manoeuvre between the staggered streets is required, avoiding the possibility of queuing in the major street.

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

Where the intersection involves a road having a classification of "Major Collector", or higher, then the designer shall demonstrate that the requirements of Section 5.2 of AustRoads Guide to Traffic Engineering Practice – Intersections at Grade have been satisfied.

Appropriate provision should be made for vehicles to park safely in accordance with Queensland Streets and Council's Road Hierarchy Plan (where appropriate).

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

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

- For intersection turning movements involving major collector streets, the “design vehicle” shall be a semi-trailer with turning path radius of 15 m. Should the Designer wish to propose a smaller turning radius, thereby resulting in a slower turning speed, then separate Council approval must be obtained.
- For intersection turning movements involving access streets or minor collector streets, but not major collector streets. The “design vehicle” shall be single unit truck with turning path radius 12.5m.
- For intersection turning movements on access places but not involving major collector streets, collector streets or access streets, the garbage collection vehicle used by Council as discussed in ‘Queensland Streets’.
- For turning movements at the head of cul-de sacs in access places sufficient area is to be provided for the garbage collection vehicle to make a three-point turn. Where driveway entrances are to be used for turning movements, the designer shall ensure that the required area is to be designed and constructed to withstand the relevant loads. Refer to ‘Queensland Streets’ for additional requirements on turning areas.

In the case where a vehicle is required to undertake a three-point turn in the “turning area”, the following points are to apply (refer to Fig. 2.12K in Queensland Streets):

- a. The maximum leg length shall be 20m (centreline to end)
- b. Driveways to all frontage lots is to be provided at the time of construction, and
- c. the pick-up point for garbage bins, pathways and parking is to be considered in the design.

No median breaks will be permitted at intersections on major collector streets, sub-arterial or arterial roads except at approved intersections.

Turning radii at intersections shall accommodate the intended movements without allowing desired speeds to be exceeded.

Threshold treatments (splitter island with pedestrian break and pavement surface treatment) raised medians with pedestrian breaks or flush painted median islands and rumble bars shall be provided at various intersections. Designers should make reference to Council's standard drawing to determine requirements.

2.11 Turning & Auxiliary Lanes

Turning and Auxiliary Lanes at intersections should be designed to accommodate the appropriate design vehicle. Generally, the turn/auxiliary lane should be at least the same width as the adjacent through lane with the following provisions:

- Where the lane is located between kerbs the distance between kerbs shall be 5.5m or the swept path for the design vehicle plus 1.6m whichever is greater
- For turn auxiliary lanes to any industrial road, the minimum lane widths shall be 3.5m, measured from lip of kerb to the edge of the through lane.

In addition, verge widths are to be maintained at the dimension equivalent to that shown on the standard road cross-section for the hierarchy of the road concerned. Auxiliary/Turn Lanes are not to be catered for by a reduction in verge width.

2.12 Roundabouts

Roundabouts are to be approved by Council.

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

- Entry width to provide adequate capacity
- Adequate circulation width, compatible with the entry widths and design vehicles 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
- Designed to ensure that the speed of all vehicles approaching the intersection will be less than 40 km/h, and
- Provide for safe pedestrian and cyclist movements.

No streetlights shall be placed inside the roundabout with all light poles to be located on the street verge/footpath. Consideration for approval of alternate light pole locations (eg in large roundabouts) will only occur where the Designer can demonstrate that illumination levels required by AS1158 cannot be achieved if the light poles are installed on the verge..

The internal area of the roundabout shall be landscaped with suitable plants that are to be watered by an approved underground irrigation system.

Raised splitter islands are to be provided on the approach to all roundabouts, unless otherwise approved.

Barrier kerb and channel is to be provided on the outside kerbs at all roundabouts.

The designer shall provide Council with plans and documentation to support the design.

2.13 Traffic Calming

Traffic calming devices are to be approved by the Council.

All calming devices (such as thresholds, slowpoints, speed humps, chicanes and splitter islands) shall be designed in accordance with the requirements of the publication AustRoads Guide to Traffic Engineering Practice – PART 10, Local Area Traffic Management (LATM), Queensland Streets and Council's Standard Drawings.

The designer may be required to provide Council with plans and documentation to support the design.

Raised traffic islands and medians less than 12 m², or narrower than 2 m between kerb faces, shall be infilled with concrete. The concrete is to be a minimum of 100 mm thick, be N25 reinforced concrete and be finished in R52 'Terra Cotta' colour in accordance with AS2700 with a herringbone paver pattern.

Note that if coloured / patterned concrete is proposed then the colouring is to extend for the full depth of the concrete.

Device designs shall comply with Council's standard drawings where applicable.

(a) Streetscape

- Enhance existing landscape character
- Maximise continuity between existing and new landscape areas

- Reduce the linearity of the street by segmentation
- Avoid continuous long straight lines (eg. kerb lines)

(b) Location of Devices/Changes

- Devices other than at intersections should be located to be consistent with streetscape requirements
- Existing or proposed street lighting power poles, drainage pits, driveways and services may decide the exact location of devices
- Calming devices are to be located at spacings of 80- 100 m
- Where any device (including linemarking) will restrict vehicle access to any abutting properties, then the property access shall be constructed at the same time as the roadworks in the approved location. This requirement also applies at intersections and roundabouts

(c) Design Vehicles

- Emergency vehicles must be able to reach all residences and properties.
- Where bus routes are involved, buses must 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

- The designer is to ensure that the road layout and location and type of any traffic calming devices will result in a speed environment (measured by the 85th percentile) in the street is no greater than the posted speed limit for the street. The designer is to endeavour to achieve the desired speed environment by appropriate road alignment design before considering the use of traffic calming devices.
- Maximum vehicle speeds will only be reduced by deviation of the motorist's travelled path. Pavement narrowings have only minor effects on average speeds with little or no effect on maximum speeds.
- Speed reduction can be achieved using calming devices which shift vehicle paths laterally (slow points, roundabouts, blister islands) or vertically (raised platform, speed cushion). Speed humps are not to be installed without express prior approval.
- Creating a visual environment conducive to lower speeds can help speed reduction. This can be achieved by 'segmenting' local streets into relatively short lengths (preferably less than 300 m), using appropriate devices, streetscapes, or street alignment to create short sight lines.
- All calming devices shall be designed to enable a single unit garbage truck to negotiate the device without mounting any kerb. Further, a heavy rigid vehicle shall be able to negotiate all calming devices without mounting the footpath/verge, landscaped areas or any parking bays, or conflicting with any signs.

(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 at proposed new speed control devices located away from existing street lighting in accordance with AS1158.4.
- A suitable qualified and experienced professional engineer (RPEQ) shall oversee the design all street lighting. The designer is to initially try and use any existing power poles where appropriate before requiring any new power poles. All street lighting shall be checked to ensure both horizontal and vertical lighting requirements are complied with.

2.14 Parking

The parking requirements associated with any land use shall comply with the conditions imposed by the Development Approval, or any separate direction provided by Council in writing.

All on-site parking should be located and have dimensions that allow convenient and safe access and usage and be designed in accordance with the relevant Australian Standard.

The parking layout shall take into consideration desired pedestrian movements and appropriate separation between vehicles and pedestrians.

Parking within the road reserve shall be in accordance with Council's Road Hierarchy and Queensland Streets.

On single-lane access streets, parking spaces shall 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 or pedestrian traffic or prevent access to adjacent properties.

The parking bays shall generally be delineated with the use of the wearing surface material, rather than with the use of painted pavement markings.

On streets in industrial areas, longitudinal line marking shall comply with requirements of the appropriate Council standard drawing.

On-street parking facilities shall provide for convenient and safe equitable access. Provision for disabled parking bays shall be provided where requested by Council and shall comply with AS 1428.1.

Parking spaces provided on the verge or carriageway shall be designed in accordance with AS 2890.5. All parking within the road reserve shall be sign posted.

Linemarking of individual on-street parking bays shall generally be provided only in the following circumstances.

- Anywhere inside the City Centre area of Mackay, or
- Adjacent to, or near, areas of high demand - eg convenience stores, schools, churches, community facilities.

All linemarking shall be in accordance with the Queensland MUTCD.

For non-residential land uses, the opportunity for joint use of parking should be maximised by being shared with a number of complementing uses.

All verge spaces and indented parking areas are constructed of concrete, interlocking pavers, asphalt 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.

90° angled kerb-side parking will generally only be permitted on access places and access streets and then only where the posted speed limit does not exceed 40 km/h.

If the designer wishes to provide 90° kerb-side parking within a posted speed limit of 50 km/h then separate approval shall be required to be given by Council. For approval to be considered then the following minimum circumstances must apply:

- There is a demonstrated need for a high level of parking, and
- The parking bays must be linemarked, and
- The edge line of the adjacent traffic lane must be marked, and
- A vehicle must be able to enter and exit the parking space without the need to cross over in any adjacent travel lane.

90° angled kerb-side parking will not be permitted in a street with a 60 km/h, or higher, posted speed limit.

2.15 Bus & Heavy Vehicle Routes

The designer will need to identify existing and proposed bus routes in consultation with Queensland Transport. It is important that the road form and network layout adequately cater 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 classified as collector streets, or higher order streets, in Council's Road Hierarchy Plan are to be capable of functioning as a bus route. Table D1.2 details minimum criteria for bus route design.

Table D1.2 Bus Route Criteria

Road Classification	10 Year Design Horizon Traffic Volumes	Stops Spacing	Bus Stop Provision
Minor Collector	<2,000 vpd	400 metre	Kerbside Stop with Shelter
	>2,000 vpd	400 metre	Indented Bay with Shelter
Major Collector		400 metre	Indented Bay with Shelter
Sub-Arterial		400 metre	Indented Bay with Shelter

Note: Shelters are subject to Council's requirements.

All new bus stops and shelters and adjacent footpaths must comply with the Federal Government's "Disability Standards for Accessible Public Transport Guidelines 2004 (No. 2).

All new bus shelters shall comply with Council's standard drawings. Alternate suppliers must be able to demonstrate that they are to supply a shelter that meets the shape, materials, colour and standard of finish.

Where projects are on identified heavy vehicle route the road form and geometry shall adequately cater for the identified vehicles. Existing heavy vehicle routes should be determined by reference to the Queensland Transport web site.

2.16 Street Lighting

Street lighting shall be provided on all urban street and road and rural street classifications. Council requires lighting of intersections on rural roads where one of the roads is classified as a "Sub Arterial", or higher, under Council Road Hierarchy Plan. Where lighting is required to be placed at an isolated rural intersection it shall be designed as "flag lighting" in accordance with AS1158.1.1

Street lighting in new access streets/places and collector streets shall be designed to a P category. The minimum lighting category for new developments is to be P4.

Arterial and sub-arterial roads shall be designed to a V category. The designer shall consider all relevant aspects of AS1158.1.1 or AS1158.3.1 when designing the streetlights.

The street lighting design shall include the lighting of any existing or proposed roundabouts, traffic calming or traffic management devices.

Where the roadway to be lit currently exists, the designer shall endeavour to initially locate any new light on existing power poles. The addition of new poles shall only be considered where the use of existing poles is impractical or results in an inefficient outcome.

If a new pole is required, the designer shall consider the implications of the removal of one, or more, existing poles to maintain the current amenity in the street. The designer shall liaise with Ergon Energy about the cost and other implications prior to making a recommendation to Council.

The alignment of street lighting poles to be utilised in any design shall be as indicated on Council's Road Hierarchy Cross Sections.

New street lights shall be the luminaire types which meet the requirement as being a 'standard' luminaire in accordance with Table 7.6 from *Ergon Energy Lighting Construction Manual and Specification RSM02*.

Designers should note that Council will not approve the installation of "Nostalgia" luminaires, as they do not comply with the glare control requirements of AS 1158.3.1. Further, Council required all luminaires installed to be fitted with Aeroscreen lamps to assist in complying with glare control.

Public Lighting tariff arrangements are described in the Queensland Transmission and Supply Commission Corporation (QTSC) standard conditions. All street lighting installations shall meet the requirements for acceptable of supply under the above conditions as Rate 2 installations.

All street lighting shall be checked to ensure both horizontal and vertical lighting requirements are complied with and that possible obtrusive lighting issues in future or existing residences are addressed as specified in AS4282.

All street lighting design records shall be included as part of the documentation to be submitted by the Designer. The Designer shall provide isolux diagrams to support their street lighting designs. Isolux diagrams shall illustrate lighting on both horizontal and vertical surfaces where these are considered to be critical to the design.

Special Requirements for Public Lighting near Foreshores

Artificial lighting on or near beaches is strongly attractive to hatchlings and can cause sea turtle hatchlings to move in the wrong direction (disorientation) as well as interfere with their ability to orient in a constant direction (disorientation). The requirement to minimise the light-pollution impact on nesting turtles is to apply where light from any artificial light (including street lighting) is visible to a person standing anywhere on a beach.

Where any proposed lighting is near a beach known to be, or likely to be, frequented by nesting turtles then the designer shall undertake a design that minimises the light-pollution impact on nesting turtles.

As any measurable level of artificial brightness is not 'acceptable' for nesting turtles, the designer is to adopt a "*best available technology (BAT)*" approach in the design of the street lighting. This will include consideration of any of the following options:

- Lighting that can be switched off or fitted with a timer
- Minimal numbers and wattage of lights
- Minimise height of luminaire to achieve light standard required
- Use of vegetation, shields or recesses to ensure that light does not reach the beach.

The use of low-pressure sodium lighting is well recognised as having the least disruptive impact on Logger Head and Leather Back sea turtles.

2.17 Residential Estate Entrances

Where it is proposed that a residential estate will have permanent entry sign that includes the "estate's name", the designer shall ensure that this sign (usually of low-wall construction) is not located on the road reserve or any other land/reserve that Council will assume the on-going maintenance for.

Council may require separate planning approval for the erection of such signage.

Council will not assume maintenance responsibility for these type of constructions/signs.

The designer shall demonstrate to Council that suitable on-going maintenance arrangements will be in place prior to any approval for the construction is given.

2.18 Street Furniture

The designer shall ensure that all proposed street furniture (including street signs) complies with Council's current standards as indicated in its standard drawings or landscape style manual.

2.19 Evacuation Routes

Where works are proposed for existing or foreshadowed evacuation routes, designers shall recognise that minimisation of inundation during flooding or storm surge events is a requirement to ensure the ability of the roadway to maintain its function as an evacuation route.

Crown levels on these roads is to be maintained at a minimum level of 5.0m AHD to ensure its viability and trafficability during evacuation incidents.

Further, where the development is controlled by the storm surge Minimum Level of RL5.0m, then the road shall be no lower than 4.7m AHD at the lip of the kerb & channel.

The evacuation routes to which this requirement applies are shown in the *Mackay City Council – Emergency Action Guide*. Copies of this document are available from Council and are on Council's web page.

3 Rural Design Criteria

3.1 General

This section applies to all roads in designated rural areas, including rural home sites and rural residential types of developments.

Design speed is to be generally used as the basic parameter of design standards. 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.

The minimum Design Speed to be adopted is specified in Council's Road Hierarchy in Table C2 attached.

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

Any new rural subdivision layout shall be designed to prevent direct property access onto a sub-arterial and higher order road.

Accesses shall be limited to one point onto any road. New property accesses will not be permitted onto any sub-arterial or arterial road.

3.2 Sight Distances

Minimum stopping and sight distances shall be provided at all points on the road in accordance with AustRoads – Guide to Geometric Design of Rural Roads.

3.3 Horizontal and Vertical Alignment

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 to the terrain to achieve desirable aesthetic quality and being in harmony with the landform.

The designer shall ensure the location of guideposts and Chevron Alignment Marker signs (CAMs) is in accordance with the Queensland MUTCD and Council's standard drawing.

3.4 Intersections

Intersections shall be designed in accordance with the publication AustRoads Guide to Traffic Engineering Practice – Part 5, Intersections at Grade. The type of intersection required will depend on existing and planned connecting roads.

New four-leg cross-intersections will not be permitted in rural areas.

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.

Staggered-T arrangements proposed for rural cross-intersections shall 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.

3.5 Plan Transitions

A plan transition is the length over which widening and shift is developed from the “tangent-spiral” point to the “spiral-curve” point; i.e., the length between the tangent and the curve. Plan transitions are generally only required on arterial and sub-arterial rural roads. 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 shall be considered.

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 percent relative to the centre line should ensure against this. The wider the pavement the longer the transition. Superelevation transitions should be used at all changes in crossfall, not just for curves. Drainage problems can arise with superelevation transitions that 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.

3.6 Superelevation

Use of maximum superelevation will be considered where the radius of the curve is 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.

Notwithstanding the above, the maximum superelevation to be adopted for rural roads is 6%. This is to minimise the likelihood of tipping of cane haulage vehicles.

3.7 Scour Protection

Scour protection of road 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 to determine the level and extent of any protection works prior to proceeding to final design stage.

Where the table drain is likely to scour, or the table drain exceeds 5%, a suitably lined table drain is to be constructed along the invert. Also for grades of less than 0.1% the inverts of the table drain shall be concrete lined to prevent siltation and facilitate on-going maintenance.

In the design of any scour protection works, the designer shall take into account the on-going maintenance requirements of Council, including the need to provide safe and

adequate access for plant and personnel, the need to minimise on-going costs and eliminate the need for any specialist plant or equipment.

3.8 Evacuation Routes

Where works are proposed for existing or foreshadowed evacuation routes, designers shall recognise that minimisation of inundation during flooding or storm surge events is a requirement to ensure the ability of the roadway to maintain its function as an evacuation route.

Crown levels on these roads is to be maintained at a minimum level of 5.0m AHD to ensure its viability and trafficability during evacuation incidents.

The evacuation routes to which this requirement applies are shown in the *Mackay City Council – Emergency Action Guide*. Copies of this document are available from Council and are on Council's web page.

APPENDIX A

ROAD HIERARCHY CLASSIFICATIONS



Table A.1

Road Hierarchy Levels and Objectives- Urban Areas

LEVEL 1: PURPOSE									
Road					Street				
<ul style="list-style-type: none"> to carry through traffic. 					<ul style="list-style-type: none"> to provide local property access; to collect local traffic. 				
LEVEL 2: FUNCTION									
Arterial Road			Sub Arterial Road			Collector Street		Local Street	
<ul style="list-style-type: none"> through traffic movements across town; longer distance strategic traffic movements; primary connection between suburbs and employment, economic, education or entertainment centres; line haul public transport task; primary freight and dangerous goods routes; regional cycle movements. 			<ul style="list-style-type: none"> through traffic between arterial roads; connections between local areas and arterial roads; access to public transport; through movement of public transport; regional – local cycle movements; pedestrian movements. 			<ul style="list-style-type: none"> carry traffic having a trip end within the specific area; direct access to properties; access to public transport; pedestrian movements; local cycle movements. 		<ul style="list-style-type: none"> direct access to properties; pedestrian movements; local cycle movements. 	
LEVEL 3: MANAGEMENT									
Highway	Arterial	Arterial Main Street	Traffic Distributor	Controlled Distributor	Sub Arterial Main Street	Major Collector	Minor Collector	Access Street	Access Place
<p><i>The aim of management policies for these categories will be to facilitate:-</i></p>									
<ul style="list-style-type: none"> longer distance traffic movements between towns; regionally and nationally significant movements. 	<ul style="list-style-type: none"> longer distance traffic movements between suburbs and other centres. 	<ul style="list-style-type: none"> longer distance traffic movements; access to commercial properties; car parking; pedestrian movements. <p><i>Treatment may involve preservation of aspects of local amenity in balance with traffic operation</i></p>	<ul style="list-style-type: none"> connection of local areas to arterial roads; through movements between arterial roads. 	<ul style="list-style-type: none"> connection of local areas to arterial roads; access to properties (certain cases). <p><i>Treatment may control some aspects of traffic operation to ameliorate impacts.</i></p>	<ul style="list-style-type: none"> connection of local areas to arterial roads; access to commercial properties; car parking; pedestrian movements. <p><i>Treatment may involve preservation of aspects of local amenity in balance with traffic operation.</i></p>	<ul style="list-style-type: none"> connection of local and/or minor collector streets with traffic carrying roads; access to grouped/ commercial properties and community facilities. 	<ul style="list-style-type: none"> connection of local streets with traffic carrying roads; access to individual adjacent properties. 	<ul style="list-style-type: none"> access to individual adjacent properties; connection to other local streets. 	<ul style="list-style-type: none"> access to individual adjacent properties.
LEVEL 4: DESIGN									
<ul style="list-style-type: none"> according to relevant guidelines and codes including Council Development Manual, AUSTRROADS Guides, Queensland Streets, AMCORD, Australian Standards. 									



Table A.2

Road Hierarchy Levels and Objectives- Rural Areas

LEVEL 1: PURPOSE							
Road				Street			
<ul style="list-style-type: none"> to carry through traffic. 				<ul style="list-style-type: none"> to provide local property access; to collect local traffic. 			
LEVEL 2: FUNCTION							
Arterial Road		Sub Arterial Road		Collector Street		Local Street	
<ul style="list-style-type: none"> through traffic movements between towns; longer distance strategic traffic movements; primary connection between town and employment, economic, education or entertainment centres; line haul public transport task; primary freight and dangerous goods routes; regional cycle movements. 		<ul style="list-style-type: none"> through traffic between arterial roads; connections between local areas and arterial roads; access to public transport; through movement of public transport; regional - local cycle movements. 		<ul style="list-style-type: none"> carry traffic having a trip end within the specific area; direct access to properties; access to public transport; local cycle movements. 		<ul style="list-style-type: none"> direct access to properties; pedestrian movements; local cycle movements. 	
LEVEL 3: MANAGEMENT							
Highway	Arterial	Traffic Distributor	Controlled Distributor	Major Collector	Minor Collector	Access Street	Access Place
<i>The aim of management policies for these categories will be to facilitate:-</i>							
<ul style="list-style-type: none"> longer distance traffic movements between towns; regionally and nationally significant movements. 	<ul style="list-style-type: none"> longer distance traffic movements between town and other centres. 	<ul style="list-style-type: none"> connection of local areas to arterial roads; through movements between arterial roads. 	not normally required	not normally required	<ul style="list-style-type: none"> connection of local streets with traffic carrying roads; access to individual adjacent properties. 	<ul style="list-style-type: none"> access to individual adjacent properties; connection to other local streets. 	<ul style="list-style-type: none"> access to individual adjacent properties.
LEVEL 4: DESIGN							
<ul style="list-style-type: none"> according to relevant guidelines and codes including Council Development Manual, AUSTRROADS Guides, Queensland Streets, Australian Standards. 							



Table B.1

Road Hierarchy Desirable Performance Criteria – Urban Areas

Criterion	Road						Street			
	Arterial Road			Sub Arterial Road			Collector Street		Local Street	
	Highway	Arterial	Arterial Main Street	Traffic Distributor	Controlled Distributor	Sub Arterial Main Street	Major Collector	Minor Collector	Access Street	Access Place
<i>Functional Characteristics</i>										
Dominant linkage	Regional	Metropolitan	Metropolitan/sites	Specific area	Specific area	Specific area/sites	Environmental cell	Environmental cell	Sites	Sites
Traffic carrying function	Volumes not restricted	Volumes not restricted	<20,000vpd	Volumes not restricted	<10,000vpd	<10,000vpd	<6,000vpd	<3,000vpd	<750vpd	<150vpd
Residential access function	Nil	Nil	Site specific	Nil desirable, accept consolidated	Accepted with conditions	Site specific	Consolidated	Individual	Individual	Individual
Commercial access function	Nil	Nil	Site specific	Consolidated	Consolidated	Site specific	Direct possible for large sites	Individual	Individual	Individual
Industrial access function	Nil	Nil	Nil	Site specific (large sites)	Site specific (large sites)	Site specific (large sites)	Direct possible for large sites	Individual	Individual	Individual
Traffic speed environment	>=100km/h	70-80km/h	40-50km/h	60-80km/h	May be controlled to 50-70km/h	40-50km/h	60km/h	50km/h	<=40km/h	<=25km/h
Heavy vehicle movement	Primary freight routes	Primary/secondary freight routes	Should bypass except for access	Secondary routes	Should bypass except for access	Should bypass except for access	Access only	Access only	Access only	Access only
Dangerous goods movement	Primary routes	Nominated routes only	Inappropriate except for access	Nominated routes only	Nominated routes only	Inappropriate except for access	Inappropriate except for access	Inappropriate except for access	Inappropriate except for access	Inappropriate except for access
Public transport facilities	Line haul, priority treatments	Line haul, priority treatments	Bus route	Bus route	Bus route	Bus route	Bus route	Bus route	Nil	Nil
Cycle facilities	Trunk Routes, off carriageway	Trunk Routes, off carriageway or cycle lanes on road	Trunk/District routes, cycle lanes on road	Trunk/District routes cycle lanes on road	Trunk/District routes cycle lanes on road	Trunk/District routes cycle lanes on road	District/Neighbourhood routes, cycle lanes on road	District/Neighbourhood routes, marked lanes not required	Neighbourhood routes, shared road space with cars	Neighbourhood routes, shared road space with cars
Pedestrian movement facilities	Only where linkage required, separate from road	Only where linkage required, pathways	Pathways both sides	Only where linkage required, pathways	Pathways both sides	Pathways both sides	Pathways both sides	Pathways both sides or as determined by master plan	Generally nil unless identified in master plan	Generally nil unless identified in master plan



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Table B.1 (continued)

Road Hierarchy Desirable Performance Criteria – Urban Areas

Criterion	Road						Street			
	Arterial Road			Sub Arterial Road			Collector Street		Local Street	
	Highway	Arterial	Arterial Main Street	Traffic Distributor	Controlled Distributor	Sub Arterial Main Street	Major Collector	Minor Collector	Access Street	Access Place
<i>Frictional Characteristics</i>										
Access Control	No access	No access	Selective access control	Selective access control	Selective access control	Selective access control	Selective access control	Individual sites	Individual sites	Individual sites
Parking Provision	Nil	Nil	Keep clear of through lanes	Nil	Keep clear of through lanes	Keep clear of through lanes	Generally nil	Kerbside	Generally no specific provision (dedicated bays where required)	Generally no specific provision (dedicated bays where required)
Bus stopping provision	None on road	Indented bays where appropriate	Indented bays where appropriate	Indented bays where appropriate	Indented bays where appropriate	Indented bays where appropriate	Indented bays where appropriate	Kerbside/ Indented bays where appropriate	No provision	No provision
Pedestrian crossings	Grade separated	Signalised	Controlled points	Controlled points	Controlled points	Controlled points	Some controlled points	Some controlled points	No specific provision	No specific provision
Intersection spacing	1-2km highway >=2km motorway	500-1000m	Site specific	300m	300m	Site specific	100m	60m	40m	Nil
Intersection treatments	Grade separated	Grade separated/ signal/roundabout	Signal/roundabout	Signal/roundabout /priority T	Signal/roundabout/ priority T	Signal/roundabout /priority T	Roundabout/ priority	Roundabout/ priority	Priority	Priority
Cross section	Volume driven, divided	Volume driven, could be divided	4 or 2 lanes, could be divided	Volume driven, could be divided	4 or 2 lanes, could be divided	Generally 2 lanes	2 lanes, could be divided	2 lanes	2 lanes	2 lanes
<i>Impact Characteristics</i>										
Abutting land use types	Non sensitive to traffic	Non sensitive, vehicle associated	Retail/ commercial	Non sensitive to traffic	Preferably non sensitive to traffic	Retail/ commercial	As specified under zoning	As specified under zoning	As specified under zoning	As specified under zoning
Land use impact amelioration	Barriers/buffers/ setbacks	Buffers/streetscaping/ setbacks	Streetscaping	Streetscaping/ setbacks	Streetscaping	Traffic management/ streetscaping	LATM/ streetscaping	LATM/ streetscaping	LATM/ streetscaping	LATM/streetscaping

* reduced carriageway width can be accepted in special circumstances



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Table B.2

Road Hierarchy Desirable Performance Criteria – Rural Areas

Criterion	Road				Street			
	Arterial Road		Sub Arterial Road		Collector Street		Local Street	
	Highway	Arterial	Traffic Distributor	Controlled Distributor (not normally required)	Major Collector (not normally required)	Minor Collector	Access Street	Access Place
<i>Functional Characteristics</i>								
Dominant linkage	Regional	Intra regional	Specific area	-	-	Local area	Sites	Sites
Traffic carrying function	Volumes not restricted	Volumes not restricted	Volumes not restricted typically 250 - 1,000vpd	-	-	Typically <250vpd	Typically < 250vpd	Typically < 100vpd
Residential access	Nil	Nil	Nil	-	-	Individual	Individual	Individual
Commercial access	Nil	Nil	Consolidated	-	-	Individual	Individual	Individual
Industrial access	Nil	Nil	Nil	-	-	Individual	Individual	Individual
Traffic speed	>=100km/h	80-100km/h	80-100km/h	-	-	Maximum 60km/h	Maximum 60km/h	Maximum 50km/h
Heavy traffic movement	Primary freight routes	Primary/secondary freight routes	Secondary routes	-	-	Access only	Access only	Access only
Dangerous goods movement	Primary routes	Primary/secondary routes	Nominated routes only	-	-	Inappropriate except for access	Inappropriate except for access	Inappropriate except for access
Public transport	Line haul, priority treatments	Line haul, priority treatments	Bus route	-	-	Bus route (if required)	Bus route (if required)	Nil
Cycle facilities (where required)	Regional, off carriageway	Regional, on or off carriageway	Regional/local, on or off carriageway	-	-	No specific provision	No specific provision	No specific provision
Pedestrian movement facilities	Where linkage required, separate from road	Where linkage required, separate from road	Where linkage required, separate from road	-	-	No specific provision	No specific provision	No specific provision
<i>Frictional Characteristics</i>								
Access control	No access	No access	Selective access control	-	-	Individual sites	Individual sites	Individual sites
Parking provision	Nil	Nil	Nil	-	-	No specific provision	No specific provision	No specific provision
Bus stopping provision	None on road	Dedicated bays where appropriate	Dedicated bays where appropriate	-	-	In carriageway	In carriageway	Nil
Pedestrian crossings	Grade separated	Controlled points	Controlled points	-	-	May require controlled points	No specific provision	No specific provision
Intersection spacing	4-8km (maximum 12km)	>1000m	>300m	-	-	>100m	>100m	Nil
Intersection treatments	Grade separated/ priority	Roundabout/ priority	Roundabout/ priority	-	-	Roundabout/ priority	Priority	Priority
Cross section	Volume driven	Volume driven	Volume driven	-	-	2 lanes	2 lanes	2 lanes
<i>Impact Characteristics</i>								
Abutting land use types	Non sensitive, vehicle associated	Non sensitive, vehicle associated	Non sensitive to traffic	-	-	-	-	-
Land use impact	Setbacks	Setbacks	Setbacks	-	-	Setbacks	Setbacks	Setbacks



Table C.1

Road Hierarchy Acceptable Solutions – Urban Areas

Criterion	Units	Road						Street			
		Arterial Road			Sub Arterial Road			Collector Street		Local Street	
		Highway	Arterial	Arterial Main Street	Traffic Distributor	Controlled Distributor	Sub Arterial Main Street	Major Collector	Minor Collector	Access Street	Access Place
Design speed	km/h	> = 100km/h	80km/h (min)	50km (max)	70km/h (min)	70km/h (max)	50km/h (max)	60km/h (max)	50km/h (max)	40km/h (max)	25km/h (max)
Reserve width	m	50m (min)	40m	site specific	30m	30m	site specific	24m	17.5m	15m	13.5m
Carriageway form	form	divided	could be divided	site specific	could be divided	could be divided	site specific	2 lanes (could be divided)	2 lanes	2 lanes	2 lanes
Through lane or carriageway width	m	3.5m	3.5m	site specific	3.5m	3.5m	site specific	3.5m	7.5m carriageway	6m carriageway *	5.5m carriageway *
Verge width	m	10m (min)	7.5m (min)	site specific	7.5m (min)	7.5m (min)	site specific	5.5m (min)	5.0m	4.5m	4.0m
Shoulder width	m	2.0m (min)	2.0m (min)	site specific	2.0m (min)	n/a	site specific	1.5m (min)	n/a	n/a	n/a
Median width	m	6m raised 10m depressed	6m raised 10m depressed	site specific	min. 2.0m (where provided)	3.0m (min)	site specific	min. 2.0 (where provided)	Nil	Nil	Nil
Kerb type	type	site specific	site specific	site specific	site specific	generally barrier kerb (subject to drainage)	site specific	generally barrier kerb (subject to drainage)	mountable kerb and channel	mountable kerb and channel	mountable kerb and channel
Off street path width (pedestrian/cycle)	m	shared path 2.5m (if provided)	shared path 2.5m	site specific	shared path 2.5m	pedestrian path 1.5m shared path 2.5m	site specific, generally full width	pedestrian path 1.5m shared path 2.5m (typical both sides)	pedestrian path 1.5m (typical both sides)	pedestrian path 1.5m if required	Nil
Bicycle lane width	m	n/a	2.5m	site specific	2.5m	2.5m (min)	site specific	2.5m (min)	incorporated in carriageway width	in carriageway	in carriageway
On street parking (width, indented)	m	Nil	Nil desirable	site specific	Nil desirable	2.5m (min)	site specific	Nil desirable	incorporated in carriageway width	in carriageway or indented	in carriageway or indented
Bus stop (width, indented)	m	Nil	clear of carriageway	site specific	clear of carriageway	clear of carriageway	site specific	indented	incorporated in carriageway width	Nil	Nil
Grade - longitudinal	%	5% (max)	5% (max)	site specific	6% (10% max)	6% (10% max)	site specific	10% (16% max)	16% max	16% max	16% max
Noise attenuation		barriers, buffers, landscaping	barriers, buffers, landscaping	site specific	barriers, buffers, landscaping	barriers, buffers, landscaping	site specific	barriers, buffers, landscaping	Nil	Nil	Nil
Appropriateness of LATM		not appropriate	not appropriate	appropriate	not appropriate	not appropriate	appropriate	not normally appropriate	acceptable	acceptable	acceptable

* reduced carriageway width can be accepted in special circumstances



Table C.2

Road Hierarchy Acceptable Solutions – Rural Areas

Criterion	Units	Road				Street			
		Arterial Road		Sub Arterial Road		Collector Street		Local Street	
		Highway	Arterial	Traffic Distributor	Controlled Distributor (not normally required)	Major Collector (not normally required)	Minor Collector	Access Street	Access Place
Design speed	km/h	>=100km/h	80-100km/h	80-100km/h	-	-	60km/h	60km/h	60km/h
Reserve width	m	50m (nominal)	30m	25m	-	-	20m	20m	20m
Carriageway form	form	2 lanes (min)	2 lanes	2 lanes	-	-	1 or 2 lanes	1 or 2 lanes	1 or 2 lanes
Through lane or carriageway width	m	3.5m	3.5m	3.0m	-	-	4.0m (single lane) or 6.0m (2 lanes)	6.0m (2 lanes, may be unsealed)	6.0m (2 lanes, may be unsealed)
Verge width	m	11.0m (min)	10.5m (min)	8.5m (min)	-	-	6.0m (min)	6.0m (min)	6.0m (min)
Shoulder width	m	2.0m	1.0m	1.0m	-	-	1.0m (min)	1.0m (min)	1.0m (min)
Median width	m	10m (if divided)	n/a	n/a	-	-	n/a	n/a	n/a
Kerb type	type	Nil	Nil	Nil	-	-	Nil	Nil	Nil
Off street path width (pedestrian/cycle)	m	not normally required	not normally required	not normally required	-	-	no provision	not required	not required
Bicycle lane width	m	not normally required	not normally required	not normally required	-	-	no provision	not required	not required
On street parking (width, indented)	m	Nil	Nil	Nil	-	-	no provision	not required	not required
Bus stop (width, indented)	m	none on road	dedicated bays where appropriate	dedicated bays where appropriate	-	-	in carriageway	in carriageway	no provision
Grade - longitudinal	%	3-5% (flat) 4-6% (rolling) 6-8% (mountainous)	3-6% (flat) 4-7% (rolling) 6-9% (mountainous)	3-6% (flat) 4-7% (rolling) 6-9% (mountainous)	-	-	0.3% min - 16% max	0.3% min - 16% max (20% absolute max)	0.3% min - 16% max (20% absolute max)
Noise attenuation		n/a	n/a	n/a	-	-	increase reserve and verge widths	increase reserve and verge widths	increase reserve and verge widths
Appropriateness of LATM		not appropriate	not appropriate	not appropriate	-	-	not appropriate	not appropriate	not appropriate